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P O Box 25171 Nairobi 00603 Kenya

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Concepts and Methods for Research and Management

Nairobi Kenya 8 –26 March 2004

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Urban Agriculture (inclusive of Peri-urban Agriculture) is a new area of knowledge. All the organisations leading the course are involved in developing such knowledge, exploring its dimensions and promoting awareness of and action on it at international, regional, and municipal levels. Developing an approach to training is part of this process.

Course outline and objectives

The course offers an outstanding opportunity for staff of development and local government organisations, as well as researchers and civil society organisations, to improve their understanding of Urban Agriculture (UA) in its various forms, and to prepare for effective participation in processes of multi-stakeholder policy development, research, action planning and implementation in the field of UA.

During the course, the teams from up to seven cities will:

- Discuss, develop, and evaluate proposals for action-research and intervention in UA.
- Deepen their knowledge on the concept and nature of different UA crop production and livestock systems.
- Gain a greater understanding of the role and impact of UA policies and practices related to other components of urban management and local sustainable development (including environmental management, solid and liquid waste management, health and land use planning).
- Improve their skills in understanding, assessing, sharing experiences and intervening locally in UA-related development and management issues.
- Participate in field visits within the Nairobi area.

There will be seven learning modules:

1. UA History, Concepts and Dynamics.
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Anglophone Africa Regional Training Course on Urban Agriculture
Nairobi, Kenya
8– 26 March, 2004

Module 1: UPA Concepts and Dynamics

Hand out 4 Case Study: History, dynamics and institutional and political aspects of urban agriculture in Yaoundé, Cameroon

Dr. A. Bopda, National Institute of Cartography, Cameroon

The development of the city of Yaoundé and changing farming systems

In 1890 the present area of the city of Yaoundé was characterised by small settlements at distances of 3-6 km (the hearing distance of a small tam-tam) and grouped in clan clusters at distances of 10-30 km (the hearing distance of a large war tam-tam). The large family households occupied relatively large areas and applied a system of nomadic slash-and-burn agriculture. Although the habitat was dispersed in pattern, the settlements were relatively dense.
In this period the agriculture dominates over the settlements.

In the period up to 1950, we see the gradual development of a two ring dense city centre separated by a "free zone":

- In the hart of the city, a centre formerly prohibited for blacks.
- Around this centre 'free-zones' were found. In fact, during the colonial days, the 'white' houses were to be at least 800 m separated from the 'black' houses. This distance was based on the action-radius of a mosquito which might transmit malaria from 'blacks' to 'whites'. On this basis the urban racial segregation was established from 1908 under the Germans and from 1923 until 1933 under the French administration. This was resumed in the planning principles decreed by the colonial urbanists in the fifties.
- On the other side of the 'free zone', this 'geographical mosquito net', were the first indigenous districts characterised by a high density, with the highest concentration near the 'gates' through which the blacks could 'enter' the (white) city.

Conditioned by the constraints of a hilly area and influenced by the dispersed pattern of the traditional settlements, urbanisation has long been confined to the initially European city centre and the surrounding indigenous districts where the density gradually increased up to over 320 inhabitants/ha.

In this period agriculture in this area was influenced by the introduction of modern cash crops like cacao and oil palm during the period between the two world wars and aquaculture was introduced in the forties which resulted in the following production pattern by the early fifties.

Table 1: Structure of the agricultural production at Yaoundé (*Djoungolo*) in the fifties

CROPS	PRODUCTION IN TONNES								
	Ha In 1957	**1950**	**1951**	**1952**	**1953**	**1954**	**1955**	**1956**	**1957**
Millet and sorghum									
Maize	322				601	550	600	720	750
Rice	13								10
Sugar cane	63				600	400	500	600	650
Groundnuts	2500				1915	1900	1010	2480	2520
Woandzu	3								2
Beans	29				6	5	6	7	10
Taros macabos	767				6595	6300	6600	7040	7800
Cassave	4695				59220	59000	59200	60000	60120
Sweet potatoe	37				674	650	680	720	740
Yam					422	500	530	560	580
Potato	7				25	20	20	10	7
Banana	401				6240	6000	6280	6780	6830
Pumpkin seeds	68				27	29	28	30	38
Sesame									
European vegetables	18								10
African vegetables	100								100
Cacao	13000ha	2000	2100	2130	2280	2700	3000	3575	3750
Coffee									
Palm oil			900	850	800	750	800	700	800
Palmistes			1800	1600	1500	1350	1200	1000	800

Source: Colonial administrative archives

At the end of the fifties, the city starts to grow rapidly in a radial way, occupying more and more agricultural land in the urban periphery, taking in, at first, the slopes of the hills (if not steep) and the hill-tops. The floodplains were only attacked much later, starting with those closets to the centre.
The administrative limits of the city are constantly enlarged to catch up with the urban spatial growth (for the development of 587 ha of urban zone, 650 ha have been relocated between 1970 and 1990). The city apparently becomes dominant over the surrounding agricultural area *(city without borders*).

The population has been growing with 6 to 9 % a year and its spatial growth has been on average 5.6 % per year for the last 50 years. This population explosion is caused by:

a. Immigration from all corners of Cameroon and other countries. The indigenous Yaoundé people constituted 80 % of the population in 1960; today they represent about 20 %.

b. The demographic explosion Almost 40 % of the Yaoundé citizens are born in this metropolis.

In the last three decennia, two new circles of districts have been formed around the old city centre and the surrounding first ring of indigenous housing:

- The first one dates from the period in which the overpopulated first ring was restructured (indigenous housing being replaced by modern “white” city centre buildings).

- The second one has arisen with the sprawl of the city into the rural areas within a radius of 4 km of the town-centre, replacing the original villages in this area. This process also may be called "*de-autochthonisation'* of the city centre.

Around this outer ring are located the remaining original villages, often considered as reserves for further urban expansion of the city.
With an extension of almost 24 km from north to south, a length of around 16 km from east to west, the city of Yaoundé has become a department of nearly 300 km².

Due to the urbanisation process we see that again important changes take place in the agricultural systems in and around Yaoundé:

- A decline in cash crop production not only in surface occupied but especially in % of revenues generated (although cacao and the oil palm still occupy 51 % of the surface, these crops only represent now only 5 % of the revenues generated in UA).
- Growth of market gardening of vegetables, food crops and fruits. These crops now each have an equal contribution to the revenues of urban agriculture, with a slight domination of the food crops that holds 38, 2 % of the financial income of urban agriculture.

Table 2: Production structure of urban agriculture in/around Yaoundé (*Mfoundi*) in 1998

		Hectare (ha)	**Ton (t)**	**(ha)**	**(t)**	**Price/ Kilo***	**% surface**	**yield (in Millions F cfa)**	**% F Cfa**
Cacao (extensive)				733	72	300	50,7	22	
Oil palm				27	40	150	1,9	6	5,4
Vegetables	**of which**			**94**	**196**		**6,5**	**145**	**28,4**
	tomato	13	59			480		28	
	chilli pepper	12	28			900			25
	Celery Persil	11	4			1100		5	
	various	58	105			827		87	
Food crops	**of which**			**472**	**1495**		**33**	**195**	**38,2**
	maize			119	142	200	8,2	28	
	groundnut			31	10	309	2,1	3	
	cassava			139	463	190	9,6	88	
	Macabo yam			92	156	80	6,4	12	
	Banana (plantain)			77	724	87	5,3	63	
	various			14			1,0		
Fruits	**of which**			**120**	**647**		**8,3**	**143**	**28,0**
	mangoes	49	180		189	150		27	
	pineapple	22	195		316	200		39	
	safou	15	24		24	400		10	
	guava	13	60		60	300		18	
	various		188			263		49	
TOTAL				**1445**	**3039**		**100**	**511**	**100**

Source: Consumers price (DSCN 1998, Temple Dury 2003).

While urban agriculture has transformed itself, it has not disappeared from the city.

Contrary to what most city managers believe, urban agriculture did not dwindle away with continued growth of the city. Urban agriculture appears to grow with the growing city (although its percentage of the active population is diminishing)!

Table 3. Evolution of actives and agricultural plots in Yaoundé

Year	Active population	Number of persons engaged only in agriculture or livestock breeding	% of active population specialised in agriculture or livestock breeding	% of plots for agriculture or livestock breeding	Average age of actives in agriculture or livestock breeding
1957	*3721*	*653*	*18*	*99*	*35-39*
1964	*31077*	*3571*	*11*	*95*	
1976	*86909*	*1985*	*2*	*90*	*20-29 & 30-39*
1983	*106000*	*2500*	*2*	*88*	
1997	*275000*	*5500*	*2*	*85*	

Agriculture in and around the city today

Urban agriculture is present in the city as livestock breeding, small poultry farms in particular, which we can find in all districts of the city. They are sometimes mixed with the houses, other times placed at the border of the inhabited area.
Vegetable gardens have developed in the lower parts of the city.

UA is even present in the centre of town where decorative horticulture has a place of its own. Florists cultivate the borders of the Boulevard du 20 Mai in the centre of town. The main roads are planted with ornamental trees that provide shade.

We can still find mango, palm and papaya trees and even cacao bushes in the dense sub-centre districts. They are evidence of a planters' past, stretching out from 1.5 to 3 km from the town-centre.

In the first circle at about 2.5 to 4.5 km, maize and groundnut are planted almost religiously on the still empty plots awaiting projects or construction of houses.
Also in the second outer circle at 4 to 8 km, every vacant plot is almost immediately cultivated. When people buy a piece of land here they immediately start growing crops. This permits to have an immediate benefit from the piece of land and it marks the private appropriation of the plot.

In the autochthon villages, located at 5.5 to 25 km from the town-centre, the land is traditionally used for food and cash crops, such as cacao. Agriculture and small and large scale livestock breeding remain a popular use in an area where the town influence will be more and more noticed. Town-people will acquire land for agricultural purposes to satisfy the city-based consumers.

The markets in the city are primarily markets for agricultural goods. It is here that the producers, from within and around the city, come to sell their produce. The more recently established markets in Yaoundé are more concentrated on vegetables and fresh produce. Especially the markets in the periphery of the city are focussing on agricultural products.

Table 4. Differentiation of the markets at Yaoundé according to the distance to the centre

Urban zone type	Distance from district to centre (in km)	Number of markets		Type of market	
		« Formal »	« informal »	% of selling points of agricultural goods	% of selling points of non-agr. goods
Central zone	0-1	3	0	20-50	50-80
Urban zone	1-3	11	8	40	60
Sub-urban zone	3-7	5	3	90	10
Peri-urban zone	7-40	7	0	90	10
Hinterland	40-100	16	0	70	30

Actual urban planning of Yaoundé and urban agriculture

An urban master plan (Schéma Directeur d'Aménagement et d'Urbanisme or SDAU) was made in 1980 and a new SDAU is being elaborated.
The map of the current SDAU of Yaoundé gives an idea of the degree of consideration given to agriculture in the urban planning of Yaoundé: virtual none.
Urban planners in general see agriculture as non compatible with the city.

Agriculture and urban planning at Yaoundé have been playing hide-and-seek for a century. From the official side:

- No explicit consideration for the agriculture-related activities in the plans other than as 'green areas' rather than as a productive activity. Naming agriculture in this way reflects not how urban agriculture is, but how 'they' would like it to be.
- Unofficial consideration, by tolerating it and often understanding between the authorities and the population of UA as a source of income for the poor and a social stabiliser.

Livestock breeding has been restrained since the 1st of October 1937 with general rules and regulations concerning hygiene and public health. This Cameroonian law, under French mandate (J.O.C., 1937, p.860), states (Article 13): "Breeding of pigs, sheep, goats, cattle, or wild animals in captivity is forbidden within the city limits.
Breeding of ducks, turkeys, or fowl is sustained under the condition that the housing is approved by the hygiene service and that the birds will not roam about on the public roads and in the neighbours' courtyard".

The young and qualified urban elite dreams of a 'clean' urban area and have sought to abandon agriculture from the build up city. Whereas the urban poor and unemployed constantly seek the non-developed urban plots ('areas in-between-ownership'; "green areas") for their agricultural activities (food crops as well as ornamentals, trees and herbs), have the Municipality and land owners constantly sought to exclude the urban farmers from the centre of the built up city (for example by creation of an eucalyptus plantation on a free space in order to abandon the (in their eyes unhealthy and unaesthetical) urban-agricultural activities by the poor.

From the side of the urban population:

- Urban agriculture is practiced as a spontaneous, customary and quasi-religious practice, a constant dimension in all households. This not only by the urban poor seeking to make a living, but also by administrators and city-politicians as a commercial activity (and who this way they experience daily the tensions that they have created or maintain concerning urban agriculture).
- However this agricultural practice has an unglamorous image, as it is connected to a certain level of social and moral misery, the world of the slaves and the subordinates who accept the endurance of working on the land, the rural world

with its “bent down” work from which they sought to escape through migration to the city and seeking access to ‘standing-up’ or even the ‘seated’ work of the white collars and other commanding and bureaucratic posts.

A certain ambiguity marks the visions from the opposing sides; however they do not seem to stand so far apart. The same minister, the same major or the same officers, who order the maize and the macabo to be cut, have some chickens and a small plot of tomatoes and salad! Even their mothers and grandmothers break their backs everyday cultivating every free spot.

Several decennia after the colonial era, numerous plans, based on external ideas, have been imposed. However none of the suggestions on urban planning and management have been really integrated.

An agricultural policy is substantially missing. The input is often brought by international donors who, themselves, do not have a clear international or global agricultural policy. Even the recently upcoming environmentalists do not seem to have a clear view on their relation to agriculture, and even less to agriculture and urbanisation. And this seems odd in a time where it is believed that the world is coming to total urbanisation.

These last years, urban and sub-urban agriculture has imposed itself with forced. As a consequence of the so-called ‘economic’ crisis which has struck the African states heavily, the authorities at different levels have found themselves incapable to assure, since the mid-eighties, the benefits and an adequate purchasing power for the population of the cities and the Cameroonian countryside. On the contrary, under the pressure of the IMF, they have been forced to engage themselves in a series of measurements which are recognised today as the cause of the poverty and misery:

- Diminishing the benefits of farmers
- A stop on agricultural subsidies
- To freeze rural development programmes
- Cutting down civil servants’ salaries
- Increase of unemployment in the city
- Destruction of the dream of the social mobility chain based on the trilogy ‘plantations(cash crops)-schooling-integration into the civil service or other salaried employment’

In this situation, the state or, more exactly, the ‘more-developed’ members of the society who manage the state, have rediscovered the virtues of urban agriculture and see themselves forced to recognize rights to certain activities which had been disputed for ages. It is often when facing social ‘explosions’ and at the price of, sometimes bloody, confrontations, that the withdrawal of the repression of informal activities can be noted (with its ups and downs).

Thanks to agriculture, a minimal supply is assured, even during the tragic fall of the purchasing power. The people have thus discovered how much agricultural activities can protect the city and the country when social peace is threatened. It is a comfortable means of embezzlement of the social-political frustration that hatches under the increase of poverty and misery in the country and especially in the cities.

But does it always need a crisis to make a shift to legality for urban agriculture? And does inequality always have to make the bed for illegality, while the legitimacy of the right to decent conditions of life is recognised worldwide as a plausible fundament of social control and good governance?

How should one operate to bring about an attitude change regarding urban agriculture? How to enhance the respect vis-à-vis urban agriculture without creating a malicious or blinding fetish which will prohibit a good integration of the other fundamental dimensions of urban reality and development? How can we sensibly integrate agriculture in the management of urban development?

Conflicts and negotiation

Yaoundé brings physically closer people and goods, but there remain numerous issues of social integration and identity. The splitting up of the *Mfoundi* Division into 6 *sous-préfectures*, serving as basis for 6 urban councils, has not been an effective means of decentralization.
The elites serve to build public space out of the public domain, but fail to address the situation of the majority. Continuous tensions lead to social negotiation. Sporadic conflicts in the capital of Cameroon have time and again punctuated the relationships between inhabitants of diverse origins.
Urban and peri-urban agricultural activity in Yaoundé is ubiquitous, pops up spontaneously everywhere, and happens without supervision. It is a virtual front line where the 'rural' meets the 'urban' all the way from the farmed plot to the city quarter or the market. It is a meeting point around food security, where the nutritional requirements of citizens call out for production capacities of rural people while at the same time the food production of rural people gives rise to commercial activities of city-dwellers. However, the relationship between the two parties is not always idyllic, but rather haunted by violence:

- Violence of unequal relationships between urban and rural people, which the former do not hesitate to exploit for they are richer, better educated, and have greater decision-making power;
- Violence of rural people, who, having recourse to occult practices in the realm of mental security, do not hesitate to defraud worried city-dwellers, lost in the urban jungle.

Conflicts of legitimacy and indecision by legislators cause an uncertain environment. This leads to confusion in the question of the relationship between city and agriculture. However, a calm approach imposes itself more and more. Innovation is inevitable.

The challenge is to create for future generations an authentic African city. Amongst the terms of the needed social re-negotiation, UA stands out as a hopeful undertaking, where the good will of the elites and the ingenuity of the urban poor can combine.

UA presents itself as a vast working program for present or future institutional actors, because it is usually a spontaneous activity, with or without proper training, across Yaoundé's agglomeration, as in other Third World countries.
The possibilities for reinforcement of institutional capacity in UPA and its environment are numerous and sometimes urgent, be they in terms of promoting food production or employment of the urban poor; encouraging leisure activities that are spontaneously adopted; in defence of an urban environment, which is greener, richer in oxygen, more protected against land slides; or development of bush land in inland valleys.

The aspects of land tenure and property rights deserve special attention, because these are sensitive issues that are most often put forward. In addition, UPA activities lead to multiple conflicts in these last years. The facts once established, it is

important to understand how these conflicts come about, how they are managed, and what their consequences are.

The development of a new concept needs the involvement of a variety of actors and improvement of the relations between agriculture, livestock breeding and the city. It involves strengthening of skills and capacities of all actors (including the urban planners as well as the civil societies) and their involvement in processes of participatory planning and negotiation.

Conclusions

The history of agriculture in Yaoundé is marked by the colonial encounter between the Europeans and the Africans at the end of the 19th century. But also, a history marked by social and political changes within the indigenous societies.

Urban agriculture is rejected by an urbanism of which the logic is not inspired by the reality but by imported principles.
The history of urban agriculture in Yaoundé is one a culturally assimilated activity which survives despite the fact that the dominant actors don't recognise its place.

All in all, urban agriculture is a true construction site where social, political and economical negotiations take place between the powerful and the poor and between the traditions and the modernity of Africa.

EXERCICE:

1- Where has this picture been taken?

2- What can one see on this picture?
- **In detail?**
- **Globally?**

A – In detail we can observe

1- On the first level: infrastructures/networks

a) The elements of a modern road indicating the road network:

- a tarmac road
- a gutter
- a pavement
- a lantern
- the grass planted verges

b) The lantern is installed on a lamppost connected to a cable from the electrical network.

c) The drainage network:

- A waterway embracing a small island downstream
- The floodplains, in which the small island, overgrown by shrubs
- Plots which are covered by shrubs and small maize plants recognisable by their distinctive olive-green colour.
- A man working on the plot with shrubs.

2- On the second level: the 'green'

a) A heterogeneous section of greenery, comprising of:

- Sown plots with flowering maize, in the front fresh maize and in the back much dryer maize (yellowed leaves).
- A eucalyptus plantation that is in competition for space with the maize.

b) Some housing coming up out of the valley seems to be equally in competition for space with the maize and the eucalyptuses on the right of the picture.

3- On the third level: the sky, modern buildings and housing

a) On the left, on the slope, a storey building

b) In the middle, a impressing modern building which blocks the valley

c) On the right, covering the opposite hillside, houses which are partly hidden by the tops of the eucalyptuses.

4- Apart from the actual details: the history of urban confrontation hints at:

a) *Segregation between colonial Europeans and the indigenous populations:* The valley is a part of the old colonial « Freie Zone », separating the city of the Europeans and that of the Africans according to the urban colonial segregation.

b) *Post-colonial exclusion of the habitat of the poor:* The indigenous houses, which can be seen on the right of the picture, are set up at the peripheries of the City-centre during the colonial period, which have been 'swallowed' during the urbanisation from 1960 until 1999.

c) *Marginalisation and exclusion of the activities of the middleclass at the centre of the built up area:* The eucalyptus plantation has been created by the municipality to occupy the space, in this manner clearing and at the same time fighting against the expansion of the unhealthy and anaesthetically habitat and the urban-agricultural activities of the poor.

d) *'De-autochthonisation' and 'de-ruralisation'* On the whole, as well as the in the placing of the elements, the current occupation of the area will damage the rural indigenous land-use where agriculture predominates. But the agricultural activities will still haunt the city, even in its centre.

B – Globally, the picture offers a panorama of Yaoundé City-centre and its surroundings.

Agriculture seems to be a predominate factor in the capitals centre. Is this true? How has it come so far?

In the beginning, it was a traditional space marked by rural agriculture.

The next table gives some major characteristics, which ones?

Table … : Structure of the agricultural production at Yaoundé (***Djoungolo***) in the fifties

CULTURES	PRODUCTION IN TONNES								
	NB_Ha In 1957	1950	1951	1952	1953	1954	1955	1956	1957
MILLET AND SORGHUMS									
MAIZE	322				601	550	600	720	750
RICE	13								10
SUGAR CANE	63				600	400	500	600	650
GROUNDNUTS	2500				1915	1900	1010	2480	2520
WOANDZOU	3								2
BEANS	29				6	5	6	7	10
TAROS MACABOS	767				6595	6300	6600	7040	7800
CASSAVE	4695				59220	59000	59200	60000	60120
SWEET POTATO	37				674	650	680	720	740
YAM					422	500	530	560	580
POTATO	7				25	20	20	10	7
BANANA	401				6240	6000	6280	6780	6830
PUMPKIN SEEDS	68				27	29	28	30	38
SESAME									
EUROPEAN VEGETABLES	18								10
AFRICAN VEGETABLES	100								100
CACAO	13000ha	2000	2100	2130	2280	2700	3000	3575	3750
COFFEE									
PALM OIL			900	850	800	750	800	700	800
PALMISTES			1800	1600	1500	1350	1200	1000	800

Source: Colonial administrative archives

A surprising stability of the structure translates a perseverance of an all-rural and all-traditional world. Nevertheless, this world has already been marked by modernity with the up come of cash crops like cacao, as well as the presence of European vegetables introduced since the beginning of the colonial period. Finally, the administrative boundaries of the city entail the subdivision between the Djoungolo, illustrating the weakness of an urban character of a ***town without autonomy***. The townsman as the villager stays briefly, conditionally, deliberate, and is always in action. ***The superstructure is far ahead of the infrastructure and the structure.***

With the city agriculture has transformed itself, it has not disappeared.
The next table, in the first place, gives an idea of the noticed changes in agriculture as a result of the rise of the city. Which are they?

Table … : Production structure of the AUPU of Yaoundé (***Mfoundi***) in 1998

		Hectare (ha)	**Ton (t)**	**(ha)**	**(t)**	**Price/ Kilo***	**% surface**	**yield (in Millions F cfa)**	**% F Cfa**
Cacao (extensive)				733	72	300	50,7	22	
Oil palm				27	40	150	1,9	6	5,4
Vegetables	**of which**			**94**	**196**		**6,5**	**145**	**28,4**
	tomato	13	59			480		28	
	chilli pepper	12	28			900			25
	Celery Persil	11	4			1100		5	
	various	58	105			827		87	
Food crops	**of which**			**472**	**1495**		**33**	**195**	**38,2**
	maize			119	142	200	8,2	28	
	groundnut			31	10	309	2,1	3	
	cassava			139	463	190	9,6	88	
	Macabo yam			92	156	80	6,4	12	
	Banana (plantain)			77	724	87	5,3	63	
	various			14			1,0		
Fruits	**of which**			**120**	**647**		**8,3**	**143**	**28,0**
	mangoes	49	180		189	150		27	
	pineapple	22	195		316	200		39	
	safou	15	24		24	400		10	
	guava	13	60		60	300		18	
	various		188			263		49	
TOTAL				**1445**	**3039**		**100**	**511**	**100**

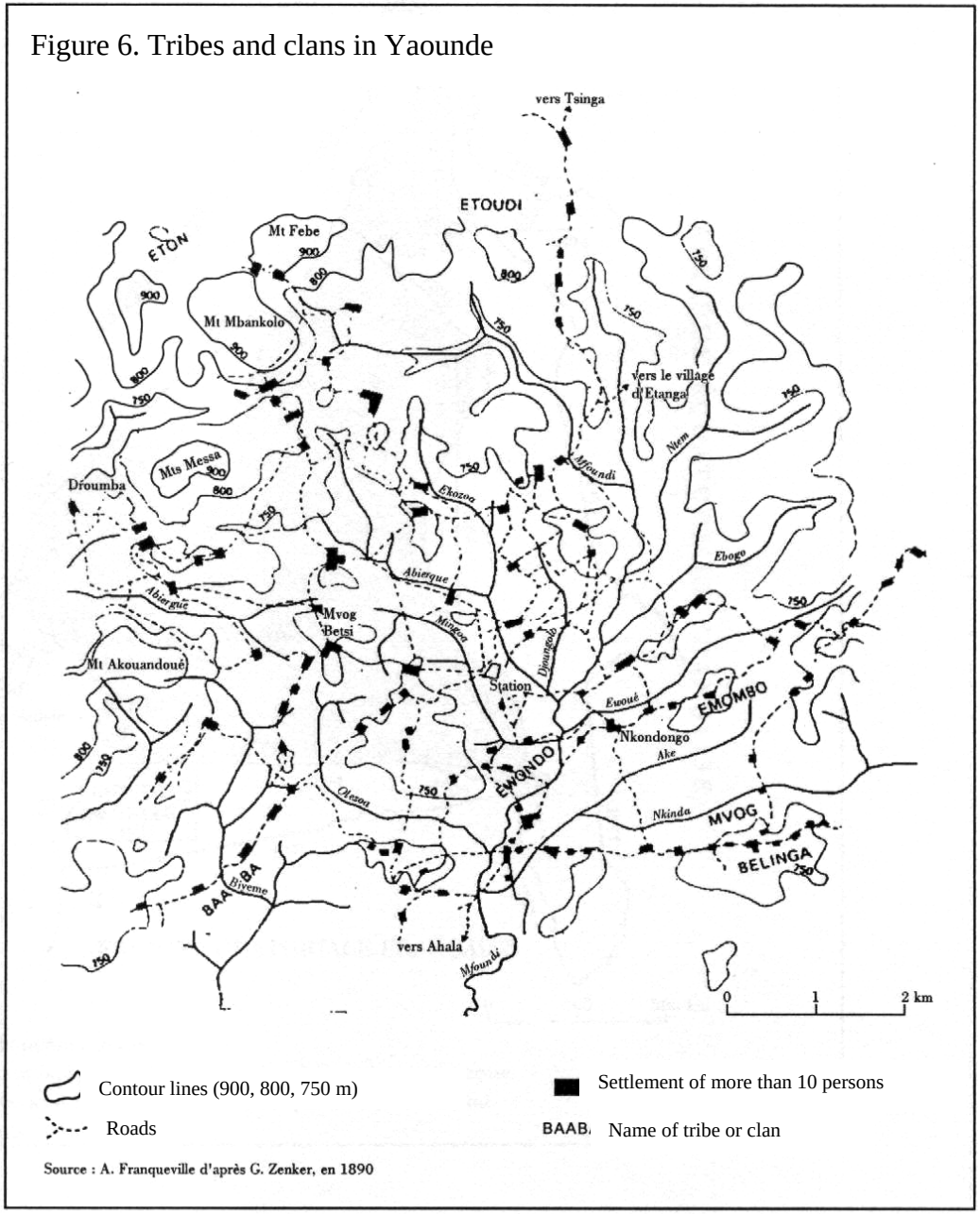
Consumers price (DSCN 1998, Temple Dury 2003).

Urbanisation causes a decline in cash crop production. Although it still occupies 51 % of the surface, the cacao and the oil palm only represent 5 % of the revenues. In percentages, market gardening, food crops and fruits have an equal charge in the revenues of the AUPU, with a slight domination of the food crops that holds 38,2 % of the financial income of the AUPU.

Over a period, everything has changed or almost in intensity or in quantity. **How? Why?**

Behind the mutations in agriculture plays a whole change in the occupation of the space.
The next figure shows the occupation of the space seen in a traditional way; how can it be observed?

Figure 6. Tribes and clans in Yaounde



The entwined native and rural land in 1890 presents a habitat which was at the same time dispersed and relatively dense, taking into account its forestry environment. The area is systematically divided by the diamond shaped settlements. They are placed at the hearing distance of a small tam-tam from one another, which is about 3 to 6 km. Related clans are then situated at hearing distance of a large war tam-tam, which comes to 10 to 30 km. These distances also give the average area occupied by a large family using the system of nomadic slash-and-burn agriculture (see photo…).

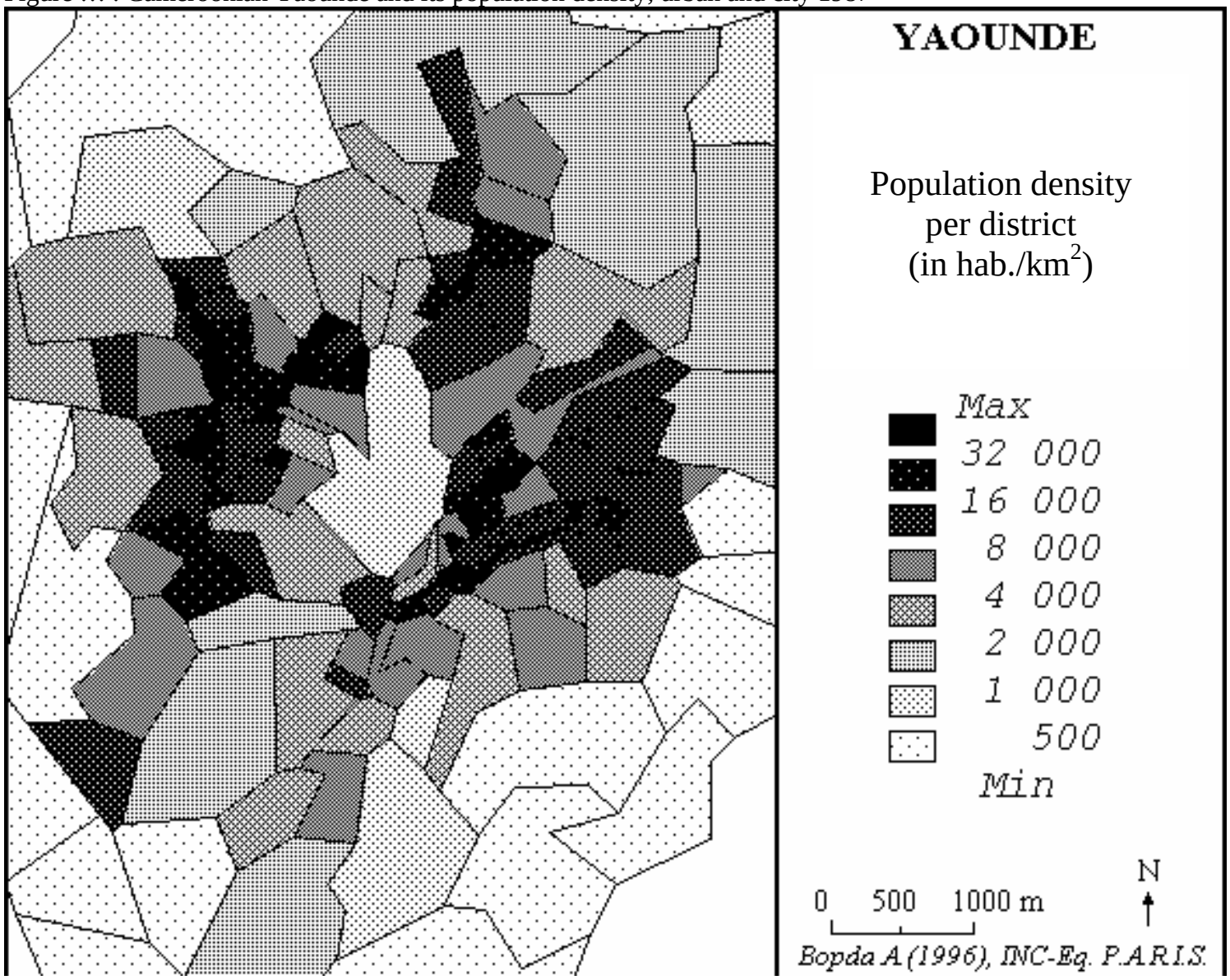
With the irruption of the city, the tree-forest has been replaced by a ‘house-forest’.

(See photo … next)

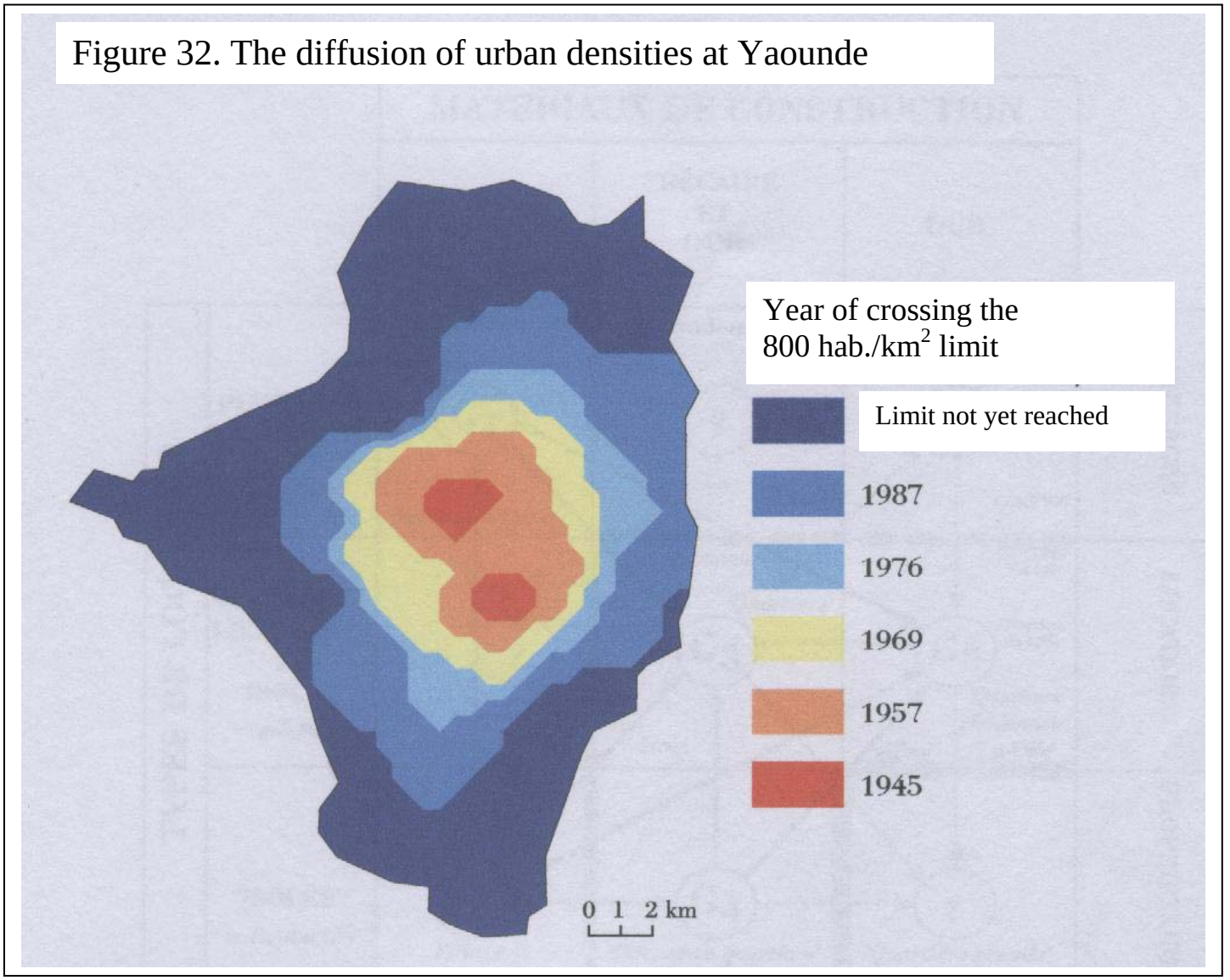
The city is the empire of high densities.

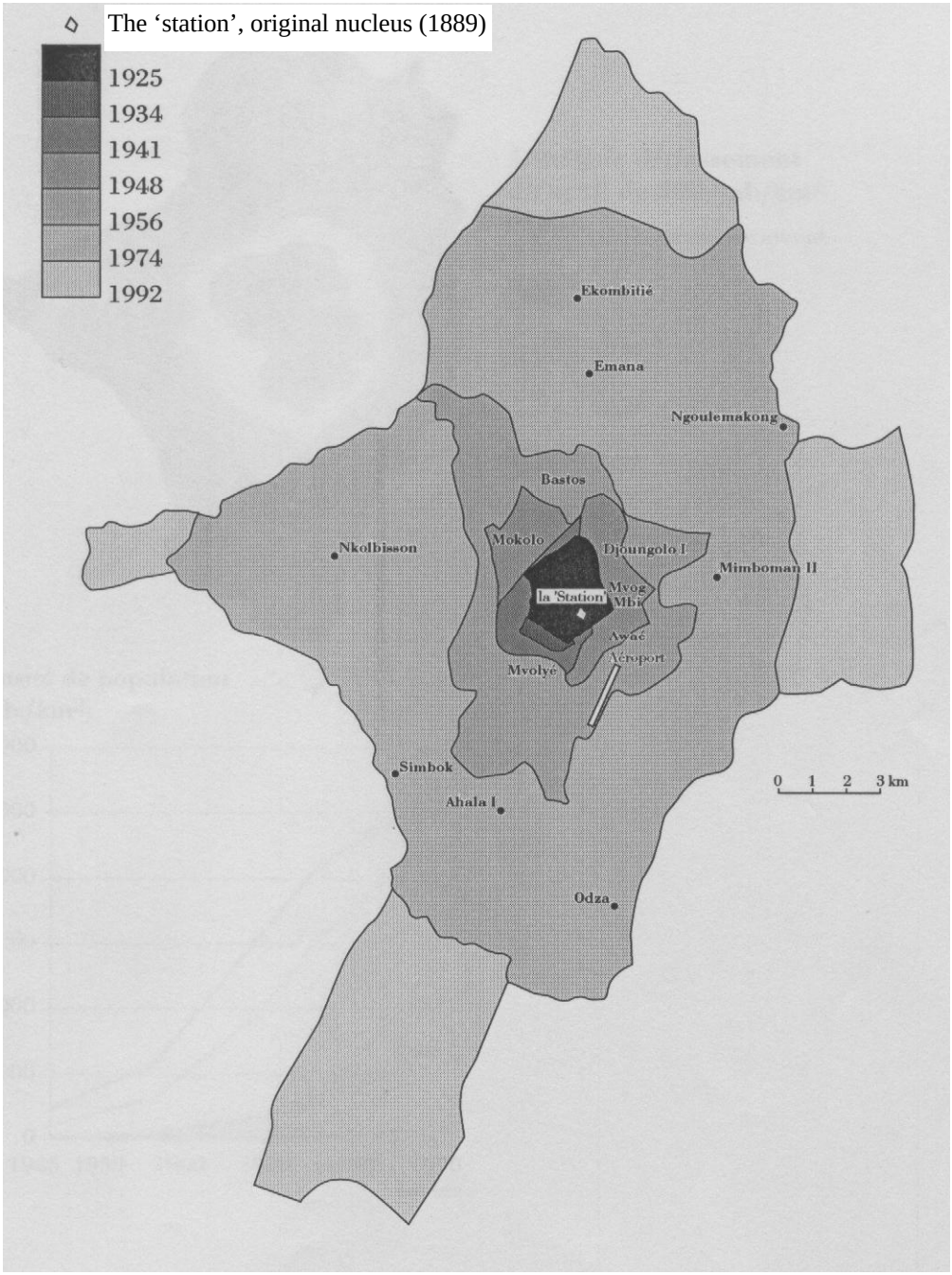
The next figure shows an illustration. What can you observe?

Figure … : Cameroonian Yaoundé and its population density, urban and city 1987



The current situation is the result of a classical spatial evolution of which the following map gives an illustration, which one?




The 'station', original nucleus (1889)
1925
1934
1941
1948
1956
1974
1992
Ekombitié
Emana
Ngoulemakong
Bastos
Mokolo
Djoungolo I
Nkolbisson
Mimboman II
Mvog
la 'Station'
Mbi
Awaé
Aéroport
Mvolyé
Simbok
Ahala I
Odza
0 1 2 3 km

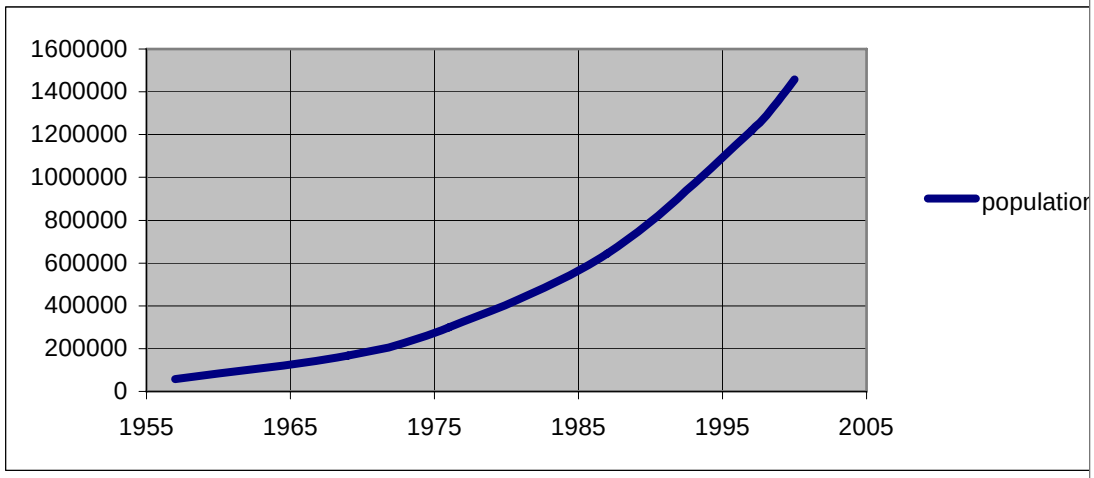
Two phases can be clearly identified. Before 1950, the occupation of the area created two dense centres. At the end of the fifties, the city continues to spread towards the rural periphery. The urban area occupies the rural area and its agricultural grounds seem to repel irresistibly. The administrative limits are constantly enlarged to catch up with the urban spatial growth.

What can explain these dynamics?

Two major factors explain this evolution to a triumphant city, rising non-stop:

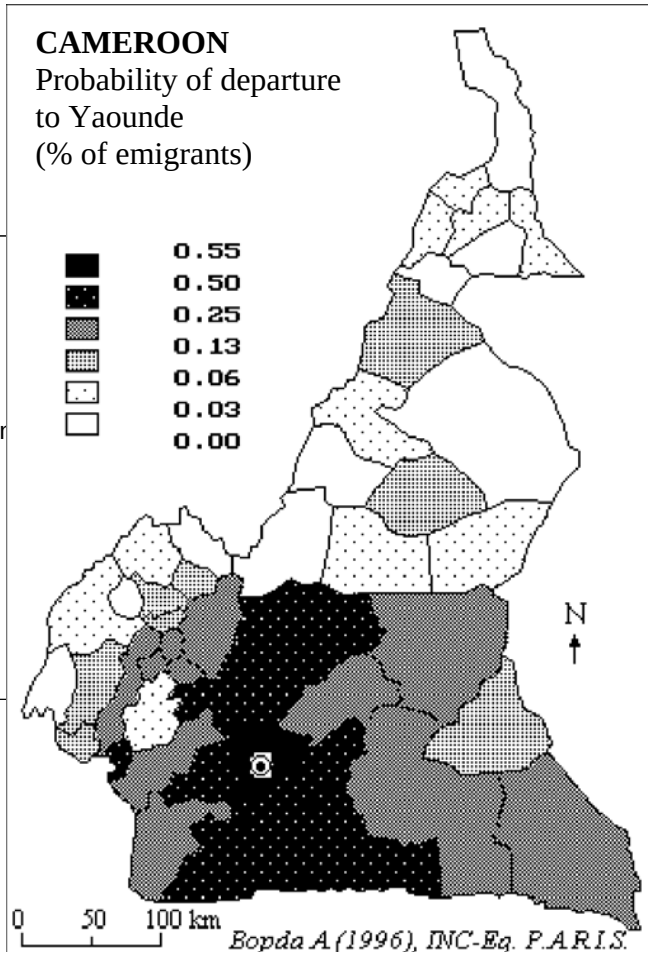
- *The demographic explosion:*

Figure … : Demographic explosion at Yaoundé



- *The migration to the capital city:*

It provides the energy of its apparent hegemony to the surrounding rural area, to the dynamics of a **city without borders**.

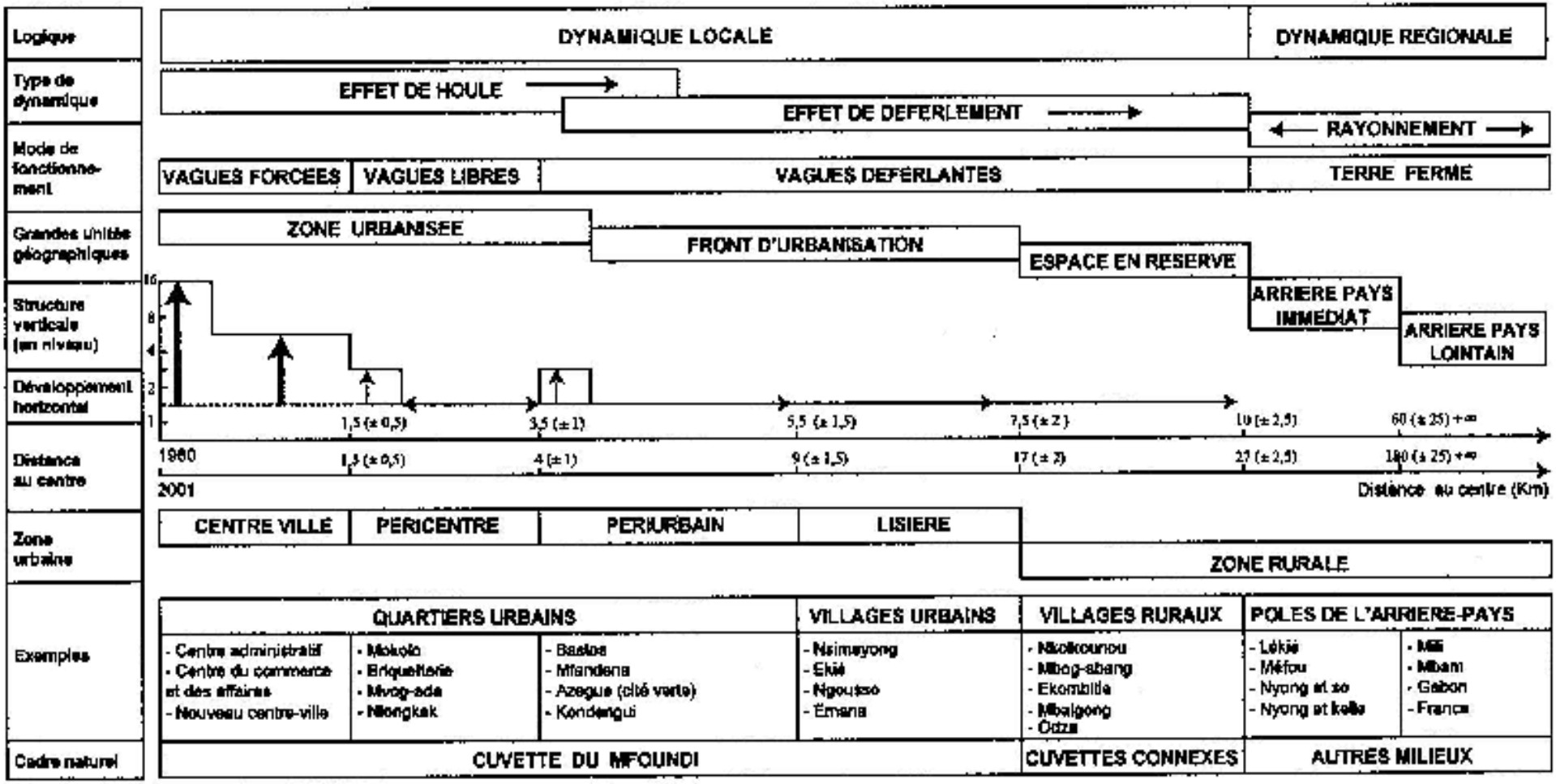


Emigration is the engine behind the demographic explosion of Yaoundé. People come from the whole of Cameroon, from the closest zones and amongst the latest the densest zones, which are globally the most touched.

The AUPU at the hart of the urban problems, urban regulations and its managerial difficulties of an expanding city of today

With an extension of almost 24 km from north to south, a length of around 16 km from east to west, an urban centre and rural surroundings, the city of Yaoundé has become a department of nearly 300 km². Decade after decade the administrators had to push the city limits in order to have correct measurers. But the reality shows a similar structure of concentric circles which have only become more in number and enlarged. (See figure…)

Figure …: The structure of the urban expansion of Yaoundé



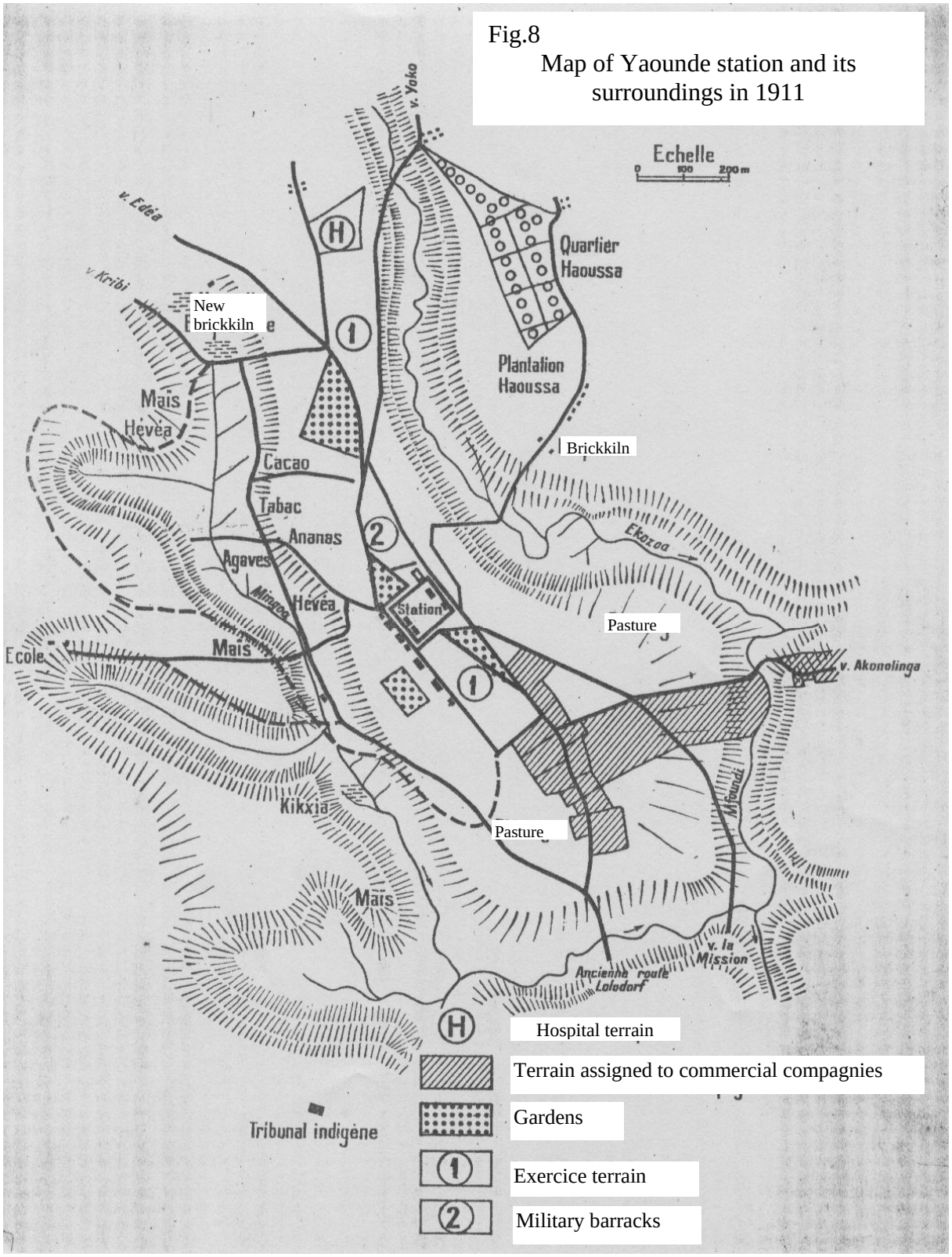
A. Bopda and J. Awono : Institutional aspects of the AUPU at Yaoundé/ august 2003

Agriculture and 'ruralness', does it really disappears with the arrival of the city?

Exercice:

Three cards have given you elements of appreciation. Which conclusion can you draw? Justify your opinion.

Figure … : Map of Yaoundé station in 1911



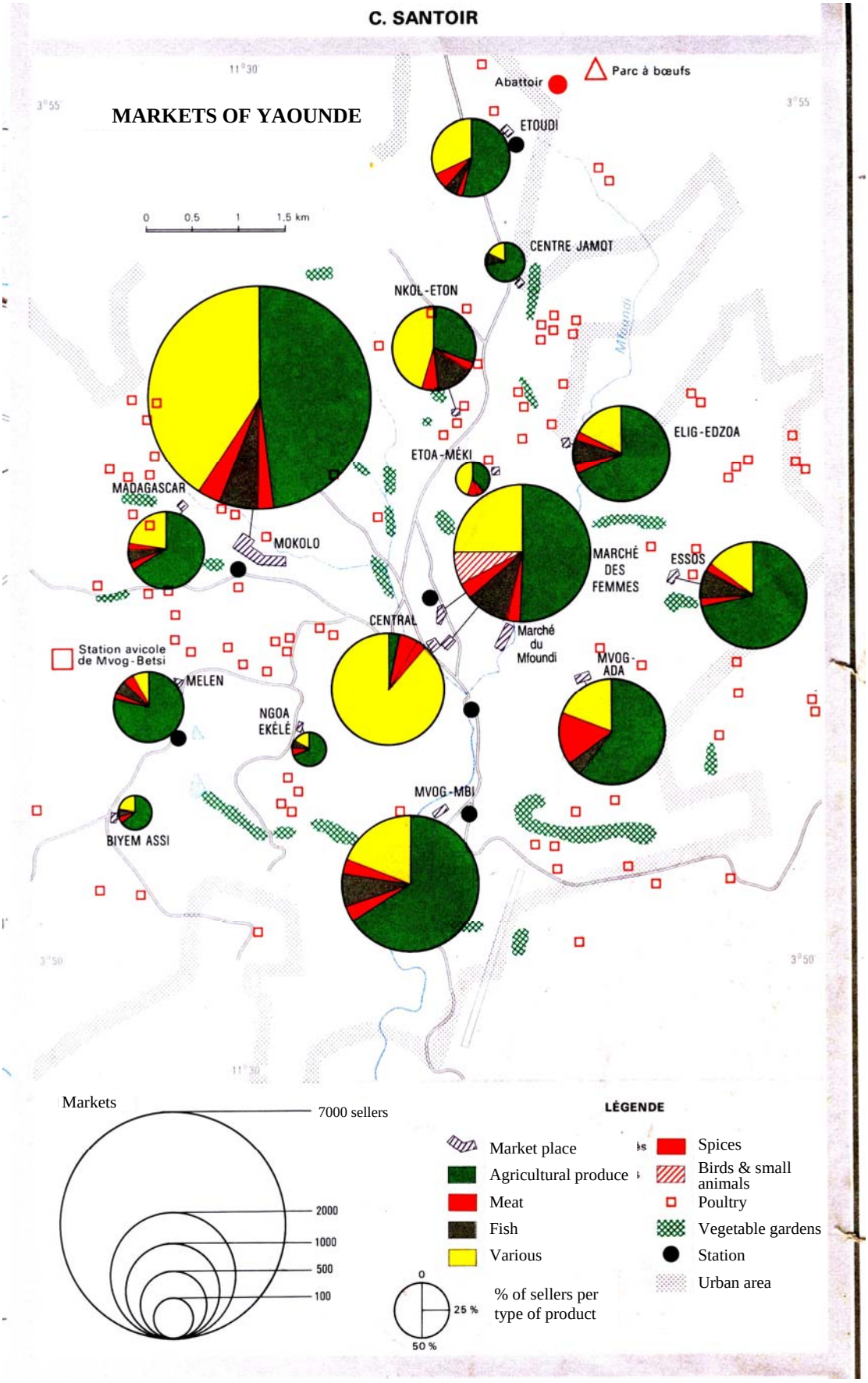
By A. Franqueville

COMMENTS

Agriculture is in the ‘urban shoot’. The colonial city has to feed itself. The soldiers of the military station are trained in this and manage to cover a large part of their needs.

A point often forgotten is that the successful introduction of ‘new’ crops in the german colonial station has been the base for the diffusion of the current cash crops. We have seen their place in the production table of the fifties.

Figure … : Agriculture and its urban markets in Yaoundé in 1986



COMMENTS

Agriculture can be found in the city in the lower parts where vegetable gardens have been developed. It is even present in the centre of town where decorative horticulture from now on has a place of its own.

Photo … : Horticulture hemming the roads in the centre of Yaoundé : 20 May Boulevard

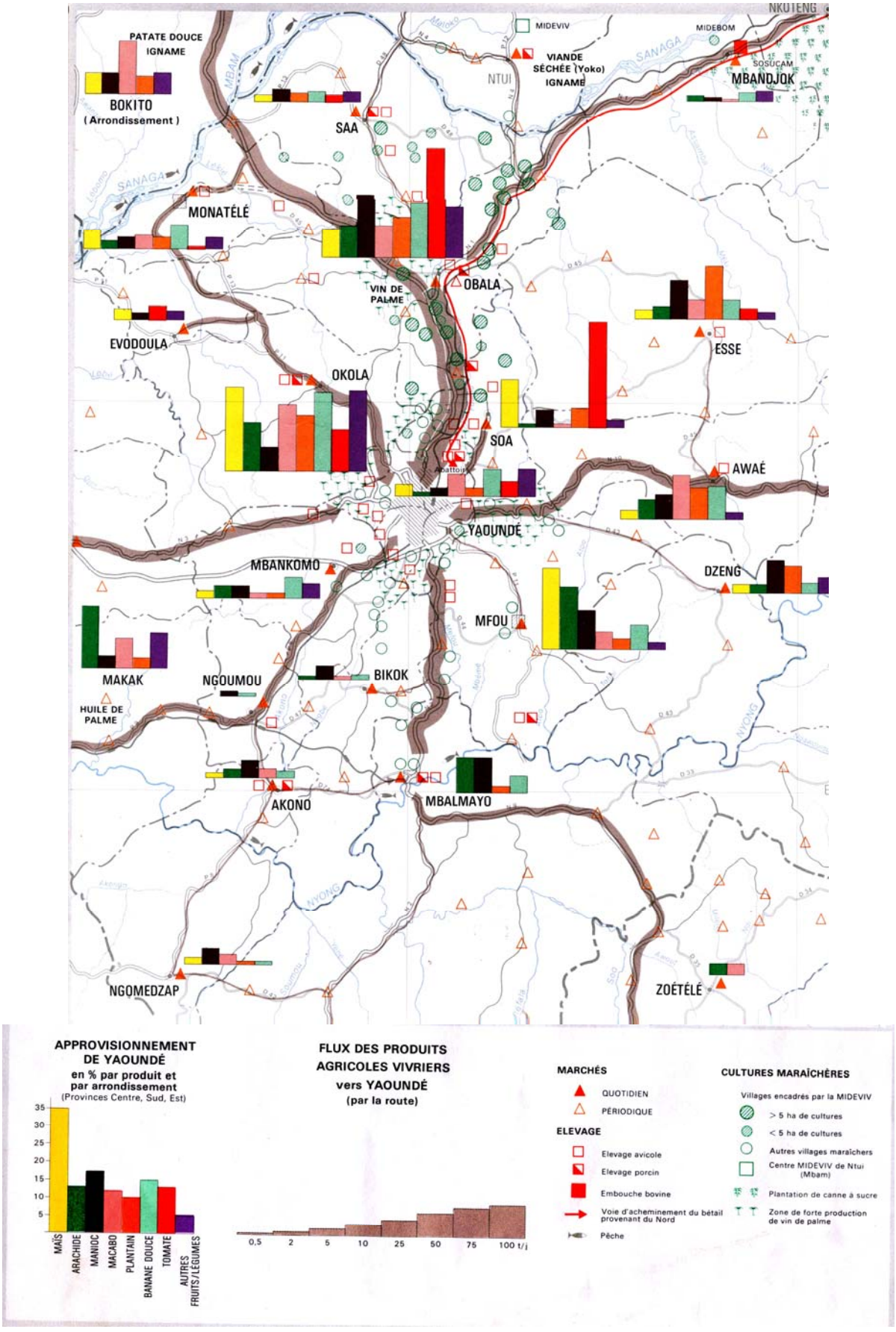
Photo by Christian Nolte

It is present in the city as livestock breeding, small poultry farms in particular which we can find in all districts of the city. They are sometimes mixed with the houses, other times placed at the border of the inhabited area.

Photo …: Urban districts charging upon the vegetable garden valley of Okolo, north of Yaoundé

Photo by Christian Nolte

Figure … : Agriculture and small poultry farms around Yaoundé (1986)



COMMENTS

It is the distance of the sub-urban fields that creates a problem here. The zone changes considerably if we look at the residential area of the producers or the location of the fields. In all cases, the impact of transport facilities is clear. The produce arrives easier in town when the roads are good and there are enough transporters.

Photo …. : Typical scène at the market at the centre of Yaoundé in 1966

Photo by A. Franqueville

The markets in town seem to be primarily markets for agricultural goods. It is here that the producers, from within and around the city, come to sell their produce. It is thus in Yaoundé that the more recent the market is, the more it is concentrated on vegetables and fresh produce. The more it is located at the periphery of the city, the more the buying and selling is concentrated on other foodstuffs and merchandise. (See table …)

Table …: Differentiation of the markets at Yaoundé according to the distance to the centre.

Urban zone type	**Distance from district to centre (in km)**	***Number of markets***		***Type of market***	
		« Formal »	**« informal »**	**% of selling points of agricultural goods**	**% of selling points of non-agr. goods**
Central zone	0-1	3	0	20-50	50-80
Urban zone	1-3	11	8	40	60
Sub-urban zone	3-7	5	3	90	10
Rural zone	7-40	7	0	90	10
Immediate or close back-land	40-100	16	0	70	30

Influenced by the same factor, the city-people who engage themselves in livestock breeding or agriculture around the city will face distances even longer than the transport facilities will permit them.

Photo … : Vegetable garden valley next to the IITA of Nkolbisson, west of Yaoundé

Photo by Christian Nolte

In all cases, this agricultural activity created by the city is certain and marks its area clearly. It deploys even expansively with the increase of the population and the inhabited area.

Is the persistence of the agricultural activities really a manifestation of an important phenomenon or a persistent fact without any room?

A look at the social and demographic dimension gives us a better idea. What does the following table with facts tell you?

Evolution of actives and agricultural plots in Yaoundé

Year	Active population	Number of persons engaged only in agriculture or livestock breeding	% of actives specialised in agriculture or livestock breeding	% of plots for agriculture or **livestock** breeding	Average age of actives in agriculture or **livestock** breeding
1957	*3721*	*653*	*18*	*99*	*35-39*
1964	*31077*	*3571*	*11*	*95*	
1976	*86909*	*1985*	*2*	*90*	*20-29 & 30-39*
1983	*106000*	*2500*	*2*	*88*	
1997	*275000*	*5500*	*2*	*85*	

What are your comments to this table?

But, the active indigenous population mostly autochthon farmers, will stay longer in a self-sufficient agricultural village with an urban mission. Also, helping the organisational circuit of commercialisation, the urban and sub-urban markets have taken over the provision of foodstuffs with out letting the agricultural activities disappear. Evidentially, the constant or occasional continuation of agricultural and livestock breeding activities cover 4/5 of the plots within the built up area. Although at the same time, the number of farmers is decreasing within the population.

What does this 'social decrease' mean within a context of 'spatial persistence'?

COMMENTS

After the Cacao-era during the two wars, aqua-culture was introduced in the forties. This was followed by vegetable market gardening in the sixties.

However, apart from this direct implication of the agricultural activity, the rural universe of Yaoundé which has left its ground to the city, converted into terrains, are changed from place to place in land titles and other sub-divided plots. The state and local communities carry out expropriations which permit modern urban allotment.

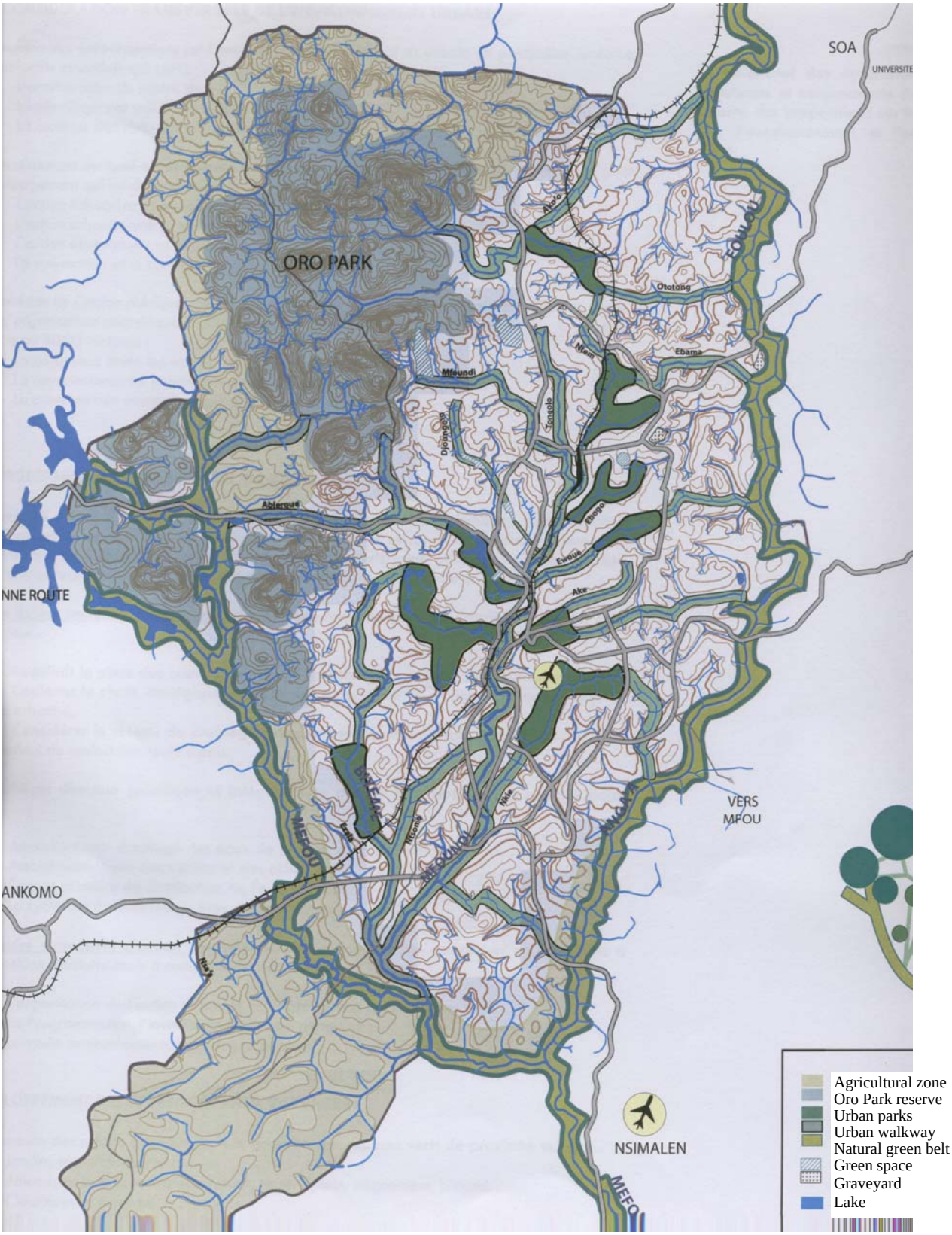
Even more, it is up to the agricultural activities to mark the non-developed urban plots as the front of urbanisation. All-in-all it is agriculture that maintains the ‘areas in-between-ownership’ which have become the inner-city’s marsh. And even the ‘green areas’ are cultivated by the unemployed, needy and destabilised population. Within the urban zone, it is an activity which is often exercised against the will of others. Actually, in all struggles, the agricultural and rural ingredient has always been a nightmare for the young and qualified who can only dream of ‘clean’ area.

In the countries capital city, agriculture is also the commercial base of administrators and city-politicians. They themselves, experience daily the tensions and even the confrontations that they have created or maintain concerning the ‘agricultural profession’. How can we explain, that agriculture, although being an omnipresent problem, is only a small issue or even absent of the political agenda or urban management? The biggest question, a belittled problem, doesn’t urban agriculture at Yaoundé deserve more respect?

IS URBAN AND SUB-URBAN AGRICULTURE GENUINLY TAKEN INTO ACOUNT IN THE URBAN PLANIFICATION OF YAOUNDE?

This map of the current SDAU of Yaoundé gives an idea of the consideration of agriculture in the urban planning of Yaoundé. What can you see?

Figure … : Yaoundé in the SDAU 2000-2020



Sources : SDAU 2000-2020

COMMENTS

The principle of the non-compatibility of agriculture and the city is clearly shown in this diagram. Actually, agriculture within the city limits is not perceived as such, but is seen as a type of ‘green’ area or urban parks by the city people. Naming agriculture in this way reflects not how it is, but how ‘they’ would like it to be. And this is where the problem lies, who are ‘they’. For the urban population ‘they’ can only be themselves. For the city people ‘they’ can only be anyone else but themselves. The incomprehension is big. It deserves to be deleted by a new concept including the different actors and the relations between agriculture, livestock breeding and the city. And this does not only concern the technical arrangement or the urban planning team. It involves strengthening of skills and capacities of all actors (including the traditional as the civil societies) in the promotion of ‘gender balanced and good governance’ in and around the city.

What, according to your point of view, will be the best terms and conditions for a similar negotiation which will reconcile the city and history? In your case? In general?

GENERAL CONCLUSION?

A history marked by the colonial encounter between the Europeans and the Africans at the end of the 19th century. But also, a history marked by social and political changes within the indigenous societies, based on the western model of a national state.

Furthermore it is an agriculture marked by reject by an urbanism of which the logic is not inspired by its reality but by imported principles. Also the history of the AUPU at Yaoundé is one of militant dissidence; one of a culturally assimilated activity which survives despite the fact that its dominant actors don't recognise its place.

All in all, it is a true construction site of social, political and economical negotiations, permanently open to questions of the towns(wo)men, of the traditions and of the modernity of Africa.

YAOUNDE: A CASE-STUDY LIKE ANOTHER

The Yaoundé-an context of urban and sub-urban agriculture

According to the impression of most Sub-Saharan African cities, Yaoundé is, as we have seen, a relatively recently created city with a rapid growth. The population has been growing with 6 to 9 % since almost one century. Its spatial growth has been an average 5.6 % per year for the last 50 years.

This population explosion is firstly cause by immigration from all corners of Cameroon and other countries. If the indigenous Yaoundé people constituted 80 % of the population in 1960, today they represent about 20 %. Nevertheless, almost 40 % of the Yaoundé-ans are born in this metropolis. This explains the importance of this natural growth as well as the existence of a strong generation of immigrant's offspring.

The structure of the city is classical as most former urban colonial centres which evolved into metropolises.

- In the hart of the city, a centre formerly prohibited for blacks.
- Around this centre, 'free-zones'. In fact, during the colonial days, the 'white' houses were to be at least 800 m separated from the 'black' houses. This distance was based on the action-radius of a mosquito which might transmit malaria from 'blacks' to 'whites'. On this basis the urban racial segregation was established from 1908 under the Germans and from 1923 until 1933 under the French administration. This was resumed in the planning principles decreed by the colonial urbanists in the fifties.
- On the other side of the 'geographical mosquito net', the 'free zone', were the first indigenous districts, marked by a high density. The districts formed an interrupted zone where the highest concentration could be found near the 'gates' through which the emigrants could 'enter' the city.
- Since the three last decennia, two circles of districts have been formed around the first ring, the old 'free zone':
    - The first dates since the first operations of restructuring of the overpopulated sub-centre.
    - The second ring has arised with the development of the rural areas within a radius of 4 km of the town-centre. The zones even further away from the centre are mainly private or administrative (SIC and MAETUR) autochthon allotments. This as stimulated the installation of vague neo-city(wo)men and their first and second generation offspring.
- Around this outer ring are the autochthon villages, often considered as reserves for further urban expansion. In fact Yaoundé is enlarging by absorbing the neighbouring countryside. One of the moist spectacular methods is relocating people from the most obsolete and dense areas. For the restructuring of 587 ha of urban zone, 650 ha have been relocated between 1970 and 1990.

Public efforts of voluntary organisations at Yaoundé have been translated in the urban plans of 1952 and 1963, and consequently a Director of Urban Planning (Schéma Directeur d'Aménagement et d'Urbanisme (SDAU)) has been created in 1980. A new SDAU is being elaborated. Essentially this will contribute to the regular extension of the sub-urban area.

Spontaneous and private efforts of valorising the area have been taken over by the placing of various activities. And the city follows by stretching out continuously day by day.

Conditioned by the constraints of a hilly area and influenced by a dispersed autochthon way of living, urbanisation has long been confined to one party initially European. The occupation of land has globally been marked by an increasing density and an unequal division between men and their activities:

- Residential densities varying from 320 residents per hectare in the old indigenous districts bordering centre-town to 80 residents per hectare in the centre and in the villages around the city.
- Taking in, at first, the least steep areas and the hill-tops. The floodplains were only attacked much later, starting with those closets to the centre.

The capital of Cameroon, Yaoundé, is a city where the activities of bodies and their administrative staff dominate the economy. The afflux of men and women and their children is a consequence of a collective dream where the initially rural world is fighting to escape 'bent-down' work and have access to 'standing-up' work, or even to the 'seated' work of the white collars and other commanding and bureaucratic posts.

Agriculture in and around the city

Agriculture can be found throughout the city, it is 'bent-down' work, mainly done by women:

- Florists cultivate the borders of the Boulevard du 20 Mai in the centre of town. The main roads are planted with ornamental trees that provide shade. (See photo of the coverage and…)
- We can still find mango, palm and papaya trees and even cacao bushes in the dense sub-centre districts. They are evidence of a planters' past, stretching out from 1.5 to 3 km from the town-centre. And further plantation is stimulated.
- In the first circle at about 2.5 to 4.5 km, maize and groundnut are planted almost religiously on the still empty plots awaiting projects or construction of houses.
- In the second outer circle at 4 to 8 km, every obtained plot is almost immediately cultivated. This permits to have an immediate benefit from the piece of land and it marks materially the private appropriation of the plot.
- In the autochthon villages, located at 5.5 to 25 km from the town-centre in the year 2000, the land is traditionally used for food and cash crops, such as cacao. Agriculture and small and large scale livestock breeding remain a popular use in an area where the town influence will be more and more noticed.
- In a ray of 20 to 100 km, agriculture and livestock breeding are particularly stimulated by the near presence of Yaoundé which offers a market of 1.25 million consumers.

The satellite villages, that develop will remain with a strong rural ambiance. Town-people will acquire land for agricultural purposes to satisfy the city-based consumers.

Agriculture and urban planning at Yaoundé have been playing hide-and-seek for a century. From the official side:

- No explicit consideration for the agriculture-related activities in the plans other than 'green areas'. (See figure…)
- Unofficial consideration, by way of tolerance and often understanding between the authorities and the population. Actually, it remains undoubtedly a source of income, and a social stabiliser.

Livestock breeding has been restrained since the 1st of October 1937 with general rules and regulations concerning hygiene and public health. This Cameroonian law, under French mandate (J.O.C., 1937, p.860), states:

Article 13
Breeding of pigs, sheep, goats, cattle, or wild animals in captivity is forbidden within the city limits.
Breeding of ducks, turkeys, or fowl is sustained under the condition that the housing is approved by the hygiene service and that the birds will not roam about on the public roads and in the neighbours' courtyard.

From the population's side:

- A spontaneous, customary and quasi-religious practice, a constant dimension in all households. (See photo…)
- However this practice has an unglamorous image, as it is connected to a certain level of social and moral misery. In other words, it is the slaves and the subordinates who accept the endurance of working on the land.

Photo ….: Pigsties and crops in Messa-Carrière district, in the upper western part of Yaoundé

Photo by Caroline Madiot in 2001

A certain ambiguity marks the visions from the opposing sides; however they do not seem to stand so far apart. The same minister, the same major or the same officers, who should order the maize and the macabo to be cut, have some chickens and a small plot of tomatoes and salad! Even their mothers and grandmothers break their backs everyday cultivating every free spot, and searching for wood. Several decennia after the colonial era, numerous plans, based on external ideas, have been imposed. However none of the suggestions on urban planning and management have been really integrated.

An agricultural policy is substantially missing. The input is often brought by international donors who, themselves, do not have a clear international or global agricultural policy. Even the recently upcoming environmentalists do not seem to have a clear view on their relation to agriculture, and even less to agriculture and urbanisation. And this seems odd in a time where it is believed that the world is ineluctably coming to total urbanisation.

'Green' just for the 'green' is not really the order of the day in the environment or in nature; everything is green in the wilderness if we do not work against the ecology and local society. How should one operate to bring about an attitude change regarding agriculture? How to accelerate the control and respect vis-à-vis agriculture without creating a malicious or blinding fetish which will prohibit a good integration of the other fundamental dimensions of urban reality and development?

These last years, urban and sub-urban agriculture has imposed itself with forced. As a consequence of the so-called 'economic' crisis which has struck the African states heavily, the authorities at different levels have found themselves incapable to assure, since the mid-eighties, the benefits and an adequate purchasing power for the population of the cities and the Cameroonian countryside. On the contrary, under the pressure of the IMF, they have been forced to engage themselves in a black series of measurements which are recognised today as the cause of the poverty and misery:

- Diminishing the benefits of farmers
- A stop on agricultural subsidies
- To freeze rural development programmes
- Cutting down civil servants' salaries
- Increase of unemployment in the city
- Destruction of the dream of the social mobility chain based on the trilogy 'plantations(cash crops)-schooling-integration into the civil service or other salaried employment'

The state or, more exactly, the 'more-developed' members of the society who manage the state have at that moment rediscovered the virtue of substitution, informally said, which has been assured for years by the 'flunked' population in a throughout unequal society. Without a state of mind, the 'elites' who assure 'good governance' of the state are surprised by their recognition of the rights to certain activities which had been disputed for ages. Elsewhere, nothing will move by itself. It is often when facing social 'explosions' and at the price of, sometimes bloody, confrontations, that the withdrawal of the repression of informal activities can be noted with its ups and downs.

Paradoxical though, the acceptance of the urban agricultural practices is for the administration, without any means of abuse to assume an equal partition of wealth and the promotion of global development, a true chance.

Thanks to agriculture, a minimal supply is assured, even during the tragic fall of the purchasing power. The people have thus discovered how much agricultural activities can protect the city and the country when social peace is threatened. It is a comfortable means of embezzlement of the social-political frustration that hatches under the increase of poverty and misery in the country and especially in the cities. But what is said about staying there?

The shift from a quiet and pugnacious legitimacy to a noisy legality, does it always have to cost a crisis? And does the unequalness always have to make the bed for illegality while the legitimacy of the right to decent conditions of life is recognised worldwide as a plausible fundament of social control and good governance? How can we sensibly integrate agriculture in the management of urban development? How can we anticipate at one's best?

The Special Programme for Food Security

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URBAN AND PERI-URBAN AGRICULTURE

A briefing guide for the successful implementation of Urban and Peri-urban Agriculture in Developing Countries and Countries of Transition

1. Edition

SPFS/DOC/27.8
Revision 2
Handbook Series
Volume III

SPECIAL PROGRAMME FOR FOOD SECURITY

Implementation of the SPFS within the framework of the follow-up to the World Food Summit

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, July 2001

Introduction and Acknowledgements

This is a the first edition of a briefing guide for the successful implementation of urban and peri-urban agriculture (UPA) in developing countries and countries of transition, in particular Low-Income Food-Deficit Countries (LIFDC). It is primarily designed to assist in implementing UPA components of FAO's Special Programme for Food Security (SPFS), and it provides useful information to policy makers, and planners, practitioners, and extensionists.

The guide fills a gap in the field guidelines series of the SPFS and is thought to be a living document which is expected to be updated and revised on a regular basis.

The document was compiled by Dr. Axel W. Drescher, Consultant, and it is available on the FAO Intranet: http://internal.fao.org and on CD Rom (in pdf format) on request. It is complementary to the FAO Publication "Food for the Cities - Food supply and distribution policies to reduce urban food insecurity", Food into Cities Collection, DT/43-00E, prepared by Olivio Argenti of the FAO Marketing and Rural Finance Service (AGSM).

The guide has been prepared with valuable contributions from members of the FAO Interdepartmental Working Group on Food for the Cities (IDWG – FFC), in particular the Informal Working Group on Urban and Peri-urban Agriculture.

Special thanks go to the following FAO staff members for there valuable contributions to this guide: Olivio Argenti and Anthon Slangen, Marketing and Rural Finance Service (AGSM); Emmanuelle Guerne Bleich, Animal Production Service (AGAP); Wilfried Baudoin, Crop and Grassland Service (AGPC); Florence Egal, Nutrition Programmes Service (ESNP); Renata Clarke, Food Quality and Standards Service (ESNS); Michelle Gauthier, Forest Conservation, Research and Education Service, (FORC), Neeltje Kielen, Water Resources, Development and Management Service (AGLW); Manuel Martinez, Inland Water Resources and Aquaculture Service (FIRI); Ester Zulberti, Extension, Education and Communication Service (SDRE). Special thanks are also due to Yeb Hiemstra, Coordination and Management Service (TCOS) for coordinating the inputs of the various FAO technical services.

A.Q. Kobakiwal
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On October 12th, 1999 the international community observed the Day of the Six Billion. The population of our planet was only 2.5 billion in 1950 and is expected to be 8.9 billion in 2050. By the year 2005, more than half the world's population will be living in cities. Local communities as well as the governments have always been concerned with feeding the growing population. In 1995 world food per caput supplies were 18% greater than in 1965 while the population growth was 70%.

The worldwide urban population is expected to double in 30 years, but the number of urban poor is expected to increase at a greater rate. The World Bank says that, due to high rates of urbanization, the majority of the poor live in urban areas in many countries**.** As of April 2001, 82 nations were defined as low-income food deficit countries (LIFDCs): 42 in Africa, 24 in Asia, 7 in Latin America and the Caribbean, 6 in Oceania and 3 in Europe. These countries are home to the vast majority of the world's 800 million chronically undernourished people.

The findings of national censuses, household surveys and research projects suggest that **up to two-thirds of urban and peri-urban households in developing countries are involved in agriculture.**

Much of the food produced is for own consumption, with occasional surpluses sold to local markets. In Africa, poor urban Kenyan households have to spend 40 - 50% of their income on food and cooking fuel alone. More recently, as a result of the economic slow-down particularly in East Asia, the urban employment opportunities have shrunk. The situation is becoming particularly critical in Indonesia, Thailand and the Philippines. Urban food production is in many cases a response of urban poor to:

Á inadequate, unreliable and irregular access to food supplies, due to either a lack of availability or a lack of purchasing power

Á inadequate access to formal employment opportunities, due to national economies in crisis.

Within the next 20 years, more poor and undernourished people in developing countries will live in cities than in the countryside.

Specific traits of the horticulture sector are: rapid and high return; and high labour inputs.

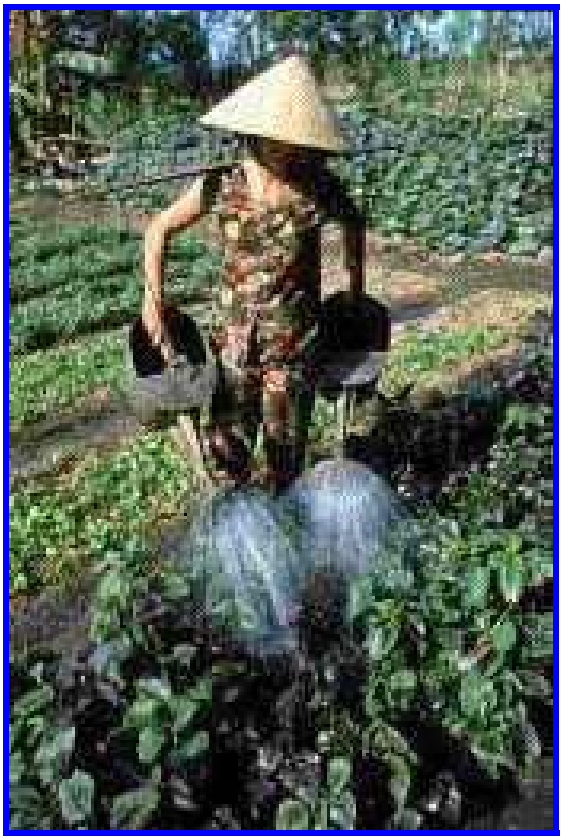
These countries could, therefore, seize their comparative advantage of cheap labour in order to conquer selected market niches for local consumption or export. Furthermore, horticulture can usefully be integrated in the global urban waste management strategy for the recycling of organic waste and by-products (compost making) and use of non conventional water.

Fruit tree crops from agroforestry systems or estate plantations are critical to maintain on a large scale the sustainability of lands and water resource in fragile ecosystems. Domesticated and wild fruit and multipurpose tree plantations (e.g. date palms, citrus, merula) in and around cities provide fruits, fuelwood, flowers and other products. Green belt plantations surrounding cities can play a vital role in protecting gardens and infrastructure against winds and sand encroachment. They improved the micro climate for annual crops, and are indispensable in mountainous areas. In one Pacific islands home-gardens, many types of tree, shrub, climbing, ground and root crops are cultivated and play a vital role in feeding and maintaining the nutritional status of urban dwellers.

Commercial peri-urban production of livestock is an extremely fast-growing sector, representing 34% of total meat production and 70% of egg production worldwide. In most developing countries keeping a few household poultry is a common practice. In and around cities, urban farmers grow horticulture crops on small plots as a part time activity or become professional growers dedicated to an intensive market gardening.

In Mexico City pigs and poultry are kept within the backyards of family homes. Producers keep an average of 3 pigs and 26 birds per household, but there are some individuals who manage up to 60 pigs, all kept within the family. Their nutrition is based on the use of food wastes available from the city including kitchen wastes, stale bread and tortilla, left-over tortilla dough, chicken guts, and fruit and vegetable wastes from the markets, amounting to 4000 tonnes per day.

One study of urban agriculture in Nairobi showed the land used for horticulture was 32% private residential land, 29% roadside land, 16% along riverbanks, and 16% in other publicly owned areas. 650 ha of the urban area of Dar es Salaam, are used for vegetable production on open spaces. This is an important source of income for over 4000 farmers. Worldwide artisanal aquaculture production is, for example dominated by Low-Income Food Deficit countries (LIFDCs). Artisanal fishers increase family food security not only through their earnings, but also with the discards they put on the family table. It is our all responsibility to make sure that poverty in cities is reduced and food security for all is guaranteed. This booklet will help to gain ideas for practical solutions.



WATERING VEGETABLES IN ASIA
(Photo FAO)

THE POLITICAL CONTEXT OF URBAN AND PERI-URBAN AGRICULTURE (UPA)

COAG 15th session

At its fifteenth Session in January 1999, the Committee on Agriculture (CL 116/8, CL 116/9 & CL 116/10) recommended the development of Organization-wide, and coordinated cross-sectoral programme on Urban and Peri-Urban Agriculture (UPA).

This endorsement concerning UPA requires that FAO, together with its partners:

- Provide guidance and assistance to member countries, in active cooperation with existing international networks by focusing its UPA activities on areas of its comparative advantage and interacting in a complementary manner with other UN organizations, local grassroots organizations, NGOs, and other organizations. These activities should lead to an improved understanding of the benefits and risks inherent in urban food security and provide a knowledge base on the issues of Urban and Peri-Urban Agriculture.

Incorporation of UPA into existing FAO Programmes:

- Testing methodologies for UPA through new and existing programmes including crop intensification and diversification opportunities.
- Providing specialized guidance on food safety to urban and peri-urban farmers, food handlers and food processors.
- Offering technical back-stopping for existing and on-going local project development in urban and peri-urban agriculture.
- Identifying appropriate policy interventions for maximizing contributions of food supplies for at-risk groups and poor households.

World Food Summit

World leaders assembled in Rome in November 1996 for the World Food Summit aimed at renewing global commitment to the fight against hunger. The summit was an FAO response to widespread under-nutrition and growing concern about the capacity of agriculture to meet future food needs.

A ZAMBIAN WOMEN SEEKING FOR FOOD ON A WASTE DISPOSAL SITE
Photo: Drescher

Roundtable of Top Local Government Officials, New York, 1997

Challenges and Benefits of Urban Agriculture

- **need for water-conserving farming systems, cost recovery from water-consuming producers, treatment of wastewater for vegetable irrigation;**
- **need for adequate agricultural technical supervision/extension to producers (site-appropriate crop selection, integrated pest management, efficient production technologies, affordable value-adding);**
- **need to promote and finance greater linkages between production, processing (agro-industry) and marketing for more self-reliant urban food systems, more local employment and revenues;**
- **need for greater decentralization of agricultural policy from central to municipal governments, for support to locally relevant urban food production and sustainable urban food systems.**

URBAN AGRICULTURE FOR FOOD SECURITY, JOBS AND WASTE RECOVERY: ROUNDTABLE OF TOP LOCAL GOVERNMENT OFFICIALS

UN OFFICE BUILDING, ONE UN PLAZA
29 JULY 1997

SECOND INTERNATIONAL COLLOQUIUM OF MAYORS ON GOVERNANCE

FOR SUSTAINABLE GROWTH AND EQUITY (UNDP),

UNITED NATIONS, NEW YORK CITY, 28-30 JULY 1997

Declaration of Quito, 2000

We are urging

Local governments to promote Urban Agriculture in their cities, develop tax incentives and other policies, and promote the collection of information on Urban Agriculture activities in their territorial planning processes.

State and national governments to include Urban Agriculture in their programs to alleviate poverty, food safety, promotion of local development and environmental and health improvement.

We are encouraging

Cities to recognize the significance of the contribution of Urban Agriculture to social development approaches, generation of jobs and income, self-esteem, environmental improvement and particularly food safety, and to add them to their key development goals in a transparent and concerted way.

We reaffirm

Our commitment to improve urban management through the promotion of Urban Agriculture experiences in our cities, ….as to enhance food security, address urban poverty, improve urban environment and health management, and develop more participatory and less excluding governance processes, as well as to protect urban biodiversity

QUITO, ECUADOR, ON APRIL 16-20, 2000,

ON THE OCCASION OF THE "URBAN AGRICULTURE IN 21ST CENTURY CITIES" WORKSHOP, SIGNED BY 27 LATIN-AMERICAN CITIES

The Special Programme for Food Security (SPFS)

The Special Programme for Food Security (SPFS) is a multidisciplinary programme that combines expertise and experience from a wide range of fields to promote an integrated and participative approach to food security. The programme was launched by FAO in 1994 after its unanimous approval by the FAO Council at its 106th session. Moreover, its concept was endorsed by world leaders at the World Food Summit in 1996.

Objectives of the SPFS

The main objective of the SPFS is to help the developing countries, in particular the Low-Income Food-Deficit Countries (LIFDCs), to improve food security both at household and at national levels through rapid increases in food production and productivity, by reducing year-to-year variability in food production on an economically and environmentally sustainable basis and by improving people's access to food.

The underlying assumption is that in most of the 82 LIFDCs viable and sustainable means of increasing food availability exist but are not realized because of a range of constraints that prevent farmers from responding to needs and opportunities. By working with farmers and other stakeholders to identify and resolve such constraints - whether they are of a technical, economic, social, institutional or policy nature - and to demonstrate on the field practical ways of increasing production, the SPFS should open the way for improved productivity and broader food access, both in rural and urban areas. The SPFS includes in its design an element of urban and peri-urban agriculture, aimed at improving access to food of people living in and around cities.

Strategies of the SPFS

SPFS implementation takes place in two phases. ***Phase I*** is a micro-economic phase consisting of four major components: water control through small systems of water collection, irrigation and drainage, intensification of crop production systems, diversification of production systems into small animal production, artisanal fisheries and aquaculture and analysis and resolution of socio-economic constraints to food security.

The scope of the Programme's ***Phase II*** is determined by the outcome of Phase I and by the need for integration with national strategies and programmes for agricultural development, sustainable use of natural resources and improved food security.

The aim is to build on the achievements of Phase I to create the macro-economic and financial environment for large-scale replication of micro-approaches that have proved successful.

Phase II, i.e. the macro-economic phase, has three dimensions: an agricultural sector policy reform to overcome socio-economic constraints, an agricultural investment programme to address infrastructure and the preparation of feasibility studies of bankable projects designed to ensure bilateral and multilateral financing.

Core features of the SPFS strategy are national ownership with the participation of farmers and other stakeholders at all stages of the Programme's conception and implementation, priority given to small farmers, environmental awareness, integrated and multidisciplinary approach, emphasis on modernization of low-cost simple technologies and social equity (gender and role of vulnerable groups).

More Information on the SPFS is available on: http://www.fao.org/spfs/

Urban and Peri-urban agriculture and the Special Programme for Food Security

The Director-General of FAO underlined the importance of urban and peri-urban agriculture (UPA) in food security among urban populations. The Director-General, therefore, requested that the Phase I of the SPFS should include at least 5 sites of UPA around big cities out of 30 sites to be covered by this phase. **It is therefore urgent that governmental and municipal authorities make the necessary arrangements and promulgate the required regulations for the sustainable development of UPA, which predominantly related to horticulture production but also includes small livestock and aquaculture. Public authorities are expected to take their responsibilities in securing the required resources essentially the land and small plots (horticulture or green zones) within and around cities, as well as sufficient water of good quality. From a technical point of view, it is urgent that improved crop management practices, technical packages and training provided under the SPFS to avoid the over- and mis-use of pesticides and other hazardous practices with the aim to supplying the high quality and "safe" produce to serve the combined interest of the producer, the environment and the consumer.**

Andre Regnier
(FAO – ADG, Nov. 1999)

URBAN AND PERI-URBAN AGRICULTURE

DEFINITIONS AND SCOPE

Definitions

Urban and peri-urban agriculture (UPA) occurs within and surrounding the boundaries of cities throughout the world and includes products from crop and livestock agriculture, fisheries and forestry in the urban and peri-urban area. It also includes non-wood forest products, as well as ecological services provided by agriculture, fisheries and forestry. Often multiple farming and gardening systems exist in and near a single city.

(FAO 1999)

Urban agriculture has been defined as '...an industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock.'"

(UNDP 1996)

More information on definitions and scope is available at:
http://www.idrc.ca/cfp/rep08_e.html

MEGA CITIES DEVELOPMENT (Source FAO)

HORTICULTURE (Photo FAO)

MAIN PURPOSE OF UPA IS FOOD PRODUCTION FOR THE POOR (Photo FAO)

The Scope

UPA comprises a set of different possible activities. The scope of urban and peri-urban food production varies from continent to continent. This variation derives from many factors, e.g., the economic status of the country and the households (which determine their needs), the household itself (determined by it's size, labour force, assets etc.), Cultural aspects (which partly determine the kind of crops grown), the infrastructure and availability of fossil energy and inputs (which determine transportation capacities, availability of seeds and fertilisers), climate, soils and water.

The main components of UPA are:

- **Urban and peri-urban horticulture and crop production**
- **Urban and peri-urban animal husbandry**
- **Urban and peri-urban forestry**
- **Urban and peri-urban aquaculture**

RABBIT RAISING (Photo FAO)

URBAN HORTICULTURE IN JAKARTA (Photo CIRAD)

AQUACULTURE SYSTEM (Photo FAO)

POULTRY RAISING (Photo FAO)

URBAN AGRICULTURE

Production sites

Urban agriculture is practised on small to medium size areas within the city for growing annual and tree crops, raising small livestock and fish for home-consumption or sale.

Urban agriculture can be found:

- **on vacant plots**
- **in home gardens**
- **on verges**
- **in containers**
- **on balconies**
- **on roof tops**
- **in fishponds**
- **in school gardens**
- **on open spaces**
- **on road strips**
- **along Railways**
- **below power lines**
- **on river banks**
- **in rivers**
- **on communal lands for community-based gardening**

MICRO GARDEN IN LUSAKA (Photo Drescher)

OPEN SPACE CULTIVATION IN JAKARTA (Photo CIRAD)

PRIVATE HOME GARDENS IN LUSAKA (Photos Drescher)

CULTIVATION ALONG THE RAILWAY IN DAR ES SALAAM (Photo Dongus)

HOUSEHOLD GARDENERS IN EASTERN EUROPE (Photo FAO)

Community-based and individual food production in cities meets several needs of the urban population.

Because of the multifaceted nature of the urban food insecurity there is need of an interdisciplinary, integrated approach to the urban sector.

Any programme has to consider, at least in the earlier stage of programme planning, all kinds of urban and peri-urban production systems and the complex urban-rural interactions.

We need to distinguish between the production of perishable, nutrient-rich and essentially commercial foods, such as vegetables, fruits, eggs, milk and poultry, on the one hand, and of staple foods and other subsistence foods, on the other.

Needs Met by Urban Food Production Activities

THEY:

- **aim food production, income generation and recreational opportunities;**
- **contribute to the prevention of micronutrient deficiencies**
- **can enrich the urban environment;**
- **improve access to consumer markets;**
- **imply less need for packaging, storage and transportation of food;**
- **create potential agricultural jobs and incomes;**
- **provide non-market access to food for poor consumers;**
- **increase availability of fresh, perishable food;**
- **improve proximity to services, including waste treatment facilities;**
- **create opportunities for waste recycling and re-use possibilities.**
- **contribute to preserve and improve biological diversity by integrating it in the ecosystem**

THE USE OF RAILWAY LINES FOR CROP PRODUCTION IN SOUTH AFRICA (Photo Drescher)

PERI-URBAN AGRICULTURE

Peri-urban agriculture happens on farm units close to town that operate intensive semi- or fully commercial farms to grow vegetables and other horticulture, raise chickens and other livestock, and produce milk and eggs. Peri-urban agriculture embraces other activities too, such as fish farming. Creation of fish ponds is increasing in Malawi and the Daloa region of Côte d'Ivoire. Grilled tilapia from these ponds is on the menu of many street restaurants.

Based on research results, practitioners and researchers have expressed the need for a clear differentiation between urban and peri-urban agriculture. This distinction is not to suggest two different programmes, but to recommend differences in the approach towards the two spaces.

Peri-urban agriculture has been supported for a long time through development projects and technical assistance (e.g. in the 1970s and 1980s through OECD). The peri-urban areas of most cities are explicit sites for horticulture. The recent interest in UPA is a consequence of rapidly growing cities in the South and the related food insecurity in these cities.

PERI-URBAN PRODUCTION ON TERMITE HILLS (Photo Drescher)
Cultivation of Swiss Chard on fertile soils of Termite hills near Lusaka increases yields and reduces the need for fertilizer inputs.

AQUACULTURE FISH PONDS
A model fish farm in Laos. Shelter above water is for chicken farming; excrements drop into the pond and constitute an input to the integrated system. (Photo FAO)

A PERI-URBAN PROJECT DESCRIPTION IS AVAILABLE AT:
http://www.avrdc.org.tw/periurban.html

BOX 1 URBAN AND PERI-URBAN

Differences between "urban" and "peri-urban"

Characteristics of "urban" and "urban agriculture"	Characteristics of "peri-urban" and "peri-urban agriculture"
attitudes differ between urban and peri-urban dwellers	peri-urban production is economically dependent on the city
different kind of people, often women	lower population density than urban
different activities, often small scale subsistence	more land/space available
concept of "urban" varies a lot cross-nationally	PU area has more natural resources
UA is part time job	PUA is a full time job
UA technology is different from PUA due to smaller plot sizes and different motivation for agriculture	PUA technology is different from UA, due to larger plot sizes and more commercialised agriculture
knowledge of urban farmers is different	knowledge of PU farmers is different
urbanised	land under threat of urbanisation
more infrastructure/construction	less infrastructure/construction
more services (banks, schools, medical centres etc.)	fewer services (banks, schools, medical centres, etc.)
different landuse than in peri-urban areas, smaller areas cultivated, more subsistence production	different land use than in urban areas larger areas cultivated
lower availability of natural resources	higher availability of natural resources
differences in policies/incentives/disincentives, institutional responsibilities (urban)	differences in policies/incentives/disincentives institutional responsibilities (urban/rural)
easy access to markets	less access to markets
poor air quality	better air quality
high cost of labour and land	lower cost of labour and land
primarily subsistence production	Primarily market oriented production
management strategies different from PUA, mostly small scale agriculture	management strategies different from UA, medium to large scale agriculture
small-scale, scattered and low-value crops produced in cities	Intensive, market-oriented, high value crops
practised by poor urban dwellers for subsistence	practised by groups and individuals with ready access to capital markets
UA can never become UPA again, but expand when zones of “urban blight” evolve	UPA can become UA with accelerating urbanisation

GENDER ASPECTS OF UPA

Women play an important role in household food supply: through their productive labour; through their decision-making about production, consumption and division of food; and through the income they generate, which is often used to buy food. Various studies have shown that women's income has a greater positive impact on the health and nutritional status of the children than does men's income. Women (especially widows) and elderly are powerless in many urban societies. Any policy intervention therefore should take the gender and ageing issue into consideration. Women tend to dominate urban cultivation because they are marginalized in other forms of employment in the formal sector of the urban economy. In some cases in Southern Africa urban agriculture is even synonymous with "farming by women", indicating that this is a very typical female work.

COMMUNITY GARDENING BY WOMEN FARMERS (Photo FAO)

Side Step

With respect to policy recommendations there is major concern with the gender dimension. Urban agriculture in many cities is an important income generating "working niche" for women farmers. Women, generally excluded from the formal employment market are searching for income possibilities that align with their other needs. Zambian women have expressed lack of means to earn income as a major feature of poverty. Supporting UA through policy decisions might lead to a trend towards intensification and commercialisation of this activity - thus making it more of a men's domain and diminishing women's job opportunities. Policy recommendations should therefore also consider strengthening women's access to the formal labour market. Any policy recommendation with respect to standardisation and quality of products should take into consideration the individual character of family-based food production. Traditionally extension officers are not trained for intervention in this field of activity. Misuse and abuse of power must be prevented and therefore the urban issue requires training for extension staff.

Further Reading: More information on the role of gender is available at: http://www.idrc.ca/cfp/rep21_e.html: NGO Gender Capacity in Urban Agriculture: Case Studies from Harare (Zimbabwe), Kampala (Uganda) and Accra (Ghana)
A RESOURCE GUIDE CAN BE FOUND AT: http://www.idrc.ca/cfp/gender.html

URBAN AND PERI-URBAN HORTICULTURE

Horticulture production development in urban and peri-urban areas is proposed as a means to partially meet the job and food requirements of the increasing urban population. In view of its potential high return rate and scope for intensification, horticulture (mainly vegetable and ornamental plant production under irrigation, but also fruits, tubers and roots, and mushrooms) can be an attractive opportunity in meeting the above challenge. Horticulture species, as opposed to other food crops, have a tremendous yield potential and can provide up to 50 kg of fresh produce per square meter per year, depending on the technology applied. As compared to other agricultural activities horticulture makes efficient use of the scarcely available land and water resources. Locating their production close to the consumption centres will help to contain the requirements for special packaging and storage facilities and reduce the post-harvest losses, which commonly reach 30%.

TYPES OF URBAN AND PERI-URBAN HORTICULTURE AND APPROPRIATE TECHNOLOGIES

In urban and peri-urban areas three broad categories of horticultural producers can be distinguished. The division is mainly related to the growers excess to land and water resources which largely determines the type of activities that can be developed.

Stakeholders: Families that have no access to land normally living in densely populated areas

- Urban micro-gardens and mushroom production as well as high value exotic ornamentals, condiments and aromatics

A simple and low-cost technology is proposed for growing healthy and safe vegetables on roof tops, terraces or patios without requirement for soil i.e. micro-gardens or hydrophonics. This system is ideally suited for uptake by women's groups or unemployed labour force who would not only be able to produce for their own needs but could also produce small surpluses for sale, providing them with minimum cash. Some specialised production could be specifically targeted for sale i.e. condiments and aromatic plants which could be locally processed.

Urban micro-gardens are a simple low-cost technology adapted to the high density areas of urban suburbs. They can be established almost everywhere – in backyards, on flat roof-tops, balconies and even hanging on walls. Micro-gardens are best suitable for the urban landless. The technology allows the

land-less households to produce a broad range of vegetables for family consumption and sale to the neighbourhood. The system is based on growing crops on substrates or floating on water.

Of a total cost (fix + variable) of approx. 4.6 US $/sqm, fertilizers are only 0.63 US $/sqm. In many countries the availability of mineral fertilizers is a limiting factor. In this respect research is needed for the use of alternative sources including organic nutrient solutions obtained from the fermentation of organic waste material. A low cost, simple and proved formula is available from the self-teaching course prepared by FAO in 1993 on simplified hydroponics that is at:

http://www.rlc.fao.org/prior/segalim/prodalim/prodveg/10046.pdf

The micro-garden system is environmentally friendly since it not only uses recycled materials, but also for growing in a "closed system" with a very high water use efficiency ratio.

The cost-benefit analysis shows that these micro-gardens when successfully implemented, can provide for 1 to 3 US$ a day as an "opportunity revenue" from a 10 sqm, which is often competitive as compared with the casual labour wage, the women could obtain by working outside the household. A variation on the micro-garden is the hydroponic (see Box).

A SOLAR DRIVEN HYDROPONIC IN SOUTH AFRICA. The nutrients are pumped from the bottom to the top of the system with the help of solar energy. (Photo Drescher)

Stakeholders: Families that have access to small-size plots normally living in populated urban areas

- Highly intensive cultivation systems under localised irrigation methods and small-scale nurseries.

HYDROPONIC MICRO-GARDEN SYSTEM (Photo: C.Marulanda and J.Izquierdo, 1991)

"ORGANOPONICS" IN CUBA (Photo Drescher)

In many areas in the world horticultural crop production relies on the use of irrigation to reduce the risks associated with rainfall variability and to optimise input use. Though water is scarce in many urban centres and water systems are not designed for the increasing population. As water supply for agricultural uses in cities is not planned for in most cities alternative water sources of reliable quantity and quality need to be sought. For cultivation in urban centres these sources might include groundwater, collected rainwater, protected springs and wells, or sometimes extension of the municipal water supply network.

Irrigation is a key tool for agricultural intensification.

Although only 16 percent of the world's fields are irrigated, they yield 36 percent of global harvests. In developing countries, irrigation increases yields of most crops by 100 to 400 percent. Despite this, some of the world's most needy farmers are still unable to water their land effectively.

As part of the Irrigation component of the Special Programme for Food Security, treadle pumps were installed, tested and demonstrated in various parts of Zambia. The Zambian farmers, who usually draw water by bucket from ponds and shallow wells for their vegetable plots, were enthusiastic about the ease with which the treadle pumps were installed and the volume of water pumped.

TREADLE PUMP IN ZAMBIA – A SOLUTION FOR THE URBAN SECTOR AS WELL (Source FAO http://www.fao.org/news/1997/970409-e.htm)

To further minimise competition between water users and to prevent contamination of down stream water sources efficient irrigation methods such as small scale localised irrigation methods should be promoted. Depending on the financial and economic situation of the producers irrigation methods promoted might be based entirely on local materials and workmanship, imported materials but local fabrication or imported components e.g. low pressure drip

irrigation. For more information on irrigation methods see Box 4 on page 61.

Stakeholders: Families that can be integrated in organised growers' schemes in open urban spaces and peri-urban areas

- Establishment and organization of small-scale allotment schemes.

These schemes would aim at the development of intensive commercial horticulture for year round production of high quality vegetables and ornamentals as well as intensive fruit tree orchards for local consumption or export. Modalities for contract growing or joint ventures would be explored. Marketing potential and peri-urban versus countryside comparative advantage for horticultural production would need to be carefully analysed as a pre-requisite to programme's formulation.

Participatory Training and Extension could be used as the preferred development approach and training methodology

For each of these groups projects will aim at introducing and demonstrating adapted technologies including cost-efficient water supply which includes reuse of treated wastewater, low-cost and efficient irrigation, manure production and simple and low-cost shelter structures which will protect the crop against the adverse effect of high rainfall. Concurrently, farmers will be provided with improved vegetable and fruit varieties highly adapted to local climatic conditions as well as high quality mycelium strains. They will also be trained in cropping system management, the adoption of Integrated Plant Production and Protection Management (IPP), in order to avoid the excessive use or misuse of pesticides and fertilisers. To be successful farmers will need to be organised in farmers' groups or growers associations. The main challenge from a water point of view is to promote (peri) urban horticulture in such a way that it does not compete with other urban water needs, is environmental friendly and does not pose risks to human health. At this level it is often proposed to use treated wastewater to attain increased food security and recycle two valuable resources, i.e. water and nutrients. Decentralised community-based treatment facilities are promoted as a solution for developing countries. Regulations and health guidelines for reuse of treated wastewater for food production are the major issues when promoting reuse of treated wastewater for irrigation.

The primary objective of wastewater irrigation reuse projects should be to minimise or eliminate potential health and environment risks. To ensure this monitoring and legal authorisation to enforce compliance with regulations and guidelines is required. To attain this an adequate legal, institutional and administrative framework is required. In addition a well functioning community-based organisation structure is a prerequisite. Training and education of local communities is of critical importance as well as.

Unless projects for food production have a specific objective to develop a scheme for recycling of wastewater with the primary aim to minimise or eliminate potential environmental and health risks by addressing technological, social, economical, legal and institutional aspects, reuse of wastewater in (peri) urban food production should not be promoted. Other reliable sources of water of sufficient quantity and quality, which do not interfere with other urban needs, should be considered first (See Annex 3 for an example on Integrated wetland systems).

Yam can be grown anywhere:

….even downtown, on paved roofs, terraces, balconies and why not? in the living room. In Cameroon, for example, a clever do-it-yourselfer senior citizen of some sixty odd years has developed an original method of growing a white yam variety. It has the decided advantage of being cheap and represents a good example of economic use of space in cities.

The yams are planted in plastic sacks or cases made from raffia bamboo. These are filled with a mixture of soil and compost, and a yam seedling is planted 10 cm deep. The stalks are attached to stakes, and guided towards the roof, or to branches of nearby trees. They are protected from sun and rain by a straw sheet. When the yam tubercle starts to form, the downward head is removed, taking care not to damage the roots. This allows the tubercle to be sliced up into several new pieces. When ready to harvest, the yam is almost the same size as the sack or case (about 1 metre in length).

Source: SPORE no 76 - AUGUST 1998

SOPHISTICATED HYDROPONIC SYSTEM IN SOUTH AFRICA YIELDS LARGE AMOUNTS OF SWISS CHARD
(Photo Drescher)

Further Reading: FAO (2001): Participatory Training and Extension in Farmers' Water Management.
http://www.fao.org/ag/AGL/aglw/farmerwatertraining/

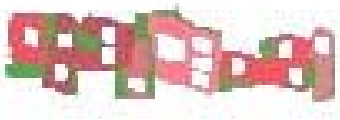
PARTICIPATORY TRAINING AND EXTENSION IN FARMERS' WATER MANAGEMENT

Farmers' Water Management (FWM) is the process in which individual farmers and farmers institutions set objectives for the management of their water resources; establish appropriate conditions, and identify, mobilize and use resources, so as to attain these objectives.

Participatory Training and Extension (PT&E) is a training and extension approach that is based on a participatory analysis of the constraints and opportunities and based on the outcome of this analysis the introduction of new and appropriate technologies. Group based extension and training activities that enhance farmers' capacities and skills, as well as capacity building of the staff involved in the extension activities go hand in hand.

PT&E is a tool to reach the goal of improved Farmers' Water Management involving and supporting farmers. In order to support farmers and increase their capacity in FWM they need training and support for the introduction of technologies.

The programme for Participatory Training and Extension in Farmers' Water Management (PT&E-FWM) was developed within the framework of the FAO- Special Programme for Food Security. It has been implemented and tested in several countries (Zambia, Nepal, Cambodia and Bangladesh). The PT&E-FWM programme incorporates the concept of the Farmer Field School (FFS) introduced under the Integrated Pest Management (IPM) programme. Although PT&E was not developed for peri-urban and urban irrigated horticulture it can be applied in this context. Still, micro garden development requires the installation of pilot modules and training.



Development of intensified production of high value ornamental plants and quality vegetables targeting for the high income bracket population. Small scale nurseries could be launched in different neighbourhoods of the city in order to provide for vegetable seedlings, ornamental pot plants and flowers as well as fruit tree saplings for home and terrace gardening

Group based extension and training activities that enhance farmers' capacities and skills, as well as capacity building of the staff involved in the extension activities go hand in hand.

MICRO GARDENS

Micro gardens

Beneficiaries: **landless poor people in urban areas**

Actors: **women & children**

Purpose: **daily availability of fresh vegetables for home consumption and neighbourhood marketing**

before

after

Construction of a simple micro-garden:

Materials and supplies needed:

- **Simple tools**
- **Substrate**
- **Wooden pallets**
- **Plastic sheet**
- **Seeds**
- **Irrigation water**
- **Nutrient solution**

Crops suitable for micro garden cultivation: Lettuce, basil, tomato, beans, onion, potato, celery, pepper, carrot, cucumber, radish, cabbage, red beet, spinach, eggplant, strawberries, squash, etc.

Criteria for a suitable location: 1 to 10 square metres of free space, minimum of six hours of daily sunlight, clean water source.

Possible container for cultivation: Wooden crates lined on the inside with plastic, old tires, any plastic containers etc.

Cultivation substrates according to availability: Rice hull, sawdust, volcanic scoria, sand, gravel, coconut fibre, perlite, peat, peanut husks etc.

Prepared by: Horticultural Crops Group, Crop and Grassland Service,
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BOX 2 SIMPLIFIED HYDROPONICS AND SUBSTRATE CULTURE

Under hydroponics, plants can be grown closer together than in the field, thereby increasing yields, and multiple cropping (the growing of several crops in the same tank) can be practiced. In addition to conserving space, hydroponics almost eliminates weed and pest problems.

SUBSTRATE CULTURES (Photo FAO)

Wood and plastic materials are provided so beginners can build their own growers. Each grower is one by two meters surface area. In these first projects the growers are placed on legs at least knee high. The small patio or backyard growers produce a crop of lettuce in 60 days. Each square meter of floating bed growers will produce one head of lettuce a day. So the three bed garden should provide a family with more than enough salad greens for a days needs.

Once the lettuce beds are established, some of the garden owners go on to increase their numbers of growing tables, increase daily production and provide more food for their families. A garden of 18 bed growers can produce about 4.5 kg of food a day in the tropics. It is fresh food produced at a fraction of the cost of store purchased vegetables, and a start of a home based business.

The cost for hydroponic production differ form country to country. Being a space saving method, hydroponics do not need large areas.

Otherwise “unproductive” open space, like balconies or backyards do not require the payment of additional rent. The estimated costs for the establishment of hydroponics are at US$ 1.50 fixed costs per sqm and US$ 3.10 variable per sqm, which amounts to a total of US$ 4.60. Compared to regular Irrigation, hydroponics are extremely cheap and water saving. If regular irrigation is set to 100, hydroponics require only 7 percent, compared to 30 percent for drip irrigation.

Further Reading:

FAO (1990). Soilless culture for horticultural crop production. FAO Plant Production and Protection Paper 101.

How to teach Children in hydroponics is taken from: ***http://www.hydrogarden.com/children/comic/comic.htm*** . The pages: http://www.rlc.fao.org/prior/segalim/prodalim/prodveg/hidro.htm (Hidroponia Escolar, in Spanish), ***http://www.hydrogarden.com*** and ***http://www.carbon.org*** provide many useful information on the subject.

How to make seeds for hydroponics is taken from:
Peggy Bradley (***www.hydrogarden.com*** and ***www.carbon.org***)

URBAN AND PERI-URBAN SMALL ANIMAL PRODUCTION

LIVESTOCK SPECIES FOR URBAN CONDITIONS

Livestock keeping in cities is common in many developing countries. Goats, sheep, cows, horses, camels, chickens, buffaloes, pigeons and many other types of animals can be found in cities around the world. Each of these animals has its specific advantages and disadvantages. Particularly small animals are adaptable to backyard conditions, they require little capital to start with, it is easy to sell them and they reproduce fast. Aquaculture represents an interesting diversification of agriculture at the periphery of cities. In Abidjan (Côte d'Ivoire), fish are fed rice bran and slaughterhouse residues or manure are used as fertilisers to produce feed. Tilapia culture in Southeast Asia is presently both spreading and intensifying. In Thailand, periurban enterprises use processing wastes and other inputs from cities.

MILKING GOATS ARE IMPORTANT SUPPLIERS OF NUTRIENTS (PROTEIN) AND INCOME TO POOR FAMILIES IN MULTAN, PAKISTAN
(Photo FAO)

"URBAN" COWS IN DAR ES SALAAM
(Photo Drescher)

SOME FACTS

25% of the 4.5 million small ruminants in Ghana are raised by people living in and around cities and towns. National statistics quoted by van der Bliek (1992) for the livestock population in Nairobi: 25,000 cattle, 30,00 small ruminants, 30,000 pigs, 8,500 rabbits and 350,000 poultry hint at the important contribution of the sector to protein needs of the urban population. A survey carried out by Gefu (1992) in Zaria, a Nigerian university town, revealed that 80% of respondents keep livestock, raising goats, poultry and sheep, primarily to meet immediate household needs, but also to supplement family income.

(CFP Series 24 , 1998)

In particular, the commercial peri-urban production of livestock is an extremely fast-growing sector, representing 34% of total meat production and nearly 70% of egg production worldwide. With it comes expansion in food processing activities in the peri-urban zones.

(FAO 1999)

Pig farming for urban conditions

Pig farming in urban areas is common in many countries, except in places where Islam or Jewish religion is prominently present. Pig keeping adapts well to being a mostly family-type activity, where the role of women is very important, both in collecting household waste and in looking after the animals. Pig production implies a significant reuse of household waste as a feed, but the waste of commercial enterprises (bakery, market vegetable and fruit leftovers) and industrial (brewery, abattoir) activities is also quite welcome. Pig farming allows households to generate supplementary income in peri-urban squatter settlements (slums) in for instance Montevideo (Uruguay) and Port-au-Prince (Haiti). In these areas the activity is generally linked to the widespread practice of collecting, sorting and selling of household waste to the local recycling industry.

PIGS SCAVENGING ON A LANDFILL WITH GARBAGE IN VITORIA, THE CAPITAL OF ESPIRITU SANTU IN BRASIL (courtesy Wubbo Boiten; 1987)

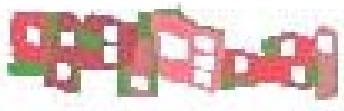
CASE STUDY

Trends and practices of pig husbandry in and around Port-au-Prince, Haiti[1]

Port-au-Prince is experiencing an enormous population growth and has almost reached 2.5 million inhabitants, mainly due to migration from rural areas. Surrounding towns and villages have been overgrown by the city resulting in a giant metropolis, which still has certain rural characteristics. Pigs and goats are widely raised and a common sight roaming around scavenging for feed. As such, in Haiti, pork is the most popular and expensive meat. The majority of the population can hardly afford fresh meat; they buy mostly cheap "fifth quarter" parts (ears, pettitoes) imported from the United States. Particularly, the elite who can afford the prices for meat of international quality standards in supermarkets constitute a niche market for fresh pork. Four types of pig producers can be distinguished:

- *large producers (70- 90 sows);*
- *midsize producers (5 to 20 sows);*
- *small producers (1-2 sows) or fatten 1 to 5 pigs a year;*
- *"non-conventional" producers, who let the pigs scavenge in the streets and on garbage dumps. These "scavenging pigs" represent a major public health risk. Fortunately, Haitians usually "deep fry" pork before consumption preventing outbreaks of diseases like cisticercosis .*

SMALL SCALE PIG PRODUCTION IS A PROFITABLE ACTIVITY FOR MANY FEMALE HEADED HOUSEHOLDS IN PERI-URBAN AREAS IN HAITI (Photo FAO)



Chicken farming for urban conditions

Poultry production can be distinguished into traditional backyard poultry, semi-commercial, commercial and industrial poultry systems. Large poultry enterprises are found everywhere, but small scale poultry production is also widespread in urban areas. Poultry officially include chickens, ducks, turkeys etc., but this paragraph only refers to chickens.

POPULAR IN VIETNAM AND OTHER SOUTHEAST ASIAN COUNTRIES, DUCKS ARE WELL ADAPTED TO HIGH RAINFALL, GROW TO A GREATER SIZE AND LAY MORE AND LARGER EGGS THAN MANY INDIGENOUS CHICKENS AND ARE LESS SUSCEPTIBLE TO DISEASES AND PARASITES (courtesy M. van Dorp).

They are kept for many reasons, including gifts and ceremonial activities. A major purpose of chicken keeping is also to supplement the household revenues in terms of food and cash. With low daily wages the sale of only a few eggs can be a very substantial contribution to the family income. However, urban households with relatively high incomes keep chickens, especially laying hens, because they think that eggs produced at home are of higher quality than those found at the market. The special liking that people take for village raised chickens (more taste, tougher meat) is expressed in a higher price for these animals. Specialised, large scale and market oriented chicken production is found in and around urban situations across the world where access to young chicks for broiler and egg production, inputs (feed) and markets is relatively easy.

SCAVENGING CHICKENS PROVIDING AT ALMOST NO COST SOME EGGS, AT SPECIAL OCCASIONS SOME MEAT AND WHEN NEED ARISES, SOME CASH TO THEIR OWNERS IN SAHIWAL, PAKISTAN (Photo FAO)

The following section highlights two important modes of urban poultry:

- traditional family poultry with scavenging chickens;
- backyard chicken production (small scale up to some 100 birds).

The two systems are fundamentally different from each other. Farmers with chickens in a scavenging system live with different economic and social conditions than those who keep backyard, often enclosed, animals. The latter produce mainly for the market and are therefore ready to spend cash on concentrates, disease prevention, housing. The former keep in the first place animals for home consumption or sale when need arises, and they do not invest because this way of chicken keeping is for them the most economic one. Unfortunately, the extension workers often mistakenly believe that, with education and some inputs, the scavenging system can be transformed fairly easily into a more intensive backyard system. This is a typical case where a so-called problem in (urban) livestock production can be overcome by re-orienting the extension workers: farmers are not necessarily stupid by adopting one mode of production or another, they behave according to rules based on tradition and economics.

Family Poultry (FP) farmers organisations

Organizing FP farmers is not an easy task. There are several reasons. Flock sizes are small and birds are maintained with minimal land, labour and capital inputs. That means that FP is generally considered by farmers as secondary occupation compared with other activities in agriculture, trade, etc. Nevertheless, it is essential to :

- develop producers groups which will:
  - allow the group members to have easier access to inputs: feed supplementation, improved birds, drugs and vaccines, technical advice, etc., and
  - facilitate access to credit, training, transportation and marketing of poultry products
- encourage educated people to initiate poultry farming as a secondary occupation, conducted at family level using medium-sized flocks, and
  - develop associated activities like market gardening which can utilize poultry manure and

SEMI-COMMERCIAL SYSTEM WITH BROILERS IN BATTERY CAGES MADE OF LOCAL MATERIAL (BAMBOO) WITH METAL TRAYS TO COLLECT DUNG WHICH IS USED ON GARDENS AS A FERTILISER IN BATU, INDONESIA (Photo, FAO)

Scavenging birds

A flock of scavenging birds usually consists of some adult chickens, one cock and some pullets. In several places hybrid layers are also part of the same flock. Housing is absent or very rudimentary: often an improvised pen of old boxes upside down, baskets, etc. Grains, legumes, food wastes are given in provisional feeders or thrown on the soil. Water is supplied only in the dry season. Nests are made out of leaves or old clothes to keep costs low and scavenging chickens eat mostly household food leftovers, second quality grains and milling by products. Scavenging chickens need to be protected against predators during the night. In many cases the chickens spend the night in a tree. These trees can be covered by a metal guard. Farmers in Africa use often a small shed on poles, near the homestead. Dogs are sleeping nearby and in daytime even cocks are used to protect/warn the hens for pending danger of predators.

Low input (scavenging) poultry keeping is generally regarded as a women's activity. Husbands often become interested when more cash is involved. Especially government officers, who have access to cash and credit, take up the activity as a second source of income. Still, chicken production is highly preferred by women and can be an important tool to increase their income. Small informal groups to get women started on this activity have shown to be of significant impact.

Technical skills in poultry raising need to be considered at both farmer and extension levels. Training is essential for both farmers and extension officers in the following areas: disease control, housing and equipment, feeding, genetic improvement and marketing. A basic knowledge in specific features of poultry anatomy/physiology is also important to understand the basis of above topics. Housing and management could be improved through appropriate farmer training, preferably conducted on-farm. Local craftsmen could be trained to manufacture small equipment, like feeders, drinkers, etc.

CASE-STUDY

Home-based food production in urban Jamaica

Women's groups

The project aimed at strengthening women's groups through meetings held by RADA. In Bowerbank, the Bureau of Women's Affairs supported this part of the project. Training was given on team building and economic self-sufficiency, women's role in community development, developing positive self-esteem, and cooperation among urban and poor women. In both communities the women started to organize themselves into formal groups with regular meetings and a budget created by their own contributions.

CONSTRUCTION OF A CHICKEN COOP IN BOWERBANK (Photo A. Valstar)

Backyard system on pens

This system refers to small scale activities with confined chickens that are undertaken by a family in their backyard. These activities demand care and the input of concentrates, whereas scavenging chickens balance their own feed intake and need less inputs. Young broiler chicks are usually bought at the age of one day, and fattened during a period of six to eight weeks. Governments and NGOs have been instrumental in getting such activities going. Especially help with vaccination schemes, input supply and marketing can serve very well to make them survive the first years. Feed can consist of up to 70% of the total production costs. It is therefore important that feed is used efficiently. Good feeders that keep losses due to spoilage minimal are worth the investment. This activity is popular due to its quick returns in cash due to the short production cycle.

In the urban backyard an old building, or even a room is often used as a poultry shed. For confined chickens a good pen is required, of which easy waste disposal should be an important feature. A good example is a layer pen constructed at one meter height equipped with a floor of wire mess or

wooden slats. Cleaning is normally done when the litter is absorbed with manure (around feeders and drinkers), and after every batch of animals. If cleaning is a hassle, it won't be done often enough, leading to health and environmental problems. Manure is a valuable fertiliser for gardens. Investments in easy manure collection are therefore also paid back by higher crop production and feed for livestock. Proper bedding (rice husks or fruit pulp rather than sawdust) can also make the dung even more palatable or used to ensile the dung. The use of hormones or other medicines makes the dung less suitable for cows. Disease pressure in an enclosed environment is different than in open, "scavenging", systems. Especially coccidiosis occurs frequently when animals are confined, but timely application of coccidiostatica is effective. Worms, bronchial viral infections and bacterial diseases, like coli infections and cholera are frequent, but treatment and vaccinations can solve those problems.

A number of factors and principles need to be taken into account in designing the most appropriate interventions.

These include:

- local availability of feed resources (e.g. agro-industrial by-products, market and institutional food wastes, road-side forage, compounded feed, etc);
- the market demand for various animal products, including traditional and cultural preferences;
- market opportunities, including competitive advantage of locally produced animal products;
- availability of breeding stock; and
- the financial viability and credit worthiness of the proposed enterprises.

Pre-requisites

- an adequate understanding of the local markets (inputs and outputs), feed resources and the disease situation;
- a local willingness to participate in and contribute to a programme;
- an institution (government or NGO) capable of initiating and supervising the programme in the project areas;
- advisors/extension staff with the necessary skills and training; and
- functional credit institutions willing to co-operate with the programme.

Possible range of typical activities:

- selection of potential target areas and communities based on national priorities, local resources and market opportunities;
- identification, through consultation and Rapid Rural Appraisal, of the main potentials and constraints to production and, consequently, the most appropriate small animal species and the production practices for the areas;
- preparation of appropriate and financially viable production packages;
- training of technical staff, extensionists and selected farmers in the necessary skills required for successful backyard small animal production;
- establishment of demonstrations units of the selected production systems in representative households and the development of out-reach programmes working closely with local credit institutions; and
- a socio-economic evaluation of the impact of the small animal enterprise established with project assistance

Further Reading:

Losada et al (1997): Information on animal production in Mexico City**:**
http://www.cityfarmer.org/mexico.html
Rabbit Raising in Cities, facts form Hungary, Cuba and Nigeria:
http://www.cityfarmer.org/rabbits.html

More information is available on the bibliography on urban livestock at the Resource Centre for Urban Agriculture and Forestry (RUAF) in the Netherlands: http://www.ruaf.org/data/rptUrbanLivestock.PDF

In view of lessons from the past rural poultry improvement programmes, a new approach should aim at increasing flock productivity instead of individual animal productivity. The potential of the village chicken as a provider of food and income should be exploited. A combined approach is suggested, which must be accompanied by improved extension services and farmer training on good husbandry practices, namely: housing, hygiene, feeding and health control: A.J. Kitalyi Village chicken production systems in developing countries: what does the future hold?
http://www.fao.org/livestock/agap/war/warall/w6437t/w6437t07.htm

In this edition of ***New Agriculturist*** some of the current challenges for improving scavenging poultry systems are highlighted, including species which have not yet fulfilled their potential. There is also a brief look at the potential for farming the world's largest bird - the ostrich.
http://www.new-agri.co.uk/00-1/focuson.html

Network for Smallholder Poultry Development, formerly the Danish Network for Poultry Production and Health in Developing Countries:
http://www.poultry.kvl.dk/

The First INFPD/FAO Electronic Conference on Family Poultry: The Scope and Effect of Family Poultry Research and Development (7 December 1998 - 5 March 1999):
http://www.fao.org/ag/aga/agap/lpa/fampo1/fampo.htm

XXI World's Poultry Congress, paper collection:
http://www.wpc2000.org/content/prgrm_scientific.htm#proced

URBAN AND PERI-URBAN FORESTRY

Innovative urban forestry practices promote the best use of trees within urban agriculture and other urban services. Urban forestry is not only street trees for beautification and parks for recreation. Many urban trees suitable for resource poor settlements can provide food, particularly fruits, but also edible leaves, shoots and even flowers. Managing trees and shrubs on the same land as agricultural crops or livestock in spatial arrangement or temporal sequence in poor neighbourhoods is common. Urban forestry programmes should facilitate this trend to plant fruit and multipurpose trees to increase the agricultural land sustainability. There are no reasons why different agroforestry techniques developed in rural area could not be adopted to the context of urban areas.

Source: Kuchelmeister (1998)

Meeting resource-poor people's basic needs

Beyond their aesthetic and ecological value, trees can contribute to the satisfaction of energy requirements as well as the daily food requirements of urban dwellers, particularly in the case of the poorest elements of society.

Fuelwood supply

People in many developing countries continue to depend on fuelwood and charcoal for their energy needs which are consequently satisfied by uncontrolled collection, often resulting in the extensive degradation of areas around urban settlements in developing countries. When "free" wood energy supplies are exhausted or are too difficult for people to tap into, fuelwood markets develop. Even this energy source is relatively expensive; studies report expenditures of 30 to 40 percent of total income by low-income groups to meet domestic energy requirements. Wood-based building materials - poles, branches and leaves for thatching are also in high demand in many urban areas. In addition to greenbelt plantations, the renewal of fruit-tree plantations and the maintenance of street trees and parks may be an interesting source of fuelwood material.

Food production

Fruit-trees are often an important component of urban home gardens. In some places, trees are planted to help supplement fodder needs and even to provide raw materials for handicrafts. The role of agroforestry in improving productivity and diversifying production should be examined - it is a field that should become much more important in the future. Food producing trees are

not widely grown in public places, although Webb (Webb, cited in Carter, 1994) reports that in Beijing, persimmon and walnut trees are grown in parks, and in Singapore the Housing Authority has a policy of growing fruit trees in housing areas for the benefit of elderly people.

- **Home Gardens**

In pacific island, a number of studies have shown that urban dwellers with homegardens are better nourished than those without. In Honiara (Solomon Islands) people without homegardens were found to have a lower intake of iron and vitamins A and C (coming from traditional foods and the edible leaves of local trees such as Moringa citifolia, Pisonia grandis and Plyscias spp). (Thaman, R.R., 1987, cited in Carter, 1994)

- **Solid waste recycling**:

The use of organic waste as compost being already quite spread in urban agriculture. Of particular note in the current contexts is its common use in the cultivation of fruit trees and tree seedlings. In China, the utilisation of solid wastes is particularly well developed in virtually “closed systems” urban gardens (Honghai, 1992). Another aspect f organic wastes in cities is those acquire through the maintenance of parks and street trees. In a number of towns and cities in the developed world, tree pruning are chipped and used as mulch, while leaf material (including grass mowings) is composted. Similar systems may be possible in cities such as Hong Kong and Singapore, but in many developing countries it is difficult to envisage. Tree and grass trimmings have a greater alternative value as fuel or fodder (Ranking and Joshi, 1992, cited in Carter, 1994)

Urban forestry Creates Jobs

In Delhi, poor people gain income from the harvesting and sale of a number of proucts from trees growing on land owned by the Municipal Corporation.

Further Reading:

Carter, E.J. (1994). The potential of Urban Forestry in Developing Countries: A concept Paper. FAO, Rome. 90 pp. (English, French and Spanish).

FAO, (1994). An annotated Bibliography on Urban Forestry in Developing Countries. Rome. 100 pp.

Murray, S. (1997). Urban and Peri-Urban Forestry in Quito, Ecuador: A Case-Study. FAO, Rome. 104 pp. (English and Spanish).

El Lakany, H, Medhipour Ataie, A. Murrays, S. et al. (1999). urban and Peri-Urban Forestry: Case Studies in Developing Countries. FAO, Rome. 200 pp.

Unasylva, 1993/2. Vol. 44, no. 173. Urban and peri-urban forestry. FAO, Rome. [also available on htpp://www.fao/docrep/u9300E/u9300E00.htm]

Kuchelmeister, G. (2000). Trees for the urban millennium: urban forestry update , UNASYLVA. http://www.fao.org/docrep/X3989e/x3989e00.htm. Paper, Web page.

Kuchelmeister, G. (1998). Urban forestry in the asia-pacific region: status and prospects. APFSOS Working Paper No. 44

Kuchelmeister, G. & Braatz, S. (1993). “Urban forestry revisited“. *In* UNASYLVA, 1993/2. 44 (173): 3-12. Urban and peri-urban forestry. FAO, Rome.

Honghai, D., (1992). Urban agriculture as urban food supply and environmental protection subsystems in China. Proceedings of the International Workshop on Planning for sustainable urban development: cities and natural resource systems in developing countries, department of city and regional planning, University of Wales College of Cardiff; DPU, University College, London; Institute of Local Government Studies, University of Birminghan; IIED, London.

URBAN AND PERI-URBAN AQUACULTURE

There are many options for the development of aquaculture in urban and peri-urban areas. The following are few selected examples:

- **Integration of Aquaculture with Rice farming**

It is estimated that about 20% of the irrigated rice fields may be considered suitable for fish culture. Even a modest adoption of integrated rice-fish culture system could dramatically increase income and food supply, particularly protein food supplies. Culture of fish in conjunction with rice can yield 50-300 kg/ha/crop. Alternatively, fish can be reared in rotation with the rice crop yielding an average of 300-3000 kg/ha/crop depending on the intensity of management, and on the climatic conditions prevailing in the location of the rice fields. Rice fields are found in peri-urban areas within a few hours distance from most cities in these countries.

- ***Peri-urban Ponds***

The inclusion of commercial ponds, where not available, or the rehabilitation/upgrading of existing ones, would diversify farm output/redistribute risk amongst activities, and provide additional income to farmers and protein food supply for the urban markets. Aquaculture production levels from ponds will vary depending on: species selected (which could also include brackish water species in addition to freshwater ones); and the level of inputs and management practice utilized. Production levels could range from 1500 to over 10,000 kg/ha/yr. Over 20 different species, including crustaceans, finfish and molluscs could be considered.

Such ponds can be either used exclusively for fish culture (i.e. not integrated with agriculture) or serve the double purpose of an on-farm irrigation reservoir and fish pond. The latter increase the efficiency of water use, diversify farm output/reduce risk, and provide additional income and protein food supply. In the case of stand-alone fish ponds, rehabilitation and improved management of existing ponds , and/or construction of new ponds would increase income to farmers. Fish production from both types of ponds will vary depending on inputs and management intensity, ranging from 500 to 5,000 kg/ha/yr.

- **Integration of Aquaculture with Livestock Rearing**

Several forms of integration exist, going from association of pig or chicken sties on the sides of the ponds or on stilts in the pond, to selected duck strains which not being piscivorous can coexist with fish fry and fingerlings in the ponds. The approach is to utilize ponds which are built for water storage and for livestock

drinking, also production of fish in a synergistic way. When in addition to the use of the pond for recycling of manures produced by livestock some agricultural by-products or processing wastes have been used (such as rice bran or cakes of various seeds used for oil extraction), fish production has attained annual levels ranging from three to seven tons of fish per hectare.

The approach is to manage ponds which are built for water storage and for livestock drinking also for production of fish in a synergic way, as the recycling of organic wastes from livestock would contribute to enhance the natural productivity of the water in the ponds, thus permitting high fish stocking densities and higher fish production. The selection of fish species for this model privileges those which feed on plankton or detritus. These species are frequently cultured together in order to maximize the utilization of natural food available in the pond. Tilapias and various species of carps have been regularly utilized to transform water productivity into edible fish protein. When in addition to the use of the pond for recycling of manure produced by livestock some agricultural by-products or processing wastes have been used, such as rice bran or cakes of various seeds used for oil extraction, fish production has attained annual levels ranging from three to seven tons of fish per hectare. Several forms of integration exist, going from association of pig or chicken sties on the sides of the ponds or on stilts in the pond, to selected duck strains which not being piscivorous can coexist with fish fry and fingerlings in the ponds.

URBAN AQUACULTURE (Photo FAO)

Further Reading:

Information on the integration of waste water and aquaculture from Hartwick College available at:
http://www.hartwick.edu/envirsci/Courses/hydroponics.htm#1

Small Ponds Make a Big Difference is available at:

English version:
http://www.fao.org/docrep/003/x7156f/x7156f00.htm

Spanish version:
http://www.fao.org/docrep/003/x7156s/x7156s00.htm

Arabic version:
http://www.fao.org/docrep/003/x7156a/x7156a00.htm

Chinese version:
http://www.fao.org/docrep/003/x7156c/x7156c00.htm

FAO TRAINING SERIES

"Simple methods for aquaculture" Series:

Volume 4 Water for freshwater fish culture 1981. 111 pp. ISBN 92-5-101112

Volume 6 Soil and freshwater fish culture 1986. 174 pp. ISBN 92-5-101355-1

Volume 16/1 Topography for freshwater fish culture: topographical tools 1988. 328 pp. ISBN 92-5-102590-8

Volume 16/2 Topography for freshwater fish culture: topographical surveys 1989. 266 pp. ISBN 92-5-10259-1-6

Volume 20/1 Pond construction for freshwater fish culture: building earthen ponds 1995. 355 pp. ISBN 92-5-102645-9

Volume 20/2 Pond construction for freshwater fish culture: pond-farm structures and layouts 1992. 214 pp. ISBN 92-5-102872-9

Volume 21/1 Management for freshwater fish culture: ponds and water practices 1996. 233 pp. ISBN 92-5-102873-7

Volume 21/2 Management for freshwater fish culture: farms and fish stocks 1998. 341 pp. ISBN 92-5-102995-4

URBAN AND PERI-URBAN AGRICULTURE

OPPORTUNITIES & BENEFITS

◆ *UPA IMPROVES FOOD SECURITY*

A BASKET OF FRESH AND HEALTHY VEGETABLES (Photo FAO)

An estimated 1300 million persons throughout the developing regions live on the equivalent of less than one US dollar a day, it is also estimated than more than 800 million people, most of them in the developing countries don't have enough food to meet the basic nutritional needs.

UPA increases year round food availability and access to food

UPA contributes to urban food security through increased food availability, stability and, to some extent, accessibility.

The production of staple foods in urban areas is seen as a coping mechanism in situations of severe food insecurity and is geared to household consumption in most regions of the world. In a Soweto case study, UPA was found to be a successful strategy for the immediate relief of hunger and malnutrition.

The contribution of vegetables grown in urban and peri-urban areas of Southern Africa ranges from 20% in Windhoek and Gaborone, 30% in Lilongwe and Blantyre, to 50% in Nampula and 50 -90% (according to the type of vegetables) in Dar es Salaam.

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The horticultural species, as opposed to other food crops, have a considerable yield potential and can provide from 10 to 50 kg of fresh produce per sqm per year depending upon the level of technology applied. Due to their short cycle they provide a quick response to emergency needs for food (several species can be harvested 60 to 90 days after planting).

Although UPA production is, of course, influenced by seasons, it has also developed as a means of reducing seasonal gaps in fresh foods. It therefore contributes to the stability of urban food supply. Low income households benefit through their own production, i.e., producing foods that they would or could not otherwise buy, or from their involvement in processing and distribution activities.

Fish is a food of excellent nutritional value, providing high quality protein and a wide variety of vitamins and minerals, including vitamins A and D, phosphorus, magnesium, selenium, and iodine in marine fish. Its protein - like that of meat - is easily digestible and favourably complements dietary protein provided by cereals and legumes that are typically consumed in many developing countries. **(Photo FAO)**

UPA increases food diversity

UPA improves the quality of urban diets through diversification, by adding horticultural and animal products to the basis of staple food. This allows urban dwellers to consume a more balanced diet, that is not only sufficient in energy, but also in protein and micronutrients required for body growth and maintenance.

For instance, a major product of UPA, the egg is – the reference sample food, perfectly balanced, containing most essential amino-acids, large amounts of Ca, P, Mg, Iron, Zinc. It represents one of the main sources of Vitamine A and of Vit. B complex. It can be directly consumed through many delicious, easy to prepare recipes, or be incorporated in a lot of well- elaborated products.

Urban Agriculture, Household Food Security and Nutrition

The contribution of urban and peri-urban agriculture to urban food security and poverty alleviation is being given increasing attention by policy makers. UPA appears to expand during economic crises, such as those induced by armed conflicts and structural adjustment, highlighting its use as a coping mechanism.

Urban and peri-urban agriculture contributes to food availability in cities and therefore to the diet of urban consumers. This is particularly important for fresh foods (horticulture, fruit, eggs, milk and poultry) which can be sold on the street, in markets or in local stores but also produced for home consumption (such as green leaves). Bur it is also true of staple foods, such as maize or sweet potato, which in many towns are produced for home consumption. This can be traditional like in Southern Africa but has become a common coping mechanism in situations of food insecurity.

UPA contributes to poverty alleviation both through a reduction of expenditures and through an increase of income

UPA also generates income for urban households involved in production, processing, marketing and distribution of these foods, allowing them to buy food and face other expenses. In general the urban poor spend 60-80 percent of their income on food. UPA contributes to poverty alleviation both through a reduction of expenditures and through an increase of income. The income earned is usually spent on non-food items (e.g. transport, housing, school fees, health costs) and to a lesser extent, and especially by female producers, on food items.

On the other hand, urban and peri-urban agriculture also have environmental implications which can have positive or negative effects on urban health. It is important to understand these implications in order to prevent and/or mitigate them. This will require close collaboration with the health sector and appropriate inter-disciplinary interventions. Ensuring safe food production, processing, handling and preparation practices is particularly important.

Women engaged in UPA activities close to home will be able to organise their time better and combine productive and domestic activities in a more satisfactory way than women that work far from their homes They will save time on transport, have more time with their children and will be able to carry out a series of tasks which are essential to good health and nutrition (ensure hygienic environment and encourage healthy practices, take appropriate care of small children, sick and elderly relatives, take them to health facilities when needed...).

The contribution of UPA to the quantity and quality of food intake of urban consumers is widely acknowledged. The increased availability of fresh products allows urban dwellers to consume a more balanced diet, that is not only sufficient in energy, but also in protein and micronutrients required for body growth and maintenance.

The contribution of UPA to the quantity and quality of food intake of urban consumers is widely acknowledged.

This direct impact of UPA on household diets is increased when the income raised through vending UPA products is used to buy food items, such as cooking-oil. which can further improve the quality and quantity of the diet.

The benefits of UPA on nutrition will be further increased if people are given the information needed to make appropriate use of this food, through nutrition education, including promotion of balanced and affordable diets, child feeding, general hygiene, food safety, and appropriate household resource management.

Extension workers can therefore make a major contribution to improving food security and nutrition in urban areas by targeting food insecure households, promoting production of the foods required for a balanced diet year round and collaborating with relevant colleagues to ultimately ensure appropriate consumption of safe foods.

Further reading:

FAO (1999). Field Programme Management- Food, Nutrition and Development . A training package to assist fieldworkers in operating a rural development programme. 1999, 244pp. English - ISBN 92-5-104387-6.

FAO (1995). Improving Nutrition Through Home Gardening: A Training Package For Preparing Field Workers in Southeast Asia. Contains course materials and technical notes for trainers and participants, and home garden technology and nutrition information leaflets for farmers and their families. 1995, XX pp. English - Job Number V5290E.

FAO (2000) Mejorando la nutrición a través de huertos y granjas familiares: manual de capacitación para trabajadores de campo en América Latina y el Caribe. Este material de capacitación integra aspectos de producción agropecuaria con aspectos de nutrición y seguridad alimentaria, y ofrece pautas para la realización de acciones conjuntas en varios sectores y disciplinas para encontrar soluciones adecuadas y sostenibles a los problemas de inseguridad alimentaria y desnutrición. 2000, 248 pp. Spanish - Job Number V5290S.

◆ *UPA CREATES EMPLOYMENT*

UPA employs 800 million urban residents worldwide

Potential horticulture jobs created through UPA are one full time job every 20-50 urban consumer. The intensive horticultural and livestock production that thrives in peri-urban areas employs workers and produces high value-added products that can yield reasonable income and returns with a land use of 10-20 full time growers per hectare. Women, who can combine the food production process with childcare and other household responsibilities, are often involved in UPA on a part-time basis. In addition to direct employment there will be opportunities for induced jobs in relation to equipment and input supply including liquid fertilisers, compost making and platelets, technical servicing and marketing.

(Photo FAO)

INCOME GENERATION TROUGH MARKETING OF UPA PRODUCT

UPA generates jobs and income

Income can be as much as double from causal labour wage. Horticulture is renown for being a labour intensive activity. Labour requirements for full time occupation can reach 20 to 40 active labour per hectare. On small plots of 250 to 500 sq. meters, commercial producers can obtain sufficient revenue to sustain their family.

UPA improves the socio-economic standards

Vegetable and ornamental plant production have generally proven to be rewarding, they fetch high prices, not only on the local market, but also from export.

Families are involved with recycling activities and on a part-time with services (like compost provision), enterprise development and marketing.

Base income for a full-time worker with a worm farm is estimated at about US$ 200 per year.

In Delhi, poor people gain income from the harvesting and sale of a number of products from trees growing on land owned by the Municipal Corporation. Maintenance and harvesting of wood and non wood products from municipal

and communal greenbelt and other trees plantations create jobs all over the year.

The impact of the project on each of the participating countries is likely to vary with the level of economic development; the industrial level; etc. Funding and effort will largely be channelled into initiatives in the poorest parts of the countries – to help alleviate poverty.

◆ UPA CREATES GREEN ZONES WITHIN & AROUND THE CITIES

Urban forestry can have an important productive role in urban and peri-urban areas. Many developing countries have been active in establishing plantations and managing natural forests in peri-urban areas for fuelwood production to supply urban markets. In some cities, agroforestry practised in home gardens makes an important contribution to family nutrition.

A broad understanding of urban forestry focuses on using trees to provide food, fodder, fuel and building material, but also considers recreational and environmental benefits. It contributes immensely to the quality of life in towns and cities in the region.

In low-income settlements the most important benefits of the urban forest may be directly productive ones such as supply of building materials, fuelwood and even fodder. But beyond the products provided, the main function of trees may be to sustain agriculture and ecosystems by the protection of water-supply catchments for the cities, protection against landslides, climate mitigation. Yet others are aesthetic - the beauty and the room offered for recreation. Some roles cannot be quantified in money terms but this does not mean they are any less important.

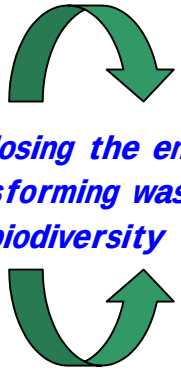
Urban greening means the planning, and managing of trees, forests and related vegetation to create or add values to the local community in an urban area. Trees have multiple functions as an integrated part of the urban food system: they provide food (fruits, roots and leaves), medicines, shade for crops and animals, fodder for the animals, and they deliver organic material for composting. In the past these benefits of trees have often been overlooked, as conventional forestry concentrated on the environmental benefits and recreational value of urban vegetation.

Climatic modification

Tree planting for micro-climate amelioration in cities as Nanjing, China have demonstrated that the drop in the average summer temperature is directly attributable to the cooling effect of trees (block afforestation of degraded hillsides, windbreaks, triple rows of trees along railways, and the lining of street sides). While the primary effect is energy saving (air conditioning), another positive impact is on the water cycle and water conservation for agricultural activities.

UPA HELPS TO RECYCLE SOLID AND LIQUID WASTES

Urban and peri-urban agriculture contribute to a reduction in waste management problems in various ways: In some cities waste is regularly burned in the streets because there is no collection system in place. This creates serious problems of air quality and contamination.



UPA helps closing the energy loops and transforming waste into biodiversity

The recycling of large amounts of organic waste (e.g. in India) helps to reduce this problem in part. In other places (e.g. in the Dominican Republic) it is observed that the owners of open space within the city plant crops on open spaces expressly to avoid illegal waste disposal. This tactic is effective since people respect planted areas more than unused spaces.

Urban solid waste management is closely related to the availability of fertiliser and the contamination of potential production sites and herewith indirectly to health.

Urban producers achieve real efficiencies by making productive use of under-utilised resources, such as vacant land, treated wastewater, recycled waste and unemployed labour. Productivity is often substantially higher than in rural areas considering the intensified agriculture practices.

Many individuals and NGOs are already involved in waste recycling activities in cities. Hereby organic waste is used for animal fodder and composting, animal waste is used for gardening and solid waste is transformed into tools and other equipment.

If properly processed animal waste is a high value fertiliser. In integrated urban food production systems large amounts of manure re-enter the nutrient cycle as fertilisers for crop and vegetable production.

WASTE METAL RECYCLING (Photo Drescher)

One example comes from an FAO pilot project. Acting on the principle that sewage is not just wastewater but also a source of nutrients, an experimental plant in operation since 1994 treats sewage with aquatic weeds and fish.

Fish farms contribute to the recycling of organic waste and urban wastewater nutrients.

One million litres of primary treated sewage a day sits first in ponds containing duckweed then in ponds stocked with carp and prawns. After five days, water quality has improved to the point where it may be used for agriculture, although not for drinking. Fish in the sewage ponds is sold after 8 to 12 months.

Wastewater recycling

Water is clearly a resource of particular potential value in arid and semi-arid areas, where nutrient-rich wastewater can be an important input for agriculture or forestry. Due to the possible health hazard, wastewater is more suitable to grow non-food tree crops than for human consumption. The raising of trees using wastewater irrigation is already practised in Lima, Cairo and Jordan.

SIMPLE TOOLS FOR IRRIGATION MADE FROM WASTE METAL (Photo Drescher)

WASTE METAL RECYCLING (Photo Drescher)

Other benefits of UPA:

- **Access to consumer markets**
- **Reduction in post-harvest losses**
- **Less need for packaging, storage and transportation of food**
- **Proximity to services, including waste water treatment facility**

URBAN AND PERI-URBAN AGRICULTURE

STRATEGIES FOR SUCCESSFUL IMPLEMENTATION

UPA presents complex interactions of social and environmental phenomena in locations that are changing fast but without adequate financial support. The future habitability of cities in developing nations will depend on whether decision-makers and urban planers develop and adhere to coherent policies for managing their urban and peri-urban areas.

UPA falls under the jurisdiction of several different levels and types of authorities (e.g. agriculture, forestry, parks and gardens, public works, transportation, urban planning), coordination and information sharing is needed for a comprehensive policy approach.

The municipalities and states should make efforts to formulate and implement urban development policies based on guidelines and models of expansion that take into account the need to reserve areas for tree plantations, agricultural and vegetable production purposes, thus giving the urban centres and their outskirts the possibility to feed a large part of the population with strictly local production.

It is necessary to design urban development plans that impose specific norms for the utilisation of the soil, banning unauthorised construction and creating large areas for vegetable and fruit production within sustainable systems in the cities and their immediate surroundings.

An adequate legislation, long-term heritable leases, leasing of the plots and gardens through a contract recognised by the municipality and correctly registered are measures, which would guarantee usufruct rights by the potential farmers, vegetable growers and livestock producers.

Intervention Modalities of the SPFS:

Intervention modalities may include:

(a) **Diversification. Diversify the range of horticultural crops systems for year round market supply and introduction of new vegetable, non wood forest products and ornamental crops and livestock products to target specific market niches**

(b) **Intensification. Development of appropriate and sustainable intensive technologies for increased horticulture and livestock productivity to meet year-round market demand.**

(c) **Product Value-Adding. Promotion of appropriate small-scale agro-processing, including peri-urban products where raw materials and market demand for processed products are available.**

REQUIREMENTS FOR PLANNING, IMPLEMENTATION AND IMPROVEMENT OF UPA

- **Creation of governmental and municipal awareness**
- **Identification of stakeholders and institutional framework (prime contact)**
- **Identification of main constraints to agriculture and greening**
- **Site survey – Identification of current and potential sites for UPA**
- **Identification of potential for cultivation practices**

This may result in:

- **The integration of UPA in urban resource management**
- **Sustainable production systems**

FIRST STEP: EVALUATION OF BASIC DATA

Availability of space for agriculture

- **Where is UPA practised and how are the tenure conditions – who owns this land and how are the institutional arrangements (toleration, leasehold, illegal etc..)**
- **Availability of water, quality of water and the potential for irrigation**
- **Assessment of soil quality**
- **What is already done on the ground ?**
- **Farming systems analysis**

***Note**: If basic data are not available through municipalities: link the basic survey with research institutions (universities, Private research companies etc.). The use of Geographic Information Systems facilitates evaluation and analysis. Co-operation with existing programmes facilitate site selection.*

SECOND STEP: STAKEHOLDER ANALYSIS

ç **Who are the Possible stakeholders ?**

- Á Male and female farmers households, elderly, children?
- Á Landless poor
- Á Urban squatters
- Á Local institutions (municipal authorities)
- Á Land owners (public – private)
- Á Government staff on target group/ grass-root level
- Á NGOs/ CBOs
- Á Projects (donors)
- Á Urban communities, women groups
- Á Private sector
- Á Religious groups
- Á Interested Individuals

Note: *As consequence of the results to these questions it is necessary to think about how to best help the farmer to organize themselves (co-operatives, water user groups, women groups, farmer associations etc.)*

THIRD STEP: IDENTIFICATION OF FIELDS OF INTERVENTION

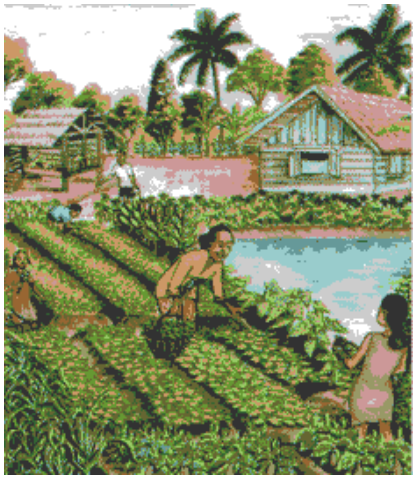
ç **Which modules should be promoted ?**

- o **Home gardens - Micro Gardens - Hydroponics – Community Gardens**

  Potential sites: rooftops, balconies, backyards, walls (edible buildings), road strips, river banks
- o **Livestock** - chicken, goats, others
- o **Aquaculture** – fish, shrimps in fishponds, rivers
- o **Urban forestry** - agro forestry systems, fruit and fodder production, non wood products etc

Note: *In most cases it is more efficient to promote already existing modules and help to improve them, instead of creating new, artificial modules which are not known to the stakeholders, not adapted to the local situation or not accepted.*

FORTH STEP: ANALYSIS OF TECHNICAL ISSUES - THE ROLE OF EXTENSION SERVICES



What are best suitable practices ?

- ü Irrigation techniques
- ü Integrated production systems
- ü Soil improvement (e.g. composting)
- ü Pest management
- ü Credit provision and community saving schemes
- ü Book keeping systems

What infrastructure is needed ?

- ü space, water wells, taps, roads, footpath, input supply etc.

THE ROLE OF EXTENSION SERVICES

Formal agricultural extension services in urban agriculture are extremely limited to not existent. In most Southern African Countries for example, traditionally the extension services serve the rural farmers in staple food production. Urban and peri-urban agriculture is hardly ever recognized as being an important subject to extension. Through training, educational programming, communication and community organization, urban-based extension services can help UPA farmers select appropriate crops, schedule production, improve harvesting techniques and reduce post-harvest losses, while ensuring that adequate attention is paid to food safety throughout the food chain. They can also coordinate inputs, transportation, storage and credit. Extension can help farmers get optimum prices for their produce by having them acquire new skills such as grading and sorting.

They can also assist individuals and businesses in food processing to take advantage of surpluses and add value to produce. Extension services can facilitate the two-way flow of information, thus helping farmers know what consumer want and need.

Extension and advisory staff need the necessary background theory to understand why certain interventions are necessary and how they work. More importantly they need the practical skills to be able to demonstrate interventions to farmers. This level of training can be provided through short in-service courses.

Activities should concentrate on developing local skills (farmers and extension staff) through short practical training sessions preferably held on plots – consider a modified farmer field school approach.

In order to get familiar with the new environment and different technical and social context of UPA the training of extension staff who will be called to work in this new context is an important activity to be promoted. Training needs to focus on refresher courses on content (technical subject matter) and methodology in particular in working with groups of both male and female UPA small farmers. In urban sectors, where dwellers have access to agriculture extension services, women's involvement has been widely ignored. Urban extension programs need to be specifically targeted to women farmers ensuring fair proportional access to women, particularly poor, women-headed households. Distance to training sites, lack of transportation and child care facilities, unfamiliar jargon, and male trainer bias in workshops and training programmes have kept women farmers from participating. To increase the number of female beneficiaries receiving agricultural extension services, the number of female agricultural extensionists working in the field must increase. Extension agencies and beneficiaries rate the work conducted by their female agents highly. In the case of extension managers, precaution should be taken so that the UPA extension is considered as a complement to the conventional agricultural and rural extension and not a mere substitute, in particular in countries experiencing mobility constraints. Extension for UPA should not be interpreted as a solution for lack of transportation in developing countries but rather an extra effort to improve food security, taking advantage of the potential of production available within and around places with high population concentration.

Urban extension programs need to be specifically targeted to women farmers

WHO NEEDS TRAINING?

Target groups for training on UPA may include:

- extensionists;
- urban farmers;
- associated enterprises e.g. in input supply, processing and marketing;
- support providing institutions e.g. GOs, NGOs, donors and financial institutions, extension services;
- policy and decision-makers;
- institutions with legal functions, and
- planning authorities

Basically agro-technological issues in urban and peri-urban areas do not vary much from what is proposed to rural small scale farmers. Nevertheless there are differences regarding scale of production, type of crops grown, and proximity to services and markets.

GENERAL RECOMMENDATIONS FOR EXTENSIONISTS

Training and extension should consider……

- **Demonstration plots within urban and peri-urban areas.**
- **Information on "Integrated Nutrient Management" and "Integrated Production and Pest Management", IPP.**
- **Farmers' field schools and training for extension staff in urban and peri-urban agriculture.**
- **Training on safe use of agro-chemicals for both suppliers and farmers.**
- **Provision of information systems translated into farmers' language, including capacity building in marketing/business.**
- **Documentation of indigenous knowledge of urban and peri-urban agriculture.**

EXTENSION SERVICES

Woman extension worker teaching woman farmer how to plant and cultivate vegetables in home **garden**. An example from the Asia-Pacific region. (Photo FAO)

Cultivation practices, crops, climate and culture vary widely form continent to continent (Annex I). Specific extension guides for all the single modules of Urban and peri-urban agriculture are not yet available.

Home gardening as one most accepted component of UPA is addressed by various handbooks for farmers and extensionists. An FAO training package, **Improving Nutrition Through Home Gardening** is designed for the instruction of agricultural extension, home economics and community development agents working with households and communities in Southeast Asia to promote home gardening for better nutrition. A new edition for the African continent is in preparation.

Support of home gardens can be a contribution to strengthening food security and biodiversity for ecological stability. The farming system itself is also influenced by home garden activities and support on home gardens can have far reaching impact on the farming system.

Areas needing extension support include; methods of improving water use efficiency, storage and marketing of home garden products. With respect to its contribution to sustainability, food security and ecological stability, home gardens should not be addressed in isolation.

While home gardening contributes significantly to food security, however there is need to address home gardening as part of the farming and livelihood system as well as other components like e.g. wild fruit gathering or staple food production.

HOME GARDENS ARE BECOMING A MORE AND MORE IMPORTANT SOURCE OF FOOD IN DECLINING ECONOMIES (A picture from Africa, FAO)

Further reading:

The question of how to help small farmer group associations was discussed in an FAO email conference from 24 September-11 November 1998. Information is available on the FAO Web site: http://www.fao.org/sd/ppdirect/ppfo0008.htm.

More information on planning for urban agriculture is available at:

Jacobi, P., A.W. Drescher & J. Amend (2000). Urban Agriculture - Justification and Planning Guidelines. GTZ, Eschborn. http://www.cityfarmer.org/uajustification.html

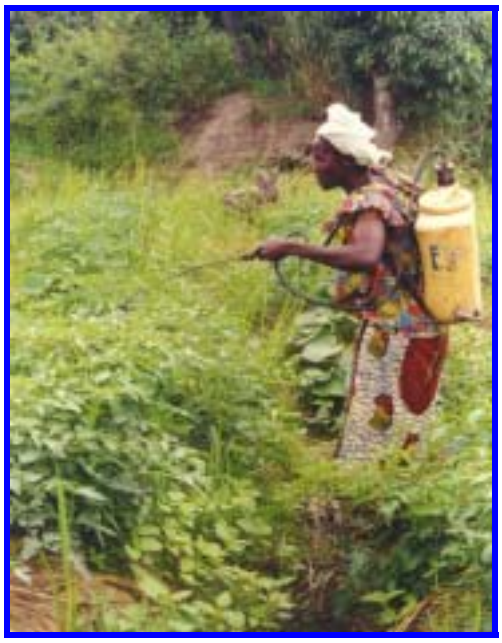
Dongus, S. (2000): Vegetable Production on Open Spaces in Dar es Salaam - Spatial Changes from 1992 to 1999 http://www.cityfarmer.org/daressalaam.html

Drescher, A.W. (1997): Management Strategies in African Homegardens & The Need for New Extension Approaches http://www.cityfarmer.org/axelA.html#lusaka

THE CONSTRAINTS & HOW TO DEAL WITH

EXCESSIVE USE OF AGRICULTURAL INPUTS

Inappropriate or excessive use of agricultural inputs (pesticides, nitrogen, phosphorus, raw organic matter containing undesirable residues such as heavy metals) which may leach or runoff into drinking water sources; microbial contamination of soil and water, including by pathogens. Extension services can play a leading role in the advice on appropriate adjustment of input supply.



PESTICIDE SPRAYING (Photo FAO)

LAND TENURE

Land tenure is often a critical constraint since most farmers do not own their land. Availability of and access to land and water are fundamental requirements for the urban dwellers to enable food production. This has been a key constraint to tree planting, as trees are often considered by laws and customs, as “markers” for claiming lands. Therefore basic questions are how to increase access to land for the poor and how to integrate the urban poor into the urban land market.

The high level of illegal occupation of land, high prices of urban land, the small dimension of lands, and the need for immediate income may represent major constraints for tree planting In most urban environments, space is precious, and subject to many competing land use pressure. Much of the challenge of urban forestry lies in making optimal use of the limited area available for urban trees and to encourage tree-based production systems responding to the landscape and ecosystems requirements.

The challenge for urban planners is to integrate coping strategies of the urban poor-- which are closely related to the

informal land market in many countries -- into their planning strategies.

This requires the definition of rules and standards but also ways to increase the supply of and access to land by the poor and implementation of land legislation to enable sustainable urban development.

Planning requires the definition of rules and standards but also ways to increase the supply of and access to land

Recently, gender aspects have entered into the discussion of planning and agriculture in cities. Women as major players on all levels of the urban food system, in production, marketing, processing and street food vending have a basic interest in being considered as an important interest group for urban planners

. A quick and reliable method for an evaluation of the peri-urban agricultural economy, the magnitude of its growth and evolution (by aerial photography, interpretation of satellite images which would show for example the areas under cultivation) need to be designed.

Geographic Information Systems (GIS) offer good opportunities to integrate data form various sources and allow effective planning.

Challenge to Micro Finance

Low Income households with (peri)-urban agricultural activities have difficult access to credit. This is because Micro Finance Institutions typically provide small loans for fast income-generating and less risky activities such as small trading and services.

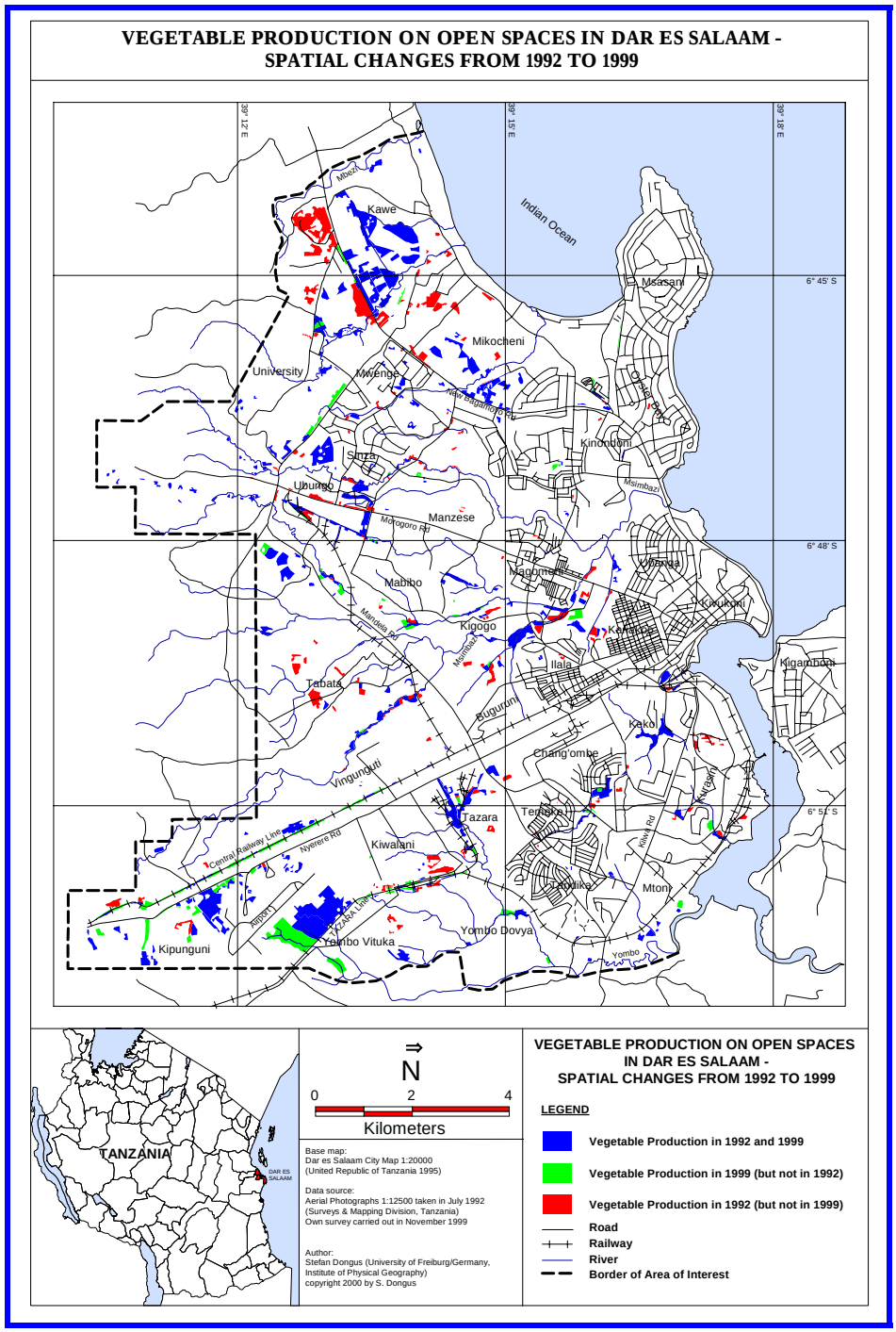
Providing adequate savings facilities together with complementary credit in order to finance essential inputs such as seed and fertilizers as well as tools, would assist low-income households with the means to generate additional food and income.

Micro credit support for processing, storage and refrigeration would raise the income potential of urban farmers and improve the safety of food sold by street vendors, who rely heavily on urban and peri-urban production.

Micro credit is the extension of small loans to entrepreneurs too poor to qualify for traditional bank loans. It has proven an effective and popular measure in the ongoing struggle against poverty, enabling those without access to lending institutions to borrow at bank rates, and start small business. But with the current explosion of interest on micro credit issues, several developmental objectives have come to be associated with it, besides those of only "micro" and "credit". Of particular importance is that of savings - as an end in itself, and as a guarantee for loans.

Micro credit has been used as an 'inducer' in many other community development activities, used as an entry point in a community organizing programme or as an ingredient in a larger education/training exercise.

Source: The virtual library on micro credits http://www.gdrc.org/icm/



USE OF GEOGRAPHIC INFORMATION SYSTEMS FOR MAPPING OF AGRICULTURALLY USED OPEN SPACES IN DAR ES SALAAM (Source: Dongus 2000)

Communities could be supported through the establishment of savings and credit schemes e.g. "micro banks for the poor" or community based saving agreements. The Grameen bank model is currently one of the most successful micro finance instruments to help the poor., but its replication under other conditions is not automatic and it has a limited focus on agriculture.

Currently, there are estimated to be about 3,000 micro finance institutions in developing countries. These institutions also help create deeper and more widespread financial markets in those countries. UN Secretary-General 1997

The Women's Bank in Sri Lanka

The Women's Bank is a cooperative bank, with saving and loan groups and bank branches Members of a group meet weekly. The leaders of all groups in one bank branch meet monthly. All members (or their representatives) of the Women's bank meet once a year.

To be eligible for membership of a group, a woman will have a low income, she must reside in a poor-income settlement area and she must be willing to participate in group activities according to a set of rules and regulations. Only one member of a household can participate in a particular group and only persons who trust each other can be members. The groups consist of 5-15 members only; no money lender can join the group and the group leader cannot be actively involved in party politics.

Source: The Virtual Library on Microcredit
http://www.gdrc.org/icm/inspire/womenbank.html

In order to enable the farmers to enter into saving agreements training for numeracy and simple bookkeeping is needed. This is for example successfully practised with urban farmers in in Dar es Salaam.

Those training courses enhance the management skills of micro business entrepreneurs and thus not only increase the income poetential of their productive activities, but also improve their self-esteem, and their status in the community. Increased self-esteem helps women build their confidence with outside partners and open their perspectives to further development

It is important that social and economic support programmes include managerial capacity building of the individuals / groups they aim to assist, as this is the only way that such programmes can achieve a lasting effect.

TRAINING URBAN FARMERS IN BOOK KEEPING IN DAR ES SALAAM

(Photo: Drescher)

In this regard, it is recommended that Home Economics Institutions consider or enhance curriculum components preparing their students for development approaches, catering for social AND economic needs of their ultimate target audience. Seldom will social advancement be achieved without economic betterment and improvements in individuals' economic situations will most likely contribute to increased power and participation in household and community decision-making. This will contribute to linking micro-level improvements with intermediate and national level development opportunities.

Further Reading:
More Information on constraints, planning, food security and environmental issues related to urban and peri-urban agriculture is available as a final report of an FAO/ETC electronic Conference:
FAO (2000). URBAN AND PERIURBAN AGRICULTURE ON THE POLICY AGENDA. Virtual conference and information market, August 21 - September 30, 2000, Final Report. By Drescher, A.W., R. Nugent & H. de Zeeuw http://www.fao.org/urbanag/

STRENGTHENING SMALL SCALE FARMERS: The "small group" approach

For FAO, bringing the rural poor together - in groups of 10 to 15 people - is the starting point of participation. This concept could be modified and transferred to the urban sector as well. It's plain common sense:

- First, groups offer significant economies of scale. Individual small farmers can't afford to undertake activities that involve additional investment or risk. But a group of people can share costs by pooling their ideas, capital and labour.
- Second, groups are cost-effective receiving systems for development assistance. Most governments do not have the staff or funding to reach each and every rural household. But when their clients are organized in groups, it is far less costly to deliver inputs, training, credit and other services.
- Groups foster collective learning. Individual farmers have particular talents and skills - but don't have the opportunity to share them with their neighbours. In a group, they can learn from each other, and share valuable new skills as well.
- And groups promote democracy. As individuals, the rural poor expect to have little or no say in decision-making. In a group, they learn to discuss and solve problems together. They elect their own leaders and hold them accountable. Later, they apply these principles in community life.

But groups of people sometimes drift apart. Friends argue. Businesses fail. How then do FAO projects ensure that farmers' groups remain cohesive and sustainable?

Experience from the* FAO's Peoples Participation Programme (*PPP) project in Zambia:

"We operate through what we call group promoters. They are trained for two weeks in the small group approach, then assigned to an extension area. The group promoter in each area will carry out a survey to find out what services are available, the resources and activities that are going on, and identify the people to be our beneficiaries.

"When we introduce our approach to the farmers, we sit and talk with them, and it is finally the people who agree on whether they make a group or not. These groups have to be small, manageable and the group members should be of such a level - both social and economical - that they can understand each other. In these groups they are taught to work together, leadership skills, how to keep records and how to carry out income-generating activities.

"Thereafter, if the members are willing to undertake any other new ventures, then the group promoters will act as link between the groups and any other organization that will give the service of knowledge to the groups."

Source: http://www.fao.org/waicent/faoinfo/SUSTDEV/FSdirect/FBdirect/FSP006.htm

Source and further reading at:

FAO 2000a: "FAO supports the Nineteenth Congress of the International Federation for Home Economics" *http://www.fao.org/sd/wpdirect/wpre0133b.htm*

This collection of papers provides more information on various topics related to home economics.

BOX 3 THE IMPACT OF THE NUMERACY AND SIMPLE BOOKKEEPING TRAINING PROGRAMMES

Training in numeracy and bookkeeping systems leads to:

- **increased skills and knowledge,**
- **greater trading skills and higher returns, and**
- **improved self-esteem and general well-being**

- **Increased skills and knowledge**
- able to avoid being cheated (by literate people);
- recognise the need to handle their business in a professional manner, irrespective of its size;
- able to distinguish between money "left over at the end of the day" and profit;
- able to cost & price services or goods correctly and to determine the actual profit obtained;
- enhanced analyses of -financial- issues before decision-making;
- able to determine where and when the greatest profits could be obtained, sometimes leading to diversification of the activity;
- more cautious about spending and trading: rational decision-taking on most profitable products, services or investments;
- able to weigh cotton, to write down the weight of the cotton and to calculate the income which should be obtained (Togo);

- **Greater trading skills and higher economic returns**
- nearly two thirds of the interviewed learners of the initial courses reported a tripling of their economic returns;
- 3/4 of the interviewed learners of the initial courses had started to save money and the majority of them reported reinvesting part of their savings into their business;
- learners reported that they sell other things to re-invest.

- **Improved self-esteem and general well-being**:
- an improved self-esteem:
- "improved public image" = increased status:
- increased harmony in the family as they are able to maintain proper accounts and to discuss financial matters rationally;
- extra income is being spent on increased family food intake, school fees, possibly reflecting the impact of nutrition education programmes or showing the need for increased expenditures in these areas;
- increased enrolment of their children into schools;
- helping their children with maths homework and being able to judge their marks (children are even using their books);
- emanating desire to continue learning;

WATER AVAILABILITY, QUALITY AND SAFE PRODUCTION

Water is scarce in many urban centres and both water and sewage systems are not designed for the increasing population. Water supply for agricultural uses in cities is not planned for in most cities.

Therefore (peri) urban agriculture is to be promoted in such a way that it does not compete with other urban water needs, is environmental friendly and does not pose risks to human health. Rapid urban expansion has resulted in a large flow of unmanaged wastewater. This does not only threaten the immediate surroundings of the urban and industrial centres but also affects downstream water resources. It causes severe environmental pollution, threatens public health and makes water resources less or unsuitable for other potential beneficial uses, including food production in the (peri) urban and rural areas.

Only 8 to 10% of the sewage waters are properly managed in Africa, Asia and Latin America (Biswas, 2000)

Microbiological quality guidelines for wastewater use in agriculture

	Reuse condition	Exposed group	Intestinal nematodes (arithmetic mean no. of eggs per litre)	Faecal coliforms (geometric mean no. per 100 ml)
A	Irrigation of crops likely to be eaten uncooked, sports fields, public parks	Workers, consumers, public	≤ 1	≤ 1000
B	Irrigation of cereal crops, industrial crops, fodder crops, pasture and trees	Workers	≤ 1	No standard recommended
C	Localised irrigation of crops in cat. B	None	Not applicable	Not applicable

Health hazards associated with water pollution relate to the accumulation of heavy metals, and carcinogens, mainly organic chemicals, in crops. Two of the best know examples of heavy metal pollution that can cause health concerns are cadmium and selenium. Pathogenic organisms give rise to the greatest health concern in agricultural use of water contaminated by urban wastewater. Although there are no specific water quality guidelines for pathogenic contamination of irrigation water the WHO microbiological quality guidelines for design of wastewater treatment might be used to evaluate the health risk of the use of polluted water sources for irrigation. These guidelines are based on the survival times of excreted pathogens in water, soil and on crop surfaces and in combination with the irrigation conditions.

Promotion of safe production

The Accra Metropolitan Public Health Department has recorded an increase in the incidence of intestinal diseases among children in the metropolis due to the consumption of contaminated food, especially vegetables eaten raw. The main source of vegetable contamination identified by the Accra lboratories is the water of very poor quality used for irrigating the vegetables at all sites within the metropolis. This problem received large attention from national an international media, causing negative impacts on trade and tourism. Provision of safe water for irrigation in combination with a certification programme might be a solution.

Water from shallow wells might also contain a high level of contaminants if they are not protected against intrusion of run-off drainage water. Microbiological contamination also occurs in open and tubewells as well as springs that are located within approximately 30 meters of a contamination source e.g. pit latrines. Besides, water from shallow wells can be contaminated with high levels of salinity and toxic trace elements, either natural or through groundwater flow from a pollution source. At present arsenic contamination of wells in the Bangal is a serious problem.

Where water sources do not meet the WHO water quality guidelines for irrigation measures will need to be taken to lower risks to public health. The most widely used measure is crop restriction. The success of crop restriction programmes greatly depends on whether the wastewater use occurs in a defined area. Reality in many developing countries, however, is that the wastewater - treated, partially treated and untreated - is discharged directly to surface waters and these are again diverted downstream for irrigation purposes. This unrestricted discharge leads to widespread distribution of the wastewater and makes crop restriction extremely difficult.

Developing a programme to promote safe production areas is an alternative to crop restrictions and can be done with a three-phased process. Each phase depends upon the successful completion of the previous phase. The first phase is to develop a sound information base (water quality monitoring phase) that can be used to evaluate the existing levels of contamination (water quality) in the water being used for production. The second phase involves evaluating the water quality data collected in the first phase and developing procedures to

assess the levels of contamination (data analysis and evaluation phase). The overall goal of both Phases I and II is to ensure that the database can be used to define safe production areas. The third and final phase of developing a programme to promote safe production areas is developing mechanisms to regulate the use of contaminated water on vegetable or other high-risk crops (water certification phase).

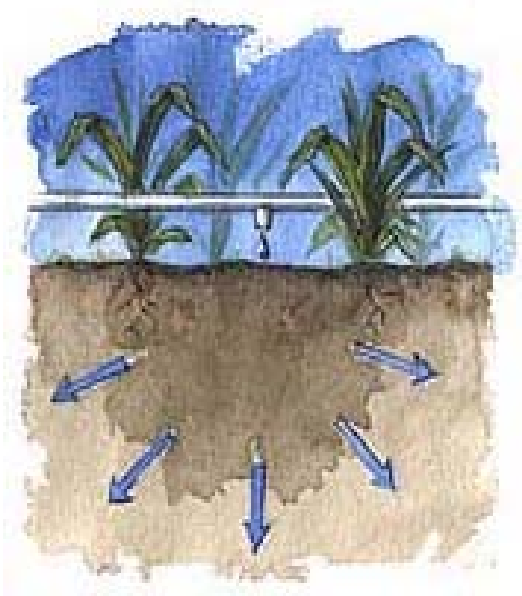
Water certification programmes

Certification programmes focus on the source of water used in production. Two approaches can be adopted i.e. certification of the water used in an irrigated area or certification of water used on a specific crop or field. The choice depends greatly on the staff and financial resources that are available as well as the characteristics of the water and pollution sources. Certification of the water used in an irrigated area can be done if the water that is distributed and used throughout the irrigation network does not change in quality. This type of certification can be done for organised growers' schemes in open urban spaces and peri-urban areas. For families that have access to small-size plots normally living in populated urban areas and who do not make use of the same water source or where secondary contamination is likely to take place certification of water used on a specific crop or field is more applicable.

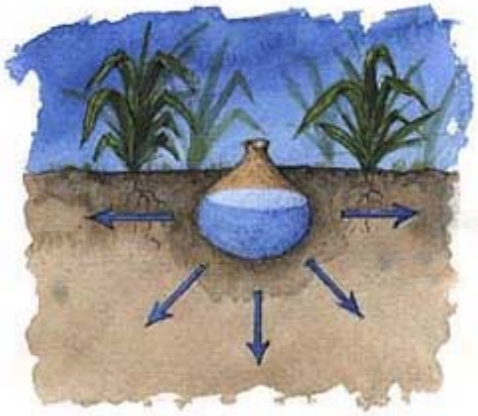
IRRIGATION WATER USED FOR WATERING IN THE URBAN GARDENS IS NOT ALWAYS SAFE AND CLEAN. An example from Dar es Salaam (Photo Drescher)

Box 4 Locally adapted small-scale irrigation systems

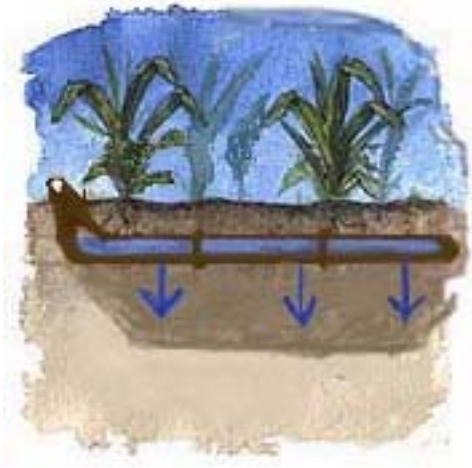
Locally adapted small-scale irrigation and plant production methods and schemes are possible solutions to save water. To alleviate the water problem, new water-saving sub-surface irrigation methods are used.



Drip irrigation - the slow, localised application of water, literally drop by drop *(Source: FAO)*



The use of porous jars buried up to the neck is one of the oldest irrigation methods and is practised by traditional farmers throughout North Africa and the Near East
(Source: FAO)



A new water-saving sub-surface irrigation method, using underground clay pipes (approx. 10 cm diameter) has recently been introduced by an ODA-funded community development project in Zimbabwe. *(SOURCE: after Drescher, Hagmann & Chuma 1999, modified)*

SUMMARY OF SMALL-SCALE IRRIGATION METHODS

Methods based entirely on local materials and workmanship

- Low-fired porous ceramic pots are placed on the surface or embedded in the soil within the root zone. When filled with water and dissolved fertilizers, the permeable clay receptacles ooze water and nutrients into the soil.
- Sectioned ceramic pipes constitute line sources that feed elongated beds.

Methods based on imported materials but local fabrication

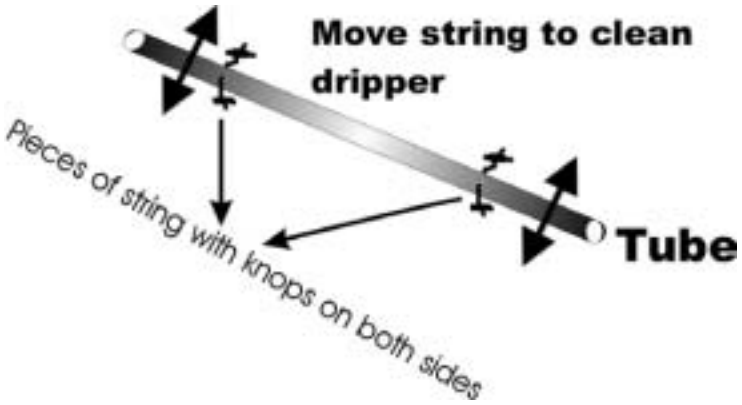
- Moulded plastic pipes or extruded plastic tubing are perforated manually and laid over the ground to simulate drip irrigation.
- Vertical sections of plastic pipes (or even discarded plastic containers such as bottles) are embedded in the ground.
- Thin-walled plastic vessels are filled with sand or gravel to provide mechanical resistance to crushing.
- Slit plastic sleeves cover the perforated sections of the tubes to prevent root penetration into the outlet holes.
- Sand filters prevent suspended particles or algae from clogging the outlets.
- Auxiliary containers are used to dissolve and inject fertilizer into the irrigation water.
- Vertical standpipes are used to deliver water from an underground pipe to small basins.

Methods based on imported components*

- Manufactured drip emitters and micro sprayer assemblies are carefully supervised and maintained.
- Ancillary equipment such as screen and media filters, metering valves, pressure regulators and fertilizer injectors are used in various combinations.
- These options will be justified only for cash crops in a stable market economy.

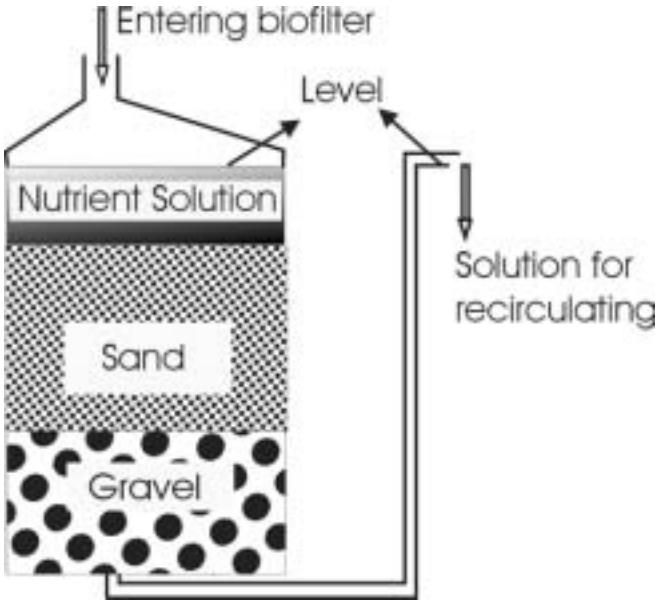
Source FAO Web News 1997 : http://www.fao.org/news/1997/970704-e.htm

Blocking of irrigation tubes is a major problem in drip-irrigation. A self-made drip system which prevents the system from blocking has been developed in South Africa.



Simple self-made drip system

A simple bio-filter helps to recycle high value nutrient solutions, which can be used either in drip-irrigation systems or in hydroponics. The effluent is filtered through layers of sand and gravel. No diseases developed up to date after transplanting four months ago.



Schematic illustration of an adapted bio filter

(Source FAO 2001)

Further readings on irrigation, water quality, wastewater reuse and safe production:

FAO (1985) Irrigation Water Management: Training Manual No. 1 - Introduction to Irrigation
http://www.fao.org/docrep/R4082E/R4082E00.htm

FAO (1990) Irrigation Water Management: Training Manual No. 5 - Irrigation Methods
http://www.fao.org/docrep/S8684E/S8684E00.htm

FAO (1992). Wastewater treatment and use in agriculture. Irrigation and Drainage Paper 47.
http://www.fao.org/docrep/T0551E/T0551E00.htm

FAO (1997). Quality Control of Wastewater for Irrigated Crop Production. Water Reports 10.
http://www.fao.org/docrep/W5367E/W5367E00.htm

G. D. Rose (1999). Community-Based Technologies for Domestic Wastewater Treatment and Reuse: options for urban agriculture. CFP Report Series Report 27.
http://www.p2pays.org/ref/03/02008.htm

UNEP (2000). Sourcebook of Alternative Technologies for Freshwater Augmentation". IETC Technical Publication Series No. 8.
http://www.unep.or.jp/ietc/Publications/TechPublications/TechPub-8a/index.asp

Orwin, A. (1999). The Privatization of Water and Wastewater Utilities: an International Survey.
http://www.environmentprobe.org/enviroprobe/pubs/ev542.html

WHO (1989) Guidelines for the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture: Measures for Public Health Protection
http://www.who.int/environmental_information/Information_resources/documents/wastreus.pdf

SUSTAINABLE SOIL FERTILITY MANAGEMENT

Composting, mulching, tillage, irrigation, crop rotations, mixed cropping systems are common practices in sustainable soil fertility management.

Manure is a Good Source of Humus

Manure is are a good source of humus or organic matter for yard and garden soils. It also provide some nutrients if there is not too much litter (straw, sawdust, or shavings) mixed in, and if it has not been stored outdoors where heavy rains wash out the nutrients. Poultry or rabbit droppings, taken from beneath roosts or hutches, are high in nitrogen. They may actually burn plant roots if used too generously. It is important to ensure adequate treatment of the manure fertilizers to avoid contamination of the fresh produce.

Average Nutrient Content Table

Livestock	Nitrogen	Phosphorus	Potassium
Poultry	20	14	9
Cow	8	4	6
Hog	10	7	7
Steer	10	6	8

Source:
http://gardening.wsu.edu/library/lanb003/lanb003.htm

This table is based on the average nutrient content in one yard of undiluted animal and poultry excrement. Divide these numbers by 40 to estimate the nutrient content per 5-gallon bucket of fresh, undiluted manure. The value of manure as fertilizer depends on how much it has been diluted or leached by water and the proportion of bedding, such as straw, sawdust, or shavings, that is mixed in undiluted manure.

MARKET WASTE IN THE DOMINICAN REPUBLIC (Photo Drescher)

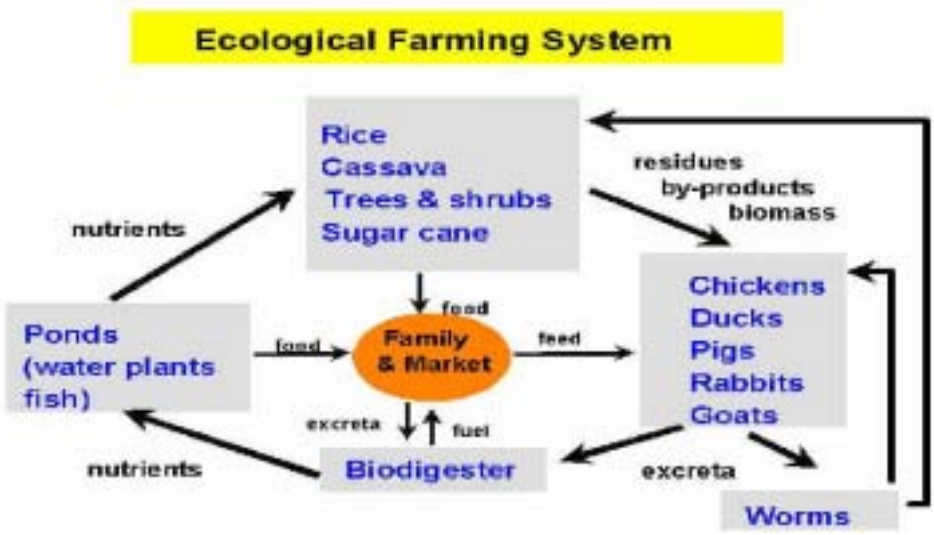
Organic market wastes can readily be used as animal feed as for example practiced in Mexico City

Composting Recycles Plant Refuse

Composting is the biological breakdown of organic matter. Composts are a good source of humus and a good way to recycle plant refuse from the yard or garden. However, backyard composting may not kill weed seeds, disease organisms, or underground stems or roots of specific weeds. Do not put diseased plant materials in your compost. Fruit and vegetable wastes are good compost materials, but do not compost meat and fatty food. You may dig organic materials directly into fallow (unplanted) areas of your garden. This is a good way to improve your soil using food wastes.

In SE Asia, the integration of crops and livestock, and the use of manure as fertilizer, are traditional practices and are the basis of the farming systems, especially at small-holder level.

An online available FAO manual prepared by Preston and Rodriquez (1999), describes ways in which these systems can be made more efficient, more productive and more environmentally friendly, by applying simple, low-cost technologies for recycling the manure through bio digesters, duckweed ponds and earthworms. It is online available at : **http://www.fao.org/livestock/agap/frg/recycle/default.htm**



Source: FAO 1999

Vermiculture

Earthworms can be raised in heaps of manure on the surface of the ground. At family level, where scavenging chickens are the norm, the beds must be protected. A hole in the ground about 1x1 m area and 30 cm deep is one alternative. Once the manure and earthworms are introduced the hole is covered to keep out the chickens. When the process is completed the cover is removed so that the chickens themselves "harvest" the worms

VERMICULTURE USING GOAT MANURE

(Source: FAO http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGA/AGAP/FRG/Recycle/Earthwm/maworm.htm#Earthworms)

Further Reading:

Preston & Rodriguez (1999). Recycling Livestock Wastes
http://www.fao.org/livestock/agap/frg/recycle/default.htm

BOX 5: ORGANIC MANAGEMENT PRACTICES

Urban agriculture, because of its proximity to human settlements, needs careful management of natural resources even more than peri-urban agriculture. Organic farming practices guarantee long term sustainability and environmental protection.

Main pillars of organic farming are:

- Sustainable soil conservation and management practices
- Alternative Pest Management practices, without using chemical pesticides
- Alternative Post-harvest practices

Soil management practices include :

- Increasing humus content and biological activity as well as meeting mineral deficiency of soils for example through the application of rock dust, manure, crop and agro-industry residues, household waste or compost.

Pest management practices include:

- manipulation of crop rotations, to minimize survival of crop-specific pests (in the form of, for example, insect eggs, fungi) which can infest the next crop; strip cropping, to moderate spreading of pests over large areas; manipulation of planting dates, to plant at a time most optimal for the crop, or least beneficial for the pest; biological control methods, to encourage natural enemies of pests by providing habitat (for example hedges) or by breeding and releasing them in areas where they are required; biological pesticides (for example, derris dust, pyrethrum, rotenone, neem) or other local known biological pesticides.

Post-harvest practices include:

- in temperate countries, grains can be well conserved when harvested and stocked in conditions which allow air circulation (in jute sacs, ventilated silos, etc.);
- traditional procedures allow conservation and enhancement of the nutritional value of cereals and leguminous

Further Reading on Organic Farming Practices:

FAO (1998). Evaluating the potential contribution of organic agriculture to sustainability goals (FAO) http://www.fao.org/sd/epdirect/EPre0055.htm

Sullivan, P. (1999). Sustainable Soil Management. ATTRA. http://www.attra.org/attra-pub/soilmgt.html#abstract. Web page

van der Bliek, J. 1992. Urban agriculture: possibilities for ecological agriculture in urban environments as a strategy for sustainable cities. Leusden, ETC.

BOX 6 INTEGRATED PEST MANAGEMENT (IPM)

CUBA'S EXTENSION FOR URBAN FARMERS

The government also encourages gardeners through an extensive support system including extension agents and horticultural groups that offer assistance and advice. Many gardeners were inexperienced in the type of small-scale, organic cultivation necessary for urban production. The extension services helped to educate gardeners and spread the word about new biologically based pesticides and fertilizers and agroecological techniques. Seed houses throughout the city sell seeds, gardening tools, compost, and distribute bio-fertilizers and other biological control agents to small farmers at very reasonable rates.

New biological products and organic gardening techniques are developed and produced by Cuba's agricultural research sector, which had already begun exploring organic alternatives to chemical controls. This emphasis on alternative methods of pest and disease control has enabled Cuba's urban farms to become completely organic. In fact, a new ordinance prohibits the use of any pesticides for agricultural purposes anywhere within city limits.

Food First 1999

IPM Field Schools are forums for community action. Farmers who live in a village share both its ecological location and a social and political community. IPM Farmers' Field Schools are forums where farmers and trainers debate observations.

They apply their previous experiences and present new information from outside the community; the results of the meetings are management decisions on what action to take. Thus, IPM is a dynamic process that is practised and controlled by farmers. It is not a passively adopted product or technology. IPM training assists farmers to transform their observations to create a more scientific understanding of the rice agro-ecosystem.

The discovery-based learning process reduces farmers' dependence on outside technology and increases their self-reliance, strengthens indigenous investigations that farmers have carried out through millennia and makes them more active, stronger partners who can make the research and extension system responsive to local needs and priorities. Farmers' Field Schools often take root in pre-existing farmers' organizations and help them work better. IPM Farmers' Field Schools catalyse these groups to focus on concrete goals: the rice crop and more sustainable production. The IPM training process shows how to build better stronger groups from the individual insights and accomplishments of members.

Trainers are often embedded in extension systems that emphasize the delivery of fixed messages and physical and financial inputs from a central source. For IPM training, however, they must become skilled facilitators of groups; this means that the training of trainers, which is much more intensive for IPM than normal agricultural extension, includes group dynamics and group strengthening.

Source: FAO 1994

POLLUTION TO THE ENVIRONMENT

There are many health and environmental risks associated with UPA. Both animal and plant waste can causes serious problems in towns and cities. The closeness of livestock to large numbers of people increase the risks of disease transmission from animals to humans.

Soils and/or water in urban and peri-urban areas of developing countries are often contaminated. Problems arise when food crops are grown on soils contaminated with heavy metals and other toxic materials and irrigated with polluted water.

In the area of health and environment, extension services can play a significant role in helping food producers and those involved in processing and marketing help protect the public against unsafe and unhealthy food. Strategic extension campaigns can also help inform the general public about the health and environmental risks associated with UPA.

In cities there is a reduced environmental capacity for air pollution absorption (e.g. carbon dioxide and methane from organic matter, ammonia, nitrous oxide and nitrogen oxide from nitrates).

Without appropriate management and monitoring of resources, negative environmental and health effects of UPA can be imposed on society.

The contribution of UPA to the citizens is dependent upon the advantage taken from the opportunities and an awareness of how the risks can be monitored and controlled. In places where farm to market systems are inadequate, UPA fill critical gaps. Manure and its effluent require an appropriate treatment for recycling and use in horticulture production.

ORGANIC WASTE COLLECTION IN HYDERABAD

Source: http://indiaa.com/exnora/swm.html

Optimal management of urban and peri-urban resources requires land use planning which views agriculture as an integral component of the urban natural resources system and balances the competition of the natural resources (water, land, air, wastes) among the users.

Benefits include improved hydrological functioning through soil and water conservation, microclimate improvements, avoided costs of disposal of the recycled urban wastes (wastewater and solid waste), improved biodiversity, and greater recreational and aesthetic values of green space.

A case Study on waste management in India: EXNORA INTERNATIONAL Solid Waste Management. http://indiaa.com/exnora/swm.html

SPECIFIC PROBLEMS WITH ANIMAL PRODUCTION

There is a wide range of evidence that many human diseases can be transmitted from livestock to people during production, processing or consumption. Major diseases include bovine tuberculosis, brucellosis, salmonella. The closeness of human beings to animals in urban areas might facilitate the spread of diseases.

SMALL LIVESTOCK KEEPING

Ducks at the South Suburb Beijing Company, which raises the "Beijing Duck" - famous worldwide for its special taste.

1. Animal products (like red meat, poultry meat and eggs) may be contaminated with pesticides (especially organo-phosphates) and/or antibiotics, if animals kept in an intensive system
2. Animal products may become contaminated by heavy metals if animal feed and/or drinking water was polluted by industry or traffic
3. Free wandering animals can injure people and may cause traffic accidents
4. Allergens from livestock wastes/dust (esp. poultry) can cause occupational diseases in farm workers (asthma, allergic pneumosis)
5. Tanneries may discharge hazardous chemicals in their wastes (tannum, chromium, aluminium)

Although, generally speaking, the keepers of large livestock and those of small livestock were rather unanimous regarding the various problems, there are some problems which are more specific to large than to small livestock and vice versa.

Lack of feed and safe drinking water is much more a problem for large livestock keepers, probably simply because these animals eat and drink much more than small animals. Harassment, though not frequently mentioned, is also a constraint specific to large livestock. This may be related to the regulation which says that it is forbidden to let large animals freely roaming around.

Further Reading: Smith O.B. & E.A. Olaloku (1998). PERI-URBAN LIVESTOCK PRODUCTIONS SYSTEMS Cities Feeding People, CFP REPORT SERIES Report 24 http://www.idrc.ca/cfp/rep24_e.html

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REFERENCES AND SUGGESTED FURTHER READINGS

ATTRA – USDA web site on Aquaponics. This page provides a lot of web addresses on the topics: http://www.attra.org/attra-pub/PDF/aquaponic.pdf

AVRD (no year): Development of Peri-Urban Vegetable Production Systems for Sustainable Year-Round Supplies to Tropical Asian Cities. http://www.avrdc.org.tw/periurban.html

Biswas, A.K. 2000, Missing and Neglected Links in Water Management, Paper presentaed at the 10th Stockholm Water Symposium, Stockholm, Sweden 2000. 6p. Stockholm Symposium site: http://www.siwi.org/sws/sws.html

Bruns, B. Reflections on Turning Over Irrigation to Farmers: Collected Papers 1989-1994. http://www.cm.ksc.co.th/~bruns/0content.html

Bradley, P. (1998) : A Garden for Niki. http://www.hydrogarden.com/children/comic/comic.htm

Carter, E.J. 1994. The Potential of Urban Forestry in Developing Countries: A Concept Paper. FAO, Rome. 90 pp. (English, French and Spanish)

Ciparisse Gérard (1997). Food in Cities: Land tenure dynamics and agriculture in peri-urban areas. Dynamiques fonciérec et agriculture en zones périurbaines, SDAA, Land Reform, 1997/1, ISSN 0251-1894

COAG (1999). Committee on Agriculture, 15th session Urban And Peri-Urban Agriculture http://www.fao.org/unfao/bodies/coag/coag15/X0076e.htm. Paper, Web page.

Dennery, P. (1998): Urban Agriculture in Informal Settlements . http://www.cityfarmer.org/nairobi.html

Dongus, S. (2000): Vegetable Production on Open Spaces in Dar es Salaam - Spatial Changes from 1992 to 1999 http://www.cityfarmer.org/daressalaam.html

Drescher, A.W. (1997): Management Strategies in African Homegardens & The Need for New Extension Approaches http://www.cityfarmer.org/axelA.html#lusaka

Drescher A.W. and D.L. Iaquinta (1999). Urban and Peri-Urban Food Production. Available at FAO/AGPC

Drescher, A.W, J. Hagmann & E. Chuma (1999): Home gardens - a Neglected Potential for Food Security and Sustainable Land Management in the Communal Lands of Zimbabwe. In: Der Tropenlandwirt, 2/1999: 163-180. Kassel-Witzenhausen.

Drescher, A.W., Nugent & H. De Zeeuw (2001): Informe Final - Agricultura Urbana y Peri-urbana en la Agenda Política Conferencia Electrónica Conjunta FAO/ETC, 21 de agosto - 30 de septiembre, 2000 (as well in english and french) http://www.ruaf.org/proc_econf_spanish.html

El Lakany, H., Medhipour Ataie, A., Murray, S. *et al*., (1999): Urban and Peri-Urban Forestry: Case Studies in Developing Countries. FAO, Rome, 200 pp. (English)

EXNORA INTERNATIONAL Solid Waste Management. http://indiaa.com/exnora/swm.html

FAO (1990). Soilless culture for horticultural crop production. FAO Plant Production and Protection Paper 101.

FAO (1990) Irrigation Water Management: Training Manual No. 5 - Irrigation Methods http://www.fao.org/docrep/S8684E/S8684E00.htm

FAO (1992). Wastewater treatment and use in agriculture. Irrigation and Drainage Paper 47. http://www.fao.org/docrep/T0551E/T0551E00.htm

FAO (1993). Popular Hydroponics Gardens, Technical manual, Regional Office for Latin America and the Caribbean, Santiago de Chile, available at FAO/AGPC. Book

FAO (1994). An Annotated Bibliography on Urban Forestry in Developing Countries. FAO, Rome. 100 pp. (English)

FAO (1995) Improving Nutrition Through Home Gardening: A training package for preparing field workers in Southeast Asia, Food and Nutrition Division, 171 p. Book

FAO (1997). New FAO publication aims to bring small-scale irrigation to farmers in sub-Saharan Africa http://www.fao.org/news/1997/970704-e.htm.

FAO (1997a). Guidelines for small-scale fruit and vegetable processors. (FAO Agricultural Services Bulletin - 127) by Peter Fellows: http://www.fao.org/docrep/W6864E/W6864E00.htm

FAO (1998), Evaluating the potential contribution of organic agriculture to sustainability goals (FAO) http://www.fao.org/sd/epdirect/epre0055.htm. Paper, Web page.

FAO (1998a). Female agricultural extension agents in El Salvador and Honduras: do they have an impact? By G.A. Truitt, SD Dimensions http://www.fao.org/sd/EXdirect/EXan0032.htm Also available at : "Training for agricultural and rural development 1997-98" . Paper, Web page.

FAO (1998b). Treating sewage by aquaculture http://www.fao.org/NEWS/1998/sewage-e.htm. Paper, Web page.

FAO (1998c). Hidroponia Escolar http://www.rlc.fao.org/prior/segalim/prodalim/prodveg/hidro.htm

FAO (1999). Spotlight Issues in urban agriculture Studies suggest that up to two-thirds of city and peri-urban households are involved in farming http://www.fao.org/ag/magazine/9901sp2.htm.

FAO (1999a) Small farmer group associations: Bringing the poor together FAO experience: Service-related issues E-mail conference 24 September-11 November 1998 http://www.fao.org/sd/ppdirect/ppfo0008.htm.

FAO (1999b): 6,000,000,000 and counting: Food security and agriculture in a demographically changing world. SD Dimensions, Population Programme Service, FAO Women and Population Division http://www.fao.org/sd/wpdirect/wpan0040.htm

FAO (1999). Field Programme Management- Food, Nutrition and Development . A training package to assist fieldworkers in operating a rural development programme. 1999, 244pp. English - ISBN 92-5-104387-6.

FAO (2000). URBAN AND PERIURBAN AGRICULTURE ON THE POLICY AGENDA. Virtual conference and information market, August 21 - September 30, 2000, Final Report. http://www.fao.org/urbanag/. Prepared by Drescher, A.W., R. Nugent & H. de Zeeuw.

FAO (2000a). Enhancing women's managerial skills for small scale business enterprises through numeracy and simple bookkeeping training´ .SD-Dimensions: http://www.fao.org/sd/wpdirect/wpre0133b.htm.

FAO (2000b) Mejorando la nutrición a través de huertos y granjas familiares: manual de capacitación para trabajadores de campo en América Latina y el Caribe. Este material de capacitación integra aspectos de producción agropecuaria con aspectos de nutrición y seguridad alimentaria, y ofrece pautas para la realización de acciones conjuntas en varios sectores y disciplinas para encontrar soluciones adecuadas y sostenibles a los problemas de inseguridad alimentaria y desnutrición. 2000, 248 pp. Spanish - Job Number V5290S.

FAO TRAINING SERIES (various years)

“Simple methods for aquaculture” series:

Volume 4 Water for freshwater fish culture 1981. 111 pp. ISBN 92-5-101112

Volume 6 Soil and freshwater fish culture 1986. 174 pp. ISBN 92-5-101355-1

Volume 16/1 Topography for freshwater fish culture: topographical tools 1988. 328 pp. ISBN 92-5-102590-8

Volume 16/2 Topography for freshwater fish culture: topographical surveys 1989. 266 pp. ISBN 92-5-10259-1-6

Volume 20/1 Pond construction for freshwater fish culture: building earthen ponds 1995. 355 pp. ISBN 92-5-102645-9

Volume 20/2 Pond construction for freshwater fish culture: pond-farm structures and layouts 1992. 214 pp. ISBN 92-5-102872-9

Volume 21/1 Management for freshwater fish culture: ponds and water practices 1996. 233 pp. ISBN 92-5-102873-7

Volume 21/2 Management for freshwater fish culture: farms and fish stocks 1998. 341 pp. ISBN 92-5-102995-4

FAO/UNDP (1993). "Popular Hydroponic Gardens: Technical Manual - Audio Visual Course". UNDP and FAO-Regional Office for Latin America and the Caribbean, Santiago, Chile, 1993. (a manual for beginners). In Spanish: "La Empresa Hidoponica de Mediana Escala: La Tecnica de la Solucion Nutritiva Recirculante ("NFT") Universidad de Talca y FAO Officina Regional para America Latina y El Caraibe. Santago, Chile, 1996 (for more advanced entrepreneurs

Foeken, Dick W.J. & Samuel O. Owuor (2000). Urban Farmers in Nakuru, Kenya. *http://www.cityfarmer.org/nakuru.html*.., ASC Working Paper 45 / 2000, Centre for Urban Research, University of Nairobi, Kenya.

Gefu, J.O. 1992. Part-time farming as an urban survival strategy: a Nigerian case study. In: Baker J. and Pedersen, P.O. The rural-urban interface in Africa: expansion and adaptation (Scandinavian Institute of African Studies, Stockholm) pp. 295 - 302. Paper

Gündel, Sabine & John Butterworth (2000). Agriculture and Training Needs. Discussion paper for FAO-ETC/RUAF electronic conference 'Urban and Periurban Agriculture on the Policy Agenda'. August 21 - September 30, 2000 http://www.nri.org/E-Conf/papertext.htmUrban. Natural Resources Institute (NRI).

Hartwick College, New York (2000). Environmental Science and Policy Programme: Aquaponics. http://www.hartwick.edu/envirsci/Courses/1

Hasna, M. K. (1998). NGO Gender Capacity in Urban Agriculture: Case Studies from Harare (Zimbabwe), Kampala (Uganda) and Accra (Ghana). IDRC, CFP Series No. 21. http://www.idrc.ca/cfp/rep21_e.html

Hovorka, A. (1998). Gender Resources for Urban Agriculture Research: Methodology, Directory and Annotated Bibliography. IDRC, CFP Series No. 26. http://www.idrc.ca/cfp/gender.html

IDRC (1998). Cities Feeding People, Program initiative, CFP Report Series report 22: http://www.idrc.ca/cfp/rep22_e.html. Paper

Jacobi, P., A.W. Drescher & J. Amend (2000). Urban Agriculture - Justification and Planning Guidelines. GTZ, Eschborn. Http://www.cityfarmer.org/ Paper

Krabuan Wattanapreechanon (1999). Soilless culture : an alternative method of growing vegetables in Thailand Department of Botany , Faculty of Science, Chulalongkorn University, Bangkok 10330,THAILAND http://www.hydroponics.th.com/abstract.htm. Web page

Kuchelmeister, G. (2000). Trees for the urban millennium: urban forestry update , UNASYLVA. By: http://www.fao.org/docrep/X3989e/x3989e00.htm. Paper, Web page.

Kuchelmeister, G. (1998). Urban forestry in the asia-pacific region: status and prospects. APFSOS Working Paper No. 44

Kuchelmeister, G. & Braatz, S. (1993). Urban forestry revisited. UNASYLVA, N0. 193. Vol. 44, 1993/2. FAO.

Lazard, J. (2001). Peri-urban pisciculture in Africa. (This Page contains much more information on peri-urban agriculture). http://www.cirad.fr/publications/documents/agricult-peri/en/TopOfPage, CIRAD.

Losada et al. (1997). Urban Agriculture And Livestock In The City Of Mexico: An Option For A Sustainable Future http://www.cityfarmer.org/mexico.html

Mougeot, Luc J.A (1994). URBAN FOOD PRODUCTION: EVOLUTION, OFFICIAL SUPPORT AND SIGNIFICANCE (with special reference to Africa). International Development Research Centre Urban Agriculture Notes. City Farmer: Canada's Office of Urban Agriculture http://www.cityfarmer.org/lucluxury41.html.

Murray, S. 1997. Urban and Peri-Urban Forestry in Quito, Ecuador: A Case-Study. FAO, Rome. 104 pp. (English, and Spanish)

N.N. Growing Plants Using Hydroponics: A useful online manual explaining advantages, growth media, nutrient solutions for hydroponic production and finally gives useful hints concerning possible problems with this method. http://web.singnet.com.sg/~pathokl/hydroponics.htm

Preston, T.R. & L, Rodriquez (1999). Recycling livestock wastes. http://www.fao.org/livestock/agap/frg/recycle/default.htm (FAO).

Regis M. (1999). Urban Horticulture Project, Port-Au-Prince, Haiti Information on an urban horticulture project in Haiti, including lessons learned form the project: http://www.cityfarmer.org/haiti.html

Resh, H.M. (1993). Hydroponic Food Production. Woodbridge Press, California, USA. Book

RUAF (2000). Bibliography on Urban Agriculture. http://www.ruaf.org/data/rptUrbanLivestock.PDF

SPORE (1998). Selling to the cities http://www.agricta.org/Spore/spore76/SP2_76A.html SPORE no 76 - AUGUST 1998 CTA's bulletin. Web page

Sewage and Sunshine – India 14 March, 2000 *http://info.tve.org/ho/doc.cfm?aid=572* TVE Television Trust for the Environment Web page

Smith O.B. & E.A. Olaloku (1998). PERI-URBAN LIVESTOCK PRODUCTIONS SYSTEMS Cities Feeding People, CFP REPORT SERIES Report 24. Paper

SPFS (1999). Guidelines for the formulation of the phase I of SPFS http://internal.fao.org/TechDpts/spfs.htm (internal FAO). Paper, Web page.

SPFS - Web site: : http://www.fao.org/spfs/

Unasylva, 1993/2. Vol. 44, no. 173. Urban and peri-urban forestry. FAO, Rome. [also available on line on http://www.f ao.org/docrep/u9300E/u9300E00.htm]

Washington State University (no year). Soil Management in Yards and Gardens. http://gardening.wsu.edu/library/lanb003/lanb003.htm

Sullivan, P. (1999). Sustainable Soil Management. ATTRA. http://www.attra.org/attra-pub/soilmgt.html#abstract.

van der Bliek, J. (1992). Urban agriculture: possibilities for ecological agriculture in urban environments as a strategy for sustainable cities. Leusden, ETC.

Webb, R. 1992. Personnel communication. Urban Area Development Office. Hong Kong. *In* Carter, J. “An annotated bibliography of urban forestry”. FAO, Rome.

World Bank (2000). World Bank Press Release Launches Report "Making Transition Work for Everyone: Poverty and Inequality in Europe and Central Asia". http://wbln0018.worldbank.org/news/pressrelease.nsf/673fa6c5a2d50a67852565e200692a79/34cb0373aac4bdc58525695f004b2464?OpenDocument

Annex I: City and location of main agricultural activities - farming systems information

City	Urban Area	Peri-urban Area	Average Farm (Plot) Size	Gender Specifics
Africa				
Accra (Ghana)	Food crops, home gardens: vegetables, poultry Open spaces: crops, vegetables	Crop farming, mixed farming	No data	PU[5]: Men (vegetables) U[6]: Men (crops) Women (small livestock)
Nairobi (Kenya)	Home gardens, vegetables, poultry Open spaces	Market farms, crops, poultry, livestock	No data	U: Women PU:
Dakar (Senegal)	Home gardens: vegetables Small scale livestock (poultry, sheep)	Vegetables, battery chicken, laying hens	U: 10-30 m² PU: 0,1 - 1,0 ha (small-scale); 1 - 20 ha (market)	PU: Men U: Women (98% home gardens) and men
Dar es Salaam (Tanzania)	Home gardens, community gardens, small-scale livestock Open space: vegetables	Vegetables, mixed crop-livestock system fruit production	PU: 2 ha U: few m² to some 100 m² (Home gardens) U: 700-950 m² (open spaces)	PU: Men and Women U home gardens: Women U open spaces: Men and women
Kampala (Uganda)	Open spaces: crops, vegetables, poultry		PU: 1200 m² U: 100 - 400 m²	U: Women
Lusaka (Zambia)	Home gardens, small scale livestock Open space: crops and vegetables (rainy season)	Vegetables and crops, livestock	PU: 830 m² (small scale) U: 120 m² (gardens, high density); open space: 420 m²	PU and open spaces: Men U: home gardens: Women
Harare (Zimbabwe)	Home gardens, vegetables, small livestock Open space: crops (rainy season)	Market horticulture vegetables, crops, livestock	PU: 430 m² U: 30 m² - 300 m² (high density - low density))	PU: Men (large scale market) Women (small scale market) U: Women
Europe				
Sofia (Bulgaria)	Home gardens , vegetables Private commercial farms	Crops, livestock (private)	U: 1000 - 10 000 m²	U: Women
Latin America				
San Jose (Costa Rica)[1)]	Home gardens: vegetables	Vegetables	U: 20 - 100 m² PU: 100 - 2700 m²	U: 90% women (home gardens)
Havana (Cuba)	Community orchards, organoponics: vegetables, spices, medicinal plants	Organoponics, poultry, fruits,	U: 1200 m²[2] PU:	U and PU: men and women

Continued ANNEX I: Latin America

City	Urban Area	Peri-urban Area	Average Farm (Plot) Size	Gender Specifics
Latin America				
Santiago (Dominican Republic) [2)]	Solares (plots): food crops, tobacco, small scale livestock Home gardens: vegetables	Food crops, tobacco, livestock	U: 200-600 m² PU : ca. 2 ha	U: men (crops), women (small scale livestock, home gardens) PU: dito [2)]
Port-au-Prince (Haiti)[3)]	Home gardens: Ornamentals, vegetables, medicinal plants crops, trees	Open spaces: crops, vegetables, trees, ornamentals,	U: 5 m² - 1 ha PU: 100 m² - 25 ha and more	U: Women and men PU: Men and women
Mexico City (Mexico)[4)]	Home gardens, *parcelas familiares, solares*: vegetables, flowers, fruits Roof production Pigs	Grain, vegetables, forage, sheep. pig and poultry	Intensive use: 800-1000 m² Extensive use: 0,5-2 ha	U: Women Whole family
Lima (Peru)	Home gardens, community gardens	Vegetables, tubers, trees, hydroponics, herbs, medicinal plants, livestock (PU)	U: 60 - 200 m²	U: Women PU: Women and Men
Asia				
Hubli-Dharward (India)	Vegetables, small livestock	Livestock, vegetables, sewage based Farming System	PU: 6000 - 8000 m²	Vegetables: Women , livestock: men and women
Vientiane City (Laos)	No information	Vegetables,	PU: 5000 m²	PU: Women and men
Manila (Philippines)	Vegetables, fish, poultry	Rice	no information	U: Women (vegetables) PU. no information
Cagayan de Oro (Philippines)	40 % home gardens/ fish production	Crops and vegetables/ fish production	PU: 1,7 ha, 0,5 ha for vegetables	no information
Ho Chi Minh City (Vietnam)	No information	Crops, vegetables, sugarcane, rubber, gardens, orchards	no information	no information

1) Information on San Jose (Costa Rica) from C. H. Marulanda (personal communication), according to this source, the situation in other major cities of the area, like Managua (Nicaragua), Guatemala (Guatemala), San Salvador (El Salvador) and Bogotá (Colombia) is very similar with respect to sizes of the home gardens and the high involvement of women in vegetable production.
2) Information for Santiago (Dominican Republic) from J. P. del Rosario (personal communication)
3) Information for Port au Prince from M. Regis (personal communication)
4) Information for Mexico City from B. Canabal (personal communication)
5) PU: Peri-Urban
6) U: Urban

Source: Jacobi, Drescher & Amend (2000)

ANNEX II: Population growth, informal employment and poverty in selected countries of Africa, Latin America and Asia

Country	Urban Population (in 1000)			Population Growth Rate (percent)						Informal Employment	Poor Households	Poor Households (Female Headed)
					Urban			Rural		(percent)	(percent)	(percent)
	1980	2000	2020	1980-85	2000-05	2020-25	1980-85	2000-05	2020-25	1993	1993	1993
Africa												
Angola	1,467	4,371	10,697	5,6	4,9	3,8	1,9	2,0	1,2	36	36	41
Botswana	137	1,191	2,142	13,7	4,2	1,6	0,9	-5,5	0,2	45	55	40
D.R.Congo	7,756	15,67	39,648	2,7	4,5	4,1	3,4	2,3	1,4	50	48	80
Egypt	19,178	31,297	51,098	2,6	2,6	2,1	2,6	1,0	-0,2	x	43	x
Ghana	3,368	7,644	16,742	4,2	4,2	3,2	3,1	1,7	0,7	70	25	x
Kenya	2,673	10,043	22,468	7,7	5	3,4	2,0	1,3	0,8	52	27	25
Lesotho	183	641	1,544	6,8	5,1	3,4	2,0	1,3	0,8	31	49	59
Malawi	565	1,686	4,657	5,8	5,2	4,5	2,9	2,0	1,4	51	66	x
Nigeria	19,353	56,651	124,888	5,5	4,6	3,0	1,8	1,2	0,8	77	62	67
Senegal	1,988	4,463	9,09	3,9	4	2,8	2,2	1,3	0,6	47	13	x
South Africa	14,043	23,291	39,548	2,6	2,7	2,2	2,4	1,5	0,0	x	x	x
Tanzania	2,741	9,376	23,354	6,7	5,2	3,7	2,5	1,7	1,0	x	23	x
Togo	599	1,556	3,589	5,9	4,3	3,6	2,0	1,8	1,0	27	12	x
Uganda	1,154	3,18	9,333	4,8	5,5	4,8	2,1	2,5	1,7	46	77	36
Zambia	2,285	4,067	8,019	2,8	3,3	2,9	1,8	1,8	0,6	x	17	69
Zimbabwe	1,587	4,387	8,928	5,8	4,1	2,5	2,5	1,0	0,0	17	x	x
Europe												
Bulgaria	5,42	5,82	5,867	1,3	0,0	-0,1	-1,6	-1,7	-1,8	12	x	
America												
Costa Rica	985	1,97	3,308	3,7	2,9	2,0	2,3	0,7	-0,1	x	24*	
Cuba	6,613	8,727	9,838	1,7	0,8	0,3	-1,1	-1,4	-1,2	x	x	x
Haiti	1,269	2,727	5,471	3,7	3,6	3,1	1,2	0,8	0,6	x	65*	
Dominican Rep.	2,877	5,537	8,013	3,8	2,3	1,2	0,5	-0,3	-0,6	x	45*	
Mexico	44,832	73,553	99,069	3,2	1,7	1,2	0,2	0,6	-0,5	x	23*	
Brazil	80,589	137,527	182,139	3,4	1,7	0,9	-0,7	-1,4	-0,6	36	19	22
Peru	11,187	18,674	26,778	3,1	2,1	1,4	1,0	0,2	-0,3	49	29	7
Asia												
China	195,908	438,236	711,698	4,2	2,9	1,7	0,6	-0,6	-0,8	x	9* total Popul.	x
India	158,851	186,323	498,777	3,2	2,9	2,5	1,8	0,9	-0,2	67	17	14
Laos	429	1,336	3,361	5,4	5,2	3,5	1,8	2,0	0,7	x	24	x
Philippines	18,11	43,985	69,862	5,2	3,1	1,6	0,6	-0,1	-0,4	20	13	9
Vietnam	10,338	15,891	28,439	2,5	2,4	3,3	2,1	1,3	0,2	x	51	x

Source: World Resource Institute 1998-1999, p 274 ff. *Data for 1980-1990 by World Resource Institute 1996-1997, p 150 ff., x = no data available

Source: Jacobi, Drescher & Amend (2000)

ANNEX III: Integrated wetland systems (IWS)

Excerpt from: Sewage and Sunshine – India 14 March, 2000
http://info.tve.org/ho/doc.cfm?aid=572 TVE Television Trust for the Environment

Wetlands in urban areas are natural receptacles for wastewater because they harness the nutrients available in waste through fisheries and agriculture. The integrated wetland system project aims to provide a low-cost, ecologically balanced and community linked sanitation option for the poorer cities of the world with ample sunshine. It is a system that frees the river from domestic contaminants and can at the same time recover the wastewater nutrients with remarkable efficiency to grow fish. The system costs less than other technologies for treating sewage and recycling waste.

There are two types of IWS - the *flow-through system* and the *abstracted flow system*. The primary objective of the *flow-through system* is the treatment of wastewater and for the *abstracted flow system*, it is resource recovery.

In the *flow-through system*, the entire wastewater is transported through a pre-treatment system and is then detained in the recycling ponds for further treatment and for growing fish. Subsequently, the effluent from the recycling ponds is used for irrigation in downstream areas. The *flow-through system* needs less land to ensure adequate wastewater treatment and is particularly effective where cost of land is high.

The *flow-through system* can be divided into two types: minimum area or low cost system and large area system. In the minimum area system, the emphasis is on wastewater treatment and the area varies according to the effluent quality requirements. The large area system emphasises the need for aquaculture and requires an area three or four times that of the minimum area system.

In the *abstracted flow system* wastewater is abstracted from the outfall channel or receptacle stream and is used for growing fish or for irrigation, or both. In this case, the user can draw the wastewater as and when required.

Initial steps for implementing IWS projects

Evaluating wastewater loading: most of the subsequent steps depend on the volume of liquid which the system is expected to handle. It is also essential to identify the existing drainage system through which the effluent will finally flow down.

Local resistance to aquaculture will have to be identified before starting any project planning. Fish farmers are able to earn reasonable profit by selling fish to other markets so there is a tendency for fish to be harvested even where they are not locally consumed.

Ascertaining outfall direction: once appropriate project sites have been identified, it is necessary to carry out a base line survey, including hydraulic, soil, topographical and land use surveys.

Land acquisition formalities need to be completed in a legally valid manner appropriate to the country and place of the IWS.

Detailed project design: there needs to be an efficient programme of operation and maintenance support and the sustainability of the project should be protected against engineering and economic risks by safeguarding the constructions, facilitating stakeholders participation and upgrading the resource recovery system.

Major components of IWS

- **Wastewater collection** from cities through a sewerage system up to the IWS project site.
- **Pumping** of wastewater to lift it from below the ground and carry it up to the IWS project site, occasionally through a force main.
- **Pre-treatment** of wastewater to ensure safe aquaculture in recycling ponds.
- **Primary recycling ponds** are mixed flow reactors where the functions of nutrient removal and treatment of wastewater take place simultaneously.
- **Secondary recycling ponds** are the waterbodies within any user region which recycle effluent from primary recycling ponds and are used for growing fish or other commercial aquatic crops.
- **Effluent irrigation in user regions** that takes place on the downstream side of the outfall channel can be used for generating crops and planting trees. Fish can be cultured in ponds using the effluent. Linking user regions with the effluent channels will enhance the food security amongst the beneficiary communities and ensure larger participation of the stakeholders in IWS projects.

Site selection

Issues to be considered during the selection of the project site will include:

- Amount of wastewater loading
- Quality of wastewater discharged
- Location of the terminal pumping station
- Location of potential user regions
- Location of the receptacle channel
- Area of the project site, cost of land and status
- Present land use of the project site
- Land use of the area adjoining the project site
- Lay of the land and relative relief of the project site
- Whether or not the site is being considered for any other development project

Estimating wastewater loading

The quantity of waste to be treated is an important criterion for designing IWS. For estimating the quantity of wastewater it is necessary to consider:

- Per capita water consumption
- Existing population
- Future growth of population
- Industrial waste discharge
- Infiltration into the sewers

The total amount of water supply should contribute to the total flow in a sanitary sewer except for a small portion which is lost through evaporation, seepage and leakage etc.

IWS in operation

The technique of using shallow wastewater ponds for recycling urban discharge is straightforward. The flow of wastewater into the shallow ponds is controlled and it is left in the ponds for up to ten days. During this time, light penetrates the water and reacts with the waste to create an environment rich in algae and plankton which is ideal for fish to feed on and grow in. The selection of fish species suitable for wastewater ponds needs to be carefully considered and there are specific criteria that should be met.

Maintenance is minimal but in order for the small fish to thrive, the water needs to be churned up and snails, which eat the algae, need to be picked out of the pond. Water hyacinth is used to stop the banks from eroding, but also needs to be kept under control. The biggest menace is from fish thieves so at night groups of men guard the ponds.

As well as the sewage being treated, the fish farmers are averaging yields of 10,000 tonnes of fish each year. The fish contain fewer pathogens than most other fish in the market and so are perfectly safe to eat. However, it is important to make sure that no industrial waste finds its way into the sewage canals. The "clean" water can be used for irrigation on the vegetable gardens nearby. Although pisciculture is the mainstay of IWS projects, planting trees and growing crops, vegetables and flowers ensures economic and ecological sustainability.

Advantages of IWS

In many cities in developing countries, the wetlands or natural depressions accumulate wastewater and become sources of health risk for humans. However, the planned use of these receptacles can change the waterlogged areas into sustainable technology for wastewater treatment and resource recovery. The following are advantages of such a wetland system:

- **Reduced consumption of conventional energy** – IWS is basically a solar reactor and completes most of its biochemical reaction with the help of the sun.
- **ISW is a flexible system** and can work with almost no-flow condition to full-flow condition with uniform proficiency and only minor adjustments.
- **More efficient removal of pathogens** – conventional mechanical sewage treatment plants are largely ineffective in removing pathogens whereas IWS can ensure a reasonable reduction because of the detention time it allows to the incoming wastewater.

- **Enhancing food security** – IWS includes pisciculture, horticulture and animal husbandry all of which have a common and rich nutrient base that is drawn from municipal wastewater.
- **Contributes to rural development** – completion of IWS projects triggers a chain of economic activities by providing enriched irrigation water in addition to the piscicultural units which form part of the system.
- **Institutionalises participation of stakeholders** – participation of the local people at all major levels of planning construction and maintenance is a basic need for successful running of the system.
- **Longer life-span of the treatment facility** – conventional sewage treatment plants are prone to damage and frequent breakdowns with a huge financial liability accruing in order to properly maintain such treatment plants. IWS is a revenue earner and proper management will not only make it self reliant but profitable. Furthermore, being a non- structural option, the problem of damage and breakdown hardly ever arises and the system can continue to work for any length of time without any major system disorder.
- **Minimum construction time** – IWS projects can be completed within 18 months compared to 5 years for a conventional sewage treatment plant

ANNEX IV: Planning for Urban Agriculture: Research, Policy and Action

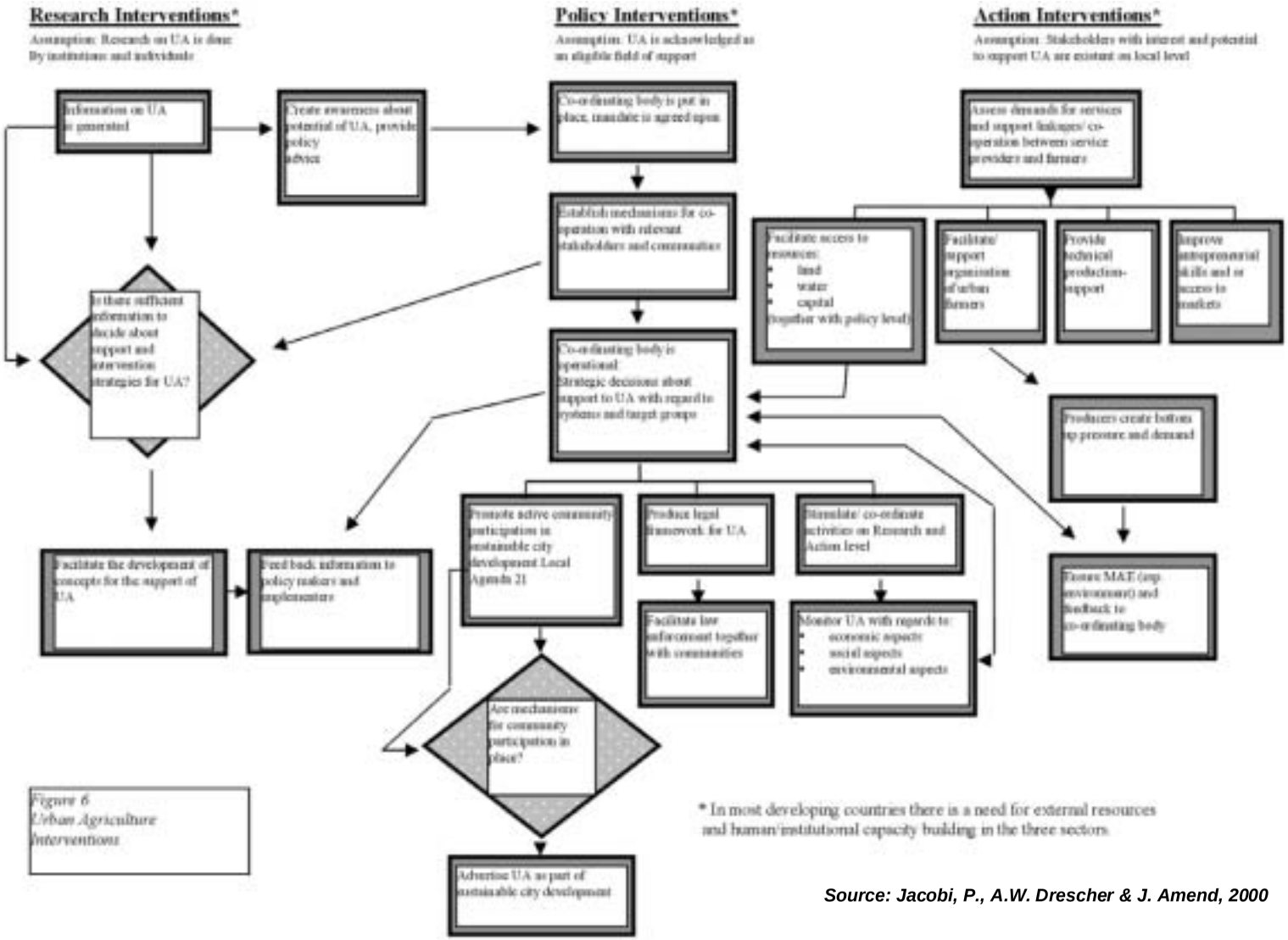

Figure 6
Urban Agriculture Interventions

* In most developing countries there is a need for external resources and human/institutional capacity building in the three sectors

Source: Jacobi, P., A.W. Drescher & J. Amend, 2000

Fact sheet on Urban Agriculture,

PRESENCE AND OUTPUT OF URBAN AGRICULTURE

The scale of urban agricultural production in the world is far above common perceptions. It has been estimated (Smit et.al, 1996) that, in 1993, 15-20% of the world's food was produced in urban areas, and that this percentage is on the increase. They further estimated that 800 million people are engaged in urban agriculture worldwide. Of these, 200 million are considered to be producing for the market, employing 150 million people full time.

Smit et.al, 1996, present the following overview of data regarding the participation of urban households in agriculture (including part timers):

Percentage of urban families is involved in urban agriculture

Ouagadougou: 36 %; Yaounde: 35 %; Maputo: 37%; Lusaka: 45%; Kampala: 35%; Dar es Salaam: 37%; Lusaka: 45%. The large majority of the urban farmers in these cities are women (65% in average).

In **Cairo**, Egypt 16% of households (30% in slums) keep small animals (Gertel and Samir, 2000).

In **Amman**, Jordan, 22 % of the surveyed households practice agriculture, both livestock and horticulture, (Department of Statistics, 2002).

Agriculture occcupies about 16% of the total urban areas of **Santiago de los Caballeros** in the Dominican Republic, and is the third most important soil use after residential and vacant land use (Acevedo Abinader, 2001).

The gardens of **Havana**, Cuba, produce a vast array of fruits, vegetables and tuber crops, using methods similar to organic farming. Approximately 18,000 individuals are involved and produced 25,000 tonnes of food in1999 (Gonzalez, 1999).

In **Dar Es Salaam**, Tanzania, urban agriculture is the largest land user (23 percent of city region; 34.000 hectares under crops) and the second largest employer (20 percent of those employed), with an estimated annual gross output (1991) of 27.4 million USD. The individual urban farmer's annual average profit was estimated at 1.6 the annual minimum salary (Sawio, 1998). In 1985, 3318 heads of cattle were counted within the city boundaries in1985, 7105 in 1988 and 9081 in 1993 (Jacobi et al. 2000). Urban fresh milk production in 1993 was worth an estimated at USD 7 million (Mougeot, 1994). More than 90 percent of leafy vegetables coming to the markets have their origin in the urban open spaces and home gardens (Stevenson et al., 1996).

In **Accra**, Ghana, 90% of the city's fresh vegetable consumption is from production within the city (Cencosad, 1994). Nearly 30% of low-income households in informal housing, had livestock worth on average nearly a full month of income (GTZ, 2000).

The Niayes zone around **Dakar**, Senegal, which constitutes 3% of Senegal's land surface produces nearly 80% of vegetables in Senegal, whilst poultry production amounts to over 65 % of the national demand (Mbaye and Moustier, 2000).

In **Nairobi**, Kenya 50% total food consumption of low-income households, produced within the city (Foeken and Mwangi, 2000). Urban agriculture provides the highest self-employment earnings in small-scale enterprises and the third highest earnings in all of urban Kenya (House et al., 1993).

In **Lomé**, Togo, the mean monthly income of a market gardener was found to equal ten minimum salaries or that of a senior public servant. Cost-benefit analysis of market-oriented productions, such as vegetable crops, have shown net incomes to largely depend on low-input practices and low-overhead cost (Abutiate, 1995); profit margins are high where sales are less middle-manned.

In **Harare**, Zimbabwe, between 1990 and 1994, the open space cultivation doubled its area, to some 16% of the city's area. More than 20.000 farmers in the city of Harare have harvested good yields, and will not be affected by the lack of maize in the city, due to the current economic problems in Zimbabwe (Mbiba, 2000). Savings accruing to small-scale urban farmers are equivalent on average was ZW$264, or slightly more than one-half month salary. Farmers sold only a small amount of their output (5 percent in 1994 and 9 percent in 1995).

In **Lusaka**, Zambia various surveys show a high increase of maize and vegetable production in the city of Lusaka. Drescher found in 1994 that of the sample of 648, nearly 50% of the women and about 35% of the men had rain season gardens where they planted maize (staple food).

In **Shanghai**, China, 60% of vegetables, more than half pork and poultry, and more than 90% of milk and eggs originate from urban and peri-urban areas." (Yi-Zhang and Zhangen, 2000).

Hong Kong, China, the densest large city in the world, produces within its boundaries 45% of fresh vegetables , 68% of live poultry, 15% of the pigs and 45% of the vegetable consumed by its citizens. (Smit et.al, 1996).

Food Security and Nutrition

Singapore is fully self reliant in meat. It further produces 25% of its vegetables it consumes. Singapore licenses many farmers, some of which high-tech farmers, but houses many more unlicensed small-scale producers (Smit et.al, 1996)

In **Jakarta**, Indonesia, 10% of vegetables, 16% of fruit and 2 % of the total need of rice in the city is produced between its city limits (Purnomohadi, 2000).

In **Hanoi**, Vietnam it is estimated that 80% of fresh vegetables, 50% of pork, poultry and fresh water fish, as well as 40 % of eggs, originate from urban and peri urban areas. (GTZ, 2000)

In **Kathmandu**, Nepal, 37% of households raise horticulture crops and 11 % raise animals; urban farming provides 30% of vegetable consumption (Smit et.al, 1996)

Karachi, Pakistan urban farming provides 50% (Smit et.al, 1996).

In **La Paz**, Bolivia, on a total of 2950 ha of land, more than 30% of the consumption of "easily perishable crops" (vegetables) is grown (Kreinecker, 2000).

In **Mexico City**, 54 percent of the owners of agricultural land *within the city* produce food for their own consumption; while 28 percent produce food to sell in the market, and the remainder do not actively produce anything on their land. Nonetheless, the quantity of food produced on any of these plots is not sufficient to cover basic requirements for a family (GTZ, 2000). Conversely the commercial agriculture in Mexico City's *peri urban* area contributes substantially to the local economy.

IMPACTS ON NUTRITIONAL STATUS

The above indicates quite clearly that presence and output of urban agriculture is substantial, but what evidence is available that the urban produce food improves the nutritional status of the urban poor?

Few rigorous analyses are available on the nutritional impacts of urban agriculture on self-producing households; However, findings from these studies are encouraging: all found that self-producing households achieved greater food security, particularly with regards to nutritional status measured by caloric and protein intake and anthropometric measurements (stunting, wasting) as compared to non-farming urban households.

Self-production represents anywhere from 18 percent (East Jakarta) to 60 percent (Harare) of total food consumption in low-income households, with sample percentages depending solely on self-production reaching 50 percent (Nairobi).

In **Harare** households involved in urban farming had more nutritious breakfasts and consumed more protein-rich food over longer periods of the year than non-farming households (ENDA, 1997). Urban agriculture provides poor households in Harare with staple meal lasting up to four months in a year (Mbiba, 1993). Sixty percent of food consumed by (a quarter of) the low-income group was self-produced (Bowyer-Bower and Drakakis-Smith, 1996).

In **Kampala**, Uganda, children aged five years or less in low-income farming households were found to be significantly better off nutritionally (less stunted) than counterparts in non-farming households (Maxwell, 1999). Urban producers obtained 40 to 60 percent or more of their household food needs from their own urban garden.

In **Nairobi** it was found that average energy and protein intake was higher in the farming groups than in non-farming group and percentages of malnourished, wasted and stunted children were much lower. The farming households produce between 20 percent and 25 percent of their food requirements, and are significantly less dependent on gifts and transfers (Foeken and Mwangi, 2000)

In **Lusaka**, low-income households in the period 1986/87 obtained one-third of their total food consumption from urban gardening (Mbiba, 1993).

In 1998, the urban farmers of **St. Petersburg**, Russia, produced more apples, pears and plums, vegetables, strawberries and cut flowers than all the agricultural farms of the Leningrad Region (Maydachenko, 1999).

In **Ouagadougou**, Burkina Faso, Gerstl et al. (2002) came to the conclusion that at least for half of the year, quantity, quality and type of food is improved for especially the lower socio-economic classes at no to little cost.

In **Jakarta**, 18% of total food consumption of low-income households is produced within the city (Purnomohadi, 2000).

In **Cagayan de Oro**, The Philippines, urban farmers eat generally more vegetables than non-urban farmers of the same wealth class and also more than consumers from a higher wealth-class (who consume more meat) (Potutan et al., 1999)

In **Addis Ababa**, Ethiopia, Getachew gives the following data to give the potential of urban agriculture in Addis Ababa: 70% of the city solid waste is household organic waste; 60.000 cows produce 44M litres of milk per year (satisfying only 5% of demand), while 70% of the 12 million kg. Of vegetables and fruits is produced within the city (Getachew 2002).

See references on page 5

COMMITTEE ON AGRICULTURE

Fifteenth Session

Rome, 25-29 January 1999, Red Room

URBAN AND PERI-URBAN AGRICULTURE

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I. FOREWORD

1. The relevance, promises, and problems associated with urban and peri-urban agriculture can be briefly illustrated by the following excerpts of statements from **The Second International Colloquium of Mayors on Governance for Sustainable Growth and Equity, UNDP, United Nations, New York City, 1997**

"*The growth of urban agriculture has been buttressed by two important factors: the availability of non-built public land, even in central parts of the city, and the requests from people who want to use it to produce food*," Ms. Rey, advisor to the Mayor of La Habana

"*Good urban agriculture depends crucially on producers being granted proper agricultural extension and advice, including assistance for selecting crops*," Mayor Iga of Kampala

"*The products are sold in public markets, and compete with supermarkets that sell only imported goods. Thus, we support globalization without social exclusion through urban agriculture. Local government loans of a few thousand dollars are being repaid in two, three or four months; the government trains, monitors, promotes. This needs to be recognized by international agencies and supported for replication, as a way to strengthen local food self-reliance with a range of other socio-economic benefits attached to it*," Governor Buarque of the Federal District of Brasilia

"*Authorities are hesitant to be more proactive on urban agriculture because it is largely seen as resulting from a failure to address rural development adequately. It is creating havoc in urban land use planning and management. It is holding up city development and redevelopment*," Mayor Mwale of Lusaka

"*Agriculture, whether in rural or urban areas, is under the jurisdiction of the central government and local governments can do little on their own in this sector currently*," Mayor Rahael of Port of Spain

2. This paper explores the major issues arising from urban and peri-urban agriculture which are central to FAO's mandate in member countries. They are how to:

- provide adequate access to nutritious food for the growing urban populations of the developing world;
- efficiently integrate urban and peri-urban agriculture with rural agriculture (in general they are not substitutes for each other);
- develop land and water policies that account for agricultural production in urban and peri-urban areas; and
- guide dynamic agricultural practices within and outside cities towards sustainability goals (economic, social, and environmental).

3. COAG's advice is sought on how FAO should organize its effort to answer these questions, what kinds of guidance and technical assistance should be provided to members regarding urban and peri-urban agriculture, and through what channels.

While there is not yet a universally agreed-upon definition, Urban and Peri-urban Agriculture – referred to jointly in this paper as UPA, except in the cases where a clear distinction must be made – is perceived as agriculture practices within and around cities which compete for resources (land, water, energy, labour) that could also serve other purposes to satisfy the requirements of the urban population. Important sectors of UPA include horticulture,[1] livestock, fodder and milk production, aquaculture, and forestry. Therefore, for expository purposes, the term UPA should be understood to be inclusive unless otherwise specified.

4. Experience shows agriculture can and does respond opportunistically to demographic, economic, and land-use changes by inventing new modes and rediscovering traditional modes of providing for the urban population. Agricultural, fishery and forestry activities are finding niches in the urban and peri-urban areas. Clearly, not all products and activities are suited for all areas, but some are likely to persist and develop further in the city area. Over time the image of urban and peri-urban agriculture may evolve into that of accepted and needed activities which will supercede the temporary and crisis-oriented image of the past. This depends upon the ability of policy-makers and urban residents to respond to concerns outlined in this paper.

II. BACKGROUND

*(*i) Demographic Trends

5. The world's current population of 5.9 billion is split about equally between cities and rural areas, with urban areas expected to surpass rural areas in population around the year 2005. Regionally, there are significant differences in the degree of urbanization. Just over three-quarters of the populations of North America, Latin America, and Europe live in urban areas, while only slightly more than one-third of the populations of Asia and Africa are urban.

6. Until recently poverty was synonymous with rural conditions, but the rapid urbanization of many developing countries has given birth to a large class of urban poor. The worldwide urban population is expected to double in 30 years, but the numbers of urban poor are expected to increase at a greater rate. The World Bank has estimated that the 1990s would see an increase from 400 million to one billion urban people living in absolute poverty; UNDP estimated a 76 percent increase in urban poor during the 1990s and a decrease in rural poor during the same period. Estimates based on health and environmental conditions suggest about 600 million people in cities live in unhealthy conditions. Hence, as Africa and parts of Asia will become increasingly urban over the next 25 years, urban poverty and food insecurity could worsen if preventive measures are not taken.

7. Expansion of cities is driven by economic growth and/or by migration from rural to urban and peri-urban areas as agricultural and rural employment opportunities decline or lag behind population growth. Other factors which, in some cases, have contributed to the rapid urban expansion are: social unrest, natural disasters (drought), and lack of educational opportunities and medical facilities in rural areas. Peri-urban areas are those areas surrounding cities which are in most ways integrated with the city. These areas also have high growth rates and receive up to 70 percent of the migrants from rural areas as well as migrants from the city itself.

[1] Horticulture comprises mainly vegetables, but includes fruit, ornamentals, mushrooms, and roots and tubers.

(ii) Implications of Population Growth for Urban and Peri-urban Areas

8. The challenge of supplying nutritionally adequate and safe food to city dwellers is substantial. Accomplishing this task under conditions of growth and congestion demands that policy-makers seize opportunities for integrating resource management and planning efforts, understanding potential linkages between rural and urban areas, and anticipating the changing needs of a country's citizens - both rural and urban. Part of the reason for the observed growth in UPA is due to its adaptibility and mobility compared with rural agriculture. As cities expand physically, the frontiers between urban, peri-urban and rural activity blur and merge, presenting opportunities for beneficial linkages.

(iii) Organization of Paper

9. The questions introduced in the Foreword to this document are among the most important faced by local, national, and international authorities today as they influence the cities of the 21st Century. These questions will be addressed, but cannot yet be completely answered. The document proceeds with a brief description of past and current FAO activities in UPA, as well as those of other international organizations. It describes the primary characteristics of UPA, as they are now understood, and then outlines the issues arising from UPA for consumers, producers, and urban societies, including benefits and risks. It identifies steps to address the above issues and specifies ways in which FAO could contribute to a global effort to solve them. The paper concludes with a proposal to COAG about future FAO direction on UPA.

III. INTERNATIONAL EFFORTS ON URBAN AND PERI-URBAN AGRICULTURE

10. FAO has been involved in UPA through targeted initiatives in the regular programmes of technical units, through technical assistance - particularly in peri-urban areas - and through participation in international fora. While so far lacking a comprehensive programmatic approach to deal with UPA, FAO nonetheless has made important technical contributions through specific programmes.

11. FAO has addressed UPA issues through the AGA Sub-Programme on Peri-urban Production Systems on Animal Production and Health and Veterinary Public Health (AGAP/AGAH), the Programme on Food Supply and Distribution to Cities (AGSM), the Programme on Peri-urban Horticulture (AGPC), and the Programme on Urban and Peri-urban Forestry (FORC). Through separate initiatives, the Organization has investigated agricultural activities and near cities through case studies, provided policy support and technical assistance, and begun to build an information base about the characteristics of UPA. In recognition of cross-disciplinary linkages staff from all technical departments have been involved for years in an informal working group.

12. Outside FAO there is growing recognition of UPA among policy-makers and NGOs. The *Support Group on Urban Agriculture* was established in 1992 and the *Global Initiative on Urban Agriculture* in 1996, composed of majors donors and international agencies (including UNDP, IDRC, FAO, World Bank, GTZ, NRI, ETC, and others). Other United Nations agencies involved in various ways include UNHCR, UNICEF, UNWHO, and UNCHS[2].

[2] UNDP: United Nations Development Programme; IDRC: International Development Research Centre;

AGUILA is a network of 16 Latin American countries sharing information about UPA, and other networks have been or are being established in West Africa, Southeast Asia, and Europe. A non-profit organization was created in the United States in 1993 called *The Urban Agriculture Network*, which has conducted research studies and promotion of UPA throughout the world. Numerous civil society organizations (e.g. CARE, SAVE , Oxfam, Heifer Institute) have become involved in grassroots projects within cities in both developed and developing countries, to support UPA. A growing number of universities offer graduate degrees in urban and peri-urban agricultural studies.

IV. CHARACTERISTICS OF URBAN AND PERI-URBAN AGRICULTURE

"Urban" agriculture, as used here, refers to small areas (e.g. vacant plots, gardens, verges, balconies, containers) within the city for growing crops and raising small livestock or milk cows for own-consumption or sale in neighbourhood markets. **"Peri-urban" agriculture**, as used here, refers to farm units close to town which operate intensive semi- or fully commercial farms to grow vegetables and other horticulture, raise chickens and other livestock, and produce milk and eggs.

13. Urban and peri-urban agriculture occurs within and surrounding the boundaries of cities throughout the world and includes products from crop and livestock agriculture, fisheries and forestry in the urban and peri-urban area. It also includes non-wood forest products, as well as ecological services provided by agriculture, fisheries and forestry. Often multiple farming and gardening systems exist in and near a single city.

14. The territory included within official city boundaries varies enormously across countries and can be more or less built-up; likewise the "peri-urban" area around cities ranges from densely to sparsely populated. The distinction between "urban" and "peri-urban" depends on the density, types, and patterns of land uses, which determine the constraints and opportunities for agriculture.

15. "Urban and peri-urban forestry" have critical environmental functions, besides some food and non-food production functions. The multiple benefits of urban and peri-urban forestry cannot be fully elaborated here but are mentioned briefly for the sake of comprehensiveness. A fully articulated strategy on the integration of urban and peri-urban agricultural production and urban and peri-urban forestry could be developed in conjunction with COFO.

16. What these diverse activities have in common - and in some cases what sets them apart from rural agriculture - is proximity to large settlements of people, thereby creating

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GTZ: German Agency for Technical Cooperation; NRI: Natural Resources International,
UNHCR: United Nations High Commissioner for Refugees; UNICEF: United Nations Children's Fund ;
UNWHO: United Nations World Health Organization; UNCHS: United Nations Centre for Human Settlements: Habitat)

opportunities as well as risks. The opportunities include:

- access to consumer markets;
- less need for packaging, storage and transportation of food;
- potential agricultural jobs and incomes;
- non-market access to food for poor consumers;
- availability of fresh, perishable food;
- proximity to services, including waste treatment facilities;
- waste recycling and re-use possibilities.

17. The risks include:

- environmental and health risks from inappropriate agricultural and aquacultural practices;
- increased competition for land, water, energy, and labour;
- reduced environmental capacity for pollution absorption.

18. The contribution of urban and peri-urban agriculture and forestry to the well-being of urban citizens is dependent upon the advantage taken of the opportunities listed above, and an awareness of how the risks can be monitored and controlled. It is essential to define the cases where UA or UPA has a clear comparative advantage over rural agriculture. The scale of production, the product or service provided, and the alternatives available are factors in determining the relative advantage. Broadly stated, a comparative advantage exists when either supply conditions or demand conditions allow UA or UPA to better serve the urban market by supplying something otherwise unavailable or by producing at a lower cost, including environmental cost. In places where rural infrastructure is poor, or where farm to market systems are inadequate, both UA and UPA fill critical gaps. However, UPA should not be developed in competition with rural agriculture, but should concentrate on activities in which it has a comparative advantage, such as production of fresh, perishable foods. Decentralized rural production zones are also essential to feeding cities.

V. ISSUES IN URBAN AND PERI-URBAN AGRICULTURE

(i) Safe and Nutritionally Adequate Food for Consumers

19. When carried out properly under safe conditions, UPA can contribute to food security in three ways.

20. Firstly, the quantity of food available is increased through both UA and UPA. Poor urban dwellers often lack the purchasing capacity to acquire adequate amounts of food. Urban agriculture appears to reduce food insecurity by providing direct access to home-produced food to households and to the informal market. Much UA is for own consumption with occasional surpluses sold into the local market. Even for people who have little or no land part-time farming of vegetables can provide food and income. Simple, popular hydroponics or substrate culture in beds can produce high value and nutritious vegetables on surfaces as small as one metre.

21. Urban agriculture also appears to enhance food security during times of crisis and severe scarcity. Whether caused by national crises (civil war, widespread drought, currency

devaluations, inability to import, etc.) or household crises (illness, health, sudden unemployment, etc.), UA plays an important role in providing emergency supplies of food.

22. Secondly, UPA enhances the freshness of perishable foods reaching urban consumers, increasing overall variety and the nutritional value of food available. While not universal, case studies have shown differences in nutrition, especially among children, when poor urban families farm. An important reason appears to be that food produced by consumers or in close proximity to them is often fresher than food that travels long distance to markets.

23. Thirdly, UPA offers opportunities for productive employment in a sector with low barriers to entry. UPA is estimated to involve 800 million urban residents worldwide in income-earning and/or food-producing activity. Based on a combination of national census data, household surveys, and individual research projects in specific cities, it is estimated that one-quarter to two-thirds of urban and peri-urban households are involved in agriculture. Urban agriculture is often carried out on a part-time basis by women, who can combine food production activity with child care and other household responsibilities. Case study data indicate that both food availability and incomes in poor farming households are significantly higher compared to households of non-farmers. Interestingly, the urban gardeners are not typically the poorest residents but rather those families that have lived long enough in the city to secure land and water, and become familiar with the market channels for selling surpluses.

24. Employment in peri-urban agriculture has not been estimated separately from employment in urban agriculture. Both UA and UPA farming methods have become adapted to the city conditions according to the type of production, and are often carried out in a more capital and/or labour intensive manner than they would be in rural areas. The intensive horticultural and livestock production that thrives in peri-urban areas employ workers and produce high value-added products that can be expected to yield reasonable income and returns. In particular, the commercial peri-urban production of livestock is an extremely fast-growing sector, representing 34 percent of total meat production and nearly 70 percent of egg production worldwide. With it comes expansion in food processing activities in the peri-urban zones.

(ii) <u>Agricultural Efficiency of Producers</u>

25. There are mixed implications from urban and peri-urban agriculture on the efficiency of agricultural and forestry production, but for different reasons. Cost savings can be achieved because of proximity to consumers of less need for an extensive and expensive infrastructure for transportation and preservation of perishable products. Moreover, quality increases because of greater responsiveness to consumer preferences as well as availability of products that cannot be obtained from rural producers, such as wood energy.

26. But in spite of such potential efficiencies, there is a strong perception of the unsuitability of agriculture in the urban and peri-urban areas. Concerns arise over competition for resources (land, water, labour, and energy) and incompatible uses (smells, noises, pollution). Though many of the same concerns can and do arise in rural agricultural production, two important differences make the concerns more acute in the urban environment: proximity to greater numbers of people and already-high stresses on the natural resource base. Without appropriate management and monitoring of resources, negative environmental and health effects of UPA can be imposed on society.

27. Horticulture, mainly vegetable production, has expanded in and around cities in many developing countries as an informal activity practised by poor and landless city dwellers. The broad diversity of horticultural crop species allows year-round production, employment and income. Growers have realized that intensive horticulture can be practised on small plots, making efficient use of limited water and land resources. Horticultural species, as opposed to other food crops, have a considerable yield potential and can provide up to 50 kg of fresh produce per m^2 per year depending upon the technology applied. In addition, due to their short cycle they provide a quick response to emergency needs for food (several species can be harvested 60 to 90 days after planting.) Leafy vegetables provide a quick return to meet a family's daily cash requirements for purchasing food. Leafy vegetables are particularly perishable and post-harvest losses can be reduced significantly when production is located close to consumers.

28. Urban producers also achieve real efficiencies by making productive use of under-utilized resources, such as vacant land, treated wastewater and recycled waste, and unemployed labour. Productivity can be as much as 15 times the output per acre of rural agriculture; however, yields often suffer from inferior or insufficient inputs, use of poorly adapted varieties, poor water management, and lack of farming knowledge.

29. Urban farming links farm cultivation with small-scale enterprises, such as street food stands, fresh milk outlets, and maize roasters. Some urban and peri-urban farmers are moving towards intensive production of high value-added produce, rather than basic food stuffs; such activities can become major sources of income for more sophisticated members of the population who have investment capacity.

30. The level of post-harvest processing in urban and peri-urban agriculture depends on the product. For peri-urban horticulture it is generally minimal and the product is delivered straightaway to the consumer on a week to week basis. One reason for the growth of peri-urban horticultural production is less need for storage, refrigeration, and transportation infrastructure, compared to food coming from rural areas. There is extensive processing for peri-urban livestock and its products.

31. Urban farmers engaged in production for themselves and their neighbours often use low-input processing and storage techniques. Estimates of the households engaged in urban farming which also preserve and store some of their production range up to 90 percent. However, for market - including street food - sales, there are limits to the quantities that can be produced and delivered without infrastructure for transportation, distribution, and marketing. Some micro-credit support for storage and refrigeration could greatly change the income potential of urban farmers, and improve the safety of food sold by street vendors who rely heavily on urban and peri-urban food production.

(iii) The Sustainability of the Urban Environment for Society

32. Doubts have been raised about the contribution of UPA to a city's environmental sustainability - in the sense of the quantity and quality of urban natural resources being maintained. Indeed, basic resources (water, soil) needed for agricultural production are in competition with other priority urban needs (drinking and industrial water use, infrastructure construction, etc.) There is real risk involved in food production in and near cities, just as there is also the possibility of improving the urban environment if food production and forestry are managed appropriately. The long-term viability of UPA itself depends on how successful farmers and urban officials are at exploiting the potential environmental benefits, minimizing the problems, and finding ways to secure growers access to land. A comprehensive assessment of the impacts is urgently needed before policies and guidelines are implemented.

33. Optimal management of urban and peri-urban resources requires land use planning which views agriculture as an integral component of the urban natural resources system and balances the competitive and synergistic interactions among the users of the natural resources (water, land, air, wastes). Benefits of appropriate management include improved hydrological functioning through soil and water conservation, micro-climate improvements, avoided costs of disposal of the recycled urban wastes (wastewater and solid waste), improved biodiversity, and greater recreational and aesthetic values of green space.

34. The risks from agricultural production systems in urban and peri-urban areas to health and environment arise from the inappropriate or excessive use of agricultural inputs (pesticides, nitrogen, phosphorus, raw organic matter containing undesireable residues such as heavy metals) which may leach or runoff into drinking water sources; microbial contamination of soil and water, including by pathogens; air pollution (e.g. carbon dioxide and methane from organic matter, ammonia, nitrous oxide and nitrogen oxide from nitrates); and odour nuisance. In particular, produce (especially leafy vegetables) can be contaminated through overuse of chemical sprays. Further, zoonotic diseases and veterinary public health issues can arise from intensive livestock production methods without proper space and equipment.

35. None of these problems are specific to urban and peri-urban production as they also result from inappropriate management in rural areas. Furthermore, while urban agriculture consists of small production units that may not present problems individually, and thus are not subject to controls or environmental restrictions, they can create substantial problems through cumulative effects.

36. Access to adequate supplies of land and water is critical to the successful integration of urban and peri-urban agriculture with urban environments. The potential for achieving such integration is simultaneously proclaimed and doubted by many. The issues involved in both challenges are discussed in some detail below.

37. The most viable source of water for urban and peri-urban agriculture is recycled treated wastewater. The guidelines developed by the World Health Organization (WHO) describe the levels of treatment needed for agricultural uses. FAO has been involved in promoting the safe use of recycled urban wastewater for horticultural crops, i.e. floriculture and fruit crops. FAO has also been involved in projects in cities in arid and semi-arid zones which use waste

water to irrigate forest plantations for purposes of combatting desertification and providing fuelwood supply.

38. FAO (1992) estimated that typical wastewater effluent from domestic sources, when appropriately treated for agricultural reuse, could supply all of the nitrogen and much of the phosphorus and potassium that are normally required for agricultural crop production. Duckweed, a floating macrophyte used to clean wastewater, can be transformed into chicken and fish feed of high quality (International Bank for Reconstruction and Development , IBRD). Sometimes unprocessed liquid waste (e.g. pig slurry, flush waters) or semi-processed waste is used for fertilization. Raw chicken and cattle manure is often used to enhance soil fertility and structure. These practices imply some health risk, but when properly managed, the risk can be minimized and the wastes used as a valuable nutrient.

39. The major danger in utilizing waste waters is food contamination by pathogenic micro-organisms and outbreaks of water-borne diseases. High health risks associated with the use of untreated or improperly treated sewage water in irrigation is infection from helminths (worms) such as *Ascaris* (nematode) and *Ancylostoma* (hookworm.) Medium to low risk is associated with enteric bacteria and viruses. In general, the evidence suggests that negative health effects are a problem only when raw or poorly treated wastewater is used for irrigation.

40. Another case of water quality risks arises with the intensive aquaculture that occurs in peri-urban areas. Intensification implies heavier use of water for recirculation, commercial feed, and drugs (antibiotics, bacteriostatics). Excess nutrients and organic matter enhance the proliferation of micro-organisms that lead to eutrophication by depleting dissolved oxygen in the water systems.

41. Some of these problems can be dealt with through small-scale irrigation using proper water quality management and monitoring and a crop selection programme. Although small-scale irrigation is the preferred choice, attention ought to be given to the cumulative effects of small but badly managed systems. FAO has published technical documents on the subject.

42. Another major challenge to the viability of UPA is land availability. UPA is influenced by rapidly changing land rights, uses, and values. High population densities give rise to competition and conflicts over land and natural resources through conversion of land from agricultural to residential and business uses, and agricultural intensification on the scarce spaces available for cultivation.

43. Steady access to land at affordable prices is almost unknown to urban, and even some peri-urban farmers. Looming over many urban farmers, both men and women, is the constant threat of losing access to their plot and being forced to stop production activities. In many areas non-farming households' inability to access land in the city is the major reason given for not farming. Farming is done in city core areas, wedge areas, the corridors out of the city, and on the periphery. One study of urban agriculture in Nairobi showed the land used for farming was 32 percent private residential land, 29 percent roadside land, 16 percent along river banks, and 16 percent in other publicly-owned areas. Each area encourages its own farming methods.

44. One of the paradoxes of UPA is that substantial agricultural investments appear to occur on very insecure holdings. One explanation may be that it is generally women and socially or economically vulnerable groups who are the most dynamic actors in UA, and since these

groups control few resources they risk little by cultivating on lands held under ambiguous or insecure tenure. Good markets for agricultural produce guarantee high short-term returns and make the risks of agricultural investment worthwhile, even on insecure lands, held by squatter, short term leasehold and other tenuous arrangements.

45. Land tenure is made more difficult because credit is almost universally unavailable to urban farmers, even where credit is granted to poor urban business-owners. Conditions appear to be different for peri-urban farmers, who are more often commercially-oriented, established enterprises with collateral for obtaining credit for capital investments.

VI. HOW TO ADDRESS URBAN AND PERI-URBAN AGRICULTURE ISSUES IN MEMBER COUNTRIES

46. The visible growth in urban and peri-urban agriculture throughout the world casts a spotlight upon some existing issues in agriculture and food security and raises new ones. The immediate needs are observable and have long been commented upon even as conditions intensify. These include a need for effective ways to deal with urban food insecurity, for basic infrastructure in urban areas to protect public health and the environment, and for integrated resource management and land use planning. These issues all arise in the context of UPA. However, new perspectives stimulated by the growth of UPA present opportunities to address these issues in innovative ways. The first steps are to recognize and understand the dynamic urban landscape and its changes, to gather necessary data and perform research, and to define the levels of authority to appropriately make decisions.

(i) Recognize Rapidly Changing Urban Conditions

47. Urban and peri-urban agriculture present complex interactions of social, economic, and environmental phenomena in locations that are undergoing extremely fast change, often with inadequate financial means to respond. Officially the choice of whether to allocate urban and peri-urban lands to agriculture, parks, or other uses is fundamentally a policy decision dependent upon priorities and political interests. Unofficially it also depends on where the city's immigrants and poor residents choose to settle. The future habitability, competitiveness, and viability of the cities in developing nations will depend on whether decision makers and urban planners develop and adhere to coherent policies for managing their urban and peri-urban areas.

48. Distinct policies and planning efforts are needed for the management of agriculture, horticulture, forestry and fisheries in the urban and peri-urban environments. As one example, urban planners must choose whether to restrict urban sprawl, force the city to grow upwards, and depend upon a surrounding green belt for agricultural produce - or to allow the urban area to expand outwards, preserving peri-urban agricultural zones within its margins. Such a choice offers differing social (food security, gender, food safety) and environmental (hydrology, amenity, soil erosion) results. Moreover, such a choice involves different economic costs, particularly since the high servicing costs of roads, water, and transport infrastructure required for agricultural production are not always taken into account by urban planners. There are few models and little information available to city managers to address these competing demands, and to develop alternative visions of the future.

(ii) Improve Data and Research

49. Urban and peri-urban agriculture are growing phenomena in most cities and a great deal of activity goes undocumented and unmonitored. The current knowledge base about UPA is growing but fundamental gaps include: how to define UPA; what are the linkages and complementarities between rural, peri-urban and urban production; how affordable is it compared to alternative food sources; and the full range of impacts, including economic, social, and environmental. A comprehensive and sustained effort at data collection is needed to fully comprehend the possibilities posed by UPA.

50. While good qualitative and case study data exist and contribute to understanding UPA, a more comprehensive set of basic data is needed. The priority needs include:

- numbers, location and characteristics of farms
- volume and type of food produced
- costs and prices of food produced and sold, both in formal and informal markets
- income earned from farming
- inputs used and methods used in urban and peri-urban farming
- environmental impact analysis
- veterinary public health effects
- use of urban wastewater and solid waste
- water needs and availability among all competing uses.

51. Once those data are available, specific research and analysis would explore:

- a model of agro-economic urban planning
- the quantitative need for organic wastes and the potential to supply it
- environmentally-friendly technologies for commercial production
- small-plot agronomic requirements
- intensified sustainable cropping systems
- harvesting technology and food processing methods for different income levels
- land use changes due to future demographic shifts
- valuation of non-market (e.g. recreational, aesthetic, and environmental) effects.

(iii) <u>Coordinate Multiple Levels of Responsibility</u>

52. Institutional gaps can exacerbate problems and neglect opportunities from UPA. In most places, UPA falls under the jurisdiction of several different levels and types of authorities. For instance, officials at municipal, provincial and national levels may deal with different issues, including agriculture, public works, forestry, urban planning, transportation, environment, justice, and the interior. Coordination and information-sharing is needed for a comprehensive policy approach.

VII. FAO'S CONTRIBUTION TO URBAN AND PERI-URBAN AGRICULTURE IN MEMBER COUNTRIES

While the interest, potential, and risks of UPA are clearly perceived, it is surprising to note that, in most cases, policy and strategy development -- as well as technical guidance -- are still embryonic.

53. The need for an interdisciplinary and multi-sectoral approach to understanding and responding to UPA is apparent. Strategic ways of dealing with the competition for water and land, as well as other environmental issues, must be developed. An objective centre of knowledge equipped with the technical capabilities to evaluate the appropriate place of UPA in agricultural and urban food systems, and to integrate that technical knowledge with sociological and economic expertise, as well as practical experience, would be an innovative and timely initiative. Some components of such a forum are available in various institutions and FAO would be a natural home for coordination of these efforts because of existing relationships with relevant institutions and the multi-dimensional nature of its work.

54. In coordination with partners from the international agency community, NGOs and academic institutions, FAO could develop increased networking opportunities, in-country activities, and inter-organizational joint efforts to gather and disseminate information and technical assistance. Partners from the international community include the UN agencies previously mentioned, the World Bank and Habitat. Among the potential NGO partners active in UPA are those providing grassroots technical assistance in food, health care and nutrition, agricultural production methods, and services, and employment programs. Academic institutions and researchers in both developed and developing countries are actively involved.

55. FAO could develop an interdepartmental strategy to operate a "virtual knowledge programme," drawing expertise on an as-needs basis from technical divisions. It would comprise a critical mass of multi-disciplinary expertise that would have the capacity for objective, in-depth, technically-sound, and long-term analysis of UPA. An awareness of the appropriate scope and scale of policy response to UPA can be created and integrated into existing programmes and institutions.

56. Specific goals and actions that would arise out of such a programme fall into three categories:

- incorporation of UPA into existing FAO programmes
- support for activities in member countries
- coordination and cooperation with partners.

(i) <u>Incorporation of UPA into existing FAO Programmes</u>

57. FAO can incorporate urban and peri-urban agriculture more fully and holistically into its programmes by:

- **testing methodologies for UPA** through new and existing programmes including crop intensification and diversification opportunities
- **providing specialized guidance** on food safety to urban and peri-urban farmers, food handlers and food processors
- **offering technical back-stopping** for existing and on-going local project development in urban and peri-urban agriculture.
- **identifying appropriate policy interventions** for maximizing contributions of food supplies for at-risk groups and poor households.

(ii) <u>Support for Activities for Member Countries</u>

58. FAO can support activities in member countries directed at sustainably managing urban and peri-urban resources by:

- **proposing and developing training** and demonstration programmes to improve quality and safety of horticultural production systems and promote marketing of "labelled" produce
- assisting member countries to **establish the appropriate policy** framework to facilitate the accrual of benefits from rural-urban linkages in national and local rural development strategies
- **assisting member countries' efforts to collect data** about urban and peri-urban agriculture using uniform definitions, including availability and accuracy of data on gender dimensions of urban and peri-urban agriculture
- **working with countries** to develop integrated land use plans in and near cities using FAO's own experience in participatory methods and land management, including watershed management.

(iii) <u>Coordination and Cooperation with Partners</u>

59. FAO can coordinate and cooperate with private, civil society groups, and other public entities to facilitate information exchange by:

- **participating** more actively in the *Global Initiative on Urban Agriculture*, and enhancing the urban forestry component of that initiative
- **working with NGOs** to strengthen the skills and capacity of urban women farmers, in particular to increase their income potential
- **providing training** for government decision-makers and municipal authorities regarding extension and education to increase awareness of UPA
- **serving as a forum** for discussion and experience-sharing among member countries and promoting inter-country cooperation through networking.

VIII. PROPOSAL FOR COAG'S CONSIDERATION

60. **In the light of the four questions posed at the beginning of this paper which articulate the relationship between UPA and FAO's mandate, the Organization seeks COAG's direction on the following initiative:**

- Should FAO establish a proactive and comprehensive programme on the subject of UPA in full partnership with relevant institutions at international and national levels, particularly those with responsibilities for urban development, by developing an interdisciplinary and inter-departmental programme in urban and peri-urban agriculture?
- This programme would develop a knowledge base around the subject, serve as a forum for debate and information dissemination, and provide guidance and assistance for member countries responding to the challenges of urbanization and feeding their populations.
- The expertise necessary for such a programme already exists within FAO but the work is being undertaken under different auspices in an uncoordinated fashion. By focusing the efforts of the multi-disciplinary specialists involved, and creating opportunities for collaboration, FAO would maximize the benefits of its existing resources to respond to on-going demographic and social shifts, without the need to add resources. Great synergy

with existing programmes would be captured, as many of the issues raised by urban and peri-urban agriculture are common to those of rural agriculture, but the difference in setting raises original questions that need to be addressed.

URBAN AGRICULTURE: DEFINITION, PRESENCE, POTENTIALS AND RISKS

Luc J.A. Mougeot

1. Introduction

Ever since the first French geographical accounts of (intra- and peri-) urban agriculture (UA) were published on Central Africa in the 1960s, scattered and isolated UA surveys by individual social scientists (e.g. Egziabher et al. 1994) have gradually been giving way to institutional projects led by multidisciplinary teams. As a result, more and better information is now available on a larger number of regions, countries and cities around the world. Over the same period, public initiatives pioneered by few local and national governments have been followed by more widespread awareness on the part of local authorities, in their regional and global fora, for the growth and potential of agriculture in and around cities. More urban governments are now seeking to exchange policy and technical experiences to better deal with a spreading phenomenon in their own city.

Initial pilot projects by a handful of donors (Mougeot 1999a) have paved the way to greater collaboration and co-ordination among international support and executing institutions, for information, assistance, training and policy in UA (IDRC/TUAN 1996, SINA 1998).

We must work harder to bring Urban Agriculture (UA) to its conceptual maturity; only with greater internal coherence and external functionality will it turn into a distinctive and useful tool for us to understand and intervene. Key features of current definitions of UA generally have downplayed a critical trait that makes UA to be urban. UA is different from, and complementary to, rural agriculture in local food systems: urban agriculture is integrated into the local urban economic and ecological system. Unless this dimension is enhanced and made operational, the concept will remain little useful on the scientific, technology and policy fronts.

On the ground, UA is growing out of its ability to assist with, resolving or coping with diverse development challenges. It is spurred by a complex web of factors still little understood, not the least of which are urban poverty and food insecurity. Little attention in particular has been paid to the women who tend to predominate

in UA, an activity which connects well not only with their care-taking and house-holding roles, but also increasingly with their need for income. UA practitioners can be categorized variously, based on a combination of tenure modality, time allocation and product destination. Differences are further observed across regions of the world, in terms of prevailing urban agriculture production systems and associated problems.

Official support to UA is age-old, has been diverse and can be organised into several types of interventions, often combined in a single city. Access to resources, land in particular, is central; access is more often an issue than availability per se. But UA production systems have diversified and producers have adapted to cope with these and other urban constraints and opportunities.

We must better understand how urban food systems work if we want to comprehensively assess and promote UA's role and impact on the welfare of particular rural and urban communities. UA tends to complement rural and foreign sources of food supply to cities. It has been promoted to effectively do so and is important to strengthening poor urban households' food security in particular.

Despite limited support and heavy losses, UA is generating products valued in the tens of millions of USD, year in and year out, in major LDC urban centers. UA is comparatively affordable, a noteworthy source of income and savings and is more profitable than rural-based production. The up and downstream effects of UA in the local economy are largely unknown and could be considerable. Low-income UA effectively contributes in several ways to reduce food insecurity by improving food intake of households and by raising children's nutritional status; this relationship could be gender-mediated.

There is little literature overtly condemning UA under any form; opposition has tended to come more from urban planning, public health and environmental circles than from agencies covering employment, community services and agriculture. Governmental checks and balances exist and have been applied to a limited extent. Regulations have remained largely ineffective and must be revised, priorised and implemented in an appropriate and participatory way; they need to be enabling. Concern over agrochemical use in UA tends to be exaggerated; actual use and related problems are limited by various factors, particularly in the case of intra-urban, home-based, women-practiced, food self-provisioning. More information seems to exist on evidence and on measures to curb public health risks posed to

UA by ambient factors, as opposed to risks introduced by UA into the urban environment. Still, the latter is a source of rising governmental concern. In both cases problems are technically manageable; however, this depends on cities making better use of prevention and mitigating measures, including trans-sectoral coordination (waste management) and the use of UA to enhance environmental quality.

Several trends underway will buttress the growth of UA worldwide and in LDCs in particular. Risks and benefits must be addressed through active policy-making and doing. So far, UA development has been assisted largely by actors in urban politics and agricultural policy circles, for poverty alleviation and food security. This measure of support now is insufficient to deal with the growing risks and benefits posed by the expansion of UA in LDCs. A fuller integration of UA into the urban eco-system requires that urban planners, public health and environmental management actors join in with others committed so far. Areas of intervention at the community, city, national and international levels are identified, where more efforts should concentrate relative to recent progress. More needs to be done by actors on the national and internal planes that will help communities and cities to capitalize on their collective experience and to integrate UA into the city organism in a fairer, more viable and sustainable way.

2. Definitions: what is intra- and periurban agriculture?

2.1 Concept development

Whether we agree or not with the phenomenon, the expression “urban agriculture” (UA), or “intra- and peri-UA”, originally used only by scholars and the media, has now been adopted by UN agencies such as the UNDP (Smit et al. 1996b) and FAO (FAO 1996; COAG/FAO 1999). This makes our need to define it self-evident, at least for our short- and mid-term governance.
Our effort to define UA should bear purpose. The concept of UA should possess a distinctive architecture of its own, both on content and form, and evolve through its interaction with the development of related concepts. Concepts are mental tools that we forge – and eventually rework – to better understand, interact with and modify our real-world experience. They are historically and culturally bound, relevant in some places and less so in others, fitting today but perhaps less so tomorrow. The UA concept needs to evolve out of our need to codify and refine

our perceptual experience with a rather new world phenomenon, so as to ensure that it remains or becomes more useful to us where we will need it. Its identity depends on this external functionality as much as on its internal coherence.

Internal coherence: Is UA really what we call, or want to call, what we perceive to be out there? Stevenson et al. (1996) rightly insist on our need to distinguish, for instance, between agriculture "in the periurban zone" and "periurban" agriculture. The overarching definition should lead us into a full conceptual system or edifice, a structure of interconnecting compartments anchored into real-world experience. Another way of looking at this system is to see a pyramid, with lower levels containing larger numbers of more operational and interdependent terms. Within and subordinated to the overarching concept, situational variations should be allowed for the sake of local and regional relevance. To build a useful and viable UA edifice requires probably more materials and engineering than assembled so far.

External functionality: How does UA position itself relative to other "kids on the block" (e.g. rural agriculture, sustainable urban development, urban food supply systems, etc.)? The overarching concept should be clear enough so that users can easily perceive its potential for complementarity and synergy with related concepts. How distinctive and value-adding is this edifice in the neighbourhood where it is being built?

We should expect interaction between the UA concept's internal and external planes to drive its evolution and renew its usefulness. Only then can the UA concept provide a yardstick against which to identify empirical manifestations and gauge how these may reflect the concept, at any given time or location (e.g. the operational translation of the UA concept should enable us to grade specific agricultural activities observed in particular urban areas). A conceptual yardstick is fundamental, as policy and technology interventions need first and foremost to identify meaningful differences and gradations, if they are to better assess and intervene with appropriate means for promotion and/or management of UA.

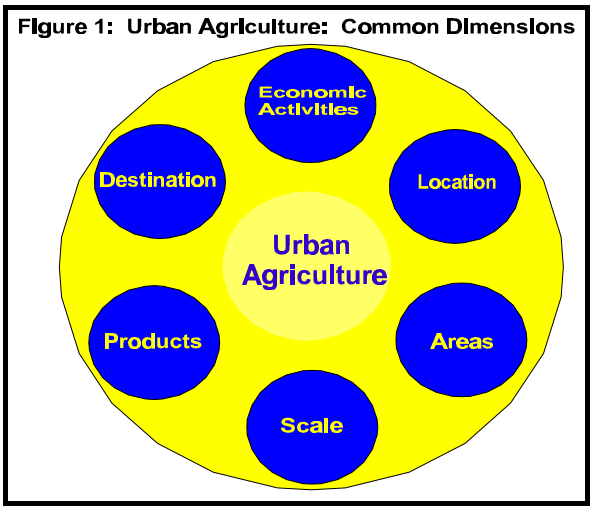
2.2 Building blocks of current definitions

Recent reviews have collated definitions of UA (Quon 1999) and identified shifting emphases in definitions throughout the history of research on UA (Mougeot 1996). This section instead highlights common building blocks of the

concept, reviews them and submits a critical direction for enhancing its conceptual distinctiveness.

The more common conceptual building blocks of UA identified are: types of economic activities, food/non-food categories of products and subcategories, intraurban and periurban character of location, types of areas where it is practised, types of production systems, product destination and production scale (see Figure 1).

Types of economic activities: Most definitions refer to the production phase of agriculture; recent definitions add processing and trade to production and stress interactions between these. Besides being sound, commodity analysis affords an integrated approach which is particularly relevant to UA where, differently from most rural agriculture, production and marketing (and also processing) tend to be more interrelated in time and space, thanks to greater geographic proximity and quicker resource flow. This is achieved by small and dispersed units, which make up an extensive and decentralised supply system within immediate reach of a massive consumption market. Economies of agglomeration seem to prevail over those of scale, the latter being more important in rural agricultural production. In UA, economies of scale through co-operative efforts may further enhance the benefits of unit-based vertical integration.



Food/non-food categories and sub-categories: The definitions embrace very diverse agricultural productions, though more highlight food productions fit for consumption by either people or livestock; then, mostly cultivated or raised food products (grain, root, vegetable, aromatic and medicinal herbs and fruit crops, and livestock of all shapes and sizes). A smaller number deal with other plants, such as ornamental and agroindustrial (e.g. silk worms, tobacco). Within food crops, definitions clearly stress the more perishable and relatively high-valued vegetable and animal products and by-products. Several studies consider food production exclusively, while others encompass both food and non-food production. As such

systems are often mutually complementary, often gendered, they reinforce not only food security but also economic and environmental benefits at various levels (from individual to city). To exclude the non-food category from the general UA concept would truncate our understanding of the UA system at large. Exchanges are taking place across production systems and within particular production units. Many ways exist in which UA interacts with other urban functions to use and provide resources, outputs and services to the city.

Intraurban/periurban character of location: By far the element most common to reviewed definitions is location "in (within) and around" cities or urban areas (e.g. Ganapathi 1983, Sawio 1993, Smit et al. 1996b, COAG/FAO 1999). This element is probably the biggest source of contention, which is why it will be discussed more at length than other elements. Most UA field studies have been carried out in large urban centres, national capitals or secondary cities; thus, few can be assumed to have largely dealt with agriculture located in rural areas "typical" of the respective countries. However, few actually differentiate between intra- and periurban locations. Those which do so have used as criteria, for intraurban agriculture, population sizes, density thresholds, official city limits (Gumbo & Ndiripo 1996, Murray 1997), municipal boundaries of the city (Maxwell & Armar-Klemesu 1998), agricultural use of land zoned for other use (Mbiba 1994), agriculture within the legal and regulatory purview of urban authorities (Aldington 1997). In a rare comparison between rural and urban agriculture, Moustier (1998) defines UA as that carried out within or on the outskirts of a city where a non-agricultural use of local resources is a real option; rural agriculture is found in areas where this option is not an issue. In the CIRAD-Agricongo study of (open-space) market vegetable farming in Brazzaville, for instance, gardens within the city limit are labelled "intraurban" whereas those off-limit (though within a certain travel-time band – see below) are called "periurban" (Moustier 1999).

For **periurban agriculture**, the locational definition is more problematic. In contrast to intraurban locations well within the older and more settled urban fabric, periurban locations are in closer contact with rural areas and tend to undergo, over a given period of time, more dramatic agricultural changes than do locations in more central and built-up parts of the city. Many authors recognise the need to differentiate peri-UA from intra-UA, but criteria used vary widely. For instance, the periurban area is one where "the advantages of combining farm and non-farm work can be maximised" (Swindell, quoted by Binns & Lynch 1998). Sumberg

(1997) applied the OCDE definition to a study of the urban milk system in Dar es Salaam; the Natural Resource Institute supplemented this definition, stressing land shortage and pollution pressures from urban expansion (NRI 1995). In the Greater Accra study, Maxwell et al. (1998) emphasised land-market pressures and changes in agricultural production. In South Africa, a sequence of production systems has been proposed which straddle an urban-rural range of population density thresholds.

Authors have been trying to delineate the outer boundary of the periurban area. Stevenson et al. (1996) say that this outer boundary varies, depending on the reach of those urban influences with the greatest impact on the production system considered. Murray (1997) and Losada et al. (1998) have identified urban and periurban zones within metropolitan boundaries of Quito and Mexico City, for urban forestry and animal husbandry studies. The latter further identified a suburban zone, and characterised all three (urban, suburban and periurban) based on varying ratios of buildings and roads and increasing ratios of open space per km^2 (Losada et al. 1998). Others understand the outer boundary of the periurban zone as some isochrone. This travel-time band is more star-shaped than circular in most cases, stretching out along main road corridors and on flat land, while contracting in wedges and rugged sectors; it can be defined by the travel time of non-resident farmers to their farm or the travel time of specific products to reach the urban market. Lourenço-Lindell (1995) used the area within which people living within the city's administrative boundaries can travel to engage in agricultural activities. Moustier (1998) used the maximum distance away from city centre within which farms can supply perishables to the city on a daily basis; Mwamfupe (1994) used the maximum distance which urban residents could travel to their farms in the periurban area on a daily basis (quoted by Stevenson et al. 1996). Stevenson et al. (1996) themselves proposed the maximum distance within which a given percentage of producers can sell their crop at farm-gate. How far from the city this outer limit will be drawn will depend on the level of development of the local road infrastructure and transportation costs: 10 km wide in Bissau, Guinea-Bissau, but 20 km in Brazzaville, Dar es Salaam or Kumasi (NRI 1995). According to these criteria strictly, this limit falls at least 90 km away from Metro Manila (Ali & Porciuncula 1999).

Types of areas where UA is practised: Criteria according to which such areas are typified vary from author to author: location respective to residence (on-plot or off-plot), development status of site (built-up vs open-space), modality of

tenure/usufruct of site (cession, lease, sharing, authorised or unauthorised - through personal agreement, customary law or commercial transaction); the official land-use category of the sector where UA is practised (residential, industrial, institutional, etc.). While some authors have focused on home-plot areas (Lee-Smith et al. 1987, Régis 1999), others have aimed their study at off-plot and open-space locations (Freeman 1991, Mbiba 1994, Kiango & Likoko 1996, Dennery 1996, del Rosario 1999). Misleading comparisons are often drawn across separate studies without due regard to the locational focus of original surveys. Some surveys have encompassed both on- and off-plot locations, under different tenure/usufruct modalities, revealing creative interactions between such locational categories (Maxwell 1995, Sawio 1993, Drescher 1996).

Product destinations: Most definitions embrace agricultural production for both self-consumption and some trade (sale, barter, gifts, etc.). Both destinations are usually found to be targeted to varying degrees by the producers or households studied. Economic research recently has been aimed at specific (export) market-oriented production and has helped us to better understand the economic performance of UA and its comparative advantages over other supply sources, both at the producer and consumer level. On the self-consumption plane, relatively more attention must be given to the economics of animal assets and the fungibility of supplemental food self-consumption afforded by UA to households. Whereas in Accra, little attention was paid to the asset value of small livestock, a study in Cairo, a city thrice as densely peopled as Accra and with only 3% of its precipitation, revealed that nearly 30% of low-income households in informal housing had livestock worth on average nearly a full month of income (GTZ 1999).

Production systems (scale of): Few definitions clearly include or exclude specific types of production systems *a priori*. Surveys collect data on the different types of systems found in the area under study (see other section for details). Generally, the research effort has focused on individual/family micro, small and medium enterprises, as opposed to large, national or transnational undertakings. However, recent studies show that the bigger interact in more than one way with smaller market-oriented units, often even to the expense of units primarily geared to self-consumption (periurban areas). Corporate outsourcing has been practised for some time in UA, particularly in Asian cities, but trade liberalisation is also making it attractive in a growing number of types of production and cities in Africa and Latin America.

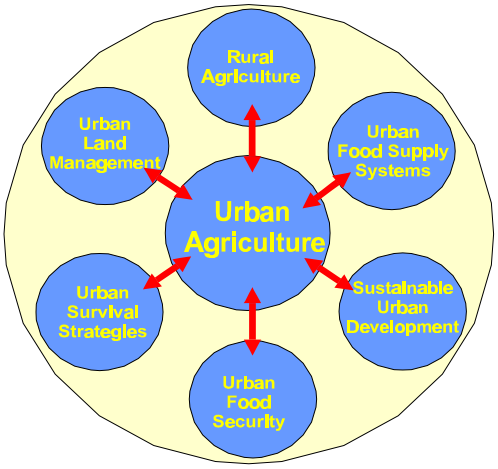
2.3 The urban ecosystem connection: a neglected trait of the concept

Most authors define UA only in general terms; this is then often developed into some typologies to organise data analysis on the afore-reviewed dimensions of the concept. Studies rarely use their findings to refine the UA concept of the day (Mbiba 1998) and to clarify UA's distinctiveness, or how UA relates to the body of related development concepts (see Figure 2). Smit et al. (1996b) briefly discuss the connection of UA with the urban nutrient cycle and with the urban food system. Several authors have further incorporated UA in their analysis of related concepts, e.g. on rural agriculture (Moustier 1998); on food entitlements (Lourenço-Lindell 1995); on food security (Koc et al. 1999); on urban households' survival strategies (Rakodi 1995); on urban food supply systems (Smith 1998); on urban land management (Lee-Smith 1998, Girardet 1992) and on sustainable urban development (Mitlin & Satterthwaite 1996). This has generally been done more on a theoretical plan than in operational terms, because of the UA concept's lack of clarity (Lee-Smith 1998, Binns & Lynch 1998, Sumberg 1999).

One striking feature of definitions so far is that few contrast urban and rural agriculture, even less so the implications of one for the other (Binns & Lynch 1998). Indeed, all building blocks reviewed earlier, excepted location, can apply to rural agriculture as well; they do not suffice to trademark UA and justify the need for UA-specific knowledge, know-how and policy. The following paragraphs identify some aspects on which efforts should concentrate and provide some evidence to clarify UA's distinctiveness.

The lead feature of UA which distinguishes it from rural agriculture is its integration into the urban economic and ecological system (hereon referred to as "ecosystem"). It is not its urban location which distinguishes UA from rural agriculture, but the fact that it is embedded in and interacting with the urban ecosystem (Richter et al. 1995). Integration into the urban system has been crucial to the persistence of UA,

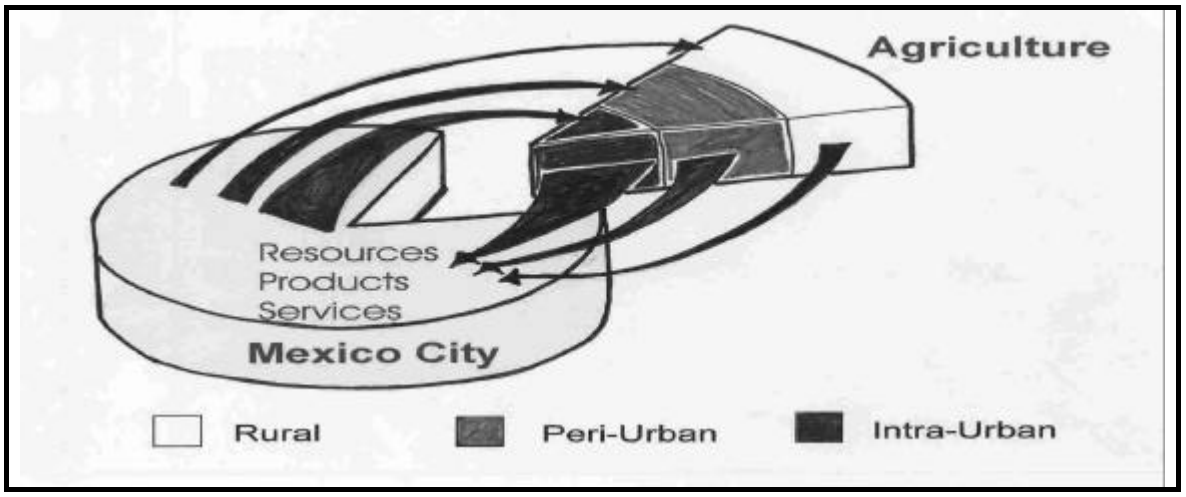
Figure 2: Urban Agriculture and other "Kids on the Block"



more so to its technological and economic influence over rural agriculture throughout history. Probably as old as our cities (Jacobs 1969), UA has not been an exceptional nor a temporary pursuit. Though the nature of cities and of urban food-supply systems has changed, the need for UA to interact well with the rest of the city, on one hand, and with rural production and imports, on the other, remains as true today as it was thousands of years ago.

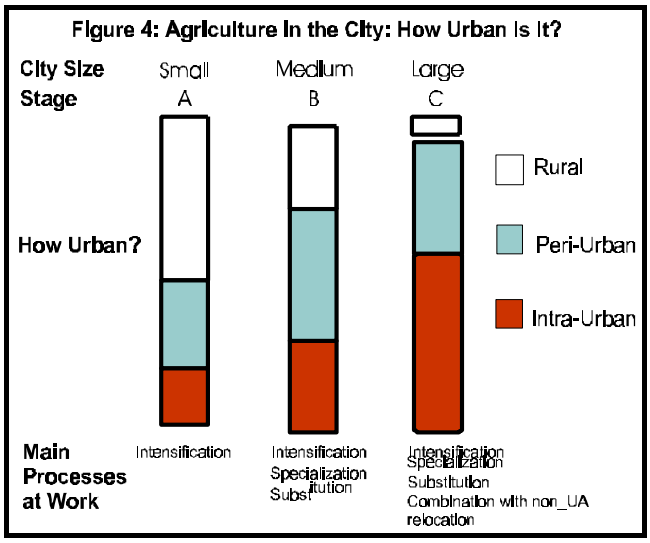
This integration with the urban ecosystem is not captured in most definitions of the UA concept, and less so developed in operational terms. This is an area in need of much greater attention beyond initial steps taken by a few. For instance, the definition by Smit et al. (1996b) of UA stresses the recycling of urban waste and the catering to the daily urban demand; this adds to the locational feature of earlier definitions an urban input-urban output loop. A revised definition is submitted as follows: **UA is an industry located within (intraurban) or on the fringe (periurban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area** (see Figure 3).

Figure 3: "Urbanising" agriculture in (Mexico) city using more from, and supplying more to, (Mexico) city



The principle of agriculture's integration into the urban ecosystem enables us to recognise three types of situations with regard to the degree to which agriculture found in the city is actually integrated into the city organism (Figure 4):

(A) In any given city at any given time, agriculture will be found that is rural, periurban and intraurban in nature, the three interacting and complementing each other to varying extents, with the latter being more integrated into the urban ecosystem.



In order for agriculture found in cities to become more urban in character, this must innovate to cope effectively with city constraints and tap no less effectively on urban assets and flows found and generated by the city. In turn, it benefits this (and others) with its products and services on a daily basis. Agriculture will be more or less urban, according to the extent to which it will use the urban ecosystem and, in turn, be used by this same urban ecosystem.

This concept enables us to assess conditions and policy interventions needed, if any, to move from lesser to greater integration.

Several studies exemplify the principle of integration through comparisons between intraurban, periurban and rural activities. UA is found to complement rural agriculture in terms of self-provisioning, marketing flows and market-supply flows, as shown for instance by CIRAD studies on vegetable and livestock production in West and Central Africa.

Self-provisioning: Specific UA productions are important sources of self-provision for all households, anywhere and anytime. Self-provision from some forms of production affords a measure of self-reliance to urban markets at certain seasons and/or periods of time; self-provision is found to benefit households regardless of their income, but is particularly critical to poor households.

Market supply: Although UA has been growing in absolute terms in most cities surveyed, its contribution to urban food supplies relative to rural agriculture and imports varies, depending on product and season. UA critically flattens price/variety seasonality by lessening dependence on off-season imports, or making up for reduced supplies from rural agriculture during the dry season.

Marketing systems: Fewer levels of trade and a higher percentage of producers are involved in the trade of UA than in rural agriculture or imports. This dispersal of trade corresponds to a dispersal and small scale of UA (demand-supply variability risks, lack of storage and of access to credit by traders). By comparison, the wholesaler-collector function in the marketing system of rural agriculture is much more significant. Volumes traded and transportation costs are larger in rural agriculture, while marginal sale profits and bargaining power of producers against traders are higher in UA (Moustier 1998).

Panigrahi (1995) and Seré & Reinhardt (1995) implicitly use the urban ecosystemic link principle, when identifying distinctive traits of periurban livestock production systems relative to rural counterparts: types of livestock, size and nature of systems are conditioned by urban demand and feed availability; feed resources are generated by urban-based activities (agroindustrial by-products, natural fodder on roadsides and in parks, abundant urban domestic wastes); and form, quality and cost of product constrained by increasingly sophisticated urban consumers. According to the systematic comparisons by Stevenson et al. (1996) of rural, periurban and urban fruit/vegetable production, in Dar es Salaam, the dependence of the production system on urban-origin inputs and on urban-destination outputs clearly increases from the rural (village) to the urban end of the spectrum. At the same time, this growing dependence impresses on production: greater intensification, specialisation, crop value and profit margin.

On the resource level, the urban ecosystemic link of UA has been explored primarily through its reuse of wastes generated by urban agricultural and non-agricultural activities. Growing interest in the link between UA and urban solid and liquid waste treatment and recovery is certainly indicative of the economic attractiveness of the urban ecosystemic dimension of UA.

(B) Across cities of different size or complexity at any given time, more of the agriculture found in the city will be of an urban nature in larger as opposed to smaller centres. Systematic evidence for this relationship remains more limited than for (A). A six-city Kenyan study further shows that intensity and productivity increase with city size; similarly, the use of organic inputs and of networks of exchange or trade increases with city size (Lee-Smith 1998).

(C) In any given city and over a period of time, during urbanisation, agriculture of an urban nature will grow as a percentage of all the agriculture found in that city. In this case, no systematic case study was found on the evolution of UA in a same city over a reasonable period of time.

However, some evidence is available on multiple-year trends for specific systems and areas of Dar es Salaam, Dakar, Hong Kong and Cagayan de Oro, where UA land-based systems have shrunk, intensified or specialised, and have been substituted by more profitable ones, increasingly combined with non-agricultural land uses, when not relocated. Shanghai exemplifies several of these processes at work, with land-extensive systems (vegetables and livestock) moving to the outskirts, while production within city limits is becoming more efficient to deliver higher yields and labour productivity and value-adding (Yi-zzhang 1999).
In all three relationships (A, B and C), agriculture will become more urban, or will integrate itself more into the urban ecosystem, through a series of processes which accumulate over time and are more numerous in the larger urban centres.

In conclusion: the urban ecosystemic link of UA throughout its entire conceptual framework remains to be fully developed. Its conceptualisation currently offers a generic definition and some indications of its distinctive traits. A de-codification of this definition is needed to help us identify its distinctiveness, in both theoretical and operational terms. Efforts in that direction have already begun and are forcing us to distinguish between UA and non-UA in urban areas (the latter will continue to exist with or without a UA concept), between intra-UA and peri-UA, and to examine the place of UA within larger conceptual frameworks. Because UA is claimed or reported to interact with so many facets of urban development, UA also holds the potential to help us diversify and strengthen our urban management strategies. This is not a small opportunity, as city-based electorates struggling for access to food, income and sanitation are increasingly calling the shots in local and national policy arenas.

3. Presence of UA: who is involved and why is it important?

3.1 Who is involved in UA?

The actors involved in UA are many; they are the suppliers of resources, inputs and services and the producers, the transporters and the processors, the retailers and the consumers, the promoters and the managers. These actors pertain to the public and private sectors, the formal and the informal economy. The political relationships which these actors thread among and between themselves as well as with resources are diverse; they can be complementary and synergetic, competitive and antagonistic, collaborative or adversarial, equitable or exploitative. This section focuses on the relationships among producers, between these and retailers, and between these and authorities, particularly with respect to selected issues such as access to land, rural and urban agriculture, and community welfare. These aspects will then be further developed in the thematic articles of this reader.

3.1.i Producers, women producers, classifications

Many stakeholders are involved in UA, but some do it in bigger ways than others. A California-based winemaker imports Chilean grapes from the Santiago region. A Brazilian electricity utility leases out right-of-way parcels to vegetable growers in metro Rio. A Dominican rehabilitation institution in downtown Santo Domingo has inmates grow and sell hydroponic lettuce to nearby supermarkets and ornamentals to high-income neighbours. Zimbabwe's Harare City Council irrigates cattle pastures with treated municipal wastewater; informal women's co-operatives farm local vacant fields for food and cash. A group of men garden small plots on a church's unbuilt estate in Tanzania's capital, Dar es Salaam. Almost everywhere where fresh dairy products are in demand, senior bureaucrats stall-feed dairy cows on their private estates. In Cuba, public-housing residents in Havana and elsewhere grow home vegetables and rainfed root and grain crops in nearby public open spaces; in Peru, women raise guinea pigs at home for sale in Lima and in secondary cities such as Cajamarca.

However, most urban farmers are low-income men and women who grow food largely for self-consumption, on small plots that they do not own, with little if any support or protection. They tend to come from smaller towns; most are not recent arrivals. For instance, a 1994 survey of three different sectors of Nairobi revealed that over 60% of 177 producers had moved to the city before 1985 (Mboganie-Mwangi 1995).

Recent studies indicate that gender ratios vary greatly from city to city, depending on cultural/religious context, the economic conjuncture, the economic activity, the production system, scale and areas involved. In vegetable marketing, men prevail in market gardening in Brazzaville, Lomé, Addis Ababa and Dakar, while men prevail among producers and women in vending in Cagayan de Oro, Philippines (Schnitzler et al. 1999); in Tanzania, gender ratios in retailing vary markedly between cities, depending on religious affiliation (Yachkaschi 1997).

The different city case studies presented in this reader cover a range of situations in terms of gender involvement and influencing factors. There is no doubt that UA connects well with women's traditional childcare and general household management roles. It allows them to strengthen food provisioning and work close to the home. Most women urban producers are probably engaged in self-provisioning to a larger extent than men (Hovorka 1999). UA is particularly significant for women with larger families to feed and/or support (Dennery 1996, Maxwell 1995). There is evidence that UA can give women greater control over household resources, budget, decision-making and benefits. Many re-invest their savings into their children's education, into small upstream (bulk purchase and retail trade of manure, Haiti) or downstream (food processing and street vending, Nairobi) UA enterprises, as well as into other small businesses (Dennery 1997, Chauca 1999, Moustier 1996).

Figure 5: Classifying Urban Producers Criteria

- City zone
- Site location
- Tenure modality
- Socio-economic status
- Production system
- Scale of production
- Time allocation
- Product destination

Classifications of UA production systems/producers are many (see Figure 5). They reflect a combination of production factors, which characterise important segments of UA in any given city: city zones, site locations, tenure modalities, producers' socio-economic status, production systems and scales. Criteria (or combinations thereof) which seem to prevail are: zonal location within the city, modality of access to land, producers' dedication of time and other inputs, and product destination. Some studies have focused on specific categories, such as production systems based at home (Lee-Smith et al. 1987, Chauca 1999) and at open-space locations (Freeman 1991, ENDA-ZW 1997, del Rosario 1999). Others have developed classifications for specific production systems, such as market vegetable (Abutiate 1995, Centres 1991) or animal husbandry production (Centres 1991,

Chauca 1999). In Kumasi and Lomé (Abutiate 1995, Kouvonou et al. 1998), vegetable producers are classified according to time dedication, including three subclasses of part-time producers (urban night-security men, artisans, periurban absentee farmers) and full-time and year-round producers (hiring labour). In Bissau, Lourenço-Lindell (1995) differentiates types of UA based on product destination: subsistence (self-consumption) or market-oriented. More elaborated classifications are based on a combination of tenure modality, time allocation and product destination, for Kampala (Maxwell 1995) and Accra (Zakariah et al. 1998); similar criteria were used by Sumberg (1999). Policy may benefit or affect the future of urban producers, depending on how they account for and intervene on those criteria, according to which particular groups of producers differentiate themselves from others.

3.1.ii How producers gain access to and use urban land

Producers gain access to urban land from a variety of urban actors, through diverse modalities of tenure and usufruct; arrangements are very often informal and sometimes based on customary law. In surveys available, those gaining access to tracts of land against the will of their owners are a very small minority.

Given the constraints on access to, and on the size of, land plots available for UA at any location, production systems are very diverse in order to make the most and the best use of particular locations within the urban fabric. Areas used are of all sizes, from tiny home spaces (windowsills, containers, fences, rooftops, basements, walls) to recreational grounds, utility and transportation rights-of-way (stream or roadsides), to suburban public or private estates.

Urban farmers may use different spaces in a complementary way over a period of time. For instance, year-round homegardens often serve as nurseries for rainfed off-plot fields, as in Lusaka (Drescher 1996); the same streamside field may carry vegetables in the dry season and grain crops in the wet season. Working several fields at different locations maximises access to critical inputs (stream water and effluents) and to niche markets (ornamentals at crossroad intersections, herbs across from catering facility, etc.), ensures stability against eviction from any particular site or against crop losses because of theft or other hazards.

UA management involves deciding which types of products and what scales of operation should be allowed in different parts of the city. A city may want to avoid major concentrations of stall-fed dairy cattle or piggeries in central districts, where

it may encourage systems integrating stacked small livestock with space-intensive high-valued crops. Even in areas where public open spaces are in short supply, tenure agreements are being sought between urban producers and owners of private or public estates with idle areas (hospital grounds in Lima, golf club in Harare, schoolyard in Santiago, Chile, ocean port grounds in Lomé, etc.).

3.1.iii Promoters – managers

Various NGOs, governments and international agencies have been supporting UA activities in less-developed countries (LDCs) since the 1970s. NGO initiatives in UA have been very diverse since the 1970s, in all major world regions, and inventoried in a number of publications (i.e. worldwide: Wade 1987, Smit 1996; on Canada: Lifecycles 1998). NGOs have been active particularly in Latin America and the Caribbean (Prudencio 1997) and less so in Africa and Asia, where more NGOs traditionally focusing on rural development are now extending into urban areas. In urban areas, more NGOs have been seeking the collaboration of governmental actors to upscale local UA interventions, such as ENDA-ZW in Harare, Zimbabwe, CEARAH-Periferia in metro Fortaleza in Brazil, CARE Haiti in Port-au-Prince, Haiti, FUNAT in Havana, Cuba, REDE in Lima, Peru, etc. Few evaluations of NGO initiatives in UA are, however, available and more are needed to orient future interventions in collaboration with other actors (Chauca 1999, Régis 1999, Mougeot 1999b).

Examples for official promoters/managers of UA are:

National and local political leaders' public appeals for self-reliance: In countries as diverse as Tanzania, Zambia, Cuba, the Philippines, Guinea Bissau and Indonesia, presidents and mayors have called on urban and rural citizens to become more self-reliant in food.

Provision for UA in city master plans: New capital cities, such as Doala in the Ivory Coast and Dodoma in Tanzania, have been designed to accommodate UA. Agriculture has been incorporated into urban expansion plans for Kinshasa, Dar es Salaam and Maputo.

Revised urban regulations: Bylaws have been revised to allow for specific production systems in specific zones and state agencies have been authorised to promote appropriate practices in such areas, as in Kampala (where roaming cattle

is still prohibited) and Kumasi (Atukunda 1998, Abutiate 1995). Dar es Salaam is one of the most elaborate bodies of legislation on UA in Africa; multi-stakeholder surveys have been used to suggest priority improvements to both text and enforcement (Sawio 1998).

New institutional mechanisms for UA: Several countries have created permanent institutional programmes and agencies. These have exploited flexible zoning modalities (Cruz 1999 and Gonzales 1999 on Cuba), purpose-specific leaseholds (Argentina), promoted UA to supply national school-catering programmes (Costa Rica) and legally organised groups of urban farmers (Zimbabwe, Tanzania), entitling them to credit and technical assistance. The Cuban Ministry of Agriculture has created an Urban Agriculture Office for Havana (Altieri et al. 1999) and the Philippino legislation enabled the Cagayan de Oro City Government to establish the City Agriculture Office, now responsible for all UA matters (Potutan et al. 1999).

Allocation of municipal open space: Organised groups have been assigned undeveloped public arable land for fixed periods of time (Harare and Gweru in Zimbabwe), and UA has been tolerated as interim or permanent land use in public-housing schemes (Dar es Saalam). In Havana, some 19 ministerial resolutions now protect urban areas under agricultural production. Following decentralisation of food production and release of state-owned land to temporary production in the 1970s, private farms in the late 1980s were supplying Sofia with 48% of its milk and eggs, 53% of its potatoes and about 50% of its vegetables. In Cagayan de Oro, the City Council has issued an initial ordinance allowing urban farmers to use parts of idle land and open spaces.

Officially promoted UA projects: In Bissau, where municipal urban regulations do not oppose UA (except roaming cattle), the Federal Government initiated with UNDP a Greenbelt Project which, in the early 1990s, benefited over 2000 cultivators, mostly women, in 14 urban districts (David & Moustier 1993). In Ghana, the Ministry of Food and Agriculture has introduced periurban milk collection to encourage periurban dairying in the Accra-Tema municipality (NRI 1995). Brasilia D.F. furthers the integration of small-scale food production with local food processing and marketing (de Carvalho 1999).

Direct public engagement in UA production: National or metropolitan public utilities have leased out land (Brazil), entered in partnership with producers (Senegal) or have become direct producers themselves (Tunisia, South Africa). In Havana, rather than producing it itself, the Ministry of Agriculture is now servicing and acquiring from individual small livestock producers a growing share of the basic meat supply for the city population and businesses (Jorge Luis Castellano, 13 October 1999).

International agency support to public UA interventions: Bi- and multilateral development agencies have been supporting more UA actively since the late 1980s: CIDA (Canadian International Development Agency) and GTZ (German Technical Assistance) have supported UA as productive use of metro green belts (Havana and Maputo), SWEDEPLAN has assisted with the inclusion of UA in the design of social housing (Maseru, Lesotho); NEDA has encouraged UA as productive open-space use near high-density residential areas; DANIDA (Danish International Development Agency) has funded fuel wood plantations and credit to female producer co-operatives; SIDA (Swedish International Development Agency) recently funded an East African workshop to inform policy research into rural-urban food production and is currently considering UA as part of a new urban environmental management programme in SE Asia (Bo Gohl, 12 October 1999). French Co-operation has supported market assessments for specific commodities (periurban vegetable crops). United Nations Development Programme (UNDP) and the UN's Food and Agriculture Organisation (FAO) have been providing technical training and feasibility studies for several production systems. UNCHS has supported formal consultations of UA as part of multi-stakeholder action plans for urban management. UNICEF and related humanitarian NGOs such as CARE, OXFAM and CEBEMO (Dutch Catholic co-financing organisation) have supported UA projects. The World Bank, (WB), the International Development Research Centre (IDRC) and the European Union (EU) have supported treatment and reuse of liquid and solid waste in periurban agriculture in Peru, Brazil, Chile and Cambodia (UNDP-WB Water Sanitation Programme guidelines). The WB recently supported projects recommending inclusion of UA as legitimate land use in new city master plans, such as in Uganda; it also commissioned an assessment for comprehensive WB support to UA in SSA (Smit et al. 1996a). FAO has formalised an inter-departmental group and will lead, with ETC Netherlands and UMP (Urban Management Programme of the UNDP), a series of electronic conferences aimed at national and local authorities to identify policy assistance needs on particular UA issues.

3.2 Why is UA important?

This section will provide a brief overview of the external functionality of UA. The issues addressed here are further explored in the thematic articles that follow this introduction. Furthermore, the city case studies provide specific examples for the different function of UA.

UA is one source of supply in urban food systems and only one of several food-security options for households; similarly, it is one of several tools for making productive use of urban open spaces, treating and/or recovering urban solid and liquid wastes, saving or generating income and employment, and managing freshwater resources more effectively.

Today, Smit et al. (1996b) claim that an estimated 800 million people are engaged in UA worldwide; of these, 200 million are market producers, employing 150 million people full-time (Smit et al. 1996b). Denninger et al. (1998) estimate that nearly 25 out of the 65 million people living in urban areas of Eritrea, Ethiopia, Kenya, Tanzania, Uganda and Zambia currently obtain part of their food from UA and that, by 2020, at least 35-40 million urban residents will depend on UA to feed themselves.

Data on several production systems show dramatic growth in numbers of producers, production systems at work, area used, production and yields in several cities. Both output and yields have increased, despite area reduction in market vegetable gardening in Dakar (Mbaye 1999, de Bon et al. 1997). Similar trends are observable in Kumasi (Abutiate 1995) , Lomé (Kouvonou et al. 1998) and in local and export specialty crops in Bissau (Lourenço-Lindell 1995). As in Singapore and Hong Kong years ago, Havana and Cagayan del Oro are now witnessing the expansion of small-livestock systems relative to plant crops.

On the urban food-supply side, crop choices, agricultural credit programmes and incentives, technical extension and research, and distribution networks often have been dictated by export and hard-currency earning policies. Official control of food prices has favoured urban wage earners and discouraged rural production. Subsidies are less frequent today, but their removal often exacerbates price seasonality; high transaction costs may discourage rural producers from supplying critical markets; institutional frameworks may not be in place for markets to operate effectively. Economic liberalisation also has made some urban-based

productions more competitive than rural counterparts and has opened up an urban market for local input and implement suppliers; export-oriented crops have even become viable in urban areas (Accra, see Zakariah et al. 1998; Bissau, see Lourenço-Lindell 1995).

On the urban food demand side, devaluated currencies, weakened purchasing power, frozen wages, retrenched public service and formal employment, and removed subsidies on food and other basic needs have curtailed the capacity of both the urban poor and middle class to purchase all the food they need. In 1990, households in nearly half of the largest cities in low-income countries were already spending on average 50-80% of their income on food (PCC 1990). This figure was higher for low-income households; even so, their purchases often have been found not to cover daily minimum requirements. No matter how efficient the urban food supply market may be, rapid urbanisation and growing urban poverty will complicate the demand side of the equation for decades to come. Where periurban production and marketing systems are considered to be efficient, as in Port-au-Prince, the retail price of local vegetables makes them simply unaffordable by the poor (Sumberg & Kleith 1994).

In this context, governments are awakening to one undeniable and gathering trend, but need to better cope with its far-reaching economic, social and political underpinnings: poverty and malnutrition are becoming increasingly urban. More of the rural poor are migrating to the cities, more of the people in cities are being born in poor families and more urban middle-class residents gravitate around the poverty line. If in 1988 at least 25% of the developing world's absolute poor were living in urban areas, by year 2000 these are expected to comprise 56% of the world's poor households (WRI/UNEP/UNDP/WB 1996; UNICEF 1993).

The importance and diversity of UA systems in any given city seems to depend on multiple factors at levels ranging from:

- global (international trade); to
- national (level of development, fiscal/ financial structural adjustment, disasters, agricultural policies); to
- regional (urban food supply system, prevailing agroclimate, strength of agricultural and food traditions); to
- urban (population growth and densities, physical layout, employment levels, consumers' tastes and market niches, legislation); to

- district within the city (urban vs periurban, low vs high income, low vs high densities, residential vs other uses); to
- household (size, dependency ratios, income levels, gendered responsibilities); and to
- individual (education level, particular mix of occupations, farming skills, access to resources, contacts with suppliers/clients).

3.2.i Nutritional benefits

Self-produced food in cities provides nutritious food otherwise unaffordable (all animal protein in low-income households of El Alto, Bolivia), replaces purchased food staples or supplements these with more nutritious foodstuff, affords savings (as much as 20% of income) which can be spent on non-produced foodstuff or other needs (school fees, transportation), and/or generates supplemental or principal income which can be reinvested in other urban businesses (sewing machine, typewriter, kitchen appliance). Self-production represents anywhere from 18% (East Jakarta) to 60% (Kampala) of total food consumption in low-income households, with sample percentages depending solely on self-production reaching 50% (Nairobi) (Mougeot 1994). In Harare, savings accruing to low-income farmers are equivalent to as much as several months of earnings (ENDA-ZW 1997). In Havana, urban gardens have significantly increased the quality and quantity of food available to the producers' households and their neighbourhood, improved the financial welfare of the households and enhanced the environmental quality of the community (Altieri et al.1999).

From an intervention viewpoint, non-food production may be the way to improve the income and nutritional status of households, depending on prevailing local constraints and opportunities. As Cox (1999) verified in the case of El Alto, Bolivia, severe water scarcity, the emphasis on exotic vegetables and the local plant demand for beautification had women participating in NGO projects abandon original community vegetable gardens in favour of more profitable tree and ornamental nurseries. Exclusive emphasis on food production may be less effective in improving nutritional health, where local food preparation and cooking practices should be corrected or the social status locally associated to particular foods should be accounted for, as verified in Dar es Salaam (Kogi-Makau 1995).

3.2.ii Impact on community welfare

The impact of UA on urban community welfare is more documented than the impact on the rural counterparts. In low-income urban districts of Bissau,

Brazzaville and Nairobi, urban farmers contribute to community welfare and funeral groups and to formal and informal channels of food acquisition. They generate employment and additional or seasonal income for other basic needs (processed food), link up with the food trade, produce food products otherwise unaffordable, reduce dependence on purchased food, enhance their own exchange entitlement and provide food gifts and meal sharing (Laurenço-Lindell 1996, Moustier 1996, Dennery 1996). In Bissau and Port-au-Prince, the frequent gifting of food by home producers strengthens reciprocity within assistance networks and reduces incidence of theft. Open-space producers also unwillingly contribute to curbing food insecurity through loss of crops, animals and other assets to theft, commonly reported in surveys (Lourenço-Lindell 1995, Régis 1999).

As to rural and urban incomes from market agriculture, in Bissau urban vegetable producers' margin of profit is larger, thanks to direct marketing by the producer; but volumes traded individually are small and corresponding incomes are only a fraction of those of rural traders. A similar principle applies to urban producers of fresh milk. The atomised structure of the production-trade network of UA has major benefits for both the producer and the consumer, which have been largely underestimated, when not openly discouraged, by attempts to dictate price controls and centralise collection and processing. Most attempts have been successfully resisted by the larger part of UA and will continue to be so, until more decentralised strategies are implemented which will safeguard and enhance such benefits.

3.2.iii Interdependence with rural agriculture

UA tries to complement supplies from rural areas and should be supported to do so. David and Moustier's (1993) study of the vegetable-supply system of Bissau showed that urban production promoted by the government to diversify and buffer the seasonality of supplies to the city has been truly complementing other (rural and foreign) sources. West African cities also frequently offer better conditions for breeding, sheltering, watering or fattening livestock otherwise kept in rural areas (Centres 1991). Stevenson et al. (1996) found that the urban, periurban and rural zones complemented each other in supplying specific produce to the city of Dar es Salaam. Tomatoes, African eggplant, cabbage and onions come from rural locations; eggplant and okra from periurban; sweet pepper from urban and periurban; and hot peppers from periurban and rural locations. In India, both the inability of rural production to meet the growing urban demand for poultry products and the continuing relocation of traditional food processing to urban areas

concur to explain the long-term proliferation and intensification of periurban poultry systems in that country (Panigrahi 1995). Overall, this two-way flow of knowledge, resources and goods for specific productions, and its impacts on both rural and urban communities, remain largely undocumented; such information is needed to devise socially acceptable and economically viable local food systems.

4. Main doubts and risks raised by UA

Little could be found in the academic literature which would condemn UA at large and advocate its ban under any form. The debate is likely to heat up as UA practice and policy grow in scale and in complexity in the next decades, thus affecting interests in very different and tangible ways. Some have argued that greater public support to UA in large cities would fuel rural-urban migration, while several surveys show that most migrants to large cities come from smaller cities and not from rural areas. The surveys further suggest that migrants arrive in the cities with the initial ambition to work in anything but agriculture and that a majority of urban producers are not recent arrivals. Others have contended that public support to UA could significantly reduce public investments in rural agriculture, while UA needs intersectoral co-ordination of current financial flows much more than major new funding. There is a gathering perception that, in an increasingly urban world, development challenges – among which poverty and hunger reduction – will not be met unless holistic agricultural policies tap on urban and rural complementarities, rather than ignoring them.

4.1 UA hampers urban development?

The more frequent argument from urban planning is that agriculture should be confined to rural areas, as it can interfere with more productive use/rent of land by other economic activities.

Yet, different UA systems do combine with a range of non-agricultural land uses; for instance, the Centre for Urban and Rural Studies of the Universidad Catolica Madre y Maestra in Santiago de los Caballeros, Dominican Republic (del Rosario 1999) found that in 1997 food crops and livestock were being produced in a third of all 2734 city blocks (38% of the blocks classified as poor, 24% of low-income, 44% of mid-income, 48% of high-income residential, 6% of commercial, 15% of industrial and 23% of institutional).

4.2 UA threatens public health?

Such concerns refer to contamination risks of producers, handlers, consumers and people in the vicinity of production areas caused by crop and husbandry inputs, products and by-products (nuisances, safety hazards). These concerns are legitimate and must be addressed; they arise from practices carried out at wrong places or in the wrong way; they have to do with the quantity and use of agricultural inputs (including feed), choice of production for site characteristics, density of use of site and vicinity (number of animals per unit area), handling of products and by-products.

Particular attention must be given to human health risks and nuisance posed by urban livestock. Flynn (1999) states that the relationship between UA and the rural-urban transition of zoonoses remains largely under-researched. There is evidence from major cities in Nigeria, India, Brazil and Saudi Arabia on human brucellosis infection and echinococcus infection transmitted by domestic livestock. The risk of such diseases spreading is real, as a result of inappropriate zero-grazing and animal-waste disposal in slaughterhouses or densely-populated areas, where space-confined husbandry of swine, goats and sheep is growing (Ayanwale et al. 1982, Pillai et al. 1996, Larrieu et al. 1988, Cooper 1991).

Health aspects of human excreta re-use have been extensively reviewed by the former International Reference Centre for Waste Disposal (1985); a comparative study of 1989 WHO (World Health Organisation) guidelines for wastewater/excreta re-use confirmed their appropriateness (Blumenthal et al. 1991/92). Problems seem to reside with implementation and acceptance. Chinese cities have a long tradition of collecting human wastes and applying “night-soil” to periurban crops, although Ling (1994) argues that treatment processes have yet to be standardised to reduce potential health risks posed by the use of human waste as crop fertiliser or fish feed.

4.3 UA has negative environmental impacts?

Environmental health issues include visual untidiness, soil erosion, destruction of vegetation, siltation, depletion of water bodies and pollution of resources (soil, air, water).

The use of agrochemicals in UA is one source of concern. Depending on the intensity of UA production, their use may vary extremely. Whereas UA for self-consumption relies less on the use of agrochemicals (Lourenço-Lindell 1995), more intensive market production might make excessive use of certain products, as observed in Bamako and Lomé.

De Bon et al. (1997) in Dakar and Kouvonou et al. (1998) in Lomé found that market vegetable farming makes more extensive use of organic than of mineral fertilisers, thereby giving value to sub-products of animal husbandry. In Cuba, the use of chemical fertilisers is prohibited within city limits and producers rely on integrated pest management and organic soil management (Altieri et al. 1999).

Lewcock (1995) found in Kano, Nigeria, that periurban farms are a traditional informal and growing market for large quantities of minimally composted waste; he also found that these producers lacked knowledge on the safety of waste materials for use as fertiliser or stock feed. Few cities outside Asia sell and deliver truckloads to large clients on the urban fringe, or encourage at-source sorting and pre-collection of organic waste by organised groups for local composting and UA use. In Egypt, compost was found to be severely contaminated with heavy metals because of poor sorting of inorganic waste (Lardinois & van Klundert 1994).

In most developing countries, municipal solid-waste management remains centralised, capital-intensive and deficit-ridden. Yet, in several African cities, neighbourhood and micro-enterprise composting has been effective. At-source sorting and doorstep collection is crucial to increase usable volumes and improve the safety and acceptance of organic waste use in UA.

4.4 UA is not very profitable?

Data available from various sources for several LDC cities indicate that UA makes an important contribution to employment and income generation. In the early 1990s, agriculture provided the highest self-employment earnings in small-scale enterprises in Nairobi and the third highest earnings in all of urban Kenya (House et al. 1993). However, studies are rare which try to systematise the economic contribution of UA at city level. The Mazingira Institute estimated the total worth of on-plot crops grown in urban Kenya at USD 4 million in one growing season of 1985. Freeman (1991) estimated the value of Nairobi farmers' 1987 annual (two-season) off-plot crop production alone to be USD 4 million.

The UA up- and downstream effects on the rest of the urban economy has not been quantified. UA requires inputs and human resources for fencing, crop management, storage, transportation and processing (milling, cooling, drying, cooking, packaging). Income from UA is used to buy processed food, appliances, clothes, and services and can be invested into other small businesses.

5. Conclusion

Smit et al. (1996b) very ably summarized the main risks and benefits, constraints and opportunities which can be posed by and to UA in any particular context; in principle, all are susceptible of meriting some form of policy intervention. The question to this paper is to short-list those policy needs which represent the main "challenges" ahead. Given the literature review, this paper discussed those aspects of UA which currently raise the more important policy "challenges", in other words, issues where there persists clearly a discrepancy between the perceived urgency of interventions and the lack of experience on record to do so. This is why the paper discussed a limited number of issues (food security, land access, gender implications, land use dynamics and urban planning, public health and sanitation, environmental impacts, interaction with RA). The paper cannot claim to treat such challenges comprehensively; fortunately, a very large number of references used for this paper do contain some policy analysis dealing with particular UA systems in intra- and periurban zones, relevant sectoral support needs, governmental levels involved and problem focus (from land provision to marketing).

Still, it is probably fair to say that most recent policy analysis comes from agricultural circles, much less so from urban planning sectors. Without overlooking the critical contribution of the former, the latter is even more fundamental to UA's adequate integration into the urban economic and ecological system. Earlier this year, Canadian Institute of Planners awardee Soonya Quon (1999) reviewed the international literature and surveyed in writing and orally some 26 urban planning professionals from 18 cities around the world, on tools and strategies for urban planners to incorporate UA into city planning, including responsibilities and limitations of urban planners. Opportunities to account for UA include: input to municipal plans and planning policy, use of tools and strategies to realize planning goals (zoning and zoning by-laws, urban land databases and urban baseline studies, environmental impact assessment, public capital investment, subdivision control, economic and other tools.). Urban politicians have been more

accommodating of UA than urban planners have been for-sighted about it. Urban governments need to listen to their planners and these need to evolve a concept of the city more fitting with local reality. Quon also found that, beyond planners' competence and willingness, the planning policy context in which they operate may be inimical to UA, as a result of a lack of awareness of the socio-economic and environmental role of UA, a lack of clear government responsibility, resistant attitudes or cultural norms held by parties in the land use planning process, and a lack of resources, technical and financial support. Quon's recommendations include: changes to land use planning policy to recognise and support UA; recognition of UA through land use zoning with UA being primary or tertiary land use; measures countering the potential negative health and environmental effects of UA activities; new multi-disciplinary institutions responsible for UA, records of UA and of land use and land tenure in communities; education to overcome ingrained attitudes against farming in cities held by various parties in the planning process.

Policy challenges regarding the issues discussed in this paper must be tackled through interventions involving actors working at different levels. Smit et al. (1996b) have proposed a list of interventions in information and research, projects, access to services and resources, policy and planning and cooperation; they indicate in each case which levels of intervention should be involved, for greater effectiveness. The following paragraphs highlight those types of interventions from Smit et al.' (1996b) which should merit a relatively greater policy effort by actors involved at each of the four levels identified by Smit et al.: community, city, national, international.

At the community level (e.g.: city district), good progress has been made to integrate UA into ongoing projects and activities of community development, including environmental regeneration. The more effective and lasting interventions are those that are perceived by the community as assisting with solving key community problems, that actively engage local actors into design and implementation and that strengthen local capacities for pursuit. At this level, more experiences in the North could act as useful references to incorporate UA into local food systems of the South, largely through developing communities' capabilities in this area (Dahlberg 1999; Hamm & Baron 1999). Also, more surveys are being conducted to document UA and inform local institutions. Such surveys are more effective when driven by issue resolution through multi-stakeholder processes, where research alternates with policy formulation for practical interventions (e.g.:

Dakar, Harare and Dar es Salaam in Africa); the participatory dimension of such experience is being emphasized in new models (e.g.: Spies 1998; van der Bliek & Waters-Bayer 1996). A range of modalities to improve access to resources, services and inputs, as well as security, have been experimented worldwide, largely through innovative partnerships between key actors. However, much less has been done for providing training in good practice or for assisting urban producers in establishing representative and effective organizations. National and international actors in both the governmental and non-governmental arenas share responsibility in this regard.

At the city level, several urban centers have initiated or completed background studies and discussions for designing or adopting regulatory or promotional policies on UA. Several also have adopted enabling legislation or recognized agriculture as an urban industry. Many more have supported disadvantaged citizen groups. However, much less progress has been recorded in taking stock of that wealth of experience, and in creating institutional structures to implement UA policies; even fewer cities have created city-level food system plans embracing both rural and urban sources. Maxwell (1999) argues that the relative invisibility of urban food security as a political issue in Africa may be due to governments still perceiving this as a household-level responsibility. Pothukuchi & Kaufman (1999) recently examined city institutions that can address more comprehensively urban food systems, such as the city department of food, the food policy council and the city-planning department. Outside Asia, the developing-country experience with citywide integration of the waste management system with the food system is very limited; this includes the use of UA to achieve environmental sustainability. Land use plans and regulatory systems still need to be designed and implemented that promote access to land, water and markets for urban producers; the same can be said of public and work safety programs. At the national level, little progress has been made for setting up national UA or food policies, even though these can greatly influence city-level policies. There are very few national food policies outside Asia that establish synergies between rural and urban production systems and guide urban-agricultural integrated programs. Northern countries' own governments are increasingly being criticized for having agricultural/production policies instead of genuine food policies (Allen 1999; MacRae 1999); the de-politicization of food is contributing to the lack of data, understanding and policy on local food systems (Dahlberg 1998). The application of U.S.A.'s Community Food Security Act to urban community agriculture projects since 1996 is a step in the right direction and may provide a useful reference (Pothukuchi & Kaufman

1999), as well as growing public lobbying for a healthier food policy in Britain (Lang, 1999). Several agricultural departments do extend technical extension to urban areas; this should be adapted, through research and training, to urban conditions and needs of urban farmers (women). There is a good range of experiences with economic incentives (tax alleviation, input subsidies), but much less on model health and land use codes, despite creative partnerships known to have facilitated access to land and water areas.

At the international level, the development of agreements on common research methods is very recent; model codes still need to be developed as a basis for national and city regulatory programs. Very few projects on record have been thoroughly evaluated for lessons to inform models that could assist local agencies with introducing improved UA practices. Comparatives studies of the industry's performance are also lacking, across cultures, climate zones and levels of development and city sizes; these are needed to better advise governments. Hardly any systematic effort has been expended so far to document, evaluate and propose models of effective urban producer organizations. Regional and global networks are developing but these have had a limited impact so far in the creation of national and local networks.

In conclusion, while prohibitive policies are bound to be ineffective, several constraints and risks are clearly associated with non-regulated UA; also, conflict, corruption and competition for scarce resources do exclude from legal UA those who stand to benefit most from it. Clearly, a permissive approach to policy-making would not address these problems and in fact could defeat its well-intended purpose. The tendency of local governments is to move beyond accommodation and into issue management (see Mougeot 1999a). From the experience reviewed, multi-stakeholder governance may still be local governments' best way of managing, if not resolving, such issues. More authors have been calling for a re-regulation of urban food systems and for UA policies to target vulnerable groups, in order to effectively strengthen local sustainability and equity (Smith, 1998; Lee-Smith 1998; see Koc et al. 1999). To be effective, such policies probably will need to include measures that enhance equity and entitlement to food and other resources, that improve urban environmental/sanitation systems managed by the urban poor in their own neighborhoods, and that actively involve urban producers in ranking their problems, developing workable solutions and self-regulating their activities and the quality of their products.

References (of full paper, which can be obtained through IDRC)

Abutiate WS. 1995. Urban and peri-urban horticultural activity in Ghana: an overview. In: NRI (ed.), Peri-urban interface research: workshop proceedings (UK Overseas Development Administration / British Council), Kumasi, Ghana, 23-25 August 1995, pp 45-50.

Aldington T. 1997. Urban and peri-urban agriculture: some thoughts on the issue. Land Reform, Land Settlement and Co-operatives 2: 43-44.

Ali M & Porciuncula F. 1999. How urban agriculture can benefit the urban poor of Metro Manila, Philippines. Paper presented at DSE/GTZ/SIDA/ACPA International Workshop Growing Cities Growing Food, Havana, Cuba, October 1999.

Allen P. 1999. Contemporary food and farm policy in the United States. In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: International Development Research Centre/IDRC), pp 177-181.

Altieri MA, Companioni N, Canizares K, Murphy C, Rosset P, Bourque M & Nicholls CI. 1999. The greening of the "barrios": urban agriculture for food security in Cuba. Agriculture and Human Values 16 (2): 131-140.

Atukunda G. 1998. An analysis of the impact of IDRC funded research projects on urban agriculture in Uganda. Makerere Institute of Social Research, University of Kampala, Kampala. Paper presented at IDRC Cities Feeding People Workshop on Lessons Learned from Urban Agriculture Projects in African Cities, Nairobi, July 1998.

Ayanwale FO, Dipeolu OO & Esuruoso GO. 1982. The incidence of Echinococcus infection in dogs, sheep and goats slaughtered in Ibadan, Nigeria. International Journal of Zoonoses 9: 65-67.

Binns T & Lynch K. 1998. Feeding Africa's growing cities into the 21st century: the potential of urban agriculture. Journal of International Development 10: 777-793.

Bliek J van der & Waters-Bayer A. 1996. Farming in the city: from analysis to action. African Urban Quarterly 11 (2-3): 259-262.

Blumenthal UJ, Abisudjak B, Cifuentes E, Bennet S & Ruiz-Palacios G. 1991/2. Recent epidemiological studies to test microbiological quality guidelines for wastewater use in agriculture and aquaculture. Public Health Review 19: 237-242.

Bon H de, Faye F & Pages J. 1997. Development of vegetable cropping systems in the Niayes Zone of Senegal. Experimental Agriculture 33: 83-90.

Carvalho JLH de. 1999. Combatir a la pobreza ayuda a dinamizar la economia. La Era Urbana 5 (3), Suplemento para América Latina y el Caribe 1: xiv-xvii.

Centres J-M. 1991. Améliorer l'approvisionnement de Bamako en produits maraîchers et en protéines animales. Paris: Groupe de Recherche et d'Echanges Technologiques (GRET).

Chauca de Zaldivar L. 1999. Proyecto sistemas de producción familiar crianza de cuyes (Peru) - IDRC 93-0028. Paper presented at IDRC Cities Feeding People Workshop on "Investigando el desarrollo de la agricultura urbana en la América latina y el Caribe: balance y optimizacion de impactos de proyectos" (IDRC/FLACSO/Alternativas para el Desarrollo), San José de Costa Rica, May 1999.

COAG/FAO (Committee on Agriculture, Food and Agriculture Organisation of the United Nations). 1999. Urban and peri-urban agriculture. COAG/99/10. Presented at 15th Session of the COAG, FAO, Rome, 25-29 January 1999.

Cooper CW. 1991. The epidemiology of human brucellosis in a well defined urban population in Saudi Arabia. Journal of Tropical Medicine and Hygiene 94: 416-422.

Cox S. 1999. Oases of food security in the urban sprawl? The case of El Alto, Bolivia. GATE Technology and Development 2 (April-June): 34-37.

Cruz MC. 1999. Resultados, problemas y retos de la agricultura urbana. La Era Urbana 5 (3), Suplemento para América Latina y el Caribe 1: viii-x.

Dahlberg KA. 1998. The global threat to food security. The Urban Age 5 (3): 24-26.

Dahlberg KA. 1999. Promoting sustainable local food systems in the United States. In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 41-45.

David O & Moustier P. 1993. Systèmes maraîchers approvisionnant Bissau. CIRAD/UR ECO-FIL 7. Montpellier: CIRAD.

Dennery P. 1996. Urban food producers' decision-making: a case study of Kibera, City of Nairobi, Kenya. African Urban Quarterly 11 (2-3): 189-200.

Dennery P. 1997. Urban agriculture in informal settlements: how can it contribute to poverty alleviation? Agriculture and Rural Development 4 (2): 46-48.

Denninger M, Egero B & Lee-Smith D. 1998. Urban food production: a survival strategy of urban households. Report of a Workshop on East & Southern Africa. RELMA Workshop Series 1. Regional Land Management Unit (RELMA) / Mazingira Institute, Nairobi.

Drescher AW. 1996. Urban microfarming in Central Southern Africa: a case study of Lusaka, Zambia. African Urban Quarterly 11 (2-3): 229-248.

Egziabher AG, Lee-Smith D, Maxwell DG, Memon PA, Mougeot LJA & Sawio C. 1994. Cities feeding people: an examination of urban agriculture in East Africa. Ottawa: IDRC.

ENDA-ZW (Environment and Development Activities - Zimbabwe). 1997. Urban agriculture in Harare: household nutrition, economic costs and benefits. Harare: ENDA-ZW.

Engberg-Pedersen P & Udsholt L. 1997. Limits of adjustment programmes in Africa. Agriculture and Rural Development 4 (2): 29-32.

FAO. 1996. Urban agriculture: an oximoron? In: The state of food and agriculture 1996 (Rome: FAO), pp 43-57.

Flynn K. 1999. Urban agriculture and public health: risk assessment and prevention for contamination and zoonoses. Cities Feeding People Programme Initiative. Ottawa: IDRC (draft).

Freeman DB. 1991. A city of farmers: informal urban agriculture in the open spaces of Nairobi, Kenya. Montreal: McGill-Queen's University Press.

Ganapathi RS. 1983. Development of urban agriculture in India: public policy options. Paper presented at the IDRC Urban Agriculture Seminar, Singapore, July 1983.

Girardet H. 1992. The Gaia atlas of cities: new directions for sustainable urban living. New York: Anchor Books Doubleday.

Gonzales Novo M. 1999. Urban agriculture in the city of Havana. Paper delivered at DSE/GTZ/SIDA/CTA/ACPA International Workshop Growing Cities Growing Food, Havana, October 1999.

GTZ (Deutsche Gesellschaft fur Technische Zusammenarbeit). 1999. Growing cities growing food: workshop materials. Distributed at DSE/GTZ/SIDA/ACPA International Workshop, Growing Cities Growing Food, Havana, October 1999.

Gumbo DJ & Ndiripo TW. 1996. Open space cultivation in Zimbabwe: case study of Greater Harare, Zimbabwe. African Urban Quarterly 11 (2-3): 210-216.

Hamm MW & Baron M. 1999. Developing an integrated, sustainable urban food system: the case of New Jersey, United States. In: Koc M, MacRae R., Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems, (Ottawa: IDRC), pp 54-59.

Hovorka A. 1999. Women urban farmers: emerging trends and areas for future research. Submitted to the Women Farmers: Enhancing Rights and Productivity Conference, Centre for Development Research, Bonn, Germany, 26-27 August 1999 (draft).

House W, Ikiara G & McCormick D. 1993. Urban self-employment in Kenya: panacea or viable strategy? World Development 21 (7): 1205-1223.

IDRC / TUAN (The Urban Agriculture Network). 1996. The 3rd meeting of the Support Group on Urban Agriculture (SGUA): proceedings, March 18-19. Cities Feeding People Report 17. Ottawa: IDRC.

Jacobs J. 1969. The economy of cities. New York: Random House. Esp. Chapter 1, pp 3-48.

Kiango S & Likoko T. 1996. Vegetable production on open spaces in Dar es Salaam city. Dar es Salaam: UVPP, Ministry of Agriculture and Co-operatives/GTZ.

Koc M, MacRae R, Mougeot LJA & Welsh J. 1999. Introduction: food security is a global concern. In: Idem. (eds), For hunger-proof cities: sustainable urban food systems. Ottawa: IDRC.

Kogi-Makau W. 1995. Consumption and the state of nutritional knowledge and beliefs on fruits and vegetables among the urban poor in Dar es Salaam. Dar es Salaam: UVPP, Ministry of Agriculture and Co-operatives/GTZ.

Kouvonou FM, Honfoga BG & Debrah SK. 1998. Sécurité alimentaire et gestion intégrée de la fertilité des sols: contribution du maraï chage péri-urbain à Lomé. In: Olanrewaju B Smith (ed.), Agriculture urbaine en Afrique de l'Ouest: une contribution à la sécurité alimentaire et à l'assainissement des villes (Wageningen: Technical Centre for Agricultural and Rural Cooperation (CTA) / Ottawa: IDRC), pp 83-103.

Lang T. 1999. Food policy for the 21st century: can it be both radical and reasonable? In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 216-224.

Lardinois I & van Klundert A. 1994. Recovery of organic waste in cities. ILEIA Newsletter 10 (3): 6-8.

Larrieu E, Iriarte J & Zavaleta O. 1988. Aportes al conocimiento de la hidatidosis como zoonosis urbana. Revista do Instituto de Medicina Tropical de Sao Paulo 30 (1): 28-31.

Lee-Smith D. 1998. African urban policy: issues and priority. Paper presented at International Conference on Urban Agriculture Policy in Southern Africa, Technikon, Pretoria, 3-5 March 1998.

Lee-Smith D, Manundu M, Lamba D & Gathuru Kuria P. 1987. Urban food production and the cooking fuel situation in urban Kenya - national report: results of a 1985 national survey. Nairobi: Mazingira Institute.

Lewcock CP. 1995. Farmer use of urban waste in Kano. Habitat International (special issue on urban agriculture and cities in the developing world) 19 (2): 225-234.

Lifecycles. 1998. Urban agriculture and food security in Canada: a survey of Canadian non-governmental organizations. Cities Feeding People Report 25. Ottawa: IDRC.

Ling B. 1994. Safe use of treated night soil. ILEIA Newsletter 10 (3): 10-11.

Losada H, Martinez H, Vieyra J, Pealing R & Cortés J. 1998. Urban agriculture in the metropolitan zone of Mexico: changes over time in urban, suburban and peri-urban areas. Environment and Urbanization 10 (2): 37-54.

Lourenço-Lindell I. 1995. Food for the poor, food for the city: the role of urban agriculture in Bissau. Paper presented at ODA Workshop on The Social and Environmental Implications of Urban Agriculture, University of Zimbabwe, Harare, 30-31 August 1995.

Lourenço-Lindell I. 1996. How do the urban poor stay alive? Food provision in a squatter settlement of Bissau, Guinea-Bissau. African Urban Quarterly 11 (2-3): 163-168.

MacRae R. 1999. Policy failure in the Canadian food system. In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 182-194.

Maxwell D. 1995. Alternative food security strategy: a household analysis of urban agriculture in Kampala. World Development 23 (10): 1669-1681.

Maxwell D & Armar-Klemesu M. 1998. Urban agriculture: introduction and review of literature. Accra: Noguchi Memorial Institute for Medical Research.

Maxwell D. 1999. Urban food security in sub-saharan Africa. In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 26-29.

Maxwell D, Odame Larbi W, Lamptey GM, Zakariah S & Armar-Klemesu M. 1998. Farming in the shadow of the city: changes in land rights and livelihoods in peri-urban Accra. Cities Feeding People Report 23. Ottawa: IDRC.

Mbaye A. 1999. Production des légumes à Dakar: importance, contraintes et potentialités. In: Olanrewaju B Smith (ed.), Agriculture urbaine en Afrique de l'Ouest: une contribution à la sécurité alimentaire et à l'assainissement des villes (Wageningen: CTA / Ottawa: IDRC), pp 56-66.

Mbiba B. 1994. Institutional responses to uncontrolled urban cultivation in Harare: prohibitive or accommodative? Environment and Urbanization 6 (1): 188-202.

Mbiba B. 1998. Urban agriculture policy in Southern Africa: from theory to practice. In: Productive open space management with a shared focus on the potential of urban agriculture (urban food production) policy and Agenda 21. Draft papers for an International Conference, Pretoria, 3-5 March 1998.

Mboganie-Mwangi A. 1995. The role of urban agriculture for food security in low income areas in Nairobi. Food and Nutrition Studies Programme Report 54. Nairobi: Ministry of Planning and National Development / Leiden: African Studies Centre.

Mitlin D & Satterthwaite D. 1996. Sustainable development and cities. In: Pugh C (ed.), Sustainability, the environment and urbanization (London: Earthscan), pp 23-62.

Mougeot LJA. 1994. Urban food production: evolution, official support and significance. Cities Feeding People Report 8. Ottawa: IDRC.

Mougeot LJA. 1996. Introduction: an improving domestic and international environment for African urban agriculture. African Urban Quarterly 11 (2-3): 137-152.

Mougeot LJA. 1998. Farming inside and around cities. The Urban Age 5 (3): 18-21.

Mougeot LJA. 1999a. For self-reliant cities: urban food production in a globalizing South. In: Koc M, MacRae R, Mougeot LJA & Welsh J (eds), For hunger-proof cities: sustainable urban food systems (Ottawa: IDRC), pp 11-25.

Mougeot LJA. 1999b. Urban agriculture research in Africa: reviewing and enhancing project impacts. Cities Feeding People Report 29. Ottawa: IDRC.

Moustier P. 1993. On performance of urban vegetable supply in African countries. Acta Horticulturae 340: 307-313.

Moustier P. 1996. Organization in the Brazzaville vegetable market. Doctoral thesis, University of London, Wye College.

Moustier P. 1998. La complémentarité entre agriculture urbaine et agriculture rurale. In: Olanrewaju B Smith (ed.), Agriculture urbaine en Afrique de l'Ouest: une contribution à la sécurité alimentaire et à l'assainissement des villes (Wageningen: CTA / Ottawa: IDRC).

Moustier P (ed.). 1999. Filières maraîchères à Brazzaville: quantification et observatoire pour l'action. Montpellier: CIRAD - Agrisud International - Agricongo.

Murray S. 1997. Urban and peri-urban forestry in Quito, Ecuador: a case study. Rome: FAO Forestry Department.

Muster G. 1997. Environmental problems of urban agriculture: a case study of Dar es Salaam / Tanzania. MA thesis, University of London.

Mwamfupe DG. 1994. Changes in agricultural land use in the peri-urban zone of Dar es Salaam, Tanzania. PhD thesis, University of Glasgow.

NRI (Natural Resources Institute). 1995. Peri-urban interface research: workshop proceedings (UK Overseas Development Administration / British Council), Kumasi, Ghana, 23-25 August 1995.

Panigrahi S. 1995. Parallels in dairy and poultry development strategies and issues relating to urbanisation in the eastern India region. Chatham: NRI (draft).

PCC (Population Crisis Committee). 1990. Cities: life in the world's 100 largest metropolitan areas. Washington DC: PCC.

Pillai K, Narayana Rao PL & Surya Rao K. 1996. A study on the prevalence of hydatidosis in sheep and goats at Tirupati municipal slaughterhouse. Indian Journal of Public Health 30 (3): 160-165.

Pothukuchi K & Kaufman JL. 1999. Placing the food system on the urban agenda: the role of municipal institutions in food systems planning. Agriculture and Human Values 16 (2): 213-224.

Potutan GE, Schnitzler WH, Amado JM, Janubas LG & Holmer RJ. 1999. City harvests: the case of Cagayan de Oro City (Philippines). Paper presented at DSE/GTZ/SIDA/CTA/ACPA International Workshop Growing Cities Growing Food, Havana, October 1999.

Prudencio Bohrt J. 1997. Agricultura urbana en América latina. Memoria. La Paz: Secretaria Ejecutiva AGUILA.

Quon S. 1999. Planning for urban agriculture: a review of tools and strategies for urban planners. Cities Feeding People Report 28. Ottawa: IDRC.

Rabinovitch J & Schmetzer H. 1997. Urban agriculture: food, jobs and sustainable cities. Agriculture and Rural Development 4 (2): 44-45.

Rakodi C. 1995. Poverty lines or household strategies? A review of conceptual issues in the study of urban poverty. Habitat International 19 (4): 407-426.

Régis MD. 1999. Horticultura urbana en Haiti: taller de evaluación. Paper presented at IDRC Cities Feeding People Workshop on "Investigando el Desarrollo de la Agricultura Urbana en la América latina y el Caribe: balance y optimizacion de impactos de proyectos" (IDRC/FLACSO/Alternativas para el Desarrollo), San José de Costa Rica, May 1999.

Richter J, Schnitzler WH & Gura S (eds). 1995. Vegetable production in periurban areas in the tropics and subtropics: food, income and quality of life - proceedings of an international workshop, Zschortau, 14-17 November 1994. Feldafing, Germany: Food and Agriculture Development Centre (ZEL), German Foundation for International Development (DSE) / Council for Tropical and Subtropical Agricultural Research (ATSAF).

Rosario PJ del. 1999. La agricultura en la ciudad. La Era Urbana 5 (3), Suplemento para América Latina y el Caribe 1: xi-xiii.

Sawio C. 1993. Feeding the urban masses? Towards an understanding of the dynamics of urban agriculture and land use change in Dar es Salaam, Tanzania. PhD thesis, Graduate School of Geography, Clark University, Worcester, MA, USA.

Sawio C. 1998. Managing urban agriculture in Dar es Salaam. Cities Feeding People Report 20. Ottawa: IDRC.

Schnitzler WH, Sanatem K, Potutan GE, Janubas LG & Holmer RJ. 1999. Case study: city harvests in Vientiane City. GATE Technology and Development 2 (April-June): 23.

Schnitzler WH, Pham Van Bien, Ngo Quong Vinh, Potutan GE, Janubas LG & Holmer RJ. 1999. City harvests: the case of Ho Chi Minh City (Vietnam). GATE Technology and Development 2 (April-June): 26.

Seré C & Neidhardt R. 1995. Urban-rural integration in periurban animal production. Agriculture and Rural Development 2 (1): 19-23.

Shuval HI, Gunnerson CG & Julius DS. 1981. Nightsoil composting. Appropriate Technology for Water Supply and Sanitation 10. Washington DC: World Bank.

SINA (Settlements Information Network Africa). 1998. SINA Newsletter 42 (September) special issue on urban agriculture. Nairobi: SINA.

Smit J. 1996. Urban agriculture: progress and prospect: 1975-2005. Cities Feeding People Report 18. Ottawa: IDRC.

Smit J, Ratta A & Bernstein J. 1996a. Urban agriculture: an opportunity for environmentally sustainable development in sub-saharan Africa. Building Blocks for AFRICA 2025 Paper 11, Post-UNCED Series. Washington DC: Environmentally Sustainable Division, Africa Technical Department, World Bank.

Smit J, Ratta A & Nasr J. 1996b. Urban agriculture: food, jobs and sustainable cities. Publication Series for Habitat II, Vol. I. New York: United Nations Development Programme (UNDP).

Smith DW. 1998. Urban food systems and the poor in developing countries. Transactions of the Institute of British Geographers 23: 207-219.

Spies L. 1998. A participative management model for urban open space projects. In: Productive open space management with a shared focus on the potential of urban agriculture (urban food production) policy and Agenda 21. Draft papers for an International Conference, Pretoria, 3-5 March 1998.

Stevenson C assisted by Xavery P & Wendeline A. 1996. Market production and vegetables in the peri-urban area of Dar es Salaam, Tanzania. Dar es Salaam: UVPP, Ministry of Agriculture and Co-operatives/GTZ.

Sumberg J. 1997. Policy, milk and the Dar es Salaam peri-urban zone: a new future for an old development theme? Land Use Policy 14 (4): 277-293.

Sumberg J. 1999. The Dar es Salaam milk system: dynamics of change and sustainability. Habitat International 23 (2): 189-200.

Sumberg J & U Kleith. 1994. Production and marketing of vegetables in the Port-au-Prince peri-urban area. Norwich: University of East Anglia / London: NRI.

UNICEF (Fonds des Nations Unies pour l'Enfance). 1993. Rapport annuel 1993. New York: UNICEF.

Wade I. 1987. Food self-reliance in Third World cities. Paris: The Food-Energy Nexus Programme, The United Nations University.

WRI/UNEP/UNDP/WB (World Resources Institute/United Nations Environment Programme/ United Nations Development Programme, World Bank). 1996. World resources. New York: Oxford University Press.

Yachkaschi J. 1997. Urban and peri-urban production, marketing system and consumption of fruit and vegetables in selected cities of Tanzania. Dar es Salaam: UVPP, Ministry of Agriculture and Co-operatives/GTZ.

Yi-zzhang C. 1999. Case study: urban agriculture in Shanghai. GATE Technology and Development 2 (April-June): 18-19.

Zakariah S, Lamptey GM & Maxwell D. 1998. Urban agriculture in Accra: a descriptive analysis. Accra: Noguchi Memorial Institute for Medical Research / Washington DC: IFPRI.

Zeeuw H de. 1998. The promotion of urban agriculture: what cities can do. Paper presented at WHO International Healthy Cities Conference, Athens, 20-23 June 1998.

Open space vegetable farming in urban Accra, Ghana.

1. City Background: Accra

Accra is the capital city of Ghana and covers an area of about 170 km². It has an estimated population of 1.6 million (Ghana Statistical Services, 2002). The population growth rate is estimated at 3.4 % annually. The population of Mega Accra, i.e. including the neighboring Tema and surrounding Ga districts, has been counted as 2.7 million with a growth rate of 4.6%. This area covers only 0.53% of the whole country but has nearly 15% of Ghana's population (Twum-Baah, 2002). Ga and Akan are the most predominant tribes living in Accra. Besides English, Ga and Twi are widely spoken. About 10 % of Accra's inhabitants are Muslims living in a Christian community.
Accra lies within the coastal-savanna zone with low annual rainfall averaging 810 mm (Agodzo, 1998) distributed over less than 80 days. The rainfall pattern of the city is bimodal with the major season falling between the months of March and June, and a minor rainy season around October. Mean temperatures vary from 24 ºC in August to 28 ºC in March. The area is characterized by the vegetation type, which is basically made up of scrubs with isolated trees mainly the neem tree, Lateritic sandy soils, grits and shales, which are deficient in organic matter and nutrients. Natural drainage systems in Accra include streams, ponds and lagoons (e.g., Songo, Korle and Kpeshie).
Economic activities comprising in Accra contribute over 10% to the nation's GDP. Main agricultural activities include fishing, poultry farming and cultivation of vegetables or horticultural gardening. In the peri-urban areas of Accra, which extends in average about 35 km from the city center agriculture plays a more significant role, also through the production of export crops (e.g. pineapple).

2. Inventory of crops grown-traditional and exotic crops

Irrigated urban agriculture takes place on 7 larger sites, mostly along streams and drains. On many other sites maize is grown in the rainy season. Besides open space farming, every second household is engaged in some form of backyard gardening generally to reduce the family's expenditures on food and also as a form of leisure. Open space vegetable farming is the most widely practiced urban farming system in Accra. Exotic vegetable production is for urban local markets whiles the indigenous crops are for both the local markets and urban households (Danso, 2002; Zakaria *et al.,* 1998; Armar-Klemesu, 1998). Exotic crops grown include cabbages[1], cucumber, lettuce[2], onions, green pepper and some of the indigenous crops cultivated also include okro, tomatoes and other green leafy plants for local consumption (see Table 1). Lettuce, spring onions and cabbage are the most common cultivated crops in Accra. Lettuce can be harvested for about 8-10 times per year given all the necessary cultural practices including adequate amount of irrigation, manure application and the needed care. Cabbage and cauliflower can be harvested on the average three times per year due to the long growing periods. In fact vegetable cultivation is carried out throughout the year under intensive irrigation. However, the cropping pattern of the crops depends on the demand during the year. Table 1 shows the cropping pattern and rotation/intercropping within a given year
Crop rotation is carried out depending on the demand for a particular product and as a strategy to control pests and diseases. Intercropping is not a common practice. Apart from the exotic vegetables which are cultivated often by 600-700 farmers in the city, about 400 farmers located at one farming site cultivates indigenous vegetables like tomatoes, okro, hot pepper and garden eggs

[1] **Lettuce**-*Lactuca sativa*; **cabbage**- *Brassica Oleracea;* ***Spring*** **onions**-*A. fistulosum;* **Ayoyo**- *Corchorus sp.;* **Alefi**- *Amaranths sp*.**; cauliflower**- *Brassica oleracea var.botrytis;* **Carrots**- *Daucus carota;* **Green pepper**- *Capsicum sp.*
[2] Lettuce is most common vegetable cultivated by urban farmers in Accra.

for the urban communities. These farmers do not cultivate throughout the year and depend heavily on rainfall and occasionally polluted steams and drains like the exotic farmers. Special crops such as Ayoyo, Alefi, Gboma and Bean leaves are also produced by some exotic vegetable farmers to serve the Muslims communities in the city.

Table 1. Crops grown and cropping pattern of the area

Main crops cultivated		Rotation/inter- planting	
Crops	**Harvest/year**	**Crop**	**Harvest/year**
Lettuce	8-10	Cabbage	1
Spring onions	6	Cabbage	2
Cabbage/cauliflower	3-4	None	None
Carrots[1]	6	Spring onions	2
Green pepper[2]	4	Lettuce	6
Radish: Red : White	8 5	Green pepper	2
Ayoyo, Alefi, Gboma	6	Red onions	3

Appendix 1 present the most common crops cultivated in the city. Vegetables are also grown in the peri-urban areas but are under the formal irrigation schemes of Weija and Ashiaman near Accra.

3. Available resource-land holding, water source, fertilizer use and labour.

- **Land tenure system**

In many cases, farmers cultivate the land which belongs to the government, an institution or some individuals: The plot sizes(ca.0.2ha per farmer) of most of these sites has diminished over time because of land loss to estate development and widening of drains leading to reduced land reservations along the drains which used to be cultivated. Farmers normally don't pay for such lands and as such there is no security of tenure as they are allowed to farm only as long as the owners do not need the land. In most cases farmers enter into an informal arrangement with the landowners to prevent weeds and encroachment of estate developers. Examples of tenure arrangements are provided below:

a. unsuitable for housing (eg: Dzorwulu/Plant Pool/North Dzorwulu)

   At Dzorwulu, farmers cultivate under high tension (i.e. pylons) lines as per mutual arrangement with the Volta River Authority (VRA) aiming to ensure that the strip along the high tension is kept clean and rid of weeds.

b. where the land has been allocated to them for their permanent maintenance and cultivation (e.g.: Marina Drive, Cantonments)

   These sites have been initially zoned up by AMA as open space to be landscaped by Parks and Gardens in line with beautifying the metropolis. However lack of funds, time and logistics has motivated the Department of Parks and Gardens to enter into informal agreement with farmers and release the land to them to promote agro-forestry with inter-cropping. Farmers are not allowed to cultivate permanent tree crops.

[1] Rotation and intercropping pattern depends on the season, Rotation is the most common.
[2] Mostly intercropping

c. with the temporary permission of the land tenant who is waiting for favourable conditions to build (North Legon, Korle-bu).

d. Customary land rights: the customary owners of land are the members of the La stool, one of the Ga chieftaincies. With the existence of inheritance land tenure arrangement, a piece of land continues to remain in a family for a long period of time until the land is disposed off by the family. Non-indigenous farmers, who want to farm in the area, have to enter into some kind of agreement with customary owners by paying rent (US $4 per ha/season) or sharecropping.

In general, as you move to the peri-urban areas, land tenure becomes more secure because it is owned under customary rights and in such cases tenure security is better.

Fig. 1 Map showing vegetable producing sites in urban Accra(see power point)

- **Water resources:**

Major drains in effect are streams or rivers, which have been lined in the section of the city to enhance easy flow of water, polluted with both industrial and domestic waste. The activities especially of sewage and refuse disposal of settlements in these drains render the water heavily contaminated and condemned for irrigation. As per the social-economic category of the farmer and his awareness of environmental sanitation, the water used for irrigation comes from different water sources with various degree of water quality and is applied with different irrigation techniques.

1. Drains and Streams

Most of the farmers use water from drains and streams and do not pay for it. The water is fetched from streams and applied to crops with buckets or watering cans. In some cases the water is channeled to shallow dug wells and fetched with watering cans (e.g: Korle-bu). The advantage perceived is that the level of nutrients in the water increases the production yield but it is labour intensive. Within the streams, all year round flows are guaranteed (e.g.: Stream Nysia, Dzorwulu). At some sites, volume of water in the drains in dry season is low (e.g: Marina Drive).

2. Pipe borne water

Pipes have been provided to farmers at some sites by AMA in order to provide alternative sources of water safe for human consumption (e.g. Dzorwulu and La). The volume and availability of water are functional of the supply and distribution of potable water by the Ghana Water Company Limited (GWCL). Farmers pay a flat rate irrespective of the volume of water used or pay in terms of per volume of water used. Farmers using piped water are in groups and share the bill according to the number of beds each farmer has. Two main application methods can be found:

1. Water is used straight from the tap and applied with a water hose.
2. Water poured in a pound and applied with a double watering can.

3. Shallow groundwater

Potential for shallow groundwater in urban areas appear to be non-existent. Within the depths under consideration, i.e. less than 8 m there are no well defined aquifers and the trickling amounts of groundwater can be attributed to direct infiltration of rainwater between the weathered top material and the first rock. Literature also confirms absence of deep groundwater for agricultural uses. Finally, where seepage/infiltration water is encountered, the groundwater quality of shallow aquifer is not assured. Natural hand dug wells are very rare in AMA, the salinity level being found is too high. When

hand dug wells are found, the water is mixed with surface water from nearby streams to reduce the salinity level.

- **Fertiliser use:**

Intensive farming in vegetable sites calls for regular application of nutrients. Poultry manure, chemical fertilizer (e.g. NPK 15-15-15, Ammonium sulphate, Urea and Muriate of potash), and cow dung are the most common ones. Poultry manure is quite abundant and the most demanded product.
It is favoured due to
1) its low price (with a price range between US$0.09-0.28 per bag of 30-35kg without transportation),
2) its effectiveness in terms of food or nutrients for plants,
3) long term effect in the soil as well as improving the soil quality.
In comparison, it has been realised that
(i) chemical fertilizer is expensive (US$14 per 50kg bag of fertilizer),
(ii) supports soil nutrient depletion, and
(iii) reduces post-harvest life span of the produce when compared to organic manure
In Accra, some groups of UA farmers have been trained by NGOs or through specific projects in compost production and/or utilization and showed general satisfaction with the product. However, the use is constrained by;

- Poor quality of the product (presence of broken bottles, polythene bags, etc.)
- Heat built up in the compost immediately after application resulting in burning of the crops
- Its high water requirements
- Lack of market for “organically” produced crops
- Location of the compost plants (transportation costs)
- Compost is expensive (averagely $1 per 50kg subsidized)

Appendix 2 presents the summary of the main farm inputs used in vegetable in urban Accra.

- **Labour use-family labour, hired labour**

Production of vegetables involves intensive care, regular weeding and watering. Urban vegetable farmers do almost everything themselves, without resorting to hired labour. This explains why farmers can be found on their farms all day, and do not engage in direct marketing. The activities involves preparing beds for planting, applying poultry manure, mineral fertiliser and occasionally compost or cow dung, frequent watering of plants, and continuous weeding. Wives and children of the farmers sometimes assist, during harvesting and marketing. Few farmers used hired, family and permanent labour. Permanent labour has monthly cost of US$21-36 per head whilst the hired labour ranges between US$0.3-3 per head but depends on the type of work (weeding, watering, beds making, spraying, etc).

4. Produce and its use

The seeds for the exotic vegetables are usually imported. Also local vegetables are grown, like okra, pepper, tomatoes and green leafy vegetables important in the Ghanaian diet. Vegetables produced are almost entirely for sale, though a few local crops are for home consumption. Usually farmers have market women who come on site to buy whole beds of vegetable even before the crops mature. Male farmers do not engage themselves in direct marketing to consumers, as their work is tedious and time consuming. This allows the farmer to plant subsequent crops quickly and avoid extra costs of delay. Occasionally, sellers do provide farmers with inputs (especially seeds) in order to produce for them. Sometimes sellers order the products beforehand and an oral contract is based on confidence. The

final amount of money received may differ from the earlier agreed as demand and supply might have changed during the growing period. Other customers are individuals, canteens and “street fried rice sellers” who buy for domestic and commercial use. Farmers confirmed that, although individual buyers offer a better price, the market women are a more reliable source of income. On the other hand, market women take advantage of the farmers during period of glut.

5. Major Constraints and Opportunities.

- **Constraints**

Urban open-space vegetables farmers listed the following constraints as barriers to improving their production. The constraints are randomly presented.

- Marketing of produce; vegetable market women/sellers dictate produce prices, some middle women harvest on credit and do not reimburse the farmers as agreed on.
- Cost of inputs (pesticides, farm tools, labor, fertilizer, etc) are high
- Pest and diseases threats to crops
- Inadequate land availability and tenure security due to the increasing rate of urban development.
- Poor exotic seed viability (lettuce, cauliflower, cabbage
- Lack of Capital/credit funding sources: Farmers have to fund themselves or make an arrangement with the market women to provide them with some advance payments.
- Labour involvement in watering of vegetables is intensive
- No farm record keeping
- Neglecting of farmers in decision making process by the authorities
- Ignorance of agro-chemical sellers as well as farmers in the use of pesticides and other chemicals
- Inadequate extension services to the farmers
- Limited access to groundwater sources

- **Opportunities**

- Income for actors (producers, sellers, traders, municipalities and governments) and opportunities for the rural-urban migrants
- Employment creation and Livelihoods for the urban poor
- Fresh vegetables for urban dwellers
- Temporary access to vacant plots for agriculture purposes
- Creation of markets media
- Presence of potentially accessible financial institutions
- Availability of urban wastes (both solid and liquid) that can be used as a resource
- Possibilities of developing related sectors
- Establishment of producer and consumers groups
- Establishment of urban vegetable producers networking groups.

6. Impacting issues

Although many benefits are derived from open space vegetable farming in the city; the authorities are skeptical about the system due to the use of polluted water and pesticides, the high risk of crop contamination through urban pollution, the risk of soil erosion and creation of breeding grounds for malaria mosquitoes. These and other objections influence the recognition of UA by the authorities and other stakeholders. Therefore, the main challenge is to strengthen the synergy between vegetable farming and the city and strategies to reduce risks to the producers, sellers and the society as whole.

Land issues are important in discussing the sustainability of the system. For instance in Accra, with the exception of farmers cultivating on lands under high-tension electrical cables at Dzorwulu and farmers who own the homes within which they cultivate, none of the farmers cultivating in urban Accra is known to be in possession of any document supporting arrangements made to cultivate on the land. However, the Accra Metropolitan Assembly (AMA), which is the Accra city authority and its municipal Food and Agriculture Directorate, which is part of the decentralized Ministry of Food and Agriculture (MoFA-AMA), are currently developing legislation to create green zones specifically for urban and peri-urban farming. Building permits can be refused in designated green-belt areas to give existing farmers the land security they need. Whether this will work out depends much on the value of the land. In addition "political recognition" (city planning, support from extension service, etc.) is an essential sustainability indicator. As long as political acceptance and corresponding support are lacking, UA remains in a fragile vacuum.

- **The dimension of gender**

There are some gender differences in irrigated vegetable farming. It is now an established fact that in Accra and also in other cities in Ghana, nearly all the farmers are men (Obosu-Mensah, 1999). Women dominate the marketing of the produce with few men playing the role of wholesalers and very few found in markets retailing. Major reasons are: (1) the arduousness of farm work especially land clearing, land preparation, watering by carrying watering cans and spraying; (2) general lack of interest in farming and (2) cultural definition of gender roles-men do the farming and women do the selling. The study further revealed that there is no gender biasness in term of access to land and water for urban farming as exist in the rural areas.

Appendix 1. Types of vegetables grown in the city:

English/Local name	Scientific name
Exotic	
Lettuce	*Lactuca sativa*;
Spring onions	*A. fistulosum*
Cabbage	*Brassica Oleracea var. capitata L*
Green pepper	Capsicum sp.
Carrots	*Daucus carota*
Cucumber	*Cucumis sativus L*
Radish: Red and White	*Raphanus sativus L*
Chinese cabbage	*Brassica pekinensis Rupr.*

Beetroot	*Beta vulgaris L*
Watermelon	*Citrullus vulgaris Schrad*
Spinach	*Talinum triangulare Wild*
Indigenous	
Okro	*Abelmoshus esculentus L*
Tomatoes	*Lycopersicon esculentum Mill*
Garden eggs	*Solanum melongena L*
Special indigenous crops	
Ayoyo	*Corchorus sp*
Sori,	
Gboma	
Alefi	
Bean leaves	

Source: Authors' own data, 2003

Appendix 2: Inputs used and related cost in vegetable farming

Input	Explanation
Fertilizer/ Manure	**Poultry manure:** Obtained from urban and peri-urban poultry farms. Mainly not sold but the farmer incurred transportation cost. Purchasing price at the farm without transportation costs ¢1,000/bag[3] (1bag = 33-35kg). Apply 2 bags/bed/season.

[3] Ghana cedis (¢) and US$ are both used in this report to preserve respondents' language. In all cases 1US$ = ¢7500

	Chemical fertilizer: Obtained from agro-industrial stores in the city (esp. MOFA head office). They apply 1 kg/bed/season in combination with poultry manure. 1 kg costs ¢4,000. This is applied on $20m^2$ per season.
	Mulch: Also used from farm waste **Compost:** Widespread usage of compost was not observed in Accra **Cow dung:** It is expensive and not accessible
Pesticides	Neem extract, karate, Dithane, etc. For example karate costs about ¢ 30,000 that can cover an area of $20m^2$ for one season and Dithane or Dipel 2x cost ¢35,000 on the same area.
Equipment	Cutlass, hoe, watering cans, picking fork, spraying machine, mattock.
Seeds	For example lettuce, cabbage seeds cost ¢ 3,500 per small bag that can cover an area of $20m^2$
Labour	Hired labour is not common, though farmers use family labor when necessary. Most labor is required in weeding, watering, harvesting etc.
Land	Land right in this category of farming is informal with usually no payment of rent, and in most cases, without permission from owners. Most of the land belongs to the governments, institutions and other individuals
Water	Urban vegetable farmers mostly use drains and streams. But some farmers are using pipe borne water for irrigation.

Source: **Danso, 2002**

Case study II

Commercial vegetable producers in Addis Ababa

Addis Ababa profile

Addis Ababa (the capital city of Ethiopia) sustains 2.5 million people (the city has grown three fold in the last three decades (CSA: 200) in a total land area of 50,000 hectares of which 20,000 hectares are under concrete and asphalt (Source).

Table I urban agriculture within Addis Ababa

Activity	Coverage	Annul production	% requirement of the city
Vegetable production	8 cooperatives	11,946 tons	30%
Dairy	5167dairy farms(58,568 dairy cows)	44 million litres	60-70 %
Poultry	29 small poultry farms 350,000birds	n.a.	n.a
Forestry	8,000 ha.	n.a.	40-50 %

Source; adapted from Demisse G/Michael, 2002.

Addis Ababa has a long and varied experience in urban agriculture (table I). Vegetable producers, organized in associations or cooperatives, have been producing vegetables along the river banks for more than 50 years. An estimated 137 hectares of land is allotted for private and small groups to practice home gardens. More than 60 % of the milk consumed by urban households is produced by small dairy producers inside the city. Small tree nurseries are found everywhere in the city. Less well known, and not recorded, are the area /gardens where medicinal plants are grown by herbalists. Axumite G/Egziabher, who wrote the first international paper on urban agriculture in Addis, calls it a "life style".

Box I. Natural environment components in Addis Ababa
Elevation 2000- 2800 m a.s.l.
Topography: rolling hills ,flat in the south
Average monthly maximum temperature: 21-24 ^{0}C
Average monthly minimum temperature: 7-14
Average annual rainfall: 1,178mm, ranging between 8mm in November and 278 mm in August.

The extent of urban agriculture is explained by the fact the city has natural as well as socio-cultural conditions that are favorable to UA (Box I).Climatic conditions are suitable; there are numerous streams and rivers running through the city. Space is still widely available, within and between compounds, along roads and river banks. Many people on the city have a farming background. There is an estimated 400,000 tons of degradable waste produced annually that can be transformed into compost and used to enrich/improve the soils, and of waste water that could be used for irrigation.

Institution and policy environment

Quon (1999) categorizes city support to urban agriculture as: enabling, permissive, neutral, discouraging and prohibitive. According to this categorization, there is a permissive level of support for UA in Addis Ababa. There is urban agriculture office, with branch offices in all the ten sub-cities and several districts, which provides technical assistance to farmers and whose home agents gets involved in vegetable growing through their work with poor women. A bureau for cooperative organization assists urban farmers in organizing themselves in legally recognized cooperatives.
The city has an environment bureau concerned with environmental protection and "greening" the city. The bureau has made an inventory of the indigenous tree species in Addis Ababa, an activity that could actually enable urban forestry.
Urban agriculture is a legal practice in Addis Ababa. Vegetable producers (and today dairy producers) pay taxes, which give them entitlement on the land. For the vegetable producers, some tax payment facilities have been offered in the past in case of difficulties (e.g. flood destroyed crop). Houses may house livestock, only free grazing is prohibited.
Of all opportunities for urban agriculture in Addis Ababa, the current decentralization process to empowering the community at district level is the most prominent one. It can help incorporating urban agriculture in the overall city planning. The division into smaller units helps to manage and bring decision-making to a level closer to the people. The on-going power devolution and allocation of grants for the districts, opens the way for authorities and communities to plan local systems that integrate food production, waste recycling and the environmental specifics and available space found in the districts.

Commercial vegetable growers in Addis Ababa
There are eight vegetable growers' cooperatives using irrigation water from the numerous rivers within the city. They cultivate a total of 246.5 hectares of land. The activity supports 581 families with 5191 people. 127 of the 581 household heads are women.
Major vegetable crops grown include:

- Carrot
- Lettuce
- Swiss chard
- Potato
- Cabbage
- Kale(indigenous lettuce)
- Beet roots
- Cauliflowers
- Ziccuni
- Shallots
- Tomatoes

These cooperatives produce an estimated 11,946 tons of vegetables annually. Assuming the minimum daily requirement percapita of 200 gm., the actual supply from these cooperatives is only 10 gm. or 5% of the requirement.
The city has allotted a total of 600 hectares of land for the promotion of vegetables growers' cooperatives.

Problems and opportunities

The major problems as stated by the cooperative members include:

Problems

- The small earth dams for the irrigation scheme are short lived and non durable.
- Problem of timely availability and the required amount of seeds and other planting material
- Lack of high yielding varieties like potatoes
- Lack of fresh vegetables market outlet.
- Flood in winter time prohibit cultivation
- Escalating price of chemical fertilizer and pesticide

Opportunities

- Provision of Legal status
- Professional service
- Policy support
- Conducive climate to grow crops of many kinds
- Very high demand for the vegetables
- Generation of farming knowledge and experience
- Availability of water resource (at a cost)
- Availability of labor (at a cost)

Ato Emnet Welde Tsadik

Family profile

Ato Emnet family if composed of nine members –a mother and eight children (three boys and five girls). After his fathers' death, Emnet assumed the management of the commercial vegetable farm. The vegetable farm with land size of one hectare is the sole livelihood to the family. The five of the children have completed their primary and secondary school and the rest are in school again the farm is the sole venture to pay for their education. None of the children are employed outside the family farm. The farm is a member of Kebena vegetable producers cooperative with 31 members.

The farming system

The farm specializes in the production leafy vegetable that includes Cauliflower, Carrots, Swiss chard and indigenous Kale all aimed at selling the produce to local market. The farm used to use chemical fertilizer and pesticide, but for reasons of non availability and high cost it has aborted the use of these chemicals. The only source of fertilizer is aged manure and vegetable waste left in the field to rout. Like every one else in the cooperatives the farm produces its seedlings by purchasing from the seed shops the exotic species and country side the local species. Irrigation water is from Kebena river that runs across the most congested part of the city with heavy contamination of household waste including sewers as well as industrial waste. External labor demand is during the time of weeding and land preparation. The rest of the routine work is the responsibility of the male members of the family. The only market outlet is local open markets for all the

leafy vegetables and supermarkets for cauliflowers.
Advantages and disadvantages of the system
Gender issues
Female members of the family have a very small role in the farm. As the farm work is considered demanding heavy drudgery, the female contribute only at times of harvest. Only seven out of the 31 members of the coop are female headed household.
Policy issues

Problems and opportunities

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Opportunities

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- Policy support
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- Availability of labor (at a cost)

2.2 Urban Horticulture

Urban horticulture in greenhouses.

(Picture: Henk de Zeeuw)

Urban and periurban horticulture in Africa and Asia: characterisation of the systems and issues of sustainability

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Definitions

Urban and periurban horticulture (UPH) refers to: (i) the production of a range of vegetables, aromatic plants, medicinal plants, flowers, ornamental plants, fruit trees and mushrooms, (ii) grown mainly in intensive production systems with high levels of inputs, (iii) located in the city or at its close periphery where there is competition for access to land between agricultural and other human activities (Moustier, 1999), (iv) the products of which are consumed in the city. This paper will study two aspects of the horticultural sector: marketing and production, essentially of vegetables, based on data from Africa and South-East Asia.

Marketing of urban and periurban horticultural products

Main supply system to the cities

The horticultural urban market is supplied by products from different areas: rural, periurban and urban, which can be located within the national territory or in foreign countries. There is a complementarity between the various origins, which may change over time. The periurban and urban productions account for a very large part of the supply of vegetable urban market, e.g. in the capital city of Hanoi (2.7 millions inhabitants). In this city, 80% of the vegetables are from the Province of Hanoi from a production area covering 7,095 ha, i.e. 118,628 tons (Mai Thi Phuong Anh, 2000). In Brazzaville, 65% of the marketed vegetables come from the urban gardens (Moustier, 1999).

The distribution between the different production areas fluctuates with the vegetable species. Soils, access to water, development of insects and diseases, climatic conditions, yields, costs of production, and most importantly the shelf life of the vegetables influence the location of vegetable production. The latter condition explains why, in most of the urban markets, leafy vegetables are from urban and periurban areas. In Brazzaville, the urban gardens supply 80% of the urban market; in Bangui, 100% ; in Bissau and Antananarivo, 90% (Moustier & David, 1997); in Dar-es-Salaam, 90% (Sabel-Koschella, 1998). Some leafy vegetables are well adapted to a hot and wet season. The very short shelf life of cut flowers such as roses and chrysanthemums also explains the development of this horticultural crop around Hanoi where they are grown in an area of 1,000 ha.

The season also influences the distribution of the supply of the urban market between rural and urban areas. In Bangui, the share of tomatoes from rural areas increases from 40% to 50% in the wet season. In Bissau, the share of tomatoes from urban areas increases from 10% to 20% in the wet season (David, 1992). Urban horticultural areas may also supply the urban market more regularly than rural areas. In Nouakchott, UPH supplies the urban market for nine months each year whereas the rural areas provide vegetables to the city for three months (Margiotta, 1997). Around Hanoi, choysum and leafy mustard are grown all year

round. In Dar-es-Salaam, amaranth is also grown throughout the year. This tendency is increased by the urban and periurban farmers' need to derive a year-round income from various high-value crops. This bias towards UPH may be due to production constraints and access to transportation infrastructure during the rainy seasons or to socio-economic causes. In some countries where flooding areas expand every year, however, it is easier to find available areas to grow vegetable in rural areas (Phnom Penh, Dacca).

Consumer demand

Even where consumption is low, consumer demand is the driving force behind urban and periurban production. In developing countries, consumption of vegetables is generally lower than the FAO recommendation of 75 kg/year/inhabitant (205 g/day/capita). The importance attached to vegetable consumption depends on the population group. Over the period 1994-1998, consumption in Vietnam was higher in urban areas (182 g/capita/day) than in rural areas (122 g/capita/day), but lower than in mountainous areas (196 g/capita/day) (Nguyen Thi Lam, Ha Huy Khoi, 1999). In Bangladesh, the consumption of vegetable was higher in urban areas than in rural areas (Ali, 2000).

Table 1: Monthly per capita consumption of vegetables (kg) in Bangladesh (From Ali, M. (ed.) 2000)

Household	Total vegetables	Leafy vegetables	Potato	Banana, papaya & eggplant	All others vegetable
Urban	6.20	1.42	1.67	0.82	2.29
Rural	5.13	1.08	1.13	0.80	2.12

Urban consumption is related to size of households, incomes and socio-cultural characteristics (Bricas, 1998). In Africa, most frequently consumed vegetables are tomato, onion and leafy vegetables. On the other hand, in Brazzaville for instance, the importance of vegetables varies from one socio-economic group to another.

Table 2: Most frequently consumed vegetables per socio-economic group in Brazzaville (Congo), ranked by importance (From Moustier, P. (Ed.) 1999)

Socio-economics groups	
Congolese households	Cassava leaves, cherry tomato, pakchoy, roselle, gnetum, dry kidney bean
Non-Congolese African households	Potato, cassava leaves, cherry tomato, dry kidney bean, amaranth, lettuce
Expatriates	Potato, "European-type" vegetables

In Cagayan de Oro, most frequently consumed vegetables are: tomato, eggplant, sweet pepper, common cabbage, papaya and cauliflower (Schnitzler et al., 1999).

Consumers' decisions are based on price, availability of the product on the market, and on the qualitative characteristics of the products. Fluctuating vegetable prices are a recognised characteristic of vegetable markets all over the world.

Traditional habits also have a very strong influence on consumer demand for specific products. In many countries, the main demand for flowers occurs around Mother's Day, Valentine's Day, and the Christmas period. In Vietnam, the Tet celebration is the opportunity to offer two ornamental trees: kumquats bearing mature orange fruits and peach trees in blossom. In urban and periurban areas in Hanoi, specific ornamental fruit-tree specialists have set up this type of production, which takes one year of preparation from buying a young tree.

Organisation in the commodity chain

Farmers have two main options for marketing:

- Direct marketing to consumers: by a family member, in retail markets, or at farm gate
- Marketing to intermediate marketing bodies: wholesalers, assemblers, cooperatives or producers' associations, at the farm gate or in markets. These intermediaries may sell directly to retailers such as supermarkets or to other wholesalers.

Farmers' organisations are often described as an efficient system for producers to obtain favourable prices and income security. Yet there are a number of obstacles to collective marketing, including the risky nature of horticultural production and marketing, the scattered location of plots, and the lack of farmers' information on consumer demand and supply sources.

Information systems

Information at farmer level means access to data on prices on the wholesale and retail markets, on production techniques, new outlets, and favourable periods of time for marketing. Access to information about retail prices is one of the main problems for the urban or periurban farmer. The problem may be less important for urban farmers than for the rural farmer because the distances from the farm to the wholesale or the retail markets are shorter. Moreover, in many cases, such as in Hanoi, a family member goes to the wholesale market everyday, so farmers have access to price trends. The proximity of the city allows farmers to gain better insight into consumer demand, to be receptive to new production options, to compare their performance with farmers located in other areas, and to have access to improved technologies.

On the marketing side, information concerns quantity and quality of the vegetables and final retail price. With regard to urban and periurban commodity chains, it can be said that if the product quantity still seems a large problem due, in most cases, to the lack of farmers' organisations, reactivity to new outlets and to retail prices has great advantages. The trader is a key player in the development of innovations mainly through the confident interrelations that he can establish with the end-consumer and with his suppliers.

Production of urban and periurban horticultural crops

Farming systems and environment

Most of the farming systems in the big cities of developing countries do not require much starting capital. Use of labour, however, is far higher than in cereal crop production. In northern Vietnam, for instance, AVRDC has shown that vegetables require twice as much labour per unit of land (456 days/ha) as rice (223 days/ha). The classification of agricultural

production systems proposed by Moustier is well suited to horticultural systems (Moustier, 2000): (i) subsistence home production, (ii) farm-type commercial production systems, (iii) entrepreneurial production systems, (iv) multicropped 'rurban' production systems. Within each group, different kinds of technical systems are used: roof production, open space in the city, hydroponics, organoponics, high-level input production systems, protected cultivation, standard cultivation. Most of the time, horticultural farming is a full-time job. In some locations, however, it becomes a part-time activity for employees, workers, shopkeepers, craftsman, etc. In Dakar, for instance, such persons are called Sunday farmers. They are urban civil servants or employees of private companies who buy land for producing fruit trees and vegetables. Traditional farmers consider that these newcomers are robbing them of their lands and market opportunities.

Land is one of the main constraints in the horticultural system. The average garden surface area for vegetable farmers is rather low: 700m² in Brazzaville, 1,500 m² in Bangui, 760 to 900 m² in Bissau, 700 m² in Antananarivo, 6,750 m² in periurban areas and 500 m² in intra-urban areas in Dar-es-Salaam, 1,490 m² in Hanoi. The harvest is either used for auto-consumption (mainly in the case of intra-urban subsistence-oriented home gardening) and/or for sale. There are two groups of horticultural farmers: (i) farmers who deal only with horticultural products (medicinal plants, ornamental plants, flowers, vegetables, and fruit trees), and (ii) those who also produce cereals or breed animals. In Hanoi province, for instance, 78% of the cultivated area is covered with rice and maize: most of the horticultural farmers also produce food crops and some animals. Whatever the level of specialisation, horticultural activity faces similar urban conditions: (i) problems of quality of natural resources (water, air, soil, light) and inputs (water, fertilizers) needed for production, (ii) high population density that may limit the use of inputs and the management of horticultural waste products.

Industrial activities, wastewater and vehicle traffic increase the levels of heavy metals in the air (lead from the vehicle), in the soil and in the water (cadmium, zinc from chemical and industrial activities). The presence of heavy metals in the environment reaches the plants through the air (roadside dust on the leaves), the underground and surface water, and the soil (deposit of dust and supply by organic and inorganic chemicals). The consequence is an increase of heavy metal content in vegetables for human consumption. In Bangkok, the presence of a permanent fog decreases the light intensity, reducing the photosynthesis activity of the plant. The presence of air pollutants such as sulphur dioxide and fluoride may reduce growth and yield through a reduction in chlorophyll content, and, hence, the inhibition of photosynthesis (Midmore, 1998).

Cropping systems and crop management

The crops

Vegetables usually include between 60 to 100 species. The range of the ornamental crops is larger. Classification may be based on length of cycle, inputs requirements, and risks related to climate and pests. In Central Africa, vegetables are divided into four groups:

- Short-cycle indigenous leafy vegetables (less than one month): amaranth, petsay, local sorrel, etc. that grow with very few disease problems. They are used very commonly, but generated incomes are low due to low prices.
- "Long-cycle" indigenous leafy vegetables (one – two months) with few risks for production and marketing: glossy nightshade, cabbage, chives, Malabar spinach, which provide higher revenues.

- Short-cycle (less than two months) “temperate origin” vegetables, e.g. lettuce and parsley, with risks at production and marketing levels situated between those of leafy vegetables and long-cycle temperate vegetables.
- Long cycle temperate vegetables (more than two months) such as tomato, carrot, purple eggplant, and cucumber that present some risk in production and marketing. They provide the highest revenues, but also present the highest risks.

Another classification is based on internal characteristics including taste, shape, size, colour, origin and shelf life. Vegetables can be ranked in five groups according to their shelf lives:

- very short (1-2 days): day lily and leafy vegetables, leafy mustard, lettuce, amaranth, choysum, jute, spinach, Malabar spinach, pumpkin leaves, sweet potato leaves, cassava leaves, Ethiopian kale, chinese kale
- short (3-7 days): pakchoi, okra, radish, green pea, asparagus
- medium (1-2 weeks): mushroom, sweet pepper, tomato, watermelon, musk melon, cucumber, yard long bean, squash, broccoli
- medium-long (3-4 weeks): common cabbage, cauliflower, eggplant, Chinese cabbage, chilli pepper
- long (more than 4 weeks): onion, garlic, pumpkin, shallot

Year-round vegetable production system or seasonality

The objective of periurban farmers is to produce horticultural products for as long as possible during the year in order to obtain a regular income. They face a number of constraints, though: (i) adverse climatic conditions such as excess of water, lack of water, high temperature; (ii) lack of technical know-how; (iii) lack of on-farm and public infrastructures; (iv) competition between suppliers. Seasonality in supply of vegetables is observed in all vegetable markets in the world. The development of urban and periurban horticulture may decrease the variation of the markets' supply during the year, because of easier access to new off-season technologies.

For year-round production, crops may be cultivated on the same fields or on different fields throughout the year. If horticultural crops are grown continually on the same fields, the length of the period between crops has to be very short. This favours the permanent presence of pests in the soils and the decrease of soil fertility. One solution is hydroponics, to be described in chapter two of this publication.

Production during hot and wet season

Some vegetable species do not adapt to high temperatures and a rainy season. Lettuce yields are still rather low during this season from June to October in the northern inter-tropical and tropical zone. Many breeding programmes have been conducted since 1950 in tropical areas of Japan, the United States, Europe, and Taiwan. Many new varieties have been successfully obtained for resistance to disease (tomato, eggplant, cucumber, melon, sweet pepper, cabbage, etc.) or for better adaptation to high temperatures (tomato, common cabbage). Still, climatic variables (heat, low irradiance) limit the development of the plant. Tomato yield during the hot and rainy season, for instance, is half of the cool season yield. There are still a number of limits to production in the hot and rainy season, especially in the intensive urban and periurban systems.

To avoid the direct physical damaging effects of the rain, it is recommended that vegetables be grown under plastic shelter houses with good static ventilation to avoid the negative effect of temperature increase due to the plastic cover. Growing tomato, cucumber, and lettuce under shelter protects the plants from heavy rains. In the hot and wet season, high temperature and high humidity are factors favouring the development of plant pathogens such as fungi (anthracnose due to *Collectotrichum spp.*, fruit rots, downy mildew, Southern blight due to *Sclerotium rolfsii*) and bacteria (bacterial wilt due to *Ralstonia solanacearum*, soft rot caused by *Erwinia spp.*). For solanaceous crops (tomato, pepper, eggplant), frequent cropping also leads to the development of bacterial wilt. Three solutions may limit the damaging effect of this disease: long-term rotations with crops that are not sensitive to the bacteria; growing resistant varieties; growing tomato –the most sensitive plant to this disease- grafted on bacterial wilt resistant solanaceous crops.

On the other hand, periurban production may have to face the problem of lack of water in particular conditions, for instance in Accra. There, the main production occurs during the rainy season and at the beginning of the dry season with the associated risk of disease development.

The development of permanent vegetable crops on a restricted location increases the risk of insect pest development. The absence of adequate rotations leads to problems in controlling pest development. This is one of the causes of the excessive use of pesticides.

Use of pesticides

Chemical pesticides have played an important role in yield increases for more than fifty years. Periurban horticulture has increased this phenomenon due to easy access to the products (via national and international companies, retailers, and wholesalers), technical information, high value of the crops, and the effectiveness of the chemicals. There are three major risks, however: (i) the health risk for consumer, (ii) the risk of polluting the environment (mainly water sources), and (iii) the user risk. Surveys have been conducted regularly on the use of chemicals, their rate of application and the period between the last application and the harvest for marketing.

In Hanoi, low-cost pesticides (organophosphates, pyrethroids, carbamates) with high toxicity (classes I and II) are very commonly used, with little information provided about how to use them. Application rates are much higher than the recommended rates (table 3) for most of the insecticides used. This and the high spraying frequency are the causes of high pesticide residues in the marketed vegetables.

Table 3. Pesticide application rates on Cruciferae (kg a.i./ha/time) in Thanh Tri and Tu Liem districts (1995) *(From, Tran Khac Thi 1999)*

Pesticides	Tu Liem	Thanh Tri	Recommended rate
Wofatox 50 EC (methyl parathion)	1.25	1.50	0.50
Monitor 70 SC (methamidophos)	1.05	1.80	0.70
Dipterex 90 WP (trichlorfon)	1.50	0.50	0.90
Sherpa 25 EC (cypermethrin)	0.20	0.20	0.12

Sumicidin 20 EC (fenvalerate)	0.20	0.20	0.12

Pesticide presence in the city's surface water and wastewater for crop irrigation constitutes a high risk for urban and periurban horticulture, even though this presence is not due solely to urban and periurban horticulture. In Bangkok, a survey has shown residues of organochlorine and organophosphate in the irrigating water (Eiumnoh.& Parkpian, 1998).

Fertilizer management

Two main groups are distinguished: organic fertilizers and chemical (or inorganic) fertilizers. Intensive production of vegetables and ornamental flowers has always made heavy use of organic fertilizers. The quantity used varies from a few tons/ha to fifty or even a hundred tons per year. The organic fertilizers provide most of the micronutrients and improve the structure of the soil. Organic fertilizers have various origins: manure from livestock or poultry; compost from vegetable waste; waste from urban activities: sewage sludge, night soil, household waste, etc. For many centuries, periurban and urban agriculture have managed and recycled the urban waste products (Fleury & Moustier, 1999). These practices cause some risks to the environment: pollution of soils with heavy metals from sewage sludge, pollution of water with nitrates due to huge quantities of organic manure; but also to the health of the consumer (see below). In South-east Asia, use of fresh night soil is a common practice even though it disseminates human pathogens.

The disadvantage of these solid organic sources for vegetable production is that they release nutrients (especially nitrogen) slowly. Liquid fertilizers act faster. This is why these liquid organic fertilizers are often used on the short-cycle leafy vegetables such as amaranth, choysum, and mustard. Often, research has been on combining organic fertilizers and inorganic ones to enhance their efficacy (AVRDC, 2000). In Hanoi, liquid organic fertilizer, such as pig urine, is used to supply nitrogen during crop growth. AVRDC is working on producing an organic liquid fertilizer that does not endanger consumer health.

Inorganic fertilizers are easier to use, especially as regards providing the right dose in relation to plant uptake. The risks concern application and contamination of soils and water by nitrates and phosphates. Also, they might be the source of heavy metals. In Thailand, it has been shown that ammonium phosphate can bring cadmium, zinc, chrome into the environment in excessive quantity[14].

Irrigation

Water is essential to the growth of the plants. Water requirements are related to climatic conditions and the plant species. In most of the capital cities of developing countries, located in tropical and subtropical areas, quantities required vary from 0.1 to 1 l / m²/day in very dry and hot areas. For a crop of 30 days, the quantity of water needed by a leafy vegetable during the dry season will be around 15 l/m².

Different techniques are used for irrigation. Water is supplied through overhead irrigation by tanks, sprinklers or perforated pipes from wells, ponds, or the sewer. Drip or trickle irrigation has been promoted for twenty years now. This technique saves water by 10 to 20% compared with overhead irrigation, but requires clean water in order to avoid blocking the emitters. The full-fledged system includes filters, pumps and a pressure regulator that low

income vegetable growers cannot afford. The advantage of this technique is that water is not in contact with fruits and leaves. It will not, however, avoid contamination of soil and roots of vegetables with biological pathogens. Underground irrigation provides water to the plant by capillarity. Such an underground system can limit the transmission of pathogens to the vegetables thanks to the filtrating effect of the soil. But installation (flat soil) and operation (control of the flows to the plants) are rather difficult and tend to be inaccurate.

Quality of the production

Studies have shown that production in urban and periurban areas does not produce lower quality vegetables than in rural areas[13]. In the context of increasing consumer awareness, it is worthwhile, all the same, paying attention to major elements of the quality of the vegetables: nitrates, biological pathogens, heavy metals and pesticide residues.

Nitrates

Nitrates can cause health problems to very young babies and pregnant women. They are also an indicator of good or bad agricultural practices. Nitrates also cause eutrophication of water in combination with phosphorus. In Europe, there is standard for lettuce (see table 4). FAO and a Russian recommendation also provide extensive standards. In urban and periurban systems, nitrates stem from fertilizers and from irrigation water. Some quick tests, such as Nitracheck®, appear to help farmers in nitrogen management. In Germany, the “KNS system” based on Nmin measurement is commonly used in field vegetable production. Still, these methods need to be validated for the specific urban and periurban leafy vegetables. Moreover, with the objective of developing the use of organic matter obtained from urban waste products in mind, it appears that specific tools must be developed that take into account the problem of the irregular and slow release of nitrogen.

Table 4. Standards for nitrates in lettuce (CE 194/97)

Lettuce type	Nitrates content limit (mg/kg)
Greenhouse lettuce October – March	4,500 ppm
Greenhouse lettuce April – September	3,500 ppm
Open field lettuce	2,500 ppm

Biological contaminants

Biological contaminants are introduced through organic fertilizers, irrigation water and handling and storing of products. Tap water and wastewater are used for irrigating crops and for cleaning vegetables. In Accra, the common micro-organisms isolated form vegetable samples include *Escherichia coli*, *Pseudomonas spp., Salmonella arizonae* on white radish, green pepper, lettuce, and carrot. Helminths and protozoans have also been identified on vegetables collected on fields and markets (Sonou, 2001). In a recent study in Vietnam, 39 samples of choysum (*Brassica campestris spp. parachinensis*) from fields have not shown any presence of Salmonella, E. coli and Shigella, but have revealed the presence of some Ascaris eggs in four cases (10%). These Ascaris eggs probably originate from top dressing applications of liquid organic fertilizer (pig urine). Similar results have been obtained in various studies in Dakar (Ndeye Fatou Diop Gueye & Mouss Sy, 2001).

Regulations exist at production level on the quality of the water and organic fertilizers used. Also, there are standards for the quality of vegetables. According to FAO, water for irrigating vegetables should contain less than 1 egg per litre for intestinal nematodes and less than 1,000 / 100ml of coliform bacteria. For flowers and ornamental crops, less strict regulations have to be set up. In Vietnam, the maximum levels in fresh vegetables are: coliforms 10/1g and Salmonella 0/1g, but for *E. coli, Staphylococcus aureus* and *Clostridium perfringens*, control is done according to a guide of Good Agricultural Practices.

The main problem will be the implementation of the regulations. Numerous projects have been set up, implemented and completed with some success about composting organic matter, deep wells, waste stabilisation ponds and treatment batches. The adoption of safer technologies will have to include mechanisms for certification and the creation of small and medium enterprises specialised in these activities.

Heavy metals residues

In Hanoi, sampling at 25 locations near industrial factories (battery factory, chemical industry), revealed an excess of lead and cadmium on choysum, lettuce, kangkong at two locations (Tran Khac Thi, 1999). In other capital cities of developing countries such as Dar-es-Salaam, it appears, however, that the negative impact due to the urban polluting environment is not as important given the lack of industrial activities (Giza Muster, 1997). Table 5 gives the maximum level for a number of heavy metals. The rate of absorption of heavy metals by vegetables seems linked to the levels present in the soil. Lead is taken up by the plant roots and is then transported to the leaves. Lead from traffic fumes in the air settles on the leaves. It can be washed away by watering the leaves, especially when the leaf surface is waxy (cruciferous plants, Alliums). Cadmium can be taken up by plants through roots and leaves. For these two very poisonous heavy metals with no biological functions, controlling their presence in plants must be done by respecting the soil standards. The locaation of vegetable production with regard to roads and polluting industry, should be looked at carefully. Bio-remediation of the soil by plants, and installation of mycorrhizae that limit heavy metal uptake are long-term projects that might help solving the management of heavy metals in the future.

Table 5. Maximum levels of heavy-metal content in vegetables (from FAO/WHO 1993)

Element	Arsenic	Lead	Mercury	Copper	Cadmium	Zinc	Boron	Antimony
Content mg/kg	0.2	0.5-1.0	0.005	5.0	0.02	10.0	1.8	200

Pesticide residues

Pesticide residues above the maximum residue limit, have been observed several times in markets[12, 13, 18]. In Hanoia survey in 1998 of common cabbages collected on the retail market showed high residues of methamidophos on cabbage, 2 out of 20 samples exceeding the maximum residue limit[17]. More recently, 1 out of 8 samples taken on choysum at harvesting time showed excessive residues of cypermethrin. This in spite of the fact that regulations were already in place for the use of pesticides and in spite of existing recommendations for health safety. The application of pesticides to crops also endangers workers if protective measures are not taken. This is mainly the case for low-income farmers who cannot afford to buy proper clothing and equipment or are not aware of the importance of doing so.

Awareness of risks due to excessive use of chemical pesticides exists at all levels, ranging from farmers, consumers, and public authorities to agro-chemical companies. The urban and periurban horticulture sector is more sensitive to this problem due to the proximity of consumer and farmer. At this moment, penalties are normally not high enough to drastically reduce the over-use of pesticides. More negotiation between all players in the commodity chain might be one solution. In any case, there will be a cost, implying that the consumer must be ready to pay more for having a better quality product and a safer environment. The development of new technology such as integrated pest management and biological control can help in reducing pesticide use.

Conclusions: gaps and research topics

Characteristics of the vegetable commodity chains in urban and periurban areas

The main characteristics of one of the agriculture commodity chains, the vegetable are summarised in the following table[4].

Table 6. Opportunities and constraints of urban and periurban horticulture (*From Moustier and David, 1997*)

	Production	Marketing
Opportunities	**Inputs and know-how flows** Access to inputs Access to urban waste products Diversity of know-how due to human migrations Diversity of sources of incomes and capital Access to technical support	**Market proximity** Low costs of transportation Access to marketing information Confidence relations
Constraints	**Risks at the production level** Precarious access to land Lack of institutional recognition Pollution of air, water and soil Theft and straying Pressure on the land fertility Phytosanitary pressure	Risks at the marketing level High elasticity of the demand (temperate vegetables) Health risks Scattered firms

Sustainability of urban and periurban horticultural systems

Two main hypotheses could be formulated:

- The urban and periurban horticulture sector is not profitable compared to other human activities and needs for urban infrastructure.
- The city would like to maintain urban and periurban horticultural activity in and around the city in order to benefit from its different advantages: links with nature, waste product recycling, job opportunities, greening of cities.

The sustainability of these systems must be of a different kind. In the first hypothesis, it will be related to the direct productive role of the commodity chain to provide horticultural products to the city; in the second one, the productive roles will be supplemented by more qualitative functions about city environment.

In the first case, the horticulture activity will follow the expansion of the city. This is a phenomenon that has been observed for centuries. Research should be more focused on the agricultural problems of horticulture: improving productivity but, at the same time, reducing the negative impacts on the environment (less pesticides, less waste products, recycling urban waste products), organisation of farmers, an innovative sector in terms of products, technologies with a quick and efficient response to consumer demands.

In the second case, more efforts will be directed towards environmental aspects, employment opportunities for a part of the urban population, greening of the city, technology for small-space horticulture, diversification of horticulture towards leisure. In this case, horticulture needs the support of policy makers for securing access to land and natural resources - water, air and light - in the city environment.

In these two hypotheses, two problems remain essential: (i) the response of the horticulture industry to quality demand by consumers, and (ii) the relationship between horticulture and the urban environment.

Periurban and urban vegetable production supply to the urban market

Technical guides on paper or on CD-ROM are now available for horticulture production in most of the cities of the world. Even in the case of small-scale and new growers, it is now possible to find technical packages for the more common vegetables. The commodity chain appears to be better understood all the time, especially in urban and periurban areas. On the other hand, there are fewer skills available for improving the functioning of the commodity chains and dealing with small farmers. NGOs with extensive know-how in vegetables, international agencies and national institutions specialised in vegetables commodity chain can respond to this demand.

In economics, further research activities need to be developed:

- The place of urban and periurban horticulture in the whole horticulture sector in a context of globalisation and agricultural trade liberalisation; what are the comparative advantages of proximity to the market?
- The diversity of the origin of the growers leads to a great diversity of horticultural products; how to link this potential to consumer demand? Analysis of consumer preferences and identification of new possible products.
- Market information and organisation. Market information systems (prices, flows) and concertation between market stakeholders (farmers, traders) are two tools that allow better fine-tuning of supply and demand. The negotiation activities between the different players of the commodity chains will be enhanced through meetings, newsletters, and daily price information.

At the production level, decision making-tools for better management of the crop, the cropping systems, the farming systems need to be established for the specific small size urban and periurban horticultural sector.

Management of horticultural product quality

Most countries have already set up standards for improving the quality of vegetables, mainly based on the improvement of farmers' practices as has been done in Vietnam (Decision 1208 KHCN/QD, July 15, 1996 Ministry of Agricultural and Rural Development; temporary regulation, April 9, 1999 by Ministry of Agriculture and Rural Development). Still, it is in many cases very difficult to set up good control mechanisms and to enforce the regulations. These problems increase in urban and periurban areas where there is easy access to the inputs. In addition, cropping areas are small, easily leading to input overdoses, coupled with the need of farmers to obtain high yields.

The first step will be to follow the existing standards. This requires certification and control mechanisms. To be effective these should be the result of inter-professional negotiations with the support of public authorities.

Some technical obstacles must be cleared for the control methods: basic analytical laboratories and quick on-field tests. New standards must be set for little known vegetables, such as African and Asian leafy vegetables. Also, new technology must be developed in order to reduce pesticide use: alternative technology to pesticide use, biological control, resistant cultivars and crop management.

Horticulture: benefit or cost for the urban environment ?

Horticulture can improve the urban environment: combustion-free zones, green spaces full of flowers, removal of carbon dioxide (on a very small scale), recycling of solid waste, recycling of liquid urban waste products. At the moment, urban planners are slowly accepting the benefits of urban horticulture[13]. The direct effect on the urban environment adds to the reduction of the problems caused by transportation of the different horticultural products in rural areas to urban markets.

The main objective of horticulture will be to reduce pollution to the environment and to limit the uptake of natural resources, especially water. Standards are available for the main risks of environmental pollution. Techniques that may be developed for reducing levels of nitrate, pesticides and heavy metals must be based on decision-making tools that integrate all components of the urban-horticulture system: economic costs, sustainability of the horticultural farming system, regulation systems, costs of control. In the same way, the use of wastewater and water saving techniques such as drip irrigation and mulching must be validated in the context of urban and periurban horticulture.

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References

Ali, M (Ed.) 2000. Dynamics of vegetable production, distribution and consumption in Asia. Asian Vegetable Research and Development Center. AVRDC publication no. 00-498, 470 p.

AVRDC. 2000. AVRDC Report 1999. Asian Vegetable Research and Development Center, Shanhua, Tainan, Taiwan, vii +152 pp (47-48)

Bricas, Nicolas. 1998. Cadre conceptuel et méthodologique pour l'analyse de la consommation alimentaire urbaine en Afrique. Montpellier, France, série Urbanisation, alimentation des filières vivrières, n°1, 48 pp.

David, O. 1992. Diagnostic de l'approvisionnement de Bangui. Mémoire de stage de l'ESAT, CNEARC / AFVP/ CIRAD, 162 pp.

Eiumnoh, A. & Parkpian, P. 1998. Impact of periurban vegetable production on soils and water: a case of Bangkok plain, Thailand. Paper presented at the « Periurban Vegetable production in the Asia-pacific region for the 21st century », 29 September-1 October 1998, Kasetsart University, Bangkok, Thailand, 24 pp.

Fleury, A. & Moustier, P. 1999. L'agriculture périurbaine, infrastructure de la ville durable. Cahiers Agricultures, 8: 281-7

Giza Muster. 1997. Environmental problems of urban agriculture. A case study of Dar-es-Salam, Tanzania. Urban Vegetable Promotion Project, Dar-es-Salam, Tanzania

Margiotta, M. 1997. Développement de la production maraîchère dans les périmètres urbains et péri-urbains de Nouakchott. République Islamique de Mauritanie, Ministère du Développement Rural et de l'Environnement, rapport FAO.

Mai Thi Phuong Anh. 2000. Current status and prospective planning upon agricultural development in Hanoi. Paper presented during the CG Strategic Initiative of Urban and Periurban Agriculture workshop, Hanoi 5-9 June 2000, 7 pp.

Midmore, D.J. 1998. Importance of periurban vegetables to Asian cities. Paper presented at the « Periurban Vegetable production in the Asia-pacific region for the 21st century », 29 September-1 October 1998, Kasetsart University, Bangkok, Thailand, 14 pp

Moustier, P. 2000. Urban and periurban agriculture in West and Central Africa: an overview. Provisional paper (30/10/00) for SIUPA stakeholder meeting and strategic workshop, Sub-Saharan region, 1-4 November 2000, Nairobi, Kenya

Moustier, P. 1999. Définitions et contours de l'agriculture périurbaine en Afrique subsaharienne. *In*: P. Moustier, A. Mbaye, H. de Bon, H. Guérin, J. Pagès (eds), Agriculture périurbaine en Afrique subsaharienne, CIRAD, Colloques, pp. 17-29.

Moustier, P. (ed.) 1999. Filières maraîchères à Brazzaville. Quantification et observatoire pour l'action. CIRAD et AGRISUD-AGRICONGO, Montpellier, France, 157 pp.

Moustier, P. & David, O. 1997. Etude de cas de la dynamique du maraîchage périurbain en Afrique sub-saharienne. Document FAO N-DT/02/96, projet: <<Approvisionnement et distribution alimentaires des villes d'Afrique francophone>>, FAO, Rome, Italie, 36 p.

Ndeye Fatou Diop Gueye and Mouss Sy 2001. The use of wastewater for Urban Agriculture. Urban Agriculture Magazine, 1, 3, March 2001, 30-2

Nguyen Thi Lam, Ha Huy Khoi. 1999. Daily nutrient requirements and vegetable consumption by Vietnamese people. In: National workshop on Safe and year-round vegetable production in periurban areas, RIFAV, CIRAD, Hanoi, December 15-16, 1999, 65-74.

Sabel-Koschella, U., Jacobi, P. and Amend, J. 1998. Urban leafy vegetable production in Dar-es-Salam. Urban Vegetable Promotion Project, GTZ, Ministry of Agriculture and Co-operatives, Dar-es-Salam, tanzanie, 9 pp

Schnitzler, W.H., Potutan, G.E., Arnado, J.M., Janubas, L.G. and Holmer, R. J. 1999. City harvests: the case of Cagayan de Oro. Urban and periurban small and medium-sized enterprise development for sustainable vegetable production and marketing systems, European Commission (No IC18-CT97-0184), Institute for Vegetable Science, TU Munchen-Weihenstephan, Freising, Germany and Xavier University College of Agriculture, Cagayan de Oro, Philippines, 43 p.

Sonou, M. 2001. Periurban Irrigated Agriculture and Health Risks in Ghana. Urban Agriculture Magazine, 1, 3, March 2001, 33-4

Tran Khac Thi. 1999. Study on some environmental factors and solutions of safe vegetable development. In: National workshop on Safe and year-round vegetable production in periurban areas, RIFAV, CIRAD, Hanoi, December 15-16, 1999, 33-46

Abalimi Bezekhaya & the Cape Flats tree project**: newsletter to our friends. Abalimi Bezekhaya (The People's Garden Centre), Private Bag X12, Observatory 7935, South Africa**

community development horticulture

South Africa; home gardening; community initiatives

A small newsletter in the true sense of the word, giving news flashes and articles on homegardening and how it helps in completing people's diets. There is also room for a notice board in its columns. Lots of pictures. (WB)

Ableman, Michael **(1999). On good land: the autobiography of an urban farm. Urban Agriculture Notes http://www.cityfarmer.org/autourbanfarm.html. 4 p. Supplier: City Farmer, Canada's Office of Urban Agriculture**
horticulture community development
community gardens; community-supported agriculture; United States

A summary of the book 'On Good Land' about the Centre for Urban Agriculture at Fairview Gardens, California. The Gardens marketing systems are described as well as the other activities on the farm. (NB)

Agbayani, A.L. P., Holmer, Robert J., Potutan, Gerald E., Schnitzler, Wilfried H. **(2001) Quality and quantity requirements for vegetables by private households, vendors and institutional users in a Philippine urban setting. Paper for the workshop "Appropriate Methodologies for Urban Agriculture", October 2001, Nairobi, Kenya. Proceedings, available On: www.ruaf.org. A shortened version is taken up In: *Urban Agriculture Magazine*, no 5, Appropriate Methodologies for Urban Agriculture, December 2001, RUAF, Leusden, The Netherlands.**
R&D Methodology horticulture
Philippines; market survey

Two studies were conducted to characterize the demands of private households, vendors and institutional users for fresh vegetables in Cagayan de Oro City, Philippines. Specifically, these surveys aimed to provide baseline data for decision-makers and farmer practitioners to further improve the market transparency for vegetables and, thus, contribute to better producer and consumer linkages. The first survey was conducted in February 1998 within different urban and periurban districts of Cagayan de Oro. The second survey using administered questionnaires was conducted in June 1999. A sample group of one hundred respondents was chosen randomly after clustering the various groups of institutional users of fresh vegetables. The generated data of both surveys were subjected to descriptive statistical analysis.

Ajaegbu, Hyacinth I; Berg, Leo van den **(1997). Market gardening, urban growth and sustainable income generation on the Jos Plateau, Nigeria. 13; 115 p.**
horticulture
Nigeria; Jos Plateau; small-scale agriculture; commercial agriculture; periurban agriculture

Examines small-scale commercial periurban horticulture on the Jos Plateau, Nigeria, focusing on marketing aspects. A number of economic models were tewsted to best describe the situation. Authors concluded that a differentiation of various zones in

the periurban area became more apparent. (WB)

Amend, Jörg; Magasini, I; Mutahiwa, Sergei; Swai, Ignaz (1997). Integrated pest management in urban vegetable production in Dar es Salaam. 17 p. Urban Vegetable Promotion Project (UVPP), PO Box 31311, Dar es Salaam, Tanzania
horticulture services
Tanzania; horticulture; home gardening; IPM

One of the objectives of urban food production is ensuring sustainable development of the cities. Proper agricultural practices are an important element for ensuring this sustainability. The underlying paper examines the application of Integrated Pest Management (IMP) methods in urban vegetable production in Dar es Salaam. Main objective of the research was to identify pest and diseases occurring in the most important crops cultivated and to develop strategies for IPM for these crops. This report contains the methodology used for the research and the results. The authors also give general recommendations for the vegetable growers in Dar es Salaam, as well as special recommendations for IPM management of the most important vegetables. (WB)

Anderton, Frances; Thompson, Mark **(1999). Agriculture in a megalopolis: farming in the heart of Los Angeles presents opportunities along with challenges. On: http://www.marketreport.com/lafarm.htm. 5 p.**
horticulture
United States; horticulture ; commercial agriculture

Describes city farms in the heart of Los Angeles. The main problem farmers face is insecurity of land tenure, complaining residents, vandalism and harassment by local officials. Most of the produce is directly marketed through farmers' markets which are close to consumers. (NB)

Andrews, S. **(2001), The Allotment Handbook: A Guide To Promoting and Protecting Your Site.**
Supplier : Eco-logic Books, 10-12 Picton St, Bristol BS6 5QA, England
urban horticulture
allotment gardens; land pressure; urbanisation

Allotments are increasingly threatened by development as land prices soar and space is needed to expand cities, towns and villages. Starting with a brief history of allotments and a look at legislation, this book shows how to make your allotment part of a thriving community. If your site is threatened, learn how to organize to stop development in their tracks. Easy to use with a comprehensive contacts, a vital tool for allotment holders, community groups and those who want to see an active use of urban open space.

Baudoin, W. **(2001), Urban Micro-Gardens. Plant Production and Protection Divison, FAO, In: Proceedings on the Sub-Regional Expert Consultation on the**

Use of Low Cost and Simple Technologies for Crop Diversification by Small Scale Farmers in Urban and Peri-Urban Areas of Southern Africa, Stellenbosch, South Africa, January 15-18 2001
urban horticulture
urban areas; gardening

This presentation reviews the opportunities of a simple, low-cost technology adapted to the high-density areas of urban suburbs. The technology allows landless households to produce a broad range of vegetables for family consumption and sale to the neighbourhood. The system is based on growing crops on substrates or floating on water. The technical assessment highlighted the high cost of the mineral fertilizers required for the preparation of the nutrient solution. In this respect, research is needed for the use of alternative sources including organic nutrient solutions obtained from the fermentation of organic waste material. The micro-garden system is environmentally friendly since it not onnly uses recycled materials, but the 'closed system' growing allows avery high water use efficiency ratio. The cost-benefit analysis shows that these micro-gardens, when successfully implemented, can provide from US$1 to US$3 a day as an 'opportunity revenue' from 10 m2, which is often competitive as compared to the casual labour wage the women could obtain by working outside the household.

Bergeron, Bernard **(1998). Activités maraîchères au Congo. 4 p. Ministère des Affaires Etrangères, Coopération et Francophonie, Bureau Production Agricole, Industrielle et Echanges**
horticulture
Congo; resource centres; development projects

Reports on activities in a periurban development programme in Congolese cities. At the heart are 'resource centres' functioning as centres for production, research, marketing, information and training. (WB)

Beverwijk, Jasmin; Baarsen, Dirk-Jan; Duuren, Bert (van) **(199?). Extension and experiental learning in urban agriculture. 7 p. PGO Tropische Landbouw en Rurale Ontwikkeling T050-200**
services horticulture
agricultural extension; allotment gardens

The underlying report analyses experiences with allotment gardening in the Netherlands. Information is given about existing organisations in the field of extension and allotment gardening. Interestingly, there is also information about Farmer Field Schools on IPM in rice as a learning model for other situations and countries. (WB)

Bishwapriya, Saynal **(1985). Urban agriculture: who cultivates and why? A case-study of Lusaka, Zambia. In: Food and Nutrition Bulletin vol. 7 no. 3 (1985) p. 15-24. Massachusetts Institute of Technology, Cambridge, Massachusetts,**

USA

horticulture food security and nutrition

case studies; horticulture; Zambia;

Most authorities are now convinced of the fact that urban agriculture is more than an accidental activity undertaken by recent rural migrants. This survey shows once more that many urban poor, who migrated to the city a long time ago, are engaged in food production in order to survive. Most of the urban farmers stated the lack of purchasing power as the major reason for farming. There were other reasons as well, however, ranging from the wish to feel settled in their city home to simple enjoyment in gardening. The survey identified two different types of gardens in Lusaka: plot gardens and rainy-season gardens, used for cultivating different types of crops. In plot gardens, higher-grade vegetables were cultivated, such as rape, tomato, cabbage, onion and spinach, as well as fruits, while in rainy-season gardens, staple food, i.e. root crops, maize and beans, were produced. The survey stressed the need for stronger support from local authorities. At this point of time, urban farmers often experience the reverse, jeopardising their activities. In addition, land tenure policies will have to be changed so as to render more land available for the urban poor. (WB)

Blair, Dorothy; Giesecke, Carol; Sherman, Sandra **(1997). A dietary, social and economic evaluation of the Philadelphia urban gardening project. Urban Agriculture Notes on: http://www.cityfarmer.org/nutritionstudy.html#diet. 6 p. Nutrition Department, College of Health and Human Development, Pennsylvania State University, University Park, Pennsylvania 16802, USA Supplier: City Farmer, Canada's Office of Urban Agriculture**

horticulture food security and nutrition economic impact

United States; home gardening; surveys

An evaluation study among 144 gardeners in the Philadelphia Urban Gardening Project and 67 non-gardening controls. Data collected included demographic variables, food frequencies and dietary habits, measures of life satisfaction, and neighbourhood involvement. The average value of garden site produce was assessed. Interestingly, gardening was positively associated with community involvement and life satisfaction. An interesting and important study. (WB - from original abstract)

Boissière, Thierry **(1999). Jardiniers et société citadine dans la vallée de l'Oronte en Syrie centrale. Doctoral dissertation in ethnology, Université Lumière Lyon 2, Lyon, France. 2 volumes. 751 p.**

horticulture community development

Syria; Homs; Hama; history; market gardening; water supply; urban gardening

This landmark study is unique in several regards. It is one of the only dissertations on urban agriculture that adopts the ethnological approach, and to be undertaken by an anthropologist. It is rare in its detailed historical analysis combined with a

thorough assessment of the present-day situation. It is a rare in-depth study of the Middle East, an underrepresented region in research on urban agriculture. Finally, it is exemplary in placing at its core the changes in water supply (in addition to farming practices); water is the oft-neglected element in such studies. “Through the management of water and crops, as well as through the human connections and the relation to the city, this study has the ambition to reconstitute the evolution of an entire society that organized itself long ago and to present its main characteristics.” This ambition is admirably met in this dissertation. (JN)

Bon, Hubert de; Ducelier, D.; Hernandez, S.; Temple, L. **Appui aux productions maraîchères et fruitières périurbaines de Yaoundé. Agriculture périurbaine en Afrique subsaharienne, p. 89-92**

rural-urban linkages horticulture

periurban agriculture; marketing; vegetables; sub-Saharan Africa

Vegetable crops are intended to be marketed and are often produced by young farmers, new to the business. The major species grown are: African spinach, jute, Solanum aethiopicum and lettuce. Green peppers, parsley, basil an dokra are also grown. CIRAD-FLHOR works on improving the production techniques practised and the sanitary quality of the marketed produce. The agronomic support for fruits aims to diversify the range of products with species adapted to the prevailing conditions. A number of varieties already has been selected and distributed. Vegetable and fruit crops from the periurban zone play an essential role in market supplies. A study under way includes quantifying fruit and vegetable movements and monitoring and analysing prices and urban market supplies. Major surveys of markets, notable in Yaoundé will determine the role of fruits and vegetables from urban and periurban areas compared to produce from further a field. (NB - Abstract adapted from original)

Boncodin R. Prain, G. and Campilan, D. **(2000) Dynamics in Tropical Homegardens. In: *Urban Agriculture Magazine*, no 1, Maiden Issue, July 2000, RUAF, Leusden The Netherlands.**

horticulture food security and nutrition

Homegardens; Philippines;

The importance of home gardens, the small areas of cultivated land immediately surrounding a home or a homestead, is often underestimated despite its vital contribution to meeting various household-needs, especially for the poor families in developing countries. The authors explore the importance of homegardens in the Philippines and give the findings of the programme, Users’ Perspectives with Agricultural Research and Development (UPWARD).

Brierley, John S **(1985). West Indian kitchen gardens: a historical perspective with current insights from Grenada. In: Food and Nutrition Bulletin vol. 7 no. 3 (1985) p. 52-60. Dept. of Geography, Univ. of Manitoba, Winnipeg, Manitoba, Canada**

horticulture
West Indies; Grenada; home gardening

Describes kitchen gardens in the West Indies and traces their history since the slave plantation days. Trees play an important role in West Indian homegardens as do root and tuber crops. Of all crops grown distribution tables with indices of occurrence are given. (WB)

Brownrigg, Leslie **(1985). Home gardening in international development: what the literature shows. Washington, DC: League for International Food Education. 126 p. + app.**
horticulture
home gardening; development projects; bibliographies; resource organisations; Nigeria; Chile; Mauritania

This is a pioneering (and little-known) literature review on home gardening, funded by USAID. The author not only reviewed the published writings on the subject, but also documented the activities of major international organizations concerned with home food production systems. The review was researched and written with two audiences in mind: international development professionals whose programs do or could include home gardening, and other readers from the range of academic disciplines which involve the home garden who have an interest in its history and traditions. It contains case histories from Nigeria, Chile and Mauritania, plus several shorter case descriptions. Three major appendices are on: resource organizations; garden projects and programs; and a bibliography. (adapted from original by JN)

Bruce, Hank; Folk, Tomi Jill **(2001), Global Gardening: Increasing the Diversity of Plants in Your Own Garden While Feeding a Hungry World. Winner Enterprises**
urban horticulture
globalisation; home gardening

All over this earth, our global garden, people are cultivating a great diversity of vegetables and fruits. There are over 15,000 edible plants that can help to sustain our global village, yet over 99% of the American diet is based on less than 100 plants. We have a world of unique, unusual and exotic vegetables to discover, enjoy and share at the dinner table of our global village. Some of these might even become a part of your garden and add diversity to your own mealtime adventure. This book is a safari into the exotic gardens of the world.

Burleigh, J.R. and Black, L.L. **(2001) Supporting Farmers Towards Safe Year-round Vegetables in Manilla. In: *Urban Agriculture Magazine*, no 3, Health , March 2001, RUAF, Leusden The Netherlands.**
health and environment horticulture
Philippines; AVRDC; IPM; agrochemicals

AVRDC collaborates with the Central Luzon State University-Philippines, the Bureau of Plant Industry-Philippines, and the Technical University of Munich-Germany in a project entitled “Development of periurban vegetable production systems for

sustainable year-round supplies to tropical Asian cities". The project aims to design, test and implement production systems for sustainable year-round supplies of vegetables to markets in Metro Manila - and by model verification, to other tropical Asian cities as well. This article focuses on part of the work of the periurban vegetable production project, which is to decrease the ubiquitous use of pesticides in periurban Manila through introduction of IPM techniques.

Cáceres, D; Arbomo, M **(1994). Surviving on little land: women's struggle in town and country. In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 8-9. Department of Rural Development, Faculty of Agronomy, National University of Córdoba, CC 509-5014, Córdoba, Argentina**
Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands
horticulture
Argentina; home gardening; labour; urban communities; urban development; urban environment; urban population; urban wastes; women

Socioeconomic policies implemented in recent decades in Argentina have led to division of land into small plots (minifundizacion) and expanding poverty belts around the big cities. Growing food in small gardens is seen as one way to help the poor feed their families. Daniel Cáceres and Miryam Arbomo present two case examples - one urban and one rural - from Córdoba Province in central Argentina. (ILEIA)

Chaplowe, Scott G **(1996). Local food security: Havana's popular gardens: sustainable agriculture. In: WSAA vol. 5 no.22 (Fall 1996). 4 p. World Sustainable Agriculture Association (WSAA), California Chapter, 8554 Melrose Ave., West Hollywood, California, 90069 USA**
horticulture
Cuba; Havana; food security; community gardens; community organisation

A description of the emergence of private gardens, state owned intensive gardens and other forms of urban farming in Cuba. The gardens enhance community participation and organisation, food security and food diversity. (NB)

Chewya, JA; Eyzaguirre, PB **(eds) (1999). The biodiversity of traditional leafy vegetables. IPGRI, Rome. 182 p.**
horticulture
Africa; vegetables; nutrition; biodiversity; gender; small-scale agriculture

Here we are presented with five reports covering five African countries South, East & West. The studies document the value of green leafy vegetables as an efficient crop for small urban parcels, as a tool in maintaining the stability of ecosystems, for their capacity to repel insects and their micronutrient value in locally based food systems. Women in Africa are found to be the primary producers, beneficiaries and the custodians of green leafy vegetables. (JS)

Chibesa, L **(et al.) (19??). Small-scale cultivation around Kalingalinga. In: In the shadow of Lusaka (source unknown) p. 13-29. 29 p.**
horticulture
Zambia; home gardening; land use; urban construction; tenure rights

Reports on homegardening in a squatter area in the eastern part of Lusaka. The paper looked specifically into possible resettlements of those who owned -or rather: leased from the government- plots as a result of building activity in this area, but could not draw positive conclusions as to the degree of competition existing for this land nor as to the quality of new plots acquired. Final part of the paper contains a number of portraits of home gardeners. (WB)

Chivinge, A.O., V. Machakaire and G. Mudimu **(2001), An Overview of Urban Agriculture in Zimbabwe, Constraints and Solutions. Crop Science Department, Faculty of Agriculture, University of Zimbabwe. Paper prepared for the Sub-Regional Expert Consultation Meeting on Urban and Peri-Urban Horticulture, University of Stellenbosch, Cape Town, South Africa, January 2001.**
Supplier: Crop Science Department, Faculty of Agriculture, University of Zimbabwe, P.O. Box MP 167, Mount Pleasant, Harare, Zimbabwe
urban horticulture
urban agriculture; Zimbabwe, Africa (Eastern)

The difficult economic conditions in Zimbabwe hit urban dwellers particularly hard. Urban agriculture was the consequence. Major activities include the growing of field crops (on any vacant piece of land), horticulture (within the confines of the land allocated for residential purposes), ornamental plants and livestock production. The history of urban agriculture indicates that it has been practised since the twons were established, although much of it started with the influx of foreigners as labour in the mining industry and as domestic workers, with the intensification of the Zimbabwean war of liberation after 1976 which brought rural people into urban areas, and with the influx of those fleeing from the Mozambican civil war after 1980 who could not get land in rural areas. In terms of horticulture , the poor in high density areas produce mostly for feeding the family, while those better off combine home consumption and selling. Constraints to increased production are the shortage of land, poor or non-existent extension services (due to lacking government support for urban agriculture) and failure to purchase inputs. These constraints vary with the location of the urban of peri-urban area. It is recommended that the city authorities accept urban agriculture as a reality and that they willl come up with policies that create an enabling environment to train urban growers. This will expose them to the correct technologies, especially in horticultural production, which is sustainable and environmentally friendly. High yields can be achieved and poverty reduced as these growers are trained and other facilities are made available.

Chongwe, E.H. and J.L. Ngondo **(2001), Urban and Peri-Urban Horticulture in Malawi. Paper prepared for the Sub-Regional Expert Consultation Meeting on**

Urban and Peri-Urban Horticulture, University of Stellenbosch, Cape Town, South Africa, January 2001.
Supplier: Ministry of Agriculture and Irrigation Development, P.O. Box 30134, Lilongwe 3, Malawi
urban horticulture
horticulture; urban areas; periurban area; Malawi, Africa (Eastern)

The paper examines the state of Urban and Peri-Urban Horticulture in Malawi where the industry is young but growing at a very fast rate. It is contributing between 30 - 40 % to the national horticultural crop demand. It is also generating cash income, raw materials for industries, foreign exchange earnings and creating employment opportunities for producers, vendors, hawkers, middlemen, input suppliers and institutions. Major urban areas in Malawi are Blantyre, Lilongwe, Mzuzu and Zomba. Out of an urbanisation rate of 14 %, about 11 % live in these four major urban areas. Broadly, horticulture in these Urban and Peri-Urban areas focuses on the growing of vegetables, fruit, spices, ornamental and floriculture. In spite of its importance, the sectors development has been spontaneous and uncoordinated hence it is being threatened by issues of pollution, high water rates, gender bias and sustainability due to urban development among many other setbacks. Policymakers have to be sensitised to these in order to bring about lasting development in the sector.

City Farmer **(1996). Food gardens in South Africa. Urban Agriculture Notes on: http://www.cityfarmer.org/s.africa.html. 2 p. City Farmer, Canada's Office of Urban Agriculture**
Supplier: City Farmer, Canada's Office of Urban Agriculture
food security and nutrition horticulture
vegetable gardens; gardening practices; Soweto; South Africa

A brief description of the Food Gardens Foundation in Soweto, South Africa. The Foundation developed a method for growing vegetables which is especially useful if there is shortage of land, water or money. (NB)

City Farmer, Canada's Office of Urban Agriculture **(1999). City farm in Perth, Australia. Urban Agriculture Notes http://www.cityfarmer.org/perth19.html. 2 p. City Farmer, Canada's Office of Urban Agriculture**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture community development
community gardens; Perth; Australia

Gives a description of a community garden in Perth, Australia. (NB)

City Farmer, Canada's Office of Urban Agriculture **(1999). City farms in the United Kingdom. Urban Agriculture Notes http://www.cityfarmer.org/cityfengland8.html. 3 p. City Farmer, Canada's Office of Urban Agriculture**
Supplier: City Farmer, Canada's Office of Urban Agriculture

horticulture food security and nutrition services
city farms; United Kingdom

Brief description of some city farms organised in the Federation of City Farms in the United Kingdom. (NB)

Cornell University Extension **(1999). Direct marketing today: challenges and opportunities. USDA On: http://www.ams.usda.gov/directmarketing/DirectMar2.pdf.**
horticulture services
market gardening; periurban agriculture

This manual presents every step the urban or rural farmer needs to take in order to be a direct marketer. Applicable everywhere, but especially in USA. Includes directory to resources. (JS)

Cosgrove, Sean **(1994). Une histoire de deux villes: comparing Canadian community gardening programs in Montreal and Toronto. Cities Feeding People Series report no. 11. 9 p. International Development Research Center (IDRC), PO Box 8500, Ottawa, Ontario, Canada K1G 3H9**
community development horticulture
Canada; Montreal; Toronto; Healthy Cities programme; community gardens

In the early 1970s Montreal developed gardening programmes. In Toronto this development has been much slower. Montreal has one of the best community gardening programmes in North America. Toronto has shown some leadership in urban environmental management including healthy cities approaches. Key challenges are to develop a valued community gardening culture in Toronto, the implementation of healthy cities principles and the establishment of effective partnerships between citizens and government. (NB)

Croon, Tom (de); Riel, Karel (van) **(1998). Urban horticulture in Dar es Salaam: farming systems, risks, strategies and gaps in information. 7 p. Wageningen University and Research Centre**
horticulture
Tanzania; home gardening; farming systems research

Describes and typifies various gardening systems within the city bounds of Dar es Salaam, in which the class depends on tenure rights, ranging from none to institutionalised rights. The different systems are typified and specific problems of the different systems are listed. (WB)

Decheng, Su **(1999). Tree mushroom production for city farmers. Urban Agriculture Notes http://www.cityfarmer.org/treemushroom.html. 3 p. 5 Skaling Ct. Apt. 9, Saint John, New Brunswick, Canada, E2K 4G8**

Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture
mushrooms

Describes how mushrooms are able to decompose polymer, cellulose and other products of organic waste and at the same time produce a crop. The remaining mushroom mycelia after harvesting are an excellent fertiliser. (NB)

Delphin Regis, Mildred **(1999). Care Haiti: urban horticulture project Port-au-Prince, Haiti. Urban Agriculture Notes http://www.cityfarmer.org/haiti.html. 5 p. Urban Horticulture CARE-HAITI, 92, Rue Gregoire P.V., BP 15546, Pétion-Ville, Haiti**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture R&D methodology
Haiti; home gardening; development projects

Offers a description of the recent initiatives in urban farming of CARE in Haiti. In two pilot sites activities started with the set up of demonstration gardens to generate interest and awareness. Based on this a number of groups have been formed for urban farming. The project aims to document technical approaches to urban agriculture, to document the food and income generation potential and to develop an effective extension and learning approach. (NB)

Dennery, Pascale **(1999). Urban agriculture in informal settlements. Urban Agriculture Notes http://www.cityfarmer.org/nairobi.html. 5 p.**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture
food security; urban policies; poverty; nutrition; Kenya

Discusses the results of a study in Kibera, Nairobi, Kenya. Findings indicate that engagement in food production is beneficial to low-income households. Produce is used directly and indirectly by the household to obtain food, access cash and educate children. In Nairobi in general and Kibera in particular, uncertainty with respect to access land is of major concern to food producers. Timely policy interventions are needed to legitimise food production in and around informal settlements. (NB)

Department of Horticulture **(1990).The role of horticulture in human well-being and social development: setting the agenda. 25 p. Department of Horticulture, Virginia Polytechnic Institute & State University; American Society for Horticultural Science; American Association of Botanical Gardens and Arboreta; American Horticultural Therapy Association**
horticulture
urban livelihoods; well-being; social aspects

The objectives of the symposium were to collect, present and analyse information on

the psychological, physiological and social responses of people to plants and to identify research priorities to further explore this issue. The underlying programme contains summaries of keynote papers as well as names and addresses of participants. (WB)

Doshi, RT **(1992). City farming: an innovative technology. 27 p.**
horticulture
India

Relates a number of horticultural practices the author has tested out in Bombay, India over a number of years. (WB)

Drescher, Axel W. **(1994). Gardening on garbage: opportunity or threat? In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 20-21. Institute for Physical Geography, Werderring 4, D-79098 Freiburg, Germany**
Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands
wastewater reuse horticulture
community health; health; health hazards; home gardening; organic wastes; toxic substances; urban environment; waste management; Zambia

Gardening on waste disposal sites is common practice in many developing countries. Such sites offer fertile land not used for other purposes, but toxic wastes and heavy metal pollution may threaten human health. Axel Drescher presents a case study of such a periurban garden in Zambia. (ILEIA)

Drescher, Axel W. **(1997). Management strategies in African homegardens and the need for extension approaches Paper presented at the International Conference on Sustainable Urban Food Systems. Ryerson Polytechnic University. Toronto,Canada. 22-25 May 1997. Papers**
gender horticulture food security and nutrition
Africa, Zambia, household survey, food security, management strategy, women's role, gender differences, intervention strategy, extension services

The relationship between urban food production, food security and urban environments has been largely neglected. This paper focuses on results from a household garden survey conducted during 1992 and 1993. The main objective of the survey was to clarify the role of household gardens for household food security in Zambia and to identify differences and problems in management strategies and their effects on production in different areas. The results reveal that the main actors in urban agriculture are often women. In all compounds studied in Lusaka, women were to a greater extent involved in cropping and gardening than men. Gender analysis is used to reveal differences between men's and women's urban agriculture techniques with respect to alternative methods of plant production, crop species, and use of fertilizer, manure and compost. The paper argues that gender specific

differences in agricultural activities need to be paid more attention by extension services in urban and periurban areas. (AH)

Drescher, Axel W. **(1997). Management strategies in African homegardens and the need for new extension approaches. In: Food Security and innovations: successes and lessons learned / F. Heidhues and A. Fadani. 11 p. Universitaet Freiburg, Hebelstrasse 27, D-79104, Freiburg, Germany**
Supplier: City Farmer, Canada's Office of Urban Agriculture
services horticulture
home gardening; food production; food security; extension services; Zambia;

Reports on gardening and cropping in Lusaka. As stated elsewhere, these activities often take place in a setting of non-co-operative authorities. This paper comments on urban farming activities and examines the relationship between land access and social status of the compounds. The author argues that, while wet-season staple food cropping is practised on a broad scale, dry-season vegetable gardening is much less widespread because many city dwellers lack access to resources necessary for this activity. Urban farming has not been addressed by extension services as these solely focused on the rural sector. Output, especially of leafy vegetables, could be increased considerably, however, were such services provided to gardeners. Information needed primarily concerns with pest management, species diversity and soil fertility. (WB)

Drescher, Axel W. **(1997). Urban agriculture in the seasonal tropics of central southern africa: a case study of Lusaka, Zambia. On: http://www.cityfarmer.org/axelB.html#axel. University of Freiburg, Germany**
horticulture R&D methodology
Zambia; periurban agriculture; home gardening; surveys

Analyses findings of the big Household Garden Survey in and around Lusaka and in Zambian rural areas in 1992-93. Purpose was to determine the role of household gardens for urban households; the contribution of garden produce to diet and budget of the household; to draw up an inventory of the main problems encountered with the household garden; and to find out about motives of households to be involved in gardening or not. A distinction is made throughout the text between different types of agriculture in and around Lusaka: gardening for food, semi-commercial and commercial gardening, and rainy season agriculture. In the rainy season the production of staple foods predominates, whereas during the dry season people concentrate on vegetable production. Factors influencing involvement in any of these types of gardening are governed by internal or external factors, such as labour availability, access or entitlement to resources, education, occupation, and more. The impression is that gardening actually does contribute to food security and/or generation of income. (WB)

Drescher, Axel W. **(1999). Urban agriculture in Northern Spain: brief observations: La Huerta del Abuelo Rosel. Urban Agriculture Notes http://www.cityfarmer.org/spain.html. 2 p. University of Freiburg**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture food security and nutrition
community gardens; Zaragoza; Spain

A brief description of 'La huerta del Abuelo Rosel' in Zaragoza, Spain. (NB)

Drescher, Axel W. **(1999). Urban agriculture in the seasonal tropics: the case of Lusaka, Zambia. In: For hunger-proof cities: sustainable urban food systems / Mustafa Koc, Rod MacRae, Luc JA Mougeot and Jennifer Welsh (eds). p. 67-76. ISBN 0_88936_882_1. CAD 35.00.**
Supplier: International Development Research Centre (IDRC), Publications Department, PO Box 8500, Ottawa, Ontario, Canada K1G 3H9
horticulture
gardening; staple crops; food production; gender; food security; household economy

This paper focuses on different components of urban agriculture in Lusaka, Zambia. Both of the major agricultural activities - the dry-season gardening and rainy-season production of staple food crops largely depend on access to resources like water and land. It was found that dry-season cultivation is practiced by those with access to the resources essential to this activity. This access is lowest in the high-density, low-income compounds in Lusaka. There are significant differences between the roles of women and men in urban household food security. Women are the major actors in urban agriculture, but they are disadvantaged with respect to income generation and access to resources and markets. Special attention is given to the cultivation of indigenous vegetables ("locals") and ongoing vegetable-gathering activities, which play an important role in nutrition and are mainly undertaken by women. A household-gardening model that is also applicable to other household activities was developed to come to a better understanding of household activities in their social, economical, and environmental contexts. Urban agriculture in Lusaka contributes to household food security directly by providing food and indirectly by reducing expenditures. (Abstract adapted form original)

Drescher, Axel W. **(2001), The German Allotment Gardens - A Model for Poverty Alleviation and Food Security in Southern African Cities? Paper prepared for the Sub-Regional Expert Consultation Meeting on Urban and Peri-Urban Horticulture, University of Stellenbosch, Cape Town, South Africa, January 2001**
urban horticulture food security and nutrition
allotment gardens; food security; poverty alleviation, Africa (Southern)

This paper asks whether the German experience with urban allotment gardens can be a model for Southern Africa. The potential exists for urban gardens to help Southern African cities to reduce poverty and improve security and living conditions. Conditions of hunger and poverty were widespread in Germany and other European

countries nearly 200 years ago when the first 'gardens for the poor' emerged. Allotment gardens consist of a piece of land between 200 and 400 square meters, most of them with a little shed for storing gardening tools. Shortly after WW II, Berlin contained 200,000 allotment gardens. Today there still are about 800,000.

Dubbeling, Marielle **(1999). Urban agriculture and feeding Latin American and Caribbean cities. Urban Agriculture Notes http://www.cityfarmer.org/feedingLatAmer.html. 5 p. Urban Management Program Latin America and the Caribbean, Garcia Moreno 1201 and Mejia, Quito, Ecuador**
Supplier: City Farmer, Canada's Office of Urban Agriculture
food security and nutrition horticulture R&D methodology
food security; Latin America; best practices; poverty alleviation; waste; resource management; food security; nutrition; income generation; gender; environment

Presents the best practices and city consultation project of the Urban Management Program for Latin America and the Caribbean. The thematic orientation is on urban poverty alleviation, urban environmental management and participatory urban governance. The objective of the project is to assist a group of resource and associate cities with documenting urban agriculture experiences, producing analysis of urban agriculture activities and implement a city consultation process. (NB)

Eames-Sheavly, Marcia **(1996). Radishes to riches. Member workbook. Cornell's Fruit and Vegetable Sciences Department. Ithaca, NY.**
horticulture
market gardening; marketing; youth; United States

The "Radishes to Riches" MEMBER workbook (142M5) is a guide for youth or anyone who wants to get into the direct-market business. It takes the reader through the basics of marketing including deciding on what to grow, (what will people buy?; how much can I sell?), where to sell the produce, how to prepare it for sale, pricing, and promotion. It includes worksheets to make project and marketing plans, keep records of accounts, and tally a business summary. (JS)

Eberhard, R **(1989) Urban agriculture: the potential in Cape Town. Summary Report, working paper 89/E1-E5. Cape Town, South Africa: City Planner's Department, Town Planning Branch, 1989.**
horticulture
South Africa; Cape Town; urban planning; land use; literature review; economics; vegetable gardens; community gardens

This early report on urban agriculture in South Africa was prepared by a professional in Cape Town's Town Planning Branch. It contains five sections that are meant to be relatively free-standing. Part 1 is the summary report. Part 1 is labeled "Literature Review", but it is in fact a more substantial piece than that. First, it uses the literature

to assess the physical, economic, socio-cultural and institutional factors that influence the interest and participation in urban agriculture. Second, it presents summaries of around two dozen case studies of urban agriculture from across the world, with an emphasis on Africa. In Part 3, an attempt is made at estimating the economic value of small vegetable gardens in Cape Town. Part 4 then presents a detailed case description of an existing project in Cape Town, initiated and run by the Catholic Welfare Bureau. Finally, in Part 5 (26 p.), an assessment is made of the potential of introducing community gardens to Cape Town. (JN)

Eberlee, J **(1999). Urban gardening in Haiti. IDRC Reports. May 28, 1999 http://www.idrc.ca/reports.**
community development horticulture
Haiti; home gardening; urban poor; nutritional status

Residents of some of the poorest urban areas of Haiti are improving their health, nutrition status and income by growing vegetables in containers (old tires, baskets, pails, etc.) in confined spaces such as backyards, verandahs and rooftops. Under the supervision of CARE-Haiti and other partners, more than 400 people from 11 neighborhoods in Port-au-Prince and Gonaïves have attended training sessions on how to establish gardens where space is limited. Funds provided by the International Development Research Centre (IDRC), CARE-Canada, the Canadian International Development Agency (CIDA) and CARE-USA are helping CARE-Haiti design, implement, monitor and evaluate space-confined gardening methods, including technologies tested in other IDRC-sponsored projects. This article is also available in French. (HC, IDRC)

Egusquiza, Rolando **(1987). Curso de cultivo de papa en huertos caseros. Asociación Perú Mujer & Universidad Agraria de la Molina, Lima.**
horticulture services
home gardening; gender; training; root crops; Latin America

This is a trainers' manual for women raising potatoes in neighborhoods. The initial objective was to train trainers or promoters. The stated objectives were good nutrition, micro-enterprise, good health and provision of service to low-income women. Methods of cultivation offered in the course were experimental. (JS)

Flood, Carlos Alberto **(1990). Small-scale sub-urban and periurban biological agriculture: a social-oriented program of local food production. 18 p.**
horticulture
Argentina; education programmes; biological horticulture

Describes underlying considerations and implementation elements of an adult education programme promoting biological food production in the suburbs of Buenos Aires. (WB)

Floquet, Anne**. Potentials and perils on (sic) periurban agriculture in a West African coastal region. Symposium 'Rural Farming Systems Analysis: Environmental Perspectives'. Workshop E: farming and rural systems in zones of transition. Paper E/6 p. 446-456. University of Hohenheim, Germany**

horticulture health and environment

West Africa; Benin; periurban agriculture; environmental degradation; rural-urban migration

Market demands change quickly in West Africa as a result of fast-growing cities. The underlying paper describes the situation in Benin, where farmers from the south have largely failed to grasp the opportunity of the urban consumption market. Soil mining has led to a decrease in the production of staple food and fuelwood in the South of Benin and to soil depletion, with ensuing rural exodus. Based on six years of field research, changes in cropping and farming systems and socio-economic changes, in the light of a rapidly changing environment, are described in this paper. (WB)

Florin, Bénédicte **(1997). Savoir faire son jardin au Caire. In: Les Annales de la Recherche Urbaine No. 74 (March 1997): 85-94.**

horticulture

Egypt; resettlement; social housing; social relations; leisure; home gardening

In addition to the enjoyment, the small gardens in an old social housing complex in Cairo are useful in regulating relations between neighbors. In a new housing estate at the edge of Cairo, where earthquake refugees have been relocated, gardens are a means of building up hope again. (adapted from original by JN)

Food and Agriculture Organization (FAO) **(2001) Proceeding of Regional Seminar "Feeding Asian Cities", Bangkok, Thailand, November 2000. On: http:/www.fao.org/waicent/faoinfo/agricult/ags/agsm/sada/asia/index.htm**

food security and nutrition horticulture services

Asia; marketing; horticulture

This seminar was organised by the Association of Food Marketing Agencies in Asia and the Pacific (AFMA), and the Regional Network of Local Authorities for the Management of Human Settlements (CITYNET), in collaboration with GTZ, International Union of Local Authorities (IULA), Ministère des Affaires étrangères (France), UNDP/UNCHS/World Bank - Urban Management Programme - Regional Office for Asia and the Pacific, World Union of Wholesale Markets (WUWM) and with the technical support of FAO.

Food and Agriculture Organization (FAO) **(2001) Proceedings of Sub-Regional Expert Consultation on "Urban and Periurban Horticulture in South-African Countries". Stellenbosch, South Africa. January 2001.**

food security and nutrition horticulture
Southern Africa; horticulture; Malawi; Zimbabwe; South Africa; Botswana; Tanzania; Namibia; Mozambique

The papers of this expert consultation on urban agriculture, focusing on horticulture in Malawi, Zimbabwe, South Africa, Botswana, Tanzania, Namibia, and Mozambique. Three discussion groups were organised on Opportunities and Constraints; Assessment of Project Profiles on selected countries; and Training Needs and Methodologies.

Freeman, Donald B. **(1991). A city of farmers: informal urban agriculture in the open spaces of Nairobi, Kenya. McGill-Queen's University Press, Montreal; 159 p.**
horticulture city ecology
Kenya; land use; land tenure; informal sector; food security

This book – one of the first commercial publications on urban farming - presents a review of urban agriculture in Kenya over the past century. It reports on a 1987 six-city survey of urban food production and consumption. And it reports on a central Nairobi metro survey of who farms what, where. It defines the benefits of this activity from several points of view. It provides a good tool for future researcher due to its extensive tables, maps, and references. (JS)

Funes Monzote, Fernando **(199?). Cuban agricultural alternatives: an overview of Cuba's experience in organic agriculture. 14 p. Pastures and Forages Research Institute (IIPF); Cuban Association of Organic Agriculture (ACAO), Apartado Postal 4029, CP 10400, Ciudad de la Habana, Cuba**
horticulture
organic agriculture; Cuba; biological control; food production systems; integrated farming systems

Provides a historical overview of agricultural development in Cuba from the perspective of organic agriculture. The state of the art of integrated farming systems, biological pest control and other issues are presented. Possibilities and approaches to encourage new strategies for the support of an organic model at national level are presented. (NB)

Furedy, Christine **(1998). Appropriate technology for urban wastes in Asia: avoiding past mistakes. In: Biocycle (July 1998) p. 56-59**
wastewater reuse horticulture
urban wastes; Asia; appropriate technology, case studies

Compost-making is widely considered as a suitable way of reducing solid waste disposal problems but has become controversial in Asia as it is mostly based on waste treatment in complicated mechanical plants. Though these are easy to

administer for municipalities with relatively few parties involved, they are often built without proper cost-benefit studies, and perform badly as a consequence. When looking, however, at composting taking place in community settings, one comes across flourishing composting systems. Among the many examples cited in this highly interesting article, we mention here the garbage farms in Calcutta, described as a model for community-based approaches to composting. Here, the wastes are used in situ, with a host of waste pickers sieving through the materials plots of mature dump land are leased out, thus avoiding the costs and complications of transportation, at the same time giving rise to a flourishing vegetable production on the dump sites. Apart from such economic or ecological arguments there is the argument of employment: an estimated 20,000 people find work as a result of this intensive farming. (WB)

Garden to kitchen newsletter**. Family Food Production and Nutrition Project, Unicef Pacific Operations, c/o UNDP, Private Mail Bag, Suva, Fiji**
food security and nutrition horticulture
Pacific Islands; children; malnutrition

This quarterly targets the Pacific Islands, contains interesting assorted information about homegardening in the pacific setting. The few issues in our possession report about pest control, country profiles, cultivation techniques, news from the field, malnutrition related diseases, and so forth. (WB)

Garnett, Tara **(1996). Farming the city: the potential of urban agriculture. In: The Ecologist vol. 26 no. 6 p. 299-307**
city ecology horticulture
home gardening; allotment gardens; political aspects; United Kingdom

Describes urban agriculture in Great Britain, primarily allotment gardens, of which there are around half a million in Britain nowadays. In spite of the fact they are thriving, with long waiting lists, allotment gardens are under heavy threat from urban development schemes. There is a highly interesting description of the rise of the allotment movement in Britain, as a result of political considerations. (WB)

Gavrilov, Alexander **(1997). Rooftop gardening in St. Petersburg, Russia. Urban Agriculture Notes on: http://www.cityfarmer.org/russiastp.html#russiastp. 3 p. Center for Citizen Innitiatives, St. Petersburg, Russia**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture food security and nutrition
rooftop gardening; home gardening; St. Petersburg; Russia

The Rooftop Gardening Program in St. Petersburg started in 1993. This short article gives facts and figures and describes some of the techniques used in the project. The project achieves much impact with citizens despite a complete lack of interest from city administration. (WB)

Gbadegesin, Adeniyi **(1991). Farming in the urban environment of a developing nation: a case study from Ibadan metropolis in Nigeria. In: The Environmentalist vol. 11 no. 2 (1991) p. 105-111**

horticulture city ecology

Nigeria; Ibadan; surveys; food security; urban poor

Reports on a survey among 800 part-time or full-time farmers in the urban fringe of Ibadan. Results showed well-known considerations such as reducing people's expenses on food and supplementing the family's income. Major threat was reported to be competition from non-agricultural land uses. The article describes characteristics of the urban farming system in Ibadan, in which the proportion of crops grown for staple is high. Interestingly, roughly half of all those who had been approached to sell their land, had turned down this offer (though the article does not give information about prices offered). (WB)

Gockowski, J**. Intensification of horticultural production in the urban periphery of Yaoundé. Agriculture périurbaine en Afrique subsaharienne p. 63-79**

rural-urban linkages horticulture

Yaoundé; Cameroon; periurban agriculture; surveys; farming systems

Population growth of more than 6%, proximity to the largest urban centre and high rural population densities all contributed to intensification and diversification in Beti farming systems around Yaoundé. A random survey of 208 households in 16 villages 12 to 90 km from Yaoundé was conducted. Sixty-five % of the households interviewed adopted an intensive monocrop horticultural system with on average 3 monocrop fields per adopting household. They maintained roughly the same number of traditional field-systems as non-adopters, indicating an increased mobilisation of labour and increased tomatoes, okra, sweet green and hot peppers. Pests and diseases were cited most frequently as the major agronomic constraint. Variation in market access resulted in significant price differentials as a function of distance to market. The valuable genetic diversity in local land races of tomatoes and the indigenous West African okra is in danger of being lost. Many indigenous leafy vegetables are very important particularly to the urban poor. These crops have largely been neglected by research with the same risk of genetic erosion as farmers turn to cabbages and tomatoes. Rootknot nematodes were the most cited problem among commercial producers. Efforts to develop improved fallows at IITA and elsewhere need to focus on the impact of fallow species on cyst populations. Given the lack of resources at the disposal of public research instates results should be shared through regional organisational frameworks. (NB - Abstract adapted from original)

Gonsalves, JF; Arizala **(1986). The bio-intensive approach to small-scale household food production. IIRR & UNICEF, Silang Cavite Philippines, illustrations, tables**

horticulture services
household gardening; bio-intensive horticulture; poverty; gender; ecology; nutrition; integrated pest management; waste recycling; composting

This is a packet of 20 educational one to six-page items that constitute the substance of a short course. They present the concept of biointensive horticulture practice and specific methods for specific crops. (JS)

Gonzalez Novo, Mario; Murphy, Catherine **(2000). Urban agriculture in the city of Havana: a popular response to a crisis. In: Growing cities, growing food: urban agriculture on the policy agenda, p. 329-347. DSE, GTZ, CTA, SIDA**
horticulture food security and nutrition
food security; food policy; land use systems; health; ecology; economic impact; gender; urban policies; reuse of waste; poverty; land tenure; environmental regulation; hydroponics; Havana; vermiculture; biopesticides; biodiversity; reforestation; Cuba

Havana probably offers the most successful example for which the concept of urban agriculture was applied as a response to a food crisis, not only by individuals, but also as a government-supported strategy. The main idea of urban agriculture in Havana is “Production by the neighbourhood, for the neighbourhood”. In general it is an intensive high input, high output system. There are many different forms of urban farming: (a) popular gardens, (b) basic production co-operative units with about 10 to 15 members, (c) state farms (d) individual farms (e) co-operative supply units. The organopónics and intensive gardens, which work well in the urban setting, are important in the total production. The government made land available for farming providing secure land-use rights and there are a number of regulations concerning urban agriculture e.g. on the use of pesticides. There is a large network of support services for producers and direct marketing by the producers has been facilitated. Urban agriculture increased the diversity of crops and had a dramatic impact on the deteriorating food situation in Havana. Overall 117,000 people work in jobs related to urban agriculture. Waste is recycled though urban agriculture a reforestation programme started and urban agriculture has become an important element in urban development and different departments co-operate in improving the impacts of urban agriculture. (NB)

Gough, Robert E; Barclay Poling, E **(eds) (1997). Small fruits in the home garden. 272 p. ISBN 1_56022_057_0 (pbk). USD 24.00**
Supplier: Food Products Press, c/o Haworth Press, 10 Alice Street, Binghamton, NY 13904-1580, USA
horticulture
fruit culture; home gardening

A technical guide to growing and harvesting small fruit in home gardens. Species presented are for temperate zones (with the exception of grapevines). (WB)

Grand-Pierre, Reginald **(1993). Preliminary investigations: periurban agriculture in Port au Prince.**
horticulture
Haiti; periurban agriculture; food processing

This is a short sub-sector analysis of urban agriculture in a Caribbean city. Fourteen sub-sectors are defined and potentials for each projected. (JS)

Groening, Gert; Wolschke-Bulmahn, Joachim **(1995). Ein Jahrhundert Kleingartenkukture in Frankfurt am Main. Frankfurt: W. Kramer & Co. 311 p.**
horticulture community development
allotment gardens; leisure gardens; policy; organisation; food security; community greening; Germany

“One hundred years of community gardening in Frankfurt” is a special history book about urban agriculture in good times and not so good times. It provides a depth of written and visual history not provided in any other book. (JS)

Groening, Gert **(1996). Politics of community gardening in Germany. In: Urban Agriculture Notes on: http://www.cityfarmer.org/german99.html#german, 16 p. Supplier: City Farmer, Canada's Office of Urban Agriculture**
community development horticulture land use planning
community gardens; Germany; municipal policies

Gives quantitative data about community gardening in Germany and highlights difficulties in obtaining urban land for small gardens in Berlin, Germany. The paper examines implications of zoning law in Germany. There is an interesting historic overview of community or allotment gardens and their contribution to community development. (WB)

Gura, Susanne **(1996). Vegetable production: a challenge for urban and rural development. In: Agriculture + Rural Development, vol. 3 (1996) no. 1, p. 42-44 Supplier: Technical Centre for Agricultural and Rural Cooperation (CTA); Deutsche Stiftung fuer Internationale Entwicklung / Zentralstelle fuer Ernaehrung und Landwirtschaft (DSE/ZEL); Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ)**
horticulture food security and nutrition
vegetable production; consumption patterns; nutrition; farming systems

Vegetables play an important role in food security. Vegetable production has been mostly concentrated on species with a high market value. However, the poor usually can't afford these types of vegetables. Urban poor mainly consume leafy vegetables which wither quickly. Urban agriculture can play an important role to increase this production. Three systems of production are distinguished: urban shifting cultivators,

household gardeners and periurban market producers. It is argued that these systems need development support for land saving technologies, improved recycling of waste, recycling technologies and urban community development approaches and interdisciplinary approaches. (NB)

Hargesheimer, Ken**. Urban agriculture: gardening, market gardening, mini-farming, mini-ranching. Gardens / Mini-farms Network, Lubbock, TX, USA**
horticulture economic impact rural-urban linkages
home gardening; gardening techniques; urban livestock production; youth; United States

Focuses on the potential of various forms of urban agriculture, notably from the perspective of an opportunity for youth employment. Much of this paper is a mapping of production techniques. In addition, a condensed overview is given of important publications and suppliers' addresses, for the American market. (WB)

Holl, Annegret **(1998). Urbane Landwirtschaft in Havanna (Kuba) zwischen staatlicher Planung und 'moviemento popular'. 90 p.**
food security and nutrition community development hydroponics
Havana; Cuba; home gardening; community gardens; food security; agricultural markets; commodity-oriented agriculture

Urban agriculture in Havana is considered by many authors as an essential contribution to Cuban food security, is very much instigated by the state and now covers over 6,000 hectares within the city boundaries. This paper reports on a fact-finding trip examining if urban agriculture in Havana is as successful as is often claimed. Doing a survey to that effect revealed itself difficult in the current political setting. The author highlights existing discrepancies from state regulations, more particularly with regard to the composition of crops produced: many citizens go for staple food production rather than vegetables. The paper concludes that the contribution of urban agriculture to food security is less than what is often reported and certainly not enough to feed Havana. Also, rural production should be much more directed towards the internal Cuban market. A refreshing look at things which are so often just taken for granted and therefore an important contribution paper. (WB)

Holmer, Robert J; Schnitzler, Wilfried H **(1999). Urban and periurban small and medium-sized enterprise development for sustainable vegetable production and marketing systems: Vietnam, Laos and Philippines. Urban Agriculture Notes http://www.cityfarmer.org/laos.html. 5 p. Periurban Vegetable Production Project (PUVeP), Xavier University College of Agriculture, PO Box 78900, Cagayan de Oro, Philippines**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture economic impact services
vegetable production; Vietnam; small- and medium-sized enterprises; Laos;

Philippines

Gives a description of the Urban and Periurban Small and Medium-Sized Enterprise Development for Sustainable Vegetable Production and Marketing Systems. The project is implemented in Vietnam (Ho Chi Minh City), Laos (Vientiane) and the Philippines (Cagayan de Oro). The project aims to facilitate small and medium sized enterprises in South-East Asia with access to the market by developing socially, economically and ecologically sustainable vegetable production systems. (NB)

Holmer, Robert J. **(2001) Appropriate Methodologies for Microenterprise Development in Urban Agriculture. Paper for the workshop "Appropriate Methodologies for Urban Agriculture", October 2001, Nairobi, Kenya. Proceedings, available On: www.ruaf.org. A shortened version is taken up In: *Urban Agriculture Magazine*, no 5, Appropriate Methodologies for Urban Agriculture, December 2001, RUAF, Leusden The Netherlands.**

R&D Methodology horticulture services

micro enterprise; informal sector

Much of the developing countries' rapidly growing population forms part of the economy that lies outside the regulatory framework of governments in what is known as the informal sector. Although the definitions vary according to the country context, it is generally agreed that the informal sector, whether rural or urban, comprises small and micro-enterprises producing and distributing basic goods and services in unregulated, but competitive markets. This paper reviews available literature and the contributions to the workshop.

Hoogerbrugge, ID; Fresco, LO **(1993). Homegarden systems: agricultural characteristics and challenges. IIED Gatekeeper series no. SA39. 23 p. Department of Agronomy, Wageningen Agricultural University (WAU), PO Box 341, 6700 AH Wageningen, The Netherlands**
Supplier: International Institute for Environment and Development (IIED), 3 Endsleigh Street, London WC1H 0DD, UK

horticulture

Asia; cultivation; family labour; home gardening; labour; land use; marginal land; population density; small-scale agriculture

In the humid tropics only two systems of traditional, low input farming have evolved under high conditions of high population densities: wet rice cultivation and homegardening. Much is known about wet rice systems but surprisingly little about homegardens. Homegardens are defined as 'small scale, supplementary food production system by and for household members that mimics the natural, multi-layered ecosystem'. This paper discusses many sources of 'informal' or 'grey' literature on agronomic aspects of homegardens, including several unpublished field observations. It aims to increase the understanding of the homegardens flexibility in the light of changing conditions in Southeast Asia and discusses its applicability and potential for increasing food security in certain parts of Africa and Central America.

(RV)

Howorth, Chris; Convery, Ian; Majani, Bituro **(1995). Feasibility study of urban horticulture in Dar es Salaam. 31 p. Natural Resources Institute (NRI), Central Avenue, Chatham Maritime, Kent ME4 4TB, UK**
Supplier: ETC(UK)
horticulture economic impact
Tanzania; economic impact; political aspects

Gives an overview of the urban agriculture situation in Dar Es Salaam. The report provides figures about cost and benefits of urban and periurban farming. A number of other issues are also discussed: local authority perception of urban farming, water and land supply, urban waste management, composting and recycling. Different projects for the promotion of urban horticulture undertaken in the Dar Es Salaam area are briefly described. (WB)

Ignacio, NG **(1994). Resettle and survive. In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 18. International Institute of Rural Reconstruction (IIRR), Silang, Cavite, Philippines**
Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands
land use planning horticulture
home gardening; Philippines; small-scale agriculture; urban communities; urban development; urban environment; urban population; vegetables

Urban populations in developing countries are growing fast. It's expected that by 2025, urban centres in the developing world will be home to some four billion people, a figure equal to the world's total population in 1975 (World Resources 1994). Rapid population growth and urbanisation are straining resources. Shelter, sewerage, clean water and even the most basic of amenities, food, are at a premium and malnutrition is endemic. (ILEIA)

International Institute of Rural Reconstruction (IIRR)**. Urban agriculture issues: case study of DBB (Dasmarinas Bagong Bayan) Project. 6 p. International Institute of Rural Reconstruction (IIRR), Silang, Cavite, Philippines**
horticulture
Philippines; development projects; resettlement projects; home gardening

Describes the Dasmarinas Bagong Bayan Project, a major semi-urban resettlement project south of Manila. In order to boost low incomes of recent settlers, the Philippine government encouraged the development of a semi-commercial bio-intensive gardening project among just over 50 growers. (WB)

Jacobi, Petra **(1997). Importance of vegetable promotion in Dar es Salaam, Tanzania. 15 p. Urban Vegetable Promotion Project (UVPP), PO Box 31311, Dar es Salaam, Tanzania**

horticulture economic impact services

Tanzania; agricultural production systems; economic analysis; marketing

Urban agriculture in Dar es Salaam involves a large proportion of the city population, Therefore, the city has been of major interest for research undertaken in this area for many years. The Urban Vegetable Promotion Project, started in 1993, deals with the different production systems of vegetables in and around Dar es Salaam. Three major production systems are determined: periurban production, open space system and homegarden production. The report gives useful information about the number of people engaged in gardening, different cropping patterns and cultivars used, cultivation periods, and approximate yield. It is argued that the different production systems all occupy a specific niche with regard to vegetable production and consumption in Dar es Salaam. (WB)

Jacobi, Petra ; Amend, Jörg; Kiango, Suzan (1999). Farming in the city: Vegetable production in Tanzania. In: Gate: Technology and Development no. 2 (April-June 1999) p. 14-20

horticulture food security and nutrition

Tanzania; vegetable production

Dar es Salaam is a good example of the potential of urban farming. Besides cattle raising, vegetable production is the most prominent activity, with a clear focus on leafy vegetables. The reasons are: a huge demand, it can be grown throughout the year, there are pest resistant crops, investments are reasonable, certain crops can be picked continuously and competition from outside the town is minimal. The authors conclude that urban farming creates jobs and income, reduces household spending, maintains green space and contributes to reusing organic waste. More and more stakeholders acknowledge the importance of urban agriculture in Dar es Salaam. An extended version of the article can be found in 'Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda' published by DSE. (NB)

Jacobi, Petra; Amend, Jörg; Kiango, Suzan (2000). Urban agriculture in Dar es Salaam: providing for an indispensable part of the diet. In: Growing cities, growing food: urban agriculture on the policy agenda, p. 257-283. DSE, GTZ, CTA, SIDA

horticulture food security and nutrition

vegetable production; dairy farming; community gardens; food security; land use systems; health; ecology; economic impact; gender; urban policies; reuse of waste; poverty; Tanzania

Homegarden production, Livestock production in homesteads, community gardens, open space production, and periurban production in Dar es Salaam are discsussed. Perishables (milk, leafy vegetables) are produced in intraurban areas the periurban area supplies a mix of perishables and staples (maize, rice a.o.). More than 90% of

leafy vegetables come form opens spaces and home gardens while 60% of the milk is produce in urban and periurban areas. Urban farming contributes to the maintenance of green open spaces, improving the micro climate and preventing illegal dumpsites. The different production systems contribute considerably to family income. There is a strong link between the socio-economic status of a family, the objective of the production and the involvement of women. “Female agriculture” contributes more to the household. Urban agriculture is affected by, access to resources (water), insecure land-use titles, the unsatisfied demand for fresh food especially green leafy vegetables. Level of organisation is low and urban retail poses problems. Urban agriculture has received attention on various policy levels. Its recognition is reflected in several laws and regulations. It is expected to keep its importance especially for the urban poor. (NB)

Jacobi, Petra. and Kiango, Suzan. **(2001) Ways to monitor & evaluate Urban and Periurban Agriculture – Experiences from Dar Es Salaam, Tanzania. Paper for the workshop "Appropriate Methodologies for Urban Agriculture", October 2001, Nairobi, Kenya. Proceedings, available On: www.ruaf.org. A shortened version is taken up In: *Urban Agriculture Magazine*, no 5, Appropriate Methodologies for Urban Agriculture, December 2001, RUAF, Leusden The Netherlands.**

R&D Methodology land use planning horticulture

Tanzania; monitoring and evaluation; participatory monitoring; indicators

In Tanzania urban and peri- urban agriculture is a well-known activity and it has reached the level of official acceptance. Systematic monitoring and evaluation as well as channelling generated information and feedback from the field to the relevant levels has supported this acceptance. In the discussion about participatory M&E against conventional M&E it appears that the former should replace the latter. It is argued in this paper that there should be a balance to be struck between “conventional” and “participatory” monitoring. There should be both “hard data” and a system that allows primary stakeholders to monitor and evaluate their activities using different methods and own indicators. Truly appropriate monitoring and evaluation should enhance internal learning and provide evidence to support qualitative statements about the impact of an action.

Jansen, Hans GP **et al (1995). Sustainable periurban vegetable production and natural resources management in Nepal: results of a diagnostic survey. AVRDC, Taiwan; 40 p.**

horticulture

irrigation; marketing; agricultural extension; economics; Nepal

This report is concerning a diagnostic survey of vegetable production in three districts of the Katmandu valley, daily delivery to the city markets. A good analysis is done of annual cropping patterns and methods of production. The economic analysis leads to a set of recommendations leading to increased production. (JS)

Jeavons, John **(1974). How to grow more vegetables than you ever thought possible on less land than you can imagine. Palo Alto, CA: Ecology Action of the Peninsula. 81 p.**

community development horticulture

history; composting; biodynamic gardening; vegetable crops; integrated pest management

This book has continued to be updated and reissued until recently. It is a manual of biodynamic raised-bed horticulture, a history, a philosophic statement and a vision. At its core are methods developed in the Marais in Paris in the 1890s, to which were added the biodynamic techniques of Rudolf Steiner in the 1920s. Alan Chadwick integrated biodynamic and intensive farming in the 1940s and brought them to California in the 1960s. This book reports on results and methods carried out at the University of California at Santa Barbara, on the basis of Chadwick's lessons. (JS)

Karaan, M. **(2001), Urban Horticculture in the Cape Metropolitan Area: An Appraisal of Activities and Institutional Support. Department of Agricultural Economics, University of Stellenbosch. In: Proceedings on the Sub-Regional Expert Consultation on the Use of Low Cost and Simple Technologies for Crop Diversification by Small Scale Farmers in Urban and Peri-Urban Areas of Southern Africa, Stellenbosch, South Africa, January 15-18 2001.**

urban horticulture

institutional support; horticulture; urban areas; South Africa,

This paper reports on research done to evaluate the contribution if urban agriculture to the livelihoods of recently urbanised people in the Cape Town Metropole. The study emanated from an evaluation of non-government support to promote urban agriculture and hence is also an appraisal of the effectiveness of NGO support. The NGO under evaluation was Abalimi Bezekhaya. The investigation is specifically an evaluation of people's motivations for engaging in urban farming, the efficiency of such activity and the effectiveness of existing support structures. First, a brief background of the study area is sketched, followed by a concise history of Alabimi Bezekhaya. The analysis that follows is specifically an assessment of motivations, production costs and support measures. A short account is also given of recent efforts by local authorities to cater for urban agriculture. Conclusions and recommendations follow.

Kalumba, KV **(19??). Ten case studies of small-scale gardening in the Thornpark / Villa Elisabetta area of Lusaka. In: In the shadow of Lusaka (source unknown) p. 37-45**

horticulture

home gardening; Zambia; surveys

Paints a picture of the typical Lusaka urban gardener and infers general conclusions about the gardener's position vis-à-vis city authorities and about his attitude towards poverty and how to cope with it. (WB)

Kiango, Suzan and M.E. Nzalawahe **(2001), Urban and Peri Urban Horticultural Production in Tanzania. Ministry of Agriculture and Co-operatives, Dar es Salaam, Tanzania. In: Proceedings on the Sub-Regional Expert Consultation on the Use of Low Cost and Simple Technologies for Crop Diversification by Small Scale Farmers in Urban and Peri-Urban Areas of Southern Africa, Stellenbosch, South Africa, January 15-18 2001**

urban horticulture

Tanzania; urban areas; periurban area; horticulture, Africa (Eastern)

In Tanzania, high urban growth rates with limited formal employment have meant a mushrooming of all kinds of informal employment. Here, urban agriculture is one of the important informal activities, as it provides income to a cross section of the urban population. It contributes to the city economy, as it is an industry in itself that includes production and marketing activities. It has proved to be one of the survival strategies for all social classes to cope with the declining standard of living. It provides and increases access to high value food for relatively poor urban dwellers. Wide ranges of ethnic groups participate in urban agriculture. Some background in horticulture and limited formal employment is the major reason for a farmer to engage in urban agriculture. The farmers represent the average working population (50-60% in the ages of 20-40). Men and women both participate: men are more active in open space production while women are responsible for home gardening in high-density areas. Availability of intra-urban land and a variety of water sources favour urban agriculture. However, land tenure, illegal land use and insecurity of land use limits long term investment in these open spaces. On the other hand, acces and reliability of water supply plays a major role in the size and duration of production. In some areas, low surface water quality and high rates of water bills limit production. The nature of urban agriculture offers opportunities for nutrient recycling from one production system to another. Composting of organic wastes contributes to the availability of inputs, especially manure, and benefits the city environment. Informal land acquisition gives equal chance on access to land to both genders. Acces to formal credit to subsistence producers appears to be difficult while capital investment in peri urban areas could play a significant role. Furthermore, a variety of recommendations looking at different institutions as well as follow up activities are highlighted.

Kleer, Jerzy **(1987). Small-scale agricultural production in urban areas in Poland. In: Food and Nutrition Bulletin vol. 9 no. 2 (1987) p. 24-28. University of Warsaw**

food security and nutrition horticulture

home gardening; allotment gardens; agricultural production; Poland

Contains a historic overview of small-scale food production in Polish towns and cities. One interesting figure: in the mid-1980s, total output from allotment gardens accounted for over 6% of total agricultural production in Poland. (WB)

Knierim, Andrea **(1996). Agricultural development potential around Dolisie in the**

Congo: a case study in the catchment area of a small town. In: Agriculture + Rural Development vol. 3 (1996) no. 2 p. 51-54
Supplier: Technical Centre for Agricultural and Rural Cooperation (CTA), PO Box 380, 6700 AJ Wageningen, The Netherlands; Deutsche Stiftung fuer Internationale Entwicklung / Zentralstelle fuer Ernaehrung und Landwirtschaft (DSE/ZEL)
economic impact horticulture rural-urban linkages
Congo; periurban agriculture; socio-economic aspects

Examines the potential of periurban agriculture around the city of Dolisie in the Congo. Technical issues are addressed, but also who are the target groups for agricultural innovations and intensification activities. In this analysis, a distinction is made into 3 agricultural circles in and around the town: (1) lots within the town and around its fringes; (2) areas within a radius of 10 to 15 kilometres; (3) villages in a radius of up to 50 kilometres. All 3 different circles are farmed by different groups of producers. (WB)

Kogi-Makau, Wambui **(1998). Production and utilization of vegetable (sic) and fruits in two urban sites in Dar es Salaam: a case study in Mbuyuni and Manzese, Dar es Salaam, November 1995 to November 1996. 74 p. Urban Vegetable Promotion Project (UVPP), PO Box 31311, Dar es Salaam, Tanzania**
horticulture services
household survey; Tanzania; consumption patterns; home gardening; marketing

Presents the results of a household survey in two areas of Dar es Salaam. Data are given on acquisition and consumption patterns of vegetables and fruits and on production and utilisation of agricultural produce. (WB)

Koizumi, M; Abbas, D; Stares, J **(2000). AVRDC report 1999. Asian Vegetable Research and Development Center Publ. No. 300-503, 152 p.**
horticulture
vegetables; Asia; Africa; Central America; nutrition; periurban agriculture; composting

This research report is full of data from Asia, Central America and Africa. Program II *Year-round vegetable production systems* includes: (i) a significant degree of data and reportage on periurban food production, (ii) its socio-economic impact, (iii) the nutritive value of policy interventions, and (iv) municipal composting. Its 134 tables are an essential resource to be up-to-date on the advance of research in vegetable production technology. (JS)

Kouvonou, FM; Honfoga, BG; Debrah, SK **(1999). Sécurité alimentaire et gestion intégrée de la fertilité des sols: contribution du maraîchage périurbain à Lomé. In: Agriculture urbaine en Afrique de l'Ouest: une contribution à la sécurité alimentaire et à l'assainissement des villes = Urban agriculture in West Africa:**

contributing to food security and urban sanitation / Olanrewaju B. Smith (ed.), p. 83-103. Institut International pour la Gestion de la Fertilité des Sols - Afrique
horticulture
vegetable production; nutrition; income generation; soil fertility management

Vegetable production can be a good example of integrated soil fertility management. Vegetable production benefits from stable markets and accessible inputs. The average net monthly income of vegetable production is relatively high. Production is sensitive to the use of organic and inorganic fertilisers. (NB)

Kropotkin, Peter **(1985). Fields, factories and workshops. Tomorrow Freedom Press First published in 1890, 199 p.**
horticulture
periurban agriculture; market gardening; environment; organic agriculture; bio-intensive production; Europe; history

This reissue of a classic work serves as a background to understanding the beginnings of modern urban agriculture in the mid-19th century. It thus assists us in perceiving the possible future of sustainable urbanization. (JS)

Kuiler, Esther **(1998). Toekomstperspectieven voor biologische stadslandbouw in Nederland: stadslandbouw als onderdeel van de urbane bosbouw. AV no. 98-07. 72 p. Departement Omgevingswetenschappen, Sectie Bosbouw, Agricultural University Wageningen, The Netherlands**
horticulture urban forestry rural-urban linkages
landscape design; urban livelihoods; biological agriculture; home gardening; Netherlands

Looks at urban agriculture from the livelihood point of view and examines its contribution to creating an attractive urban landscape in the setting of The Netherlands. In Dutch. (WB)

Lanting, H., M.S. Rao and K. Ravi **(2001), Tomato: A Field Guide to Ecofriendly Crop Protection.**
Supplier: Bangalore: Agriculture Man Ecology (AME) AME, 368, ath Cross, JP Nagar 3rd Phase, Bangalore 560 078, Karnataka, India
urban horticulture
India; pest management; vegetable production; vegetables; organic agriculture

This is an illustrated handbook of insect pests and diseases most commonly found in the tomato-growing regions of India. This book aims to promote organic plant protection practices. It does not aim to cover all the other aspects of organic tomato farming, but encourages adoption of many useful organic plant protection practices through minimal use of chemicals. For each important insect pest, disease or nematode, the reader will find recommendations and strategies for appropriate biocontrol, and simple instructions for the preparation of bio-inputs.

This guide is primarily intended for tomato growers in India and their service groups - agricultural extension workers, farm managers, horticulturists, agronomists, tomato processing units, agro-input manufacturers and seed companies. Its main objective is to serve as a quick reference tool for effective and ecofriendly management of the more economically important and prevalent pests of tomato in India.

Lahr, PF; Lehen, CC **(1989). Techniques and resources for fast growing hot weather vegetable gardening in Port-au-Prince, Haiti. ECHO (Educational Concerns for Hunger Organization) North Fort Myers, Florida. 49 p.**
horticulture
Haiti; Caribbean; small-scale agriculture; irrigation; composting; vegetables

This is a useful manual for many tropical urban areas. It includes 15 Appendices on how to do it. Eight specific types of gardens are described. (JS)

Lawrence, Joseph **(1999). Urban agriculture: the potential of rooftop gardening. Urban Agriculture Notes http://www.cityfarmer.org/roofthesisIntr.html. York University, North York, Ontario, Canada**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture
rooftop gardening

This elaborate thesis explores rooftop gardening based on the author's experience. Practicalities like farm layout, crop selection as well as analyses on economic potential and other issues are presented. (NB)

Lewis, Ingrid U **(1996). The promotion of traditional vegetables: examples from Africa. In: Agriculture + Rural Development vol. 3 (1996) no. 1 p. 48-49**
Supplier: Technical Centre for Agricultural and Rural Cooperation (CTA), PO Box 380, 6700 AJ Wageningen, The Netherlands; Deutsche Stiftung fuer Internationale Entwicklung / Zentralstelle fuer Ernaehrung und Landwirtschaft (DSE/ZEL)
horticulture
Africa; traditional vegetables; nutrition; conservation; gender issues

There has been a drastic decline in the use of traditional vegetables in the world. In the framework of the Urban Vegetable Promotion Project in Tanzania, research was conducted into the scope for restoring traditional strains of vegetables to the position of importance which their nutritional value merits. Improvement, distribution and in-situ conservation are discussed. This seems a very praiseworthy initiative in which there is much scope for community involvement, especially of women. (WB)

LifeSpin **(1997). Pocket-sized Farms - kid's garden book. LifeSpin. On: www.execulink.com/~life/**
community development horticulture

youth; education; organic gardening

Organized around the seasons the book is designed for children to use as members of a school garden club or in their own backyards. The book uses two fictional characters, the Crow and the scarecrow, in a rhyming story format to guide children through a series of important organic gardening principles. It is intended both as a source of inspiration and a learning opportunity for children. A second part of a package *Teacher's and Parent's Guide to Organic Gardening,* includes organic gardening advice, a number of educational activities, and specific tips for gardening with young kids. A third component is *The Kid's Workbook* – (JS)

Loraine, Isabelle **(1994). Agriculture in the non-urban areas of Melbourne Region. Government of Victoria, Australia.**
horticulture
periurban agriculture; Australia; urban planning; environment

This is an exceptional comprehensive analysis of periurban agriculture in a temperate climate. Its focus is urban planning and urban development strategies. The elements analyzed include: (i) land values, (ii) agricultural production and marketing, (iii) environmental impacts, (iv) recreation, natural resource conservation, (v) comparisons to France and the USA, (vi) comparisons of metropolitan sub-regions. In all a model worthy of considering when setting out to do an agricultural metropolitan study. (JS)

Losada, Hermenegildo **(et al.) (1998). Urban agriculture in the metropolitan zone of Mexico city: changes over time in urban, suburban and periurban areas. In: Environment and Urbanization vol. 10 (1998) no.2 p. 37-54**
horticulture food security and nutrition
urban livestock; ornamental plants; urban farming systems; environment; environmental pollution; urban planning; land tenure; cultural aspects

The paper describes the scale and nature of agricultural production in Mexico City, according to the different zones defined and how these have adapted to the changing demands from urban populations for food, wood and recreation. Evidence is provided that agriculture has successfully adapted its products and production methods to the changes, which include a deteriorating environment and lack of government support. The producers developed ways to use degraded land and use large volumes of waste in the production process. Its is argued that appropriate support for the diverse urban agricultural production comes with many ecological advantages and creates new jobs. However this also requires important changes in the ways city authorities manage urban expansion. (NB - Abstract adapted form from summary)

Losada, Hermenegildo **et al (1999). Assessing the sustainability of a periurban agroecosystem: the terraced production of Nopal-vegetable (Opuntia ficus**

indica) in Milpa Alta, Mexico City. (Unpublished). Universidad Autonoma Metropolitana-Iztalpalapa, Mexico DF, 29 p.

horticulture

Mexico; sustainable agriculture; farmers' organisations; economics

This study report presents a phenomenal growth of the production of Nopal (edible cactus) within a large metropolitan area by four items in 15 years. It studies this urban agriculture success story from several points of view and comes to a positive conclusion. (JS)

Madisa, M.E. and D.L. Keboneilwe **(2001), Urban and Peri-Urban Horticulture in Southern African Countries: Status of Urban and Peri-Urban Agriculture in Botswana. Department of Agricultural Research / Division of Agricultural Planning and Statistics, Paper prepared for the Sub-Regional Expert Consultation Meeting on Urban and Peri-Urban Horticulture, University of Stellenbosch, Cape Town, South Africa, January 2001**.

urban horticulture

horticulture; urban areas; periurban area; Botswana, Africa (Southern)

The contribution and performance of the horticultural subsector in Botswana continue to pose a great challenge to government, particularly the Ministry of Agriculture. Whilst physical and climatic factors that constrain the productivity of the sector cannot be ignored, the infancy of the horticulture as an industry need to be acknowledged. Horticultural farming that includes products such as cabbage, carrots, tomatoes, etc. is not part of the traditional farming systems. However, as socio-economic and demographic changes set in, urban and peri-urban agriculture has become increasingly relevant, particularly in the midst of unemployment, food insecurity and poverty. As government policy strives to improve quality of life for all people, diversification of agricultural production base has been adopted. The National Masterplan for Agricultural Development (NAMPAD) has also identified the need to better plan agricultural production zone as well as putting sewage water and contaminated well fields and dams to productive use. This will go a long way in addressing unemployment, waste management and food security problems in urban and peri-urban centers. There is, however, a need to develop a public policy that can ensure the integration and sustainability of urban and peri-urban agriculture in urban and peri-urban centers. Furthermore, low-cost technologies and training on horticultural skills will need to be developed.

Marsh, R **(1994). Nutritional benefits from home gardening. In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 14-15. Asian Vegetable Research and Development Center (AVRDC), PO Box 205, Taipei 10099, Taiwan; IICA, PO Box 55-2200, San Jose, Costa Rica**
Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands

horticulture food security and nutrition

Bangladesh; community health; home gardening; nutrition; nutritive value; urban communities; urban development; urban environment; urban population; vegetables

Seasonal hunger and malnutrition are ever-present conditions for the landless or near landless rural poor and urban slum dwellers. These groups are particularly vulnerable because of low and irregular cash incomes. In Bangladesh, as in other tropical countries, many such households use the small area around their house to grow food to supplement field crops, purchased food and generate income for households with access to markets. The pilot homegarden project of Helen Keller International (HKI) reported here has looked specifically at the impact of improved home gardening on the nutritional status and health of poor households. (ILEIA)

Marulanda C; Izquierdo J **(1991, 1998). La huerta hidropónica popular. FAO. On: www.rlc.fao.org/prior/segalim/prodalim/prodveg/10046.pdf.**
hydroponics
horticulture; training

This manual presents the step by step method of “popular hydroponic agriculture” as invented in Colombia in the 1980s. It uses illustrations and checklists. English and Portuguese versions available on paper at request. An audio-visual video training course, with nine classes, available in Spanish and Portuguese, (JS from authors)

Mbaye, Alain; Bon, Hubert de ; Pages, Jacques**. Vers une gestion concertée de resources naturelles en zone périurbaine: Le cas de la région de Dakar. Agriculture périurbaine en Afrique subsaharienne p. 125-139**
horticulture
Senegal; natural resource management; farming systems; water management

With increasing urbanisation and industrialisation the pressure on natural resources has increased. An analysis of agricultural production systems in the Dakar periurban region revealed substantial diversity, with a predominance of irrigated systems in the Niayes and Cape Verde areas. Urban agriculture faces several challenges: the deterioration and increasing scarcity of natural resources decreasing agricultural production with increasing food requirements, the development of periurban agricultural production and associated industries and the importance of horticultural and fruit production sector in the national economy. The paper focuses on the methods of water resource management and on activities of the "Centre pour le Développement de l'Horticulture" (CDH). After describing the impact of water availability on production systems and outlining a typology of farms, the main problems related to water availability are discussed. The CDH was set up to guide the development of market gardening in the Niayes region. Many innovations have been developed including pest management cropping schedules and monitoring marketing operations. TH CDH is to work on improving , diversifying and intensifying production, developing integrated systems, develop natural resource management techniques and develop decision making tools. (NB - abstract adapted form original)

Mbaye, Alain **(1999). Production des légumes à Dakar: importance, constraints et**

potentialités. In: Agriculture urbaine en Afrique de l'Ouest: une contribution à la sécurité alimentaire et à l'assainissement des villes = Urban agriculture in West Africa: contributing to food security and urban sanitation / Olanrewaju B. Smith (ed.), p. 55-66. Institut Sénégalais de Recherches Agricoles (ISRA), Centre pour le Développement de l'Horticulture (CDH)

horticulture

vegetable production; Senegal; production systems

Vegetable production in Dakar represents 40% of the national production. In Dakar there is strong pressure on available resources, which are rapidly degraded. Whereby urban vegetable production systems directly compete with non-agricultural urban needs. (NB)

Mbaye, Alain; Moustier, Paule **(2000). Market-oriented urban agricultural production in Dakar. In: Growing cities, growing food: urban agriculture on the policy agenda, p. 235-256. DSE, GTZ, CTA, SIDA**

horticulture

commercial agriculture; food security; food policy; land use systems; health; ecology; economic impact; gender; urban policies; reuse of waste; poverty; Senegal

The article defines urban agriculture as agriculture for which there is an alternative in the use of resources – one agricultural and an other non-agricultural. This generates competition but also possible complementarity. Five production systems are discussed: (a) family periurban vegetable production systems, (b) commercial periurban vegetable production, (c) specialised systems of poultry farming, (d) periurban systems of combined agriculture and poultry production, (e) backyard horticulture and livestock systems. The contribution of urban agriculture is substantial for vegetables and poultry. Cereals and tubers are of less importance. Organic waste is systematically used in farming. Dakar's principal site of agricultural production has an important function for drainage and erosion prevention. It is estimated that urban agriculture creates 15,000 jobs. There is no formal policy framework for urban agriculture, it is no priority in urban planning. This affects mainly small producers as they have insecure land use rights. The final part contains recommendations with regard to urban agriculture, the preservation of physical resources and in the area of collaborative efforts and information systems. (NB)

Mbiba, Beacon M **(1993). Urban agriculture in Zimbabwe: implications for urban poverty and management. The Making of Modern Africa Series. ISBN 1 85628 857 9. NLG 225.00. Department of Rural and Urban Planning, University of Zimbabwe, PO Box MP 167, Harare, Zimbabwe**

horticulture food security and nutrition

Zimbabwe; urban environment; urban development; development policies

The book is based on research conducted in Zimbabwe in 1991 and rejuvenated local interest on urban agriculture. In southern and eastern Africa, urbanisation is a major process transforming the economies. Most urban centres were lanned for

much smaller populations and they lack adequate formal sector employment for the growing workforce. As a result most urban environments are characterised by informal sector activities, of which urban agriculture is increasingly an important feature. While it acknowledges that the activity is a significant source of food and income for the urban poor, the book draws attention to development conflicts raised by the activity. The book places urban agriculture within the context of urban economy, urban management, and urban development also discussed are the gender dimension, environment institutional aspects. Lastly ways to develop urban agriculture to its full potential in Harare are explored. (NB)

Mbiba, Beacon M **(1999). Urban agriculture in Zimbabwe. Urban Agriculture Notes http://www.cityfarmer.org/zimbabwe.html. 2 p. Department of Rural and Urban Planning, University of Zimbabwe, PO Box MP 167, Harare, Zimbabwe Supplier: City Farmer, Canada's Office of Urban Agriculture**

horticulture food security and nutrition

Zimbabwe; poverty; income generation; food production

A summary of the book "Urban agriculture in Zimbabwe" by Beacon Mbiba. A table of contents is provided. The book adresses the phenomenon of urban agriculture in Zimbabwe. (NB)

Mbiba, Beacon M **(2000). Urban agriculture in Harare: between suspicion and repression. In: Growing cities, growing food: urban agriculture on the policy agenda, p. 285-301. DSE, GTZ, CTA, SIDA**

horticulture food security and nutrition

farming systems; food security; food policy; land use systems; ecology; economic impact; gender; urban policies; poverty; land tenure; legislation; Zimbabwe

Harare has several conditions favourable to urban agriculture including a relatively wet climate, large residential plot size and large open spaces in the city. Urban agriculture can be classified into on-plot agriculture, off-plot agriculture, and periurban agriculture. The collapse of the formal economy gives rise to urban agriculture. Most of the production is for subsistence. Whereby women provide the bulk of the labour and management inputs. This can be related to their traditional roles of food procurers. The official view is that urban agriculture poses a threat to the environment, but potential contributions to the environment remain unexplored. Existing policies swing between repression and tolerance, while urban agriculture is not perceived as a viable solution for food security or job creation. The general opinion is that there is ample rural land available for production, rather the problem is the inequitable distribution of land. Research and lobbying helped to create a basis for dialogue around the potential of urban agriculture. For this the target should be to increase food production and make it available, affordable and adequate through out the year. The challenge is to discover how the ambiguity of the legal framework can be used to extent urban agriculture. (NB)

Medellín Erdmann, Rodrigo A **(1995). Container farming: organic food production in slums of Mexico City. In: Gate (March 1995) p. 32-35**
hydroponics horticulture
Mexico

Reports on ANADEGES, a joint project by some 20 NGOs launched to help urban poor in Mexico City develop a capacity to produce food organically in backyards or on rooftops or balconies. Several techniques were introduced to increase production, mostly in relation to production and application of fertiliser. (WB)

Memon, Pyar Ali; Lee-Smith, Diana **(1993). Urban agriculture in Kenya. In: CJAS/RCEA (January 1993) p. 25-42. Mazingira Institute, Nairobi, Kenya**
horticulture food security and nutrition
food security; surveys; Kenya

Presents the results of a survey among urban farmers in Kenyan cities by the Mazingira Institute. The study concludes, once more, that subsistence production in towns and cities has been neglected in economic and spatial planning to the point of being outlawed Still, the economic value of urban subsistence farming is both significant at the national level and crucial to the poor themselves. (WB)

Meyer-Renschhausen, Elisabeth; Holl, Annegret **(eds) 2000. Die Wiederkehr der Gaerten: Kleinlandwirtschaft im Zeitalter der Globalisierung. 229 p. ISBN 3-7065-1534-2. Innsbruck: Studien-Verlag**
horticulture food security and nutrition community development
horticulture; gardening; allotment gardens; vegetables; conferences; Germany; United States; Cuba; Mexico; Burkina Faso

More and more city dwellers become involved in producing vegetables and fruit, rather than consume commercially produced food. The reasons strongly vary, however, from sheer necessity in many Eastern European and developing countries to a reaction to the unhealthy commercial products and the benefits of a relaxed pastime for overstressed urban citizens.

A number of chapters in this book were originally presented at the 'International Symposium on Urban Agriculture and Horticulture: the Linkage with Urban Planning' held in Berlin in July 2000. Cases described are from Western Europe -Germany, in particular-, Eastern Europe, the USA and from developing countries. Many different aspects are described, ranging from the land use issues, that never fail to come up in these cases, to community development and to descriptions of gardening systems, like the chinampas near Mexico City. Interestingly, a number of projects are analysed that were unsuccessful in involving the beneficiaries. Invariably, these projects did not take traditional production and consumption patterns enough into account. This is an important warning not to automatically paint a rosy picture of urban gardening. (WB)

Midmore, David J **(1994). Simple hydroponics for food security. In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 11-12**
hydroponics
vegetable production; pesticides

Vegetable growing can be intensified by means of a simple system of hydroponics - growing plants without soil - which uses resources efficiently and can be adapted to local conditions. David Midmore from the Asian Vegetable Research and Development Center (AVRDC) presents a space-saving production system which can be used worldwide. ILEIA)

Midmore, David J **(1996). Sustainable and ecologically sound vegetable growing in periurban farming. In: Agriculture + Rural Development vol. 3 (1996) no. 1 p. 50-52**
Supplier: Technical Centre for Agricultural and Rural Cooperation (CTA), PO Box 380, 6700 AJ Wageningen, The Netherlands; Deutsche Stiftung fuer Internationale Entwicklung / Zentralstelle fuer Ernaehrung und Landwirtschaft (DSE/ZEL)
horticulture hydroponics
periurban agriculture; vegetable production; nutrition, South East Asia

Examines how growing vegetables around cities can be done on a more sustainable and, at the same time, more economically sound basis. Often, claims on land and other inputs fore this activity are very high in view of increased demand for foodstuffs. The author provides alternatives, notably hydroponics, based on his experience in South East Asia with the Asian Vegetable Research Development Center (AVRDC). (WB)

Midmore, David J; Niñez, Vera K; Venkataraman, Ramesh **(1991). Household gardening projects in Asia: past experience and future directions. AVRDC Technical Bulletin no. 19. 28 p. ISBN 92_9058_049_6. Asian Vegetable Research and Development Center (AVRDC), PO Box 205, Taipei 10099, Taiwan**
horticulture
gardening; vegetables; home economics; home gardening; Asia; humid zones

Household gardens have never received much attention from development agencies. During the 1980s, however, small-scale family food production came to receive the backing of UNICEF, FAO, USAID and a number of NGOs. These small agricultural plots are mainly cultivated by women. Their importance lies in the enrichment of the staple diet. They also mean, sometimes, a much-needed additional source of income for the family, and a -relative- financial independence of women in male-dominated societies. In order to consolidate lessons learned from experiences with household garden projects, an International Workshop on Household Garden Projects was held in Bangkok, on 13-15 May 1991. During this workshop, effectiveness of projects was analysed and also which were the factors

contributing to success or failure of the projects. (WB)

Mnidga, H; Lyimo, M **(1997). Communication manual. 87 p. Urban Vegetable Promotion Project (UVPP), PO Box 31311, Dar es Salaam, Tanzania**
horticulture R&D methodology
agricultural extension; communication; participatory learning

Ten different sessions are covered in this manual, ranging from practising basic knowledge on communication, adult learning, and working in groups to facilitation. Apart from the extensionists involved in the Urban Vegetable Promotion Project (UVPP), this course was open to other interested extensionists in the Dar es Salaam region. Sessions shared a common factor: concentrating on improving the flow of information and supporting the participatory approach for distributing technical knowledge. (WB)

Mougeot, Luc JA **(1994). The rise of city farming: research must catch up with reality. In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 4-5. Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands**
horticulture food security and nutrition
home gardening; urban communities; urban development; urban environment; urban population; urban wastes

Farming has probably been carried out in cities ever since they came into being. Luc Mougeot from the International Development Research Centre (IDRC) in Canada traces the history of farming from ancient cities to the challenges facing urban planning and research in the North and South at the dawn of the 21st century. (ILEIA)

Moustier, Paule; Mbaye, Alain; Bon, Hubert de; Guérin, Hubert; Pages, Jacques (eds) **(1999). Agriculture périurbaine en Afrique subsaharienne: actes de l'atelier international 20-24 avril 1998, Montpellier, France. 278 p. Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France; Conférence des Responsables de Recherche Agronomique en Afrique de l'Ouest et du Centre (CORAF)**
horticulture
Africa; horticulture; periurban agriculture; animal husbandry

Conference proceedings providing a state-of-the-art overview of periurban agriculture and horticulture in Africa south of the Sahara. This important publication highlights the wide array of agricultural activities in and around cities in Africa and the important place these activities occupy in the unofficial economy of African states. After a general introduction defining periurban agriculture and setting its limits, numerous case studies are presented, grouped according to ecozone (humid tropical and soudano-sahelian). (WB)

Moustier, Paule **(2001) Assessing The Socio-Economic Impact Of Urban And Periurban Agricultural Development. Paper for the workshop "Appropriate Methodologies for Urban Agriculture", October 2001, Nairobi, Kenya. Proceedings, available On: www.ruaf.org. A shortened version is taken up In: *Urban Agriculture Magazine*, no 5, Appropriate Methodologies for Urban Agriculture, December 2001, RUAF, Leusden The Netherlands.**

R&D Methodology economic impact horticulture

West Africa; Central Africa; policy; vegetables

The paper provides practical indicators and field methods for assessing the impact of urban and periurban agriculture in social and economic terms (employment, income, added value, and food supply). In a context of growing advocacy for policy support in favour of urban agriculture, while public resources are shrinking, it is more and more necessary that researchers provide rigorous assessment of the contribution of urban agriculture to policy objectives. The paper is based on the author's fieldwork in West and Central Africa, mostly centred on vegetable production and marketing, as well as some literature review.

Mulenga, Bowa **(et al.) (1979). Gardening in the city. 16 p.**

horticulture

Zambia; home gardening; surveys

An early account of urban, rainfed, agriculture in areas in Lusaka and Mufulira. Many of the later so frequently advanced pros and cons of urban agriculture are already presented here. Socio-economic characteristics are given, as a result of surveys done. (WB)

Muster, Gisa **(1997). Environmental problems of urban agriculture: a case study of Dar es Salaam, Tanzania. Master's thesis, University of London, School of Oriental and African Studies. Dar es Salaam, Tanzania: GTZ, Urban Vegetable Promotion Project, 1997. 33 p.**

horticulture

Tanzania; ecology; environmental problems

This thesis was prepared through the Urban Vegetable Promotion Project (UVPP) of Tanzania. It assesses four types of environmental concerns associated with urban farming: air quality, water quality, erosion, and pollution from agriculture. The results show that farming can generally benefit the urban environment. (JN)

Muster, Gisa **(1998). Environmental problems of urban agriculture: a case study of Dar es Salaam, Tanzania. 58 p. Urban Vegetable Promotion Project (UVPP), PO Box 31311, Dar es Salaam, Tanzania**

Supplier: Ministry of Agriculture and Co-operatives (MoA&C) and Deutsche

Gesellschaft fuer Technische Zusammenarbeit (GTZ).
city ecology horticulture R&D methodology
Tanzania; open space management; off-plot cultivation; vegetable production

Shows the interaction between the urban environment of Dar es Salaam and agricultural production in open spaces, examining environmental effects in particular. In addition, the role played by urban agriculture in the city's economy is examined. A methodology is presented to estimate the environmental impact of vegetable production on the city's environment. (WB)

Niang, Seydou **(19??). L'agriculture urbaine au Sénégal: bilan et perspectives. 26 p.**
horticulture
Senegal; vegetable production; surveys

Traces the history of urban and periurban horticulture in the region of Niayes and provides factual and quantified information about horticultural activities in the area. (WB)

Niñez, Vera K **(1985). Introduction: household gardens and small-scale food production. In: Food and Nutrition Bulletin vol. 7 no. 3 (1985) p. 1-5.**
horticulture food security and nutrition
home gardening; food production; gardening practices

Discusses household gardens as a household-level food production strategy and provides a useful list of functions and benefits, apart from the obvious food supply. Definitions are given of home gardens as against field production and market gardening and a systematic comparison is made between these three production modes. Interestingly, the author remarks on the fact that those who were involved in traditional gardening systems are rarely the ones who participate in the design and implementation of garden projects. This seems a strange state of affairs. (WB)

Niñez, Vera K **(1985). Working at half-potential: constructive analysis of home garden programmes in the Lima slums with suggestions for an alternative approach. In: Food and Nutrition Bulletin vol. 7 no. 3 (1985) p. 6-14. International Potato Center (CIP), Lima, Peru**
community development horticulture
Peru; home gardening; food security; development projects; programme evaluation

Describes gardening and garden development projects in Lima, Peru, providing the socio-economic and nutritional background of low-income target populations against which small-scale food production development projects were conceived at a time when such initiatives were still rare. (WB)

Niñez, Vera K **(1986). The household garden as a lifeboat. In: Ceres no. 112 (July/Aug 1986) p. 31-36. Food and Agriculture Organization (FAO), Via delle Terme di Caracalla, 00100 Rome, Italy**

horticulture food security and nutrition

home gardening; food security; Peru; traditional gardens

Describes household gardens as an additional source of food for the urban poor. A typology for these gardens is given, both from a biophysical and a socio-economic viewpoint. Initial gardening programmes were unsuccessful, the author argues, as they were mostly a replica of temperate, 'budget' gardens and took local conditions and customs insufficiently into account. A Peruvian urban gardening project is analysed in detail. Community gardens evolved from European-style gardens to traditional Peruvian gardens as external financial support came to an end. This resulted in a shift of species planted, with a stronger staple food component, in more intercropping, and in a multi-layered set-up, including banana, papaya and climbing species. The author draws a number of conclusions based on such project experiences all hinting at the importance to link up with existing practices. Extension and advertising campaigns are important to interest as wide a range of people as possible. (WB)

Nitsch, Egbert; Aue, Christina **(199?). Bedeutung staedtischer Land- und Gartenwirtschaft in Einer Welt: Gaerten als Beitrag zur Welternaehrung und zur Oekologisierung der Staedte. 33 p.**

horticulture food security and nutrition city ecology

food security; urban poor; urban policies

Examines the role and position of urban agriculture in the light of food security for the urban poor. A number of policy measures are presented that are necessary to reach a wider impact. The authors argue that this role is not restricted to cities in developing countries but plays an important role in greening cities in industrialised countries as well. (WB)

Nitsch, Egbert; Aue, Christina; Schmitt, Brigitte **(1998). Zur staedtischen Land- und Gartenwirtschaft in einer Welt: Beitraege der gruenen Veranstaltung vomm 22 Juni 1998 in Bonn. 139 p. Arbeitskreis II (Umwelt, Raumordnung und Staedtebau, Verkehr, Landwirtschaft) der Bundestagfraktion von Buendis 90 / der Gruenen, Bundeeshaus, 53113 Bonn, Germany**

R&D methodology rural-urban linkages horticulture

Agenda 21; Germany

Contains a number of papers presented in the framework of a seminar organised by the German Green Party. In quite a number of German cities, processes are taking place that are local implementations of Agenda 21. The underlying discussion aims at giving a more practical focus to the Agenda 21 discussion. (WB)

Nugent, Rachel A. **The sustainability of urban agriculture: a case study in Hartford, Connecticut. Urban agriculture notes; on: http://www.cityfarmer.org/rachel.html#rachel. 20 p. City Farmer, Canada's Office of Urban Agriculture**

horticulture economic impact

economic impact; sustainable agriculture; sustainability; United States

This study defines a framework for examining the impacts of urban agriculture and applies it to data from the city of Hartford, Connecticut, USA. It uses an extended cost-benefit approach which includes market and non-market economic, social, and environmental factors affected by urban agriculture. Non-quantifiable factors are discussed qualitatively as they are integral to understanding the effects of urban agriculture. The author concludes that, on the basis of data gathered, it cannot be concluded that urban agriculture in and around Hartford is sustainable, be it economically, socially, or ecologically. A longer time frame would be needed to draw conclusions about this issue (WB - from original abstract)

Orione, Julio **(1990). The cultivated city: kitchen gardens in Buenos Aires. In: UNESCO Sources no. 17 (July/August 1990) p. 13**

horticulture community development

home gardening; Argentina; food security

Describes the research work on homegardening done by the Center of Urban and Regional Studies (CEUR), Buenos Aires. Much of this article deals with the motives of urban dwellers to engage in this activity. (WB)

Pérez Rivero, Roberto **(19??). Permacultura: un proyecto exitoso? Enseñanzas para el futuro. Foundation for the Nature and Humankind, Cuba**

horticulture

Cuba; permaculture

A brief historic overview of permaculture experiences related to urban agriculture in Cuba. (NB)

Permacultuur in de stad **(1996). In: Permacultuur nieuws: ontwerpen van een duurzame samenleving / vruchtbare intergratie van cultuur & natuur vol. 7 (1996) no. 22/23. 24 p.**

horticulture

United Kingdom; permaculture; community gardens; mulching; composting; rooftop gardening; city farms

An issue on different aspects of permaculture in the city, covering a wide array of themes like community gardening, balcony gardening, mulching, composting, and the City Farms programme in the UK. In Dutch. (WB)

Pinzás, Teobaldo **(1994). Can city farming survive? In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 10. Instituto de Estudios Peruanos, Horacio Urteaga 694, Lima 11, Peru**
Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands
economic impact food security and nutrition horticulture
home gardening; horticulture; Peru; urban communities; urban development; urban environment; urban population; urban wastes; vegetables; waste recycling; women

Early 1994 ETC Foundation asked Theobaldo Pinzás to make an exploratory study on urban agriculture in Peru. This is an excerpt from his report, focusing on his findings about urban vegetable growing. In his full report, he suggests that more attention be given to recycling of waste and sewage water. (ILEIA)

Portable gardens made from old tires **(1996). In: Echo Development Notes (April 1996). 1 p.**
hydroponics horticulture
San Salvador; tyres; containers

Brief introduction about growing plants in tyres in San Salvador. (WB)

Potutan, Gerald E; Schnitzler, Wilfried H; Arnado, JM; Janubas, LG; Holmer, Robert J **(2000). Urban agriculture in Cagayan de Oro: a favourable response of city government and NGOs. In: Growing cities, growing food: urban agriculture on the policy agenda, p. 413-428. DSE, GTZ, CTA, SIDA**
city ecology horticulture food security and nutrition
vegetable production; land use systems; health; ecology; economic impact; gender; urban policies; reuse of waste; land tenure; nutrition; NGOs; school gardens; home gardening; Philippines

Cagayan de Oro is a boomtown in Mindanao. A considerable number of farmers work in the periurban area mainly in vegetable production. Within town about 40% of the households engages in backyard farming and the majority of schools maintain nurseries. Vegetables are considered ‘poor man’s food’. Farmers consume more vegetables than wealthier people and farming contributes considerably to in-kind family income. There are initiatives to produce and improve composting of urban organic material. As powers became more decentralised, a City Agriculture Office was established. Awareness on urban agriculture is increasing. This all helps to promote urban agricultural initiatives. Legislation has been passed to secure agricultural land. Activities at local level are backed by a sustained flow of information through the media and by successful co-operation of NGOs and local government. (NB)

Pro Huerta **(1990?). Promoción de la autoproducción de alimentos: proyecto**

integrado. Buenos Aires, Argentina: Subsecretaria de Agricultura, Ganaderia y Pesca, Instituto Nacional de Tecnología Agropecuaria, (INTA).
community development horticulture
Argentina; manuals; training; home consumption; organic agriculture

This binder was prepared by Argentina's Pro Huerta, one of the largest and most important programs for training gardeners in the world. It contains seven training booklets: (0) a general booklet on Pro Huerta and one can use it; (1) a booklet on the small farm; (2) one on the intensive organic garden; (3) one on the organic soil; (4) one on organic soil additives; (5) one on planning for work in the garden; and (7) one on the management of the organic garden. Some technical sheets complete this well-organized collection.

Prudencio Boehrt, Julio **(ed.) (1997). Agricultura urbana en americana latina: memoria. 252 p. Agricultura Urbana Investigaciones Latino Americana (AGUILA), c/o ETC Andes, La Paz, Bolivia. Casilla 9355, La Paz, Bolivia**
hydroponics wastewater reuse urban livestock
Latin America; workshops

The outcome of a seminar on urban agriculture, held in La Paz in 1995, these proceedings are subdivided in a number of themes for which the situation in Latin America is analysed: (1) hydroponics; (2) waste recycling; (3) homegardens and communal gardens; (4) small livestock rearing. (WB)

Prudencio Boehrt, Julio **(1994). People's hydroponics in Latin America. In: ILEIA Newsletter vol. 10 no. 4 (December 1994) p. 13. Casilla 6254, La Paz, Bolivia Supplier: Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA), PO Box 64, 3830 AB Leusden, The Netherlands**
hydroponics
home gardening; horticulture; Latin America; plant production; vegetables

In Latin America urban farming is primarily a survival strategy for the poorest. This usually involves some form of gardening and small-scale animal keeping, but there have also been efforts to introduce hydroponics as a solution for landless people. This account of experience with People's Hydroponics comes from a longer article by Julio Prudencio Böhrt (1994), which gives an overview of urban farming in Latin America. (ILEIA)

Purnomohadi, Ning **(2000). Jakarta: agriculture as an alternative strategy to face the economic crisis. In: Growing cities, growing food: urban agriculture on the policy agenda. - p. 453-465. DSE, GTZ, CTA, SIDA**
horticulture economic impact
crisis response; commercial agriculture; vegetable production; food security; land use systems; health; ecology; economic impact; gender; urban policies; reuse of waste; poverty; land tenure; Jakarta; Indonesia

The production of fresh vegetables in Jakarta is essential as the congestion of the city inhibits timely rural imports. As a result of the Asian crisis urban farming spread rapidly and the governor of Jakarta gave permission to the people to farm vacant land left by broke developers. There are two main types of farmers: land owners and workers. Most workers are male migrant workers who lost their jobs in the fallout of the crisis. Farming occurs among others on vacant land, along rivers and roadsides and in home gardens. Almost all produce is marketed. Despite the widespread nature of urban agriculture it is seen as a temporary phenomenon and is not included in the city master planning. The city government could play an important role to expand the activity in Jakarta. (NB)

Research, Development and Consultancy Division (REDEC) **(1996). Urban agriculture in Gweru: proceedings of a one-day workshop organized by ENDA - Zimbabwe, Midlands Hotel, Gweru, 16 October 1996. 24 p. Research, Development and Consultancy Division (REDEC), Environment and Development Activities (ENDA) - Zimbabwe, PO Box 3492, Harare, Zimbabwe**

food security and nutrition economic impact horticulture

Gweru; Zimbabwe; workshops; home gardening; off-plot cultivation

At this workshop, results of a household survey conducted by ENDA in Gweru in 1996 were presented, looking both at on-plot and off-plot cultivation. A fair number of parameters was discussed and quantified. (WB)

Research, Development and Consultancy Division (REDEC) **(1996). Urban agriculture in Zimbabwe: realities and prospects: proceedings of a workshop organised by ETC International and ENDA-Zimbabwe. 36 p. Research, Development and Consultancy Division (REDEC) of Environment and Development Activities (ENDA), Zimbabwe; PO Box 3492, Harare, Zimbabwe; ETC International, PO Box 64, 3830 AB Leusden, The Netherlands**

horticulture food security and nutrition

Zimbabwe; urban policies; organisation of producers; socio-economic aspects; environment; health

The four-day workshop of practitioners, researchers and policy makers included stakeholders' perspectives, field visits, and the policy context of urban agriculture and research experiences. From different towns (Harare, Gweru, Mutare) perspectives on urban agriculture were presented. Issues discussed were: organisation of farmers, land tenure, technical support, risks of urban agriculture. Conclusions and recommendations regarding urban agriculture in Zimbabwe are given. (NB)

Richter, Juergen; Schnitzler, Wilfried H; Gura, Susanne (eds) **(1995). Vegetable production in periurban areas in the tropics and subtropics: food, income and quality of life. DOK no. 1721 A/a. 160 p. Zentralstelle fuer Ernaehrung und**

Landwirtschaft (ZEL), German Foundation for International Development (DSE), Wielinger Strasse 52, D-82336 Feldafing, Germany
horticulture rural-urban linkages
Africa; Asia; Latin America; marketing; plant production; vegetable crops; case studies; Chile; food supply; urban planning; workshops

Urban agriculture is receiving more and more attention as a way to improve livelihood in third-world country cities. Ensuring food supply through boosting food production in rural areas and establishing storage facilities has insufficiently reached the newly established urban masses. A figure to illustrate the upcoming of this new activity: about 200 million urban dwellers in developing countries are now urban farmers, thereby providing food to about 700 million people. Also to be considered is the aspect of food quality: vegetables, a very important produce of urban agriculture, complete the food basket of the urban population. These proceedings primarily address an audience of researchers and policy makers and have for objective to analyse the contribution to food, income and quality of life by urban agriculture. From the conclusions it appears that most European-sponsored urban agriculture projects deal with genetics and breeding of a few species -legumes, potato, tomato- with little attention given to traditional vegetable crops. Most projects are in Africa, probably reflecting priorities of development policies of European countries. As a result of this workshop, a number of preconditions for successful interventions were identified with regard to social participation, resource use, infrastructure, marketing and credit facilities. (WB)

Robson, Emma **(1989). Growing crops: rooftop gardens offer Colombia city dwellers alternatives to poverty. In: World Development Journal of the UNDP (November 1989) p. 28-29. United Nations Development Program (UNDP)**
hydroponics horticulture
rooftop gardening; Bolivia; Bogotá; waste recycling

A story about a UNDP project on rooftop gardening in Jerusalem, a poor area of Bogotá. All vegetables are grown as hydroponics, in a local low-cost version using recycled materials, like rice bran, wooden crates and recycled polythene. (WB)

Rocha, JL; Barahona, T **(1998). Puerto Morazan: la camaronicultura: un espejismo en tiere salada? Nitlapan-UCA, CIFOR, Proterierra-Inifom; 99 pages**
services hydroponics
aquaculture; ecology; financing; cooperatives

Puerto Morazan, a town famous for its shrimp farms, was hit by Hurricane Mitch in 1998, with a devastating effect on its most important industry, shrimp production, processing and shipping. The producers are grouped into cooperatives and they have a capital demand that they can not afford, and have been forced to contract heavy debts at high interest rates. This is at a time when the price of shrimp is falling worldwide. The future of the town, closely linked to shrimp with its (negative) ecological consequences, is in a state of uncertainty. Shrimp culture can be either an

oasis or an illusion. This study may have significant awareness raising capacity for other one-product urban agriculture towns and cities. (JS adapted from authors)

Rosset, Peter; Medea, Benjamin **(eds) (1994). The greening of the revolution: Cuba's experiment with organic agriculture. Ocean Press, Melbourne, Australia: 85 p.**

food security and nutrition horticulture

organic agriculture; bio-intensive horticulture; community-based agriculture; policy; planning; emergency agriculture; Cuba

This is the story of Cuba responding to an economic and health crises with an organic and urban agriculture strategy. It is particularly strong in the area of knowledge systems. It stretches from history, to policy to narrow focus specifics of how it was done. (JS)

Sanyal, Biswapriya **(1986). Urban cultivation in East Africa. UNU Paris, 75 p.**

horticulture urban livestock city ecology

home gardening; surveys; urban livestock; urban forestry; urban management; geography

This is a groundbreaking report, predecessor to a doctoral dissertation defining the role of agriculture in East African cities, focus on Lusaka. It has an economic slant with excellent micro-geography. (JS)

Schilter, Christine **(1991). L'agriculture urbaine à Lomé. Geneva: IUED, and Paris: Karthala Press. 334 p.**

horticulture economic impact

Togo; food supply; farming practices; cooperatives; marketing; economics

This is one of the first book-length commercially published studies on urban agriculture. It considers the range of farming practices found in Togo's capital, Lome. A whole chapter is devoted to the role of cooperatives. The second half of the book assesses the economic dimension of the urban food production system. (JN)

SEMTA **(1991). Manual de cultivos protegidos. Mtec 17. La Paz, Bolivia: SEMTA, Unidad de Capacitación y Transferencia Tecnológica. 120 p.**

horticulture

Bolivia; manuals; cultivation practices; sheltered cultivation; climate protection; raised beds

This "manual on protected cultivation" is much broader than the title implies. Protection includes here general climate consideration, choice of plants, soil understanding, raised beds, as well as sheltered cultivation. It includes excellent graphics to explain practices to the lay person. (JN)

Skinner, G. William **(1981). Vegetable supply and marketing in Chinese cities. In: Vegetable farming systems in China: report of the visit of the vegetable farming systems delegation to China / Donald L. Pluckett, Halsey L. Beemer, Jr. (eds), p. 215-280**

horticulture services

China; vegetable production; marketing; selfsufficiency; zoning; urban planning

Describes the marketing situation in China with respect to vegetables in the early 1980s. All cities visited had in common that the larger part, well over 85%, of vegetable demand could be fulfilled through production within the city bounds. The author also reports on production ecology differences at the various locations and highlights stringent zoning aspects as an outcome of political ideology. Very detailed information, but relevant for those interested in China. (WB)

Skinner, G. William **(1981). Vegetable supply and marketing in Chinese cities. In: Vegetable Farming Systems in China / D.L. Plucknett and H.L. Beemer, Jr. (eds). Boulder, Colo.: Westview Press, 86 p.**

food security and nutrition horticulture

food security; city planning; China; metropolitan area; periurban agriculture; waste management; livestock

This is a breakthrough study of the potential of large cities to be significantly nutritionally self-reliant in the areas of micronutrients and protein. The survey included the 15 largest cities in China, and found them to be 85 percent self-sufficient in vegetables. All aspects of the urban food security issue are examined including: (I) production methods, (ii) marketing, (iii) policy, (iv) locus (inner, suburb and peri), (v) organization (government and civic, (vi) health, (vii) waste management, (viii) land use management and more. Comparisons amongst cities are well presented. (JS)

Skoloda, David **(1984). Farming in the big apple. In: Farmfutures (April 1984) p. 32-33**

horticulture

herbs; commercial herb production; UNITED STATES; New York; marketing; greenhouses

Describes the operation of a commercial herb farm in the Bronx, New York. The city farm has managed to created itself a market niche for all year-round, high quality locally grown herbs, flowers, and specialty vegetables. (WB)

Smit, Jac **(1992). Farm in a box. Developing Countries Farm Radio Network package no. 27 script 5. 4 p. Developing Countries Farm Radio Network, 40 Dundas Street West, Box 12, Suite 227B, Toronto, Ontario, Canada M5G 2C2**

hydroponics horticulture
container gardening; composting

A radio script for dissemination in a large number of developing countries, explaining how to produce crops in containers. As usual with the Developing Countries Farm Radio Network and Jac Smit for author, this makes for nice reading, full of practical information. (WB)

Smit, Jac **(1993). Analysis of the urban agriculture sector in the metropolitan area of Port-au-Prince, Haiti. CARE. International, Atlanta. 3 Volumes.**
economic impact horticulture
Haiti; small livestock; land use

The purpose of the study reported herein was a rapid appraisal of the opportunities, constraints and potential interventions in assisting small-scale agricultural producers, processors and marketers within the Port-au-Prince metro area to increase their incomes. Twenty-two sub-sectors were analyzed and twelve identified as worthy of support. Bidonville Agriculture was particularly commended. CARE selected Vegetable production for further study and support. (JS)

Smit, Jac **(1993). Grow food cheaply by the roadside. Developing Countries Farm Radio Network package no. 29 script 8. 5 p. Developing Countries Farm Radio Network, 40 Dundas Street West, Box 12, Suite 227B, Toronto, Ontario, Canada M5G 2C2**
food security and nutrition horticulture
roadside cultivation; home gardening; vacant lands

A radio script for dissemination in a large number of developing countries, explaining how even the landless can farm using vacant land along road sides for food production or as a grazing area for their animals. Interestingly, there are some unexpected advantages to be found in roadside farming: it is easier for bringing inputs to the garden or for delivering products, even selling them along the roadside. Obviously, much of the farmers' worry concerns the many thefts, which farmers often avoid by harvesting their crops before they are completely ripe. Protecting oneself against theft eminently lends itself to group initiatives, where all farmers take turns in guarding the area. The author also gives hints at how to get the water necessary for gardening. There is a special paragraph on the hazards of lead poisoning, as a result of exhaust fumes settling on the crops. Fruiting plants or root crops are, in this context, generally safer to grow than leafy vegetables. Full of practical information, and presented clearly. (WB)

Smit, Jac **(1995). Food for the poor: urban and rural vegetable production. In: Development & Cooperation no. 5 (1995) p. 22-23**
food security and nutrition horticulture
vegetable production; deficiency diseases; horticulture; periurban agriculture; small-

and medium-sized enterprises; food security; nutrition

Describes small-scale vegetable production in Africa and Latin America, both in urban and in rural settings, and its contribution to food security and in fighting deficiency-related diseases. (WB)

Socorro Castro, Alejandro R **(1999). Cienfuegos, the capital of urban agriculture in Cuba. Urban Agriculture Notes http://www.cityfarmer.org/cubacastro.html. 4 p. University of Cienfuegos, Cuba**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture
Cuba; vegetable production

Provides production and area data on urban agriculture in Cuba. According to the indicators of the Ministry of Agriculture, Cienfuegos is the most productive province with regard to urban agriculture. (NB)

SODEM **(1990). Curso de huertos familiares. La Paz, Bolivia: SODEM. 20 p.**
horticulture food security and nutrition services
training; home gardening; Bolivia

This binder contains a collection of Spanish-language training material on home gardening. It is intended for trainers rather than gardeners themselves. (JN)

Stanhill, G **(1977). An urban agro-ecosystem: the example of nineteenth-century Paris. In: Agro-Ecosystems no. 3 (1977) p. 269-284. Institute of Soils and Water, The Volcani Center, ARO, Bet Dagan, Israel**
city ecology horticulture waste recycling
France; Paris; ecological systems; waste recycling; horses; manures

One hundred years ago a sixth of the area of Paris was used to produce annually more than 100,000 tons of high-value, out-of-season, salad crops, grown on very heavily manured 'hotbeds', partly under glass or protected from the winter cold by straw mats. The cropping system was sustained by the use of approximately one million tons of stable manure produced each year by the horses who provided the power for the city's transport area. This article gives a very detailed, quantitative account of this unique farming system, with a wealth of figures demonstrating its extent and importance. In the first quarter of the 20th century, the system declined rapidly, as a consequence of the replacement of the horse by the motor car, competition for land within the city, and competition from areas with a more favourable climate outside the city, facilitated by improvements in the transport system. A fascinating description of an outstanding system that once was known to the English-reading world under the name of 'French gardening'. (WB)

Stevenson, Christopher; Kinabo, Joyce; Nyange, David **(1994). Urban horticulture in**

Tanzania: a situation analysis of the production, marketing and consumption of fruits and vegetables in Dar es Salaam, Dodoma and Arusha. 94 p. Urban Vegetable Promotion Project (UVPP), PO Box 31311, Dar es Salaam, Tanzania
horticulture services
Tanzania; agricultural production; marketing; home gardening; consumption patterns

Presents facts and figures about urban agriculture in Tanzania's three largest cities, looking at: production of fruits and vegetables, consumption patterns, and marketing systems. A major, thorough study, putting in evidence differences between the cities due to differences in climate, land use patterns and population growth rates. (WB)

Stevenson, Christopher **(1996). Market production of fruits and vegetables in the periurban area of Dar es Salaam, Tanzania. Dar es Salaam, Tanzania: GTZ, Urban Vegetable Promotion Project. 40 p.**
horticulture economic impact
Tanzania; fruits; vegetables; market gardening; periurban agriculture

This report is one of the publications to come out of the Urban Vegetable Promotion Project (UVPP) of Tanzania. This study surveys the characteristics of urban horticultural farmers and their activities in Dar. It includes consideration of spatial and marketing characteristics. (JN)

Sumberg, James; Kleih, U **(1994). Fostering the development of periurban agriculture: the case of Port-au-Prince, Haiti. 14 p. School of Development Studies, University of East Anglia, Norwich NR4 7TJ, UK**
horticulture rural-urban linkages
Haiti; marketing; plant production; ; vegetable crops

Argues that an analysis of periurban production and marketing systems should go beyond a singular concern with the producer and consider a wide set of issues. The case of vegetable production and marketing around Port-au-Prince, Haiti, is used to briefly explore some of these issues. Vegetable production and marketing in Port-au-Prince is well established, significant in quantity and value and generating income. Public sector research and extension contribute little to the development of the sector while market opportunities, input Suppliers, farmer organisations and innovative farmers provide the stimulus for technical change. The main areas of concern are presented, among others: reduced turnover, low purchasing power of consumers, transport (costs and infrastructure), poor sanitary conditions and fluctuation in market prices. (NB)

Sumberg, James; Kleih, U; Grand-Pierre, Reginald **(1994). Production and marketing of vegetables in the Port-au-Prince periurban area: a sub-sector study. CARE International. 56 p.**
horticulture services
periurban agriculture; Caribbean ; Haiti; marketing; policy; trade; information

This report considers the production of vegetables and flowers for the daily Port-au-Prince market. It defines the periurban agriculture sector as dominated by 10,000 small-scale producers in two districts and proposes ways to improve both food distribution to the city and to improve the income of the farmers. (JS)

TEGON; HARP **(1998). Surviving in the city: resources of the urban poor in developing countries. 12 p. TEGON, Costerweg 27, 6700 AG Wageningen, The Netherlands; HARP, PO Box 1781, 3000 BT Rotterdam, The Netherlands**
horticulture
urban poor; urbanisation; informal sector; access to land; access to water

The outcome of a series of lectures called 'Surviving in the City'. In this report there are summaries of 4 lectures on: causes and consequences of urbanisation; access to land, water and houses; functioning of the informal sector; and potentials and problems in connection with urban agriculture. (WB)

Tha Hla, Patima **(1999). Bangkok gardens: how does your garden grow? Urban Agriculture Notes http://www.cityfarmer.org/Thaigardens8.html. 3 p. Supplier: City Farmer, Canada's Office of Urban Agriculture**
horticulture city ecology
Thailand; Bangkok; vegetable production; home gardening

The article is a report of a seminar on how to grow vegetables in urban areas, more specifically in Bangkok, and what are problems encountered. (NB)

Thaman, Randolph R **(1995). Urban food gardening in the pacific islands: a basis for food security in rapidly urbanising small-island states. In: Habitat International vol. 19 (1995) no. 2 p. 209-224. The University of the South Pacific, Fiji**
horticulture
home gardening; Pacific Islands

Urban food gardening is seen as an important means of overcoming problems caused by unemployment, inequality, poverty, falling real wages, malnutrition and nutrition-related degenerative diseases in the small-island states of the Pacific Ocean, such as Papua New Guinea, Fiji, Tonga, Kiribati and Nauru. This paper argues that the formal promotion, expansion and improvement of small-scale urban food gardening is a direct and economically, socially, technologically and nutritionally appropriate means of bringing about sustainable national development and promoting food security. Despite the fact that the potential urban food production is not clearly understood by planners and policy makers, it should be viewed as a component of agricultural development strategies given the benefits it confers. Policies which would lead to its growth are discussed. (original abstract)

Torres Lima, Pablo A; Canabal Cristiani, Beatriz; Burela-Rueda, Gilberto **(1994). Urban sustainable agriculture: the paradox of the Chinampa system in Mexico City. In: Agriculture and Human Values vol. 11 (Winter 1994) no. 1 p. 37-46**

horticulture

Chinampas; Mexico; sustainable agriculture; urban development; economic impact

Informs about the historical chinampa system near Mexico City. The paper examines this ancient and sustainable farming system and assesses how it has been affected by the expansion of Mexico City. The chinampa system's economic viability is based on the efficient use of farming technologies and resources management strategies that tend to maintain levels of productivity in horticulture and floriculture. Chinampa agriculture generates high income and employment for families and other local residents. It will require much effort and determination, above all from the farmers themselves, to withstand the demands for urban land for other purposes with, on the short term, a higher economic profit. (WB)

Tricaud, Pierre-Marie **(1987). Urban agriculture in Ibadan and Freetown. 45 p. The Food Nexus Programme, The United Nations University, Toho Seimei Building, 15-1, Shibuya 2-chome, Shibuya-ku, Tokyo 150, Japan**

horticulture food security and nutrition

case studies; Nigeria; Ibadan; Sierra Leone; Freetown; land tenure; urban management; forestry; livestock

This report presents urban agriculture in Nigeria and Sierra Leone. It identifies the extent of the practice, the urban farmers, the role of agriculture in the urban ambiance and the methods of cultivation. There are many similarities between two case study cities, Freetown and Ibadan, both being capitals of anglophone countries, with a similar climate and historical background. However, there are also a number of differences, Freetown being a coastal city while Ibadan is located inland. The two cities have developed in a different manner: while Ibadan grew from 600,000 to 2,500,000, Freetown simply doubled its population to 400,000. This report describes the situation with regard to land and land tenure systems in both cities. Information is given about origin and composition of city gardeners. There is a difference in the type of crops cultivated in the two cities. In Ibadan, urban farmers mostly cultivate staple food, whereas in Freetown the interest for vegetable cash crops is prevalent, due to differences in consumer habits. Actions are suggested for developing urban agriculture including land policies, composting programmes and organising the gardeners. (WB)

UNDP **(1989). The productive home and urban community. UNDP Bogota Colombia, 28 p.**

community development hydroponics

housing; poverty; hydroponics; urbanisation; Latin America

This community planning document makes and excellent presentation of rooftop hydroponics with scale models and economic analysis. (JS)

UN-FAO **(1990). Development of Pekarangan Land. FAO (TCP/INS/8852) 50 p.**
community development horticulture
home gardening; policy; training; agricultural extension; ecology; nutrition; micro enterprise; medicinal plants; herbs

This report presents the results of four surveys of home gardens in Java, Sumatra and Timor (240 farmers in all). In addition, it reviews 22 papers covering the fields of policy, ecology, nutrition, commodities, and case studies. Further, it presents the results o a desktop review of 50 papers written between 1975 and 1988. It suggests the formation of a new institution in Indonesia to support home gardens, as well as further research, extension, training, better inputs, and improved marketing. (JS)

Vasey, Daniel E **(1985). Household gardens and their niche in Port Moresby, Papua New Guinea. In: Food and Nutrition Bulletin vol. 7 no. 3 (1985) p. 37-43. Dept. of Sociology, Divine World College, Epworth, Iowa, USA**
horticulture
Port Moresby; Papua New Guinea; surveys

Reports on the results of a study of urban gardening in Papua New Guinea assessing the economic importance of urban food production in and around Port Moresby and aiming to improve future household garden programmes in that area. Data were collected through a survey in 1981 among 700 households. Improvements in home gardening might be brought about through instituting land allotments, regular water supply, and improved extension. (WB)

Vasey, Daniel E **(1984) Management of food gardens in the national capital district. Unpublished. University of Papua New Guinea at Port Moresby, 70 p.**
horticulture
Papua New Guinea; home gardening; agricultural extension; plant diseases; horticulture

This is an analysis of an extensive survey and reports on the management methods and state of the crops in home gardens, managed by the majority of household in the capital metropolitan area. Some highlights were: (i) crops grown are typically good nutritional compliments to bulk purchased food, (ii) cassava and banana most common, (iii) sweet potato and maize are the prime problem crops, (iv) one-fifth of urban farmers use commercial inputs, (v) in-migrants quickly learn the urban way of farming. Interestingly, most households raised crops, one in four of the gardeners sold their produce regularly, but only one in ten at a formal market. Two of three principal gardeners were women. Recommendations are made for extension services. (JS)

Wasescha, Anna; Ness, Karla **(1999). Involving children in children's gardens: farm in the city, St. Paul, Minnesota. Urban Agriculture Notes.**

http://www.cityfarmer.org/AnnaW.html. 11 p. Farm in the City, 1312 Dayton Avenue, St. Paul, Minnesota, USA
Supplier: City Farmer, Canada's Office of Urban Agriculture
community development horticulture
children; urban gardens; education; United States; environmental awareness

Description of the project 'Farm in the City' and its achievements. The project area, Dunning Field, lies between two educational institutions. It was hoped that the project would serve as a new town square uniting educational and residential communities and providing a gathering place for community building events. The mission of Farm in the City is to educate children about the environment, food creativity and the importance of diversity. (NB)

Webber, Tammy **(1999). Green roofs cool city rooftop gardens in Chicago to fight smog, heat. Urban Agriculture Notes**
http://www.cityfarmer.org/greenroofs.html. 2 p.
Supplier: City Farmer, Canada's Office of Urban Agriculture
city ecology horticulture
United States; rooftop gardening; city microclimate

Discusses the potential and developments of rooftop gardening for Chicago to fight smog and improve the city's microclimate. (NB)

Weber, Florence **(1998). L'honneur des jardiniers: les potagers dans la France du XXe siècle. Socio-Histoires, ed. Gérard Noiriel and Michel Offerlé. Paris: Belin. 287 p.**
horticulture
France; history; gardeners; ethnology

This remarkable book is a combination of historical and ethnological research. It studies the evolution of the gardener in France from one end of the Twentieth Century to the other. It shows how the "jardin potager" is an invention of the turn of the (20^{th}) century, resulting from the concerted actions of philanthropists, horticultural professionals and poor citizens. She shows how, among the latter, northern industrial workers played a key role in the development of the activity, which now involves one out of three households in France, whether at a home garden or in a community garden. Belin also demonstrates how, apart from economic and recreational considerations, pride in one's work plays a key motivation for the involvement of the latter group in gardening. (JN)

Wekerle, G.R. **(2001) Multicultural Gardens: Changing the Landscape of the City. In: H. Hoffmann, K. Mathey (eds.). Urban Agriculture and Horticulture, the linkage with Urban Planning. 2000. International Symposium. Berlin, July 2000. (on cd-rom).**
land use planning community development horticulture

Canada; leisure; PRA; multi-cultural society; immigration

Toronto is one of the world's most multicultural cities, yet, until recent years, the landscape of the city reflected primarily an Anglo-American tradition in landscape design and private gardens. This has changed. The landscapes of private gardens and public spaces, including parks, have begun to reflect the diversity of ethnocultural communities that inhabit and use these spaces. Horticulture forms the basis for communication across cultures; in some instances,it generates conflicts over public plantings and the appropriate use of public space. Immigrants to Toronto bring with them rural traditions formed in far flung parts of the world. Gardeners from Southern Europe, Latin America, the Caribbean, and South Asia bring to the city their agricultural experiences and make new demands on the city to meet their needs for earth to grow foods and plants from their homelands. Drawing from intensive interviews with immigrant gardeners, the paper reports on key themes emerging from the research: the importance of urban agriculture in maintaining cultures and traditional knowledge; the use of urban gardens to transmit culture to the next generation; how horticulture forms the basis for communication across cultures; and the emergence of an underground economy, divorced from the market economy, of seeds and plants to meet the needs of immigrant gardens.

Wilson, Geoff **(2002) Can Urban Rooftop Microfarms be Profitable? Urban Agriculture Network-Western Pacific. In: The Economics of Urban Agriculture - Urban Agriculture Magazine no. 7, August 2002, pp.22-24.**

urban horticulture economic impact

rooftop gardening; urban areas; Australia, Oceania (incl. Australia and NZ)

This question has been answered (on paper) by the Southside Chamber of Commerce in the city of Brisbane, in sub-tropical Australia. The Chamber calculated that with a little more than A $200,000, a "rooftop microfarm" based on waste management could yield around 20% return on invested capital, and employ three to four people. The Southside Chamber of Commerce Urban Agriculture Group is now considering how to fund a pilot project in Mt Gravatt Central in Brisbane, in the state of Queensland to prove the feasibility study findings.

Wilson, Geoff **(ed.) Urban agriculture and microfarming: growing food in small places. The Urban Agriculture Network Western Pacific (TUAN), PO Box 2223, Mansfield, Queensland 4122, Australia**

food security and nutrition horticulture hydroponics

urban food; Singapore

The first issue of the magazine published by The Urban Agriculture Network Western Pacific (TUAN). This issue is a free insert in 'Practical Hydroponics and Greenhouses' with a global circulation of 12,500 six times a year. It remains unclear whether the magazine by TUAN will be published with the same frequency. From its look, the magazine primarily addresses those who practice, or are interested to start, agriculture in a confined urban space, with a clear business orientation. The first issue features Singapore for having a well advanced urban agriculture within its city limits.

Winterbottom, Daniel **(1999). Hopeless future for gardens of hope? Casitas gardens of reclamation. Urban Agriculture Notes http://www.cityfarmer.org/casitas.html. 12 p. El Museo del Barrio, 1230 Fifth Avenue at 104th Street, New York, NY, USA**
Supplier: City Farmer, Canada's Office of Urban Agriculture
horticulture community development
United States; community gardens

Documents community gardening among Puerto Ricans in New York. Ten cases of gardens with casitas or wood frame structures are displayed. The people transformed vacant and garbage strewn lots into productive vegetable and flower gardens. The gardeners provide comments and emphasise the community aspect of their work. (NB)

Yachkaschi, Jasmin **(199?). Production, marketing and consumption of urban and periurban fruit and vegetables in Tanzania: introduction. 2 p. AFC Consultants, Bonn, Germany**
horticulture
periurban agriculture; vegetables; marketing; food consumption; Tanzania

The introductory chapter to a thesis. The study was centred around various field surveys conducted in three selected cities of Tanzania. In these cities, comprehensive investigations were made both at different levels of the production and marketing system, and at the level of household consumption. (WB)

Yapi Affou, S**. Agriculture intra-urbaine en Côte d'Ivoire: les cultures et les acteurs. Agriculture périurbaine en Afrique subsaharienne p. 101-109**
horticulture
Ivory Coast; Abidjan; Bouaké; commercial enterprises

The emergence of commercial intra-urban agricultural activities benefited from various factors. Intra-urban agriculture has grown in the main two cities of Ivory Coast (Abidjan and Bouaké) despite urban sprawl. Farming in the city has been favoured by urban growth, changes in dietary habits, increasing demand for vegetable products, availability of cheap labour and the laxity of municipal authorities. (NB - Adapted form original)

Zapp, Jorge **(1992). Cultivos sin tierra. 46 p.**
hydroponics
containers

A detailed description of how to grow plants as hydroponics. There are interesting appendices on production costs and revenues and on a comparison between plants grown in soil and in hydroponics. (WB)

Zurayk, R., Talhouk, S., Chatila, J. and Abdul-Samad, L. **(2000) Environmental costs of periurban agriculture in coastal Lebanon. . In: H. Hoffmann, K. Mathey (eds.). Urban Agriculture and Horticulture, the linkage with Urban Planning. 2000. International Symposium. Berlin, July 2000. (on cd-rom).**

land use planning horticulture

Lebanon; environment; cost-benefit; commercial

The notion of urban agriculture carries an intrinsic "small scale" connotation. On Lebanon's heavily urbanised coastal zone, intensive agriculture occupies large areas, and competes for space with human

settlements and natural ecosystems. Urban farming is favoured by a mild climate, the availability of water and a closeness to markets. In this paper, we describe the main periurban agricultural systems, which include open field vegetables, protected cultures and banana orchards. The environmental significance of the high input production, such as heavy fertiliser and pesticide application is also addressed. Special reference

is made to the implications of the competition between agriculture and natural space on plant biodiversity. Data on plant biodiversity in periurban agriculture and natural space is presented, along with GIS analysis of the dynamics of land use in selected locations on the Lebanese coast.

Zurick, David N **(1983). Food production in the urban environment of Katmandu, Nepal. Unpublished. Honolulu: University of Hawaii; 28 p.**

horticulture food security and nutrition

Nepal; land use; household economy; planning; organisation; history; land tenure; water; livestock; consumption; ecology

This study is quite comprehensive and based on grassroots observation as well as library research. It is found that urban agriculture is an important economic activity in the Katmandu metropolitan area, and in need of policy and programmatic support. (JS)

The organic approach to food production is considered by Ethiopian decision-makers as one which leads to poor yields, is backward and a reason for decaying farming systems. However, the reality is completely different.

Yilma Getachew

Hands on training on bio-intensive gardening for trainers of trainers in Wolliso Town

The Living Garden

a Bio-intensive Approach to Urban Agriculture in Ethiopia

Food security by definition is a function of providing enough quality food or the ability to purchase food. Producing only cereals using chemical agriculture cannot satisfy these functions. Organic agriculture emphasises diversity and provides both enough and quality food which generates income to purchase other food. The diversity makes the option more resistant to problems of climate change, drought or flooding, vulnerability and poverty. It further provides the family with a year-round supply of food and income together with a year-round source of employment.

Ethiopia is blessed with natural resources conducive to organic food production. Its soils are fertile and living, and its water little polluted by salts and pesticides. Also, much traditional knowledge is available.

FACTORS CONTRIBUTING TO THE NEED FOR URBAN AGRICULTURE IN ETHIOPIA

Urban areas have become an important new frontier for food production both for urban and rural settings. As the population increases amidst shrinking farmland, the arable land per capita for producing food is becoming very small, and demands diversification and intensification of farms and gardens. The following factors contribute towards the need for urban agricultural development in Ethiopia.

Ethiopia's present population is estimated at 65 million (CSA 2001). Figures indicate a fourfold increase in just 100 years. Farmlands are consequently fragmented proportionally to population increase. Today, farmlands in rural Ethiopia have been reduced to less than half a hectare per family, making it more of a gardening than a farming venture.

Two other forces that are putting pressure on the available land are city expansion and degradation. In Ethiopia, urbanisation has grown threefold in the past three decades (CSA: 2000). The economic and health problems resulting from malnutrition have caused great concern amongst planners and decision-makers.

That organic agriculture is a valid strategy for both stimulating economic growth and developing markets can be verified from my experience in promoting urban agriculture in three towns. Families in one town keep dairy cows either to supplement their meager salaries, or are totally dependent on milk and dung sales as their sole source of family income. In the other two towns, the main income source is the production of Irish potatoes and sweet potatoes together with a small amount of assorted vegetables, not only selling to local markets but also to markets within a 200 kilometer radius. In this way, organic agriculture in an urban setting can both be a tool for community building (health and vitality) and development (income generation and marketing of scarce nutritious food).

AVAILABLE TECHNOLOGIES (THE BIO-INTENSIVE GARDENING APPROACH)

The developing world in general and Ethiopia in particular badly need for technologies that are cheap, simple, locally resource-based and that can at the same time produce food sustainably. If we let the forces of nature function with little interference, the output can be very satisfying and we can let nature do the entire job.

Bio-intensive gardening is a method that capitalises on these forces of nature in all phases of development: growing, fertilisation and pest control. Below, I will primarily discuss the experiences gained at my workplace, which have focused on the bio-intensive gardening method. This method has four important components:

- production techniques;
- natural fertiliser techniques;
- natural pest and disease control techniques; and
- small-scale water harvesting techniques.

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The production techniques include:

- Biodynamic French Intensive method;
- FAITH gardening method; and
- container gardening methods.

The Biodynamic French Intensive Method

This method, according to Jeavans (1982) is a combination of biodynamic techniques developed in Germany, and the French intensive techniques developed in France.

The Biodynamic French Intensive method is a form of organic agriculture comprising three basic principles. The first principle is to grow plants so close to each other that when they mature, their leaves will just barely touch. This creates a situation in which the microclimate and the living mulch reduce weed growth and conserve moisture. The second principle is the use of raised planting beds (60 cm deep). These plots have loose soil that allows for air, moisture and warmth together with sufficient organic nutrients that help roots to properly penetrate the soil. The third principle is to feed the soil (and not the plant) by using organic fertiliser and natural methods of pest control. In short, the method is less dependent on expensive external inputs, is space intensive, water conserving, depends on family labour only, and creates minimal pest problems. Families practising the method are likely to have well-balanced nutritious food, a better income from products that are produced without risks.

The FAITH garden method

There are numerous organic wastes from our kitchen and gardens that are not recycled to produce more food. Such wastes include: weeds, grass, leaves, kitchen wastes (peels, organic refuse, eggshells), livestock manure, ash, hedge clippings, hair trimmings, chewed sugarcane, etc.

The FAITH method includes basket gardening to make use of these wastes to produce food. This technique keeps bottomless baskets on top of a hole (30 cm diameter x 30 cm depth) dug into the ground. All kitchen and garden wastes are dumped into the hole. At the same time, desired vegetables and fruits are planted about 20 cm away from the basket. Through their root systems, the plants extract moisture and nutrients from the fermenting waste. At the end of the process, the method produces organic food and fertiliser, conserves water and protects plants.

Container Gardening Method

Container gardening includes the use of barrels, tires, hollow blocks, plastic bottles etc. In a small garden, even a paved area can be used to grow a number of different crops. This generally means growing the plants in containers. Any wall or fence can also be useful.

A suitable container is anything that holds soil, as long as it meets the following requirements: not contaminated, provide ample room for roots and excellent drainage. Tomatoes, lettuce, onions, beans, strawberries and herbs are just a few of a quite extensive list of plants that respond well to container growing and will decorate your veranda, patio, window sills etc.

MANAGEMENT OF BIO-INTENSIVE GARDENS

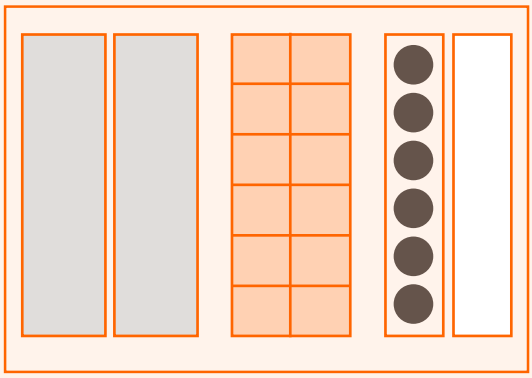
Apart from the production techniques the bio-intensive garden practitioner needs to fertilise his plots, and apply pest controls and rational water use. The following general statements enumerate the available choices.

Soil fertility

Sustaining soil fertility the natural way is the most important component in the organic farming/gardening strategy. There are a basket of choices of organic fertilisers that can be categorised as manure-based, legume-based or biomass-based. *Manure-based* fertilisers include aged manure, manure tea, earthworm casting, cow-horn manure, etc. The *Legume-based* fertilisers include intercropping with legumes (nitrogen-fixing-plants like peas, beans, leucaena, sesbania, etc.). *Biomass-based* fertilisers include compost (pit compost, heap compost, basket compost and container compost), stinging nettle manure, etc.

Additives like wood ash, bone meal, eggshells, etc. contribute greatly to organic fertilisation, by producing potash, phosphorus, calcium and iron if we allow the soil micro-organisms to work on them.

Figure I: Bio-Intensive Garden Module



The components of the module include:

- 18m² Biodynamic French Intensive plots
- 12m² FAITH garden units of 12 plots
- 6m² Container garden units that combine tires, barrels, hollow blocks, ring culture and hydroponics.
- 6m² Utility area (seedling production, pesticides, compost production, etc.)
- 28m² path

It is not a must for a family to adopt all the technologies included in the module. In areas where land space is not a limiting factor, the Biodynamic French Intensive Method is popular and highly productive. In areas where housing is highly congested, the barrel garden is popular, while the FAITH garden is popular in areas where there are plenty of organic solid wastes.

Several opportunities and constraints were recorded during the promotion of the bio-intensive garden venture, a few of which are discussed below. However, generally speaking the approach has been accepted as one means of food production and income generation addressing all sectors of the communities (women, youth, elderly, etc.) In the final analysis, the ventures can be seen as an important means of addressing community building and development.

Pest and disease controls
There are three approaches to keep pests and diseases at bay, in a natural way. The first step is to have a strong healthy plant growing in a healthy living soil that will be able to build resistance. Second is to fight harmful insects through beneficial insects and animals such as ladybirds, praying mantis, wasps, lizards, birds, etc. The third is to apply natural pesticides such as pepper, tobacco, pyrethrum, stinging nettle, etc.

Rational use of water
There are three major categories of activities aimed at the rational use of water. The first is harvesting water during the season of plenty, for use when water availability is being stretched - roof water harvesting, ponds and artificial lakes are some examples. The second is to conserve the available water (mulching, shading, precision planting, etc). The third is recycling water or reusing it for a second and third time depending on your previous use.

EXPERIENCES IN PROMOTING BIO-INTENSIVE GARDENING IN ETHIOPIA

Below is a description of the module developed on the basis of the experience I gained in my ten years of work in the promotion of urban agriculture in Ethiopia. Relying on the natural resource base, simplicity, affordability and productivity are the virtues to which the module is designed to respond towards greater sustainability, replicability and equity.
To date, 800 families have participated directly in the training programmes on bio-intensive gardening. Replicability of the technologies amongst the communities is reported to reach 8,000 families. The trainees are a mixture of male, female, urban and rural dwellers. A typical module for the demonstration training plot is about 70 m^2 (see figure below).

REFERENCES
- CSA. 2001. Central Statistical Authority of Ethiopia.
- Jeavans J. 1982. How to grow more vegetables. Berkley, California: Ten speed press.
- Yilma G. 1996. The FAITH Garden Module - The Urban farmers series. Addis Ababa, Ethiopia: Graphics.
- Yilma G. 2001. The living garden: a bio-intensive approach to urban agriculture. (Unpublished).
- Yilma G. 2001. The organic option to food production in Ethiopia: a blessing or a curse. Addis Ababa, Ethiopia: The Daily Monitor.

Policy environment
Illegal land occupation, use of contaminated downstream city rivers and the absence of urban agriculture in city planning were forces that have discouraged this venture in Ethiopia. However, through years of campaigning by environmentalists and agriculturalists, urban agriculture is now recognised by policy-makers and included in the master plan for over four cities and towns, and others are following suit.

Urban dwellers' dilemma
The majority of urban dwellers in Ethiopia shy away from working with the garden. This is because the activity is considered to be a job for the poor and uneducated. Education is considered as the means to avoid heavy farm drudgery. This is the number one problem we the promoters of urban agriculture encounter among the educated youth. However, there have been substantial changes in attitude after the training programme.

Market Problem
The market is a real problem in the Ethiopian rural setting as far as vegetables and fruits are concerned. This is due to accustomed diets being predominantly cereal-based, coupled with the products being perishable. The overall poverty situation contributes to poor consumption and production of food rich in micronutrients.

Replicability
The town of Ankober provides an example to illustrate the potential of replicability. Only ten members of the community were selected for instruction on training of trainers, and another 90 families were provided with inputs (seeds and tools). In just six months, the number of families practising bio-intensive methods reached 1,000. The most important reason for this is that people can believe it for themselves when they see the demonstration and practitioners' plots. The only expense is seeds as they already have tools. The income generated is substantial. All other inputs needed are locally found (fertilisers and pesticides, etc.).

School of Urban Agriculture
As mentioned above, training in the bio-intensive approach to urban agriculture began in Ethiopia ten years ago. Ever since then, several training sessions were held that addressed youth clubs, women's clubs, pensioners' associations, extension agents, farmers, school teachers and students, NGO workers, etc. In all cases, the training sessions utilised little hands-on practical sessions for lack of permanent demonstration plots. Thus the need for establishing a school of urban agriculture surfaced, an idea supported by several NGOs and governmental offices (GOs). At present, the proposal for the initiative has been submitted to the government, identifying the site of the school as well as the technologies to be promoted (which are partially reflected in this article). The proposal also requested for legalisation of the school and is awaiting a favourable reply in the near future.

RECOMMENDATIONS

- An estimated 16 national and international NGOs and GOs in Ethiopia together with thousands of small gardeners all over the country have voiced their desire for a training school on urban agriculture. There are 18 such schools in Africa but none in Ethiopia. Such a school should be supported by government policy, strategy and action. (The author is deeply involved in these activities at present).
- Urban agriculture is accepted as a policy by the Addis Ababa city administration and even the city planning has included land set aside for the purpose. What is not well understood by the authorities, however, is the awareness of the potential of the organic option to urban agriculture and available technologies. Seminars, workshops and publications need to be organised to address this issue.
- The poverty eradication strategy of the country needs to include urban agriculture as among the important tools in the fight against poverty in urban areas as well as in the farmyard gardens in the rural areas.
- In general, strong support and attention towards the promotion of the bio-intensive gardening approach to urban agriculture will be an important step in addressing issues of hunger, unemployment and those pertinent to youth, women and vulnerable sectors of society. Equally important, urban agriculture's contribution to reducing poverty and unemployment can have important consequences in subsequent phases, ultimately helping in the fight against crime and disease.

Micro-technologies for Congested Urban Centers in Ethiopia

This article describes the experiences of Yilma bio-consult, specializing on promotion of urban agriculture in Addis Ababa and other urban centres in Ethiopia.

Addis Ababa sustains 2.5 million people on a total area of 50,000 hectares of land, of which the concrete and asphalt build environment takes up around 20,000 hectares. In this congested city, the availability of land for food production is becoming very scarce.

The Government of Ethiopia had begun to promote urban agriculture. It is included in the research agenda of the Ethiopian Agricultural Research Organization (EARO), in the teaching agenda of Addis Ababa University, and in the development agenda of GOs, NGOs and CBOs in Ethiopia.

Addis has a 40% unemployment rate and a great majority of the unemployed are youth. The city produces an estimated 400,000 tons of solid waste annually, the bulk of which is household organic waste (CSA 2001). The city has a population of around 60,000 dairy animals with around 50% of families rearing sheep and goats (Tegegne *et al* 2002). A huge amount of livestock manure is therefore available. The average available garden space in the city is not more than 25 m^2 per family, while the rivers in the city are highly polluted with heavy metals and sewage making the vegetables and fruit cultivated along these rivers unsafe for consumption (see also Getachew, in UAM No.6).

Rapid uptake of technologies was possible, as they are cheap, simple and dependant on local materials

Yilma Getachew

Faith Garden

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Under such setting, the need for technologies that enable high-level outputs in the smallest possible space is paramount. The technologies must be cheap, simple and dependant on local resources. The choice of technologies presented here considers these principles and is based on natural processes. About 30 technologies have been identified for promotion by the Agency, but only three are detailed in this article.

BARREL GARDEN TECHNIQUE

Imagine producing over 25 plants of Swiss chard or strawberries in a space less than one square metre? The materials needed to do this are a 200-litre barrel, a corrugated iron sheet, soil mixture (preferable 2 parts soil to 1 part aged manure or compost and 1 part sand), and manure tea.

Several incisions of about 12 cm each should be made around the barrel as shown on the photo. The upper lips of the incisions are hammered inward and the lower lips outwards. The incisions should be made intervals of 15 cm horizontally and 20 cm vertically. The barrel top is open while the bottom is perforated with about 10 holes. A rolled corrugated iron sheet is place in the middle of the barrel and filled with sand. The space between the inner wall of the barrel and outer wall of the corrugated iron is filled with the soil mixture described above. Vegetables or fruits of choice are planted in the space between the two lips of the incisions. Regular watering is done through the sand in the middle. Manure tea is applied on a weekly basis through the sand in the middle. The barrel should be maintained over gravel for better aeration and drainage.

Yilma Getachew

Swiss chard on barrel

The benefits of this technology is that it enables families to increase the availability of micronutrient food and encourages the reuse of

- Old barrels and trashcans (which are freely and cheaply available), the composting organic solid waste
- Livestock waste as manure tea.

Used barrels can have several uses to urban farmers, as shown in table 1

THE FAITH GARDEN TECHNIQUE

The FAITH garden uses the abundant availability of organic waste to produce food. The

Table 1 Alternative uses of used barrels.

Production techniques	Water management	Fertilizer production	Other uses
Barrel garden (see above) Ring culture Potato growing Hydroponics garden	Drip irrigation Solar distillation of polluted water. Roof water harvesting Solar water heater	Compost making Manure tea making Plant tea making	Pesticide preparation-growing, mixing, boiling, pesticide plants. Biogas digester etc.

technology uses cheap material: bottomless baskets (available to the poor), organic solid wastes, seeds and seedlings. A hole has to be dug in the ground with a diameter of 30 cm. The basket is placed on top of the hole and all the available organic solid waste is placed inside the basket and the hole below it. Four to eight selected plants are planted about 20 cm away from the basket. After harvest, the composted waste is used to fertilize other garden activities like the container gardens. The procedure is further improved by including a series of 12 basket garden units, which are planted in succession, with an interval of 1-2 weeks. After the first harvest is made, a continuous supply of vegetables and fruits are available for home consumption.

Yilma Getachew

Training of Trainers

The benefits of this technology include lower volumes of waste, an increased availability of micronutrient food, a better skilled and environmentally aware population and increases in family incomes.

THE TRENCH GARDEN

The trench garden method is interesting in situations where malnutrition (of macro-nutrients) and excess of livestock manure go hand in hand. The technology required seed potatoes, aged manure and mulching material. To develop the trench garden, one needs to dig a 30 cm wide, 30 cm deep and 6 meters long trench. At the bottom of the trench, the soil should be cracked to a depth of another 30 cm to allow better aeration and drainage. After planting the seed potatoes at intervals of 30 cm, the trench is completely filled with aged manure in between plants.

Table 2 Alternative technologies for congested city centres

Farming technologies	Water management	Fertilizer production
Tire garden	Soddis water purifier	Earthworm husbandry
Bottle garden	Pither irrigation	Cow horn manure
PVC garden	Tube well	Portable chicken roost
Growing walls	Ferro-cement jars	
Hydroponics PVC	Rus pumps	
Window sill garden		

After two months each potato plant will yield one or two tubers per week, or about 2 kg per week, per trench, for duration of two months. After two months, the trench is refilled as before, which will continue to supply the family with potatoes for another two months (see photo on page 24). Depending on the availability of garden space the family can build several such trenches.

TRAINING AND DISSEMINATION

In addition to the technologies described in this article, several other urban farming technologies have been installed by the consultative agency. Some of these technologies are listed in Table 2.

To date, Yilma Bio-consult has disseminated the above technologies to over 800 families all over the Ethiopia. The families were also trained on how the install and maintain the technologies. The training strategy commenced with initial classroom discussions to explain how and why the technologies need to be installed and maintained as recommended. This was followed by an in-situ demonstration, the site being set up a month prior to the training programme. Finally, the technology is installed on-site (practice area and/or a individual garden plots). Each trainer is required to train 10 families following the above strategy.
These technologies are highly replicable. In one locality, training was provided to 10 trainers, who in turn trained 100 families. After three months, a thousand families were trained and the technologies were improved through hands-on experience.

The rapid uptake of these technologies was made possible, as they are cheap, simple and are dependant on local materials. Due to diversity of crops farmed through these technologies, the damage by pests and disease was minimal. There are also no difficulties with odours or wastes. The technologies however, require water, and clean water in urban areas is in short supply. It is therefore advised that these technologies are coupled with water harvesting practices.

These agricultural practices are also acceptable to policy makers as they demand little land, promote the recycling and reuse of both organic and inorganic wastes and create employment. However, the uptake of these technologies by the richer urban inhabitants, with larger garden spaces, has been low.

To promote urban agriculture, the Ethiopian government has established the Addis Ababa Urban Agriculture Office, probably the first of its kind in East Africa. Furthermore, as of May 9, 2002 the Addis Ababa city has become a signatory to the declaration "Feeding Cities in the Horn of Africa" which promotes urban and periurban agriculture. The poverty reduction strategy of the Ethiopia has also included urban agriculture as a priority.

REFERENCES

-CSA 2001 Central Statistical Authority of Ethiopia.
-Tegegne, A., Sileshi, Z., Tadesse, M., Alemayehu, M. and Woltedji, D.(2002) *Scoping study on urban and peri-urban livestock keeping in Addis Ababa,* International Livestock Research Institute(ILRI),Ethiopia.
-Yilma G.1996.*The FAITH Garden Module*-The Urban farmer Series. Addis Ababa. Ethiopia: Graphics.
-Yilma G.2002.*The living Garden: a bio-intensive approach to urban agriculture.* Urban Agriculture Magazine- No. 6.
-Yilma G.2001. *The organic option to food production in Ethiopia: a blessing or a curse.* Addis Ababa, Ethiopia: The Daily Monitor

FARMER PARTICIPATORY RESEARCH AND TECHNOLOGY DEVELOPMENT

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FROM THE EDITOR

The transfer-of-technology approach to agricultural and rural development has come under attack in recent years, largely as scholars and practitioners have begun to question not only the technologies themselves but also the assumptions on which the "transfer" has been thought to occur. In this paper, Janice Jiggins offers a critique of a number of these assumptions and then proceeds to propose Farmer Participatory Research, with its advantages and disadvantages, as a more acceptable model for agricultural development in developing countries.

We have invited Dr. Jiggins to share her views with our readers not only because of her substantial and varied experience in many countries of the world but also because of her forceful arguments in favour of recognizing the centrality of primary producers in the food system. Dr. Jiggins is a freelance consultant who has conducted recent assignments in several countries for the Ford Foundation, IRRI, the World Bank, FAO, CGIAR and for several national governments and NG0's. She has lectured at the University of Reading, Wageningen Agricultural University, the University of Zambia and the University of Ghana. She publishes widely on women in development, technology development, smallholder agriculture, and extension strategies.

J.C.M. Shute.

Editor

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BACKGROUND

Interest among developing country scientists and extension workers in participative technology development is increasing. The interest is not based on sentimental, populist or "anti-science"

feeling. Underlying economic and environmental pressures are pushing the search for approaches, methods and techniques which might complement, and make more effective, the dominant mode of agricultural technology development [1]. The dominant mode might be characterized as top-down, station-based, with a commodity or disciplinary focus, predicated on scientists' ability to identify relevant problems and generate widely-usable technologies, and the ability of extension staff to transfer the results of such a process to farmers[2].

This "transfer-of-technology" mode has been powerful in production environments which are relatively homogeneous (in agronomic as well as socioeconomic terms), in which conditions in most (if not all) farmers' fields are comparable to those on research stations, and in which farmers have access to resources which allow them to aspire to the management levels found on research stations. It has proven to be far less efficient and effective wherever, and for whomever, these conditions cannot be met.

The underlying pressures which are forcing re-consideration of the universality of the dominant mode include increases in the cost of imported agricultural inputs, limited food commodity export market potential in the face of industrial agricultural surpluses, complex environmental degradation over wide areas, local pollution and adverse human health effects through intensive chemical-based production and control methods. In addition, the failure to realize adequate non-farm employment, in either rural or urban settings, is generating renewed concern for the prospective welfare and livelihoods of the millions of small-scale farmers in less favourable areas.

Program managers, station-based scientists and field extension staff are becoming more convinced of the operational value of understanding indigenous agricultural knowledge, farmers' technology, and natural resource management practices, especially in environments which are diverse, variable and complex. There is growing recognition - at least as working hypotheses - of principles of the following kind:

- The weaker the farmers' control over the production environment, the greater the contribution of local knowledge and experience to farm performance and the less the value of external knowledge;
- The sharper the effects of seasonality and inter-annual variation, the greater the production diversity;
- The greater the production diversity, the greater the value of flexibility in intra-season and inter-season decision-making with regard to cropping patterns, cultivation practices, and varietal selections.

The implications for the organization of agricultural science and technology development are profound. Farming Systems Research is intended to deal with some of the implications. For example, delimitation of recommendation domains and homogeneous farmer categories might be seen as attempts to make heterogeneous environments susceptible to managed (top-down) intervention. Similarly, farmer collaboration in on-farm trials might be seen as an attempt to reduce the management costs of the numerous observations deemed necessary to validate the development of robust technologies in high-risk environments.

Farming Systems Research, however, has not yet developed field methods for dealing with complex simultaneous innovation, that is, the kinds of system adjustment which farmers in unstable or variable environments make as a matter of course. Nor has it proven adept at generating system interventions which lie outside the commodity focus of its institutional

bases. Furthermore, it retains an emphasis on the activities of agricultural science rather than those of technology development, not least because career incentives reward scientific excellence rather than technology adoption.

In sum, despite such modifications as Farming Systems Research has brought about, the dominant modes of research and extension practice, and the rewards and incentives which underpin it, are singularly ill-adapted to generating technologies for environments whose components, in both highly interdependent and highly responsive. There is, for example, little professional recognition in the majority of government extension services that local specificity implies limited diffusion. The prevailing criteria for program evaluation and the measurement of individual performance emphasize wide dissemination and adoption. Similarly, the majority of breeding programs incorporate the often unjustified assumption that a limited range of "robust" varieties, even a single variety, will see the farmer through the season, however much conditions might vary periodically from the mode.

At the practical level, severe pressure on public resources, particularly in some Latin American countries and in most of sub-saharan Africa, is limiting the capacity of formal agricultural science and technology development to address the potential of small-scale farmers and stock-keepers. Weak formal research capacity opens opportunities for complementary approaches and greater recognition of the contribution which other organizations might make. However, it also suggests that the potential contribution of Farmer Participatory Research (FPR) might be limited by the inadequacy or lack of accessible scientific back-up. Advocates of FPR do not claim that it can substitute for more formal science nor do FPR practitioners seek to reduce the zone of responsibility of station-based researchers to zero.

Nonetheless, in response to the kinds of pressure noted, there is an active and growing network of agricultural technology development practitioners, in both government and nongovernment organizations, who are interested in complementing formal scientific research through the exploration and testing of FPR. They are engaged in the design, testing and development of techniques, methods and approaches which build on existing farmer experimentation and innovativeness. They are seeking, in effect, to enhance experimental science and technology development capacity at community and household levels, rather than to transfer finished or semi-finished technologies.

Recent experience in how this might be done seems to demonstrate both a core sequence for getting started, as well as an increasing repertoire of techniques and methods for meeting particular difficulties and for enabling individuals and groups to work with scientists and extension workers in technology development over the longer term once the initial support is withdrawn. Methodological developments are strongly based in operational reality. Practitioners are testing approaches, methods and techniques which (1) are streamlined and inexpensive, thus usable by individual researchers, extension workers and farmers; (2) are robust in social dynamic, thus generating rapid, significant, success in terms recognizable by farmers; (3) are replicable in extent and scale, thus forming a repertoire of tested methodological components which can be locally adjusted; and (4) draw on farmer constructs for experimental design, verification and evaluation, and thus increase the manageability of on-farm trial designs and procedures[3].

The key to the present excitement with and wider dissemination of FPR activities seems to lie in the simple fact that they are fun. They release enormous individual and group creativity. Research and extension personnel who are bored and frustrated by the lack of impact of

supposedly useful technologies, and disillusioned by the lack of power of the transfer-of-technology process to transform dramatically the productivity of dryland agriculture and stock-keeping are witnessing localized but significant gains which they had come to believe were unattainable.

However, the resources of present practitioners are too limited to serve the needs of the increasing numbers of other agricultural scientists and extensionists who wish to learn from FPR experience and acquire skills in the use of participative technology development methods. There are still relatively few field sites where FPR techniques, methods and approaches are being developed, and the training capacities of the pioneers are limited. Many FPR activities are being carried out within the program of nongovernmental organizations, or managed by individuals in national agricultural research who are exploiting the marginal resources and freedoms they can claim for their regular work. The pioneers typically lack legitimation as well as peer group support.

An international meeting held at the Institute of Development Studies in Sussex, U.K. in July, 1987, and a meeting in April, 1988, at the Institute for Low External Input Agriculture (ILEIA), a project of the not-for-profit Consultants for Development Programmes (E.T.C.), Leusden, The Netherlands, have served to document and review on-going work in FPR, to critically examine its results, and to provide some peer support[4]. These two meetings have considerably strengthened awareness among FPR practitioners of each other's work but much remains to be done. Three areas in particular would seem to warrant support. The first is to critically review the cost- effectiveness of FPR in building enduring R & D capacity among and between rural communities, in cooperation with formal (government or non-government) research and extension programs. The second is to expand the numbers of those exposed to, the trained in, FPR work and experience so that the existing repertoire of FPR approaches, methods and techniques can be adapted for local cultures, institutions and resources through hands-on experience. The third, which would facilitate the other two, is to develop and disseminate simple, short (one to two page), operational guides to proven approaches, methods and techniques.

THE CORE SEQUENCE

On the basis of present information, there would appear to be a common core sequence of activities which are helpful in starting FPR[5]. In brief, these are:

- community-based dialogue, with individuals and groups, to identify and analyze the changes related to agriculture which have occurred over the last two or three generations;
- community-based analysis, with individuals and groups, to identify specific problems which are agreed to be of key concern, indicating relational aspects and system flows;
- community-based inventory of experimentation and innovation, with individuals and groups, of ways that have been tried to solve or overcome the key problems;
- community-based assessment, with individuals and groups, of the experimental record and the outcome of innovations.

It might be helpful to illustrate briefly the kinds of methods or techniques which are helpful here. For initial dialogue, visual prompts are effective, such as those developed by the GRAAP

project, using simple community-designed symbols, ideographs and flannel boards[6]. For analysis, the techniques developed by Conway and colleagues originally for eco-system analysis are proving more widely applicable[7]. Figures 1 and 2 provide examples of transects and venn diagrams for analyzing spatial and sociological relations. Innovator workshops are excellent for a systematic presentation and assessment of experimentation and innovation[8].

Facilitators and participants seem to have little difficulty either in acquiring the minimal skills required to use such aids or in perceiving their usefulness to achieve the goal of an agreed research agenda. It takes relatively little extra effort to expand the range of methods and techniques, to help individuals and groups within the program area to tap additional ideas and experience before the final research agenda is set. For example, facilitators can help arrange study tours to agricultural research stations, or set up focus group sessions with other field extension staff known to have particular experience with a problem, or with subject matter specialists[9]. Farmers can be helped to identify and contact sources of indigenous knowledge and expertise outside their community, such as highland potato growers supplying seed potatoes to lowland growers in Peru or cassava traders with access to both market information and a wide range of varieties in Nigeria. Finally, facilitators can guide brainstorming sessions in which local group creativity can be stimulated. The importance of making these wider contacts is not simply to introduce ideas not available at the village level. In the long term, it is the establishment of farmers' independent links with the wider network of expertise and sources of information and assistance which is of importance.

It is interesting that the initial extension fieldworker response to suggestions for linkage activities often is to complain that without a motorized vehicle and petrol no such activities are possible. Such a response is a strong signal that the fieldworker has not yet adjusted to the goal of programming activities on the basis of community resources, There are, presumably, relatively few communities now living wholly independent lives, cut off from any indigenous network and confining themselves entirely to limited local contacts. Community members do travel about and do communicate with members of a wider world. Once convinced that it is worth their while, communities usually have little difficulty in identifying occasions and journeys which can be appropriately adapted for the purposes of technology development. However, the comparative monetary and other costs of linkage for community members, facilitators and researchers, as well as other FPR activities, remain largely unknown at present.

There is, of course, also a need for a repertoire of methods and techniques for guiding the process of getting started so as to manage socio-economic and ecological variation within and between program areas, communities and households. Peer group referral, wealth ranking, focus group formation, are all useful here[10]. In Farming Systems Research, social science methods are used to determine target categories and recommendation domains in which heterogeneity between members is minimized and discrimination between categories is significant, based on the understanding that technologies diffuse among homophilous populations [11]. Less care has been taken to ensure that farmer selection for field trials is also representative of the range of characteristics which define the target category or recommendation domain. One of the consequences has been that the weaker or more distant members, and producers other than household heads, tend not to be selected[12].

Although targeting is an important advance on the practice of designing and aiming technologies at farmers in general in the hope that some of it will stick somewhere, the practical stumbling block is that, especially in varied and unstable environments, micro

differences are often significant enough to limit diffusion among otherwise apparently homogeneous populations. Moreover, the greater the range of variation and diversity in the production environment, the harder it is for breeders to incorporate stability and robustness over time and space.

In the FPR perspective, farmer-based R & D aims deliberately at the micro-situation and at specificity[13]. The purpose of determining local socioeconomic and other variations is to ensure that the needs and potential of no significant niche or category in a community are overlooked. FPR in essence applies the rules of probability differently to the dominant mode of R & D. It aims at the testing in reality of many ideas, each with a relatively small probability of success, over a limited area. The more the number of ideas that are tested, the higher the probability that one will pay off[14]. Dominant R & D aims at the testing in reality of relatively few ideas, replicated over wide areas, the chances that one will pay off are lower, but the payoff is higher when it does. Debates about comparative returns to resource investment in research and extension commonly confuse or conflate these two rather different approaches.

It is a matter of history that returns to resource investment in dominant R&D have been high but the historical record also reveals why: in the areas of highest production impact, irrigation reduces heterogeneity among production environments while the associated demands of irrigation management increase homogeneity of service provision, infrastructure and institutional support.

The potential for large marketed surpluses, moreover, encourages price interventions effective across large populations. The conditions for high payoff from more or less uniform technologies exist. Three kinds of cost are usually uncounted in these estimations: (1) the cost of generating a host of (semi-finished) technologies, which may have taken over ten years to generate but never find any application in reality, rarely is offset against the benefits of the relatively few ideas which lead to widely disseminated technologies; (2) the individual and social costs of those driven out of direct production by rapid innovation typically are externalized to other sectors through migration (or, within households, experienced as widening productivity differentials, typically between male and female producers); and (3) the environmental cost of intensive mono-cropping is postponed into some undiscounted future. It is too early to say whether FPR can either wholly avoid such costs or whether returns to investment will be significant over the wider scale as more practitioners engage in FPR activities.

One of the unknown cost factors at present is that of training/assembling cadres skilled in FPR. One of the cost-savings of FPR compared to FSR is that individual scientists and extensionists can initiate and support the process at the field level. On the other hand, the core sequence of FPR imposes particular social skills on facilitators. Is this a limitation? Experience so far suggests that it is relatively easy to teach a repertoire of FPR methods and techniques to those trained in agronomy or other technical and scientific disciplines. It is harder to impart to them an appropriate orientation. Nonetheless, it appears easier to do this than to give those skilled in social dynamics sufficient understanding of agricultural science and experimental procedures to be effective. The hardest task is showing those trained to regard themselves as " experts" how to manage face-to-face dialogue with farmers in a way that allows an FPR process to develop and take root.

EXPERIMENTAL TRADITIONS

For some years now, station-based scientists working with extension staff to establish farmer-designed and managed farm trials have come to appreciate both the value and the drawbacks of allowing farmers a voice in the determination of trial variables and layouts 15. The advantages include increased relevance to local agroeconomic problems /opportunities, better trial management as farmers increase their stake in the outcome, and testing over a wider scale with a greater number of instances. The disadvantages include reduced quantity of numerical data and loss of scientific control increased quantity of "fuzzy" data and reduced complexity of trial lay-out and the number of experimental variables.

In this perspective, there is an operational trade-off to be made between testing in scientific reality on the basis of statistically reliable results, and testing in normative reality on the basis of adoption and diffusion[16]. From the point of view of FPR, a greater confidence in the rationality of farmers' experimental traditions diminishes the disadvantages and optimizes the advantages.

Concretely, what does this mean? No one is yet certain how far it might be possible to go without losing touch with the power of agricultural science. A number of tentative lessons are, however, emerging. For example, the notion of a "control" is clearly not alien to farmer experimenters, although they may perceive less need than outsiders to control for variables in an environment which is as familiar (and predictable) to them as it is unfamiliar (and apparently unpredictable) to outsiders. The notion of noncomparative criteria in evaluation is also familiar. Once the confidence limits of the specific application of these notions are made explicit, the number of control plots can usually be greatly reduced.

Another example has to do with understanding how innovations enter farming systems. Only rarely are whole new systems substituted for existing systems; more typically, components and practices are added over time on the basis of "I'll try this and see". There is, commensurately, slow attrition of components over time. In this sense, the process of testing through to "finished" technology is never-ending. Adaptation of technologies and adjustment of farming systems are continuous. It follows that comparative trials and baseline data are not always needed.

The reduction in the number of control plots and comparative trials can greatly reduce research management time both on the part of the facilitator and on the part of farmers. This in turn gives more scope for discussing with farmers trial record-keeping, alternative lay-outs, appropriate procedures and for giving training in these areas as required.

Some FPR practitioners are going even further, putting improved techniques for breeding and selecting new varieties in the hands of farmers. Maurya and Bottrall [17] report from India the re lease by one rice breeding station of advanced lines to farmers for individual and community assessment and selection. In order to overcome the management difficulties of conducting replicated trials of many varieties on individual farmers' fields, researchers and farmers develop the idea of testing one genotype/variety among a set of three farmers, and repeating the test with three farmers in each of three villages in similar agroclimatic situations. The trials are managed under exactly the same conditions as other varieties grown by the farmers.

The MASIPAG project (Farmer-Scientist Partnership in Rice), is training farmers in the collection, identification, maintenance, multiplication, evaluation and hybridization of local rice

[18]. MASIPAG is a consortium of 44 farmer organizations, scientists based at the University of the Philippines at Los Banos (UPLB), and nongovernmental organizations. The farmers' breeding activities are based on a one-week training at UPLB for farmer representatives, followed by field observation and practice in the handling of materials from parents, F1 up to uniform lines. The farmer representatives become the field technicians for the project, training other farmers in how to do crosses and so on.

It is perhaps too early to say how successful FPR practitioners have been in strengthening indigenous capacity to experiment and innovate. World Neighbours reports that in Bassar, Togo, (where it no longer has program personnel present), 12 village communities are continuing to meet annually to analyze and evaluate the previous season's experiments and to schedule the research agenda for the coming season [19]. They also choose at the meeting a limited number of delegates to make the rounds of various agricultural development programmes and research stations, actively seeking new ideas and technologies to report back to the communities.

CONCLUSION

In a powerful plea for higher investment in African agricultural science, more relevant training, respect for indigenous technical knowledge, and greater partnership in the field between scientists and producers, Professor Thomas Odhiambo, Director of the International Centre for Insect Physiology and Ecology (Nairobi), stressed the need for scientists to understand the rationale for producers' farming practices and use of biomass, to listen to them, and to work with them[20]. The experience summarized here as Farmer Participatory Research forms the basis of an operational strategy for implementing Professor Odhiambo's plea.

There are many unknowns. Three areas of exploration seem particularly urgent and necessary at present. First, the FPR repertoire, the documentation of the parameters within which it appears to be useful and successful, needs to be expanded through greater, wider, field experimentation and testing[21]. Second, the costs and benefits need careful examination and conclusions drawn concerning FPR's complementarity to other approaches, methods and techniques. Third, short operational summaries of existing approaches, methods and techniques need to be made available for wide dissemination to training, extension and research centres, planners and administrators. Together, these three initiatives would considerably strengthen capacity to address the challenge of technology development, particularly for resource-poor farmers.

NOTES AND REFERENCES

1. In this article, an approach signifies a strategic combination of methods and techniques, and method signifies a sequential bundle of applied skills (i.e. techniques). For elaboration, see: Engel, P., B. Haverkort, J. Jiggins (1988), "Concepts and Processes in Participative Technology Development". Paper presented to ILEIA Workshop on Operational Approaches in Participative Technology Development in Sustainable Agriculture, E.T.C., Leusden, April 11-12; and van der Kamp, J. & P. Schuthof, "Matrices

for Different Steps in Participative Technology Development". Paper presented to ILEIA Workshop.

2. Chambers, R, and J. Jiggins (1986). 1212 *Agricultural Research for Resource Poor Farmers: A Parsimonious Paradigm.* Sussex: IDS.
3. Gubbels, P. (1988). "Peasant Farmer Agricultural Self- Development: the World Neighbours' Experience in West Africa", preliminary draft paper to ILEIA Workshop, op. cit.
4. The proceedings of the IDS Workshop will appear in 1989 as Pacey, A., (ed.). Farmer Innovation and Agricultural Research. Seven of the papers have appeared in a special issue of Experimental Agriculture, Vol. 23, Part 3, 1988. Copies of all papers are obtainable from the Agricultural Administration Unit, ODI, Regent's College, Inner Circle, Regent's Park, London NWI 4NS, U.K. The proceedings of the ILEIA Workshop are obtainable from ILEIA, c/o E.T.C., P.O. Box 64, 3830 AB Leusden, The Netherlands. Excerpts from the papers and discussion will appear in various issues of the ILEIA Newsletter.
5. What is here called the "core sequence" is described in various forms in the following papers submitted to the ILEIA Workshop: Fernandez, M., "Methodologies for Participatory Technology Transformation"; Gubbels, op. cit.; Jager, A., "Towards Self-experimenting Village Groups". Suriya Smutkupt of Khon Kaen University, Thailand, described a similar sequence.
6. The GRAAP method has been developed through action research, primarily in Burkina Faso in West Africa, partly with support from the German Agency for Technical Cooperation. For a critical analysis, see Foppes, J. (1985), *Bewustwordings Strategieen in de Voorlicting: het voorbeeld van de GRAAP in Burkina Faso.* Doctoral thesis (in Dutch), Department of Extension Science, Wageningen Agricultural University. For details of the method, see GRAAP (1987), *Pour une Pedaqoqie de l'Autopromotion.* Bobo Dioulasso, Burkina Faso, 5th. Edition.
7. G. Conway is one of the pioneers in the development of diagramming tools for agroecosystem analysis. For an introduction, see Conway, G. (198 5). "Agroecosystem Analysis", *Agricultural Administration, 20,* 31-35. More detailed information is available in two unpublished papers from G. Conway, International Institute for Environment and Development, 3 Endsleigh Gardens, London WCLH ODD, UK: Diagrams for Farmers and Rapid Rural Appraisal for Agroecosystem Analysis. Further useful notes on methods are presented in McCracken, J. (1988). "Topical Rapid Rural Appraisal", paper to ILEIA Workshop, op. cit.
8. UN ESCAP/FAO (1979). *Transfer of Knowledge and Skills Among Peer Groups: A Manual on Methodology.* Intercountry Project for the Promotion and Training of Rural Women in Income-Raising Group Activities, Bangkok.
9. Norman, D., D. Baker, G. Heinrich & F. Worman (1987). "Technology Development and Farmer Groups: Experiences from Botswana", *Experimental Agriculture, Vol.* 23, Part 3.
10. Grandin, B. E. (1986). Wealth Ranking in Smallholder Communities: A Field Manual. Nairobi, ILCA; Rocheleau, D. (1987): "The User Perspective and the Agroforestry Research and Action Agenda". Paper presented to IDS Workshop op. cit.
11. Roling, N. (1988). *Extension Science: Information Systems in Agricultural Development.* Cambridge: Cambridge University Press.
12. Sutherland, A. J. (1988), "The Gender Factor and Technology Options for Zambia's Subsistence Farming Systems", Poats, S., M. Schmink, A. Spring (eds.) (1988). *Gender Issues in Farming Systems Research and Extension,* Boulder and London, Westview Press. Feldstein, H. and J. Jiggins (eds.). *Methodologies Handbook. Series on Intra-Household Dynamics and Farming Systems Research and Extension.* Kumarian Press

(forthcoming).

13. Bunch, R. (1982). *Two Ears of Corn.* Oklahoma City World Neighbours, CUSO (1983). Rainfed Rice-Fish Farming in Southern N.E. Thailand, Gupta, A. (1987) Matching Farmers' Concerns with Technologists' Objectives in Dry Regions: An Exploratory Study of Scientific Goal Setting. Ahmedabad: Indian Institute of Management, draft mimeo.
14. Jiggins, J. and L. Fresco (1984), "Sociological and Anthropological Aspects in Preproduction Testing and Production Programmes Involving Upland Rice". Paper presented to International Upland Rice Conference, Jakarta, 4-8 March, 1985.
15. Fernandez, M. (1988), "Methodologies for Participatory Technology Transformation". Paper presented to ILEIA Workshop, op. cit.; Kean, S. (1987), "Developing a Partnership between Farmers and Scientists: The Examples of Zambia's Adaptive Research Planning Team,,, Experimental Agriculture, Vol. 23, Part 3, Ashby, J. (1986), "Methodology for the Participation of Small Farmers in the Design of On-farm. Trials", *Agricultural Administration,* 22, 1-19.
16. The material assembled by Farrington and Martin illustrates this distinction. Farrington, J. and A. Martin 0 *987). Farmer Participatory Research: A Review of Concepts and Practices.* (Discussion Paper 19), London: ODI.
17. Maurya, D. M., A. Bottrall & J. Farrington (1987): Improved Livelihoods, Genetic Diversity and Farmer Participation: A Strategy for Rice Breeding in Rainfed Areas of India", *Experimental agriculture,* Vol. 23, Part 3.
18. Medina,,J. R. (1988). "MASIPAG: Farmer-Scientist Partnership in Rice Project". Paper presented to ILEIA Workshop, op. cit. j
19. Gubbels, op. cit.
20. F. van den Houdt (1988)**.** Gesprek met de Kenyaanse hoogleraar Thomas Odhiambo: "We moeten beter luisteren naar de Afrikaanse boeren", interview (in Dutch) in *Internationale Samenwerking* March, 34-35.
21. An increasing number of pioneers are publishing accounts of their experience. At present, it is not always possible to judge from the terminology used by the authors whether they are writing about an existing item in the FPR repertoire, using a different name, or reporting in addition. An example which seems very much in the mainstream of experience reported here is: Scheuermeier, U. *(1988). Approach Development: A Contribution to Participatory Development of Techniques Based on a Practical Experience in Tinau Watershed Project, Nepal.* Lindau, Switzerland: LBL.

Identifying market opportunities for urban and peri-urban farmers in Kampala, Uganda

Robinah Nyapendi, Rupert Best, Shaun Ferris and John Jagwe

Content

- **Objective and activities of the market component**
- **Results**
- **Conclusions**
- **Areas of future intervention**

Objective and approach of market opportunities component

Objectives:

- **To identify market opportunities in Kampala for agricultural products that are already produced or could be produced by urban and peri-urban farmers.**

- **Collect and analyse information on buying conditions for the range of products identified**

Approach of market opportunities component

Steps:

I. **Participatory rapid urban appraisal**

II. **Rapid market study**

III. **Evaluation of most promising options**

I. Rapid urban appraisal

- **4 Parishes from 4 of the 5 Divisions in Kampala representing:**
  - **Urban old**
  - **Urban new**
  - **Urban – Peri-urban transition**
  - **Peri-urban**
- **190 farmers, 86 men and 104 women**
  - **Focus groups**
  - **Key informant interviews**
  - **Observation**

Ranking of crop and livestock products

Food security		Income		No. of people involved	
Product	No. of parishes	Product	No. of parishes	Product	No. of parishes
Matooke	4	Poultry	4	Poultry	4
Beans	4	Dairy cattle	4	Matooke	4
Maize	3	Pigs	3	Fruits	3
Fruits	3	Fruits	3	Cassava	3
Leafy veg.	2	Mushrooms	2	Beans	2
Cassava	2	Cocoyam	2	Sweetpotato	2
Cocoyam	2	Leafy veg.	1	Leafy veg.	1
Sweetpotato	2	Sugar cane	1	Pigs	1
		Cassava	1	Cocoyam	1
				House plants	1

Meat and milk

High value and specialty

Sources of vitamins and minerals

Basic starch and protein staples

Income and market outlets of principal marketed products

Category	Product	Market outlets
Meat, milk and eggs	Eggs	Shops, local supermarkets, roadside roasters, restaurants
	Broilers	
	Milk	Neighbours, local retailers
	Pork	Butcheries, restaurants, local supermarkets
Fruits	Avocado	Neighbours, roadside vendors, wholesalers
	Mango	
	Paw paw	
	Jackfruit	
Vegetables	Leafy veg.	School, neighbours, market vendors
	Cocoyam	Produce markets, roadside vendors
	Mushrooms	Local supermarkets, hotels, restaurants, shops, produce markets, neighbours

II. Rapid market study Principal steps

- **Definition of strategies**
- **Development of the research plan and tools**
- **Data collection**
- **Processing and analysis of data**

Matrix to identify research tools

Sources of information	Market research strategies				
	Products with high sales growth	Products in scarce supply	Demand for existing products sold by urban farmers	Demand for higher value, specialty products	Demand for street foods
Produce markets (5)					
Small shops and kiosks (21)					
Local supermarkets (3)					
Petrol stations (2)					
Supermarkets (3)					
Hotels (3)					
Food processors (8)					
Street vendors (4)					

Change in sales over past two years of major product categories

Category	Product	Greater or equal to previous year	Less than previous year	No idea/ no response
Meat and dairy	Poultry	82	18	0
	Pork	100	0	0
	Dairy	78	22	0
Fruits	Fruits (all)	65	17	17
Vegetables	Vegetables (all)	73	21	6
	Mushrooms	86	14	0

Note: Aggregated data for all outlets

Products with increasing sales growth and in scarce supply

Category		High demand	Scarce supply
Meat and fish		Beef, pork, fish	Pork, goat
Dairy		Milk, yogurt, butter	Milk
Poultry		Eggs, broiler, local chicken	Local chicken, broiler
Fruits	High value	Apple	Orange
	Medium	Passion fruit, bogoya, finger banana, pineapple, w.melon, avocado	Avocado, w.melon, pineapple, tangerine, passion fruit
	Low value	Mango, jack fruit, paw paw	Paw paw
Vegetables	High value	Broccoli, mushroom, garlic, cotmeal, cucumber	Garlic, r.pepper, mushroom
	Medium	Leafy veg., g.pepper, eggplant, carrot	Leafy veg., pumkin, g.pepper, eggplant, carrot
	Low value	Tomato, cabbage, onion, ntula	Onion, tomato

Note: Data aggregated for all market outlets

Purchasing conditions of selected products

Category	Product	Purchase price US$	Average daily purchase	Quality requirement
Meat	Pork	0.73/kg	3 pigs	Low fat, 16-55 kg
Dairy	Milk	0.20/lt	2,050 lt	Good odour, fresh, not adulterated
Poultry	Local chicken	2.42/bird	66 birds	Good health, av. size
	Broiler	1.72/bird	108 birds	Good health, min. 1.5 kg
Fruit	Mango	0.12/kg	250 kg	Mature, half ripe, free from external damage
	Avocado	0.17/kg	42 kg	
	Paw paw	0.28/kg	965 kg	
Vegetables	Mushroom	1.61/kg	12 kg	Mature, good aroma
	Leafy veg.	0.42-0.54/kg	16-30 kg	Fresh, intact green leaves
	Carrot	0.51/kg	37 kg	Clean, med. size, orange colour

III. Evaluation of options

Steps:

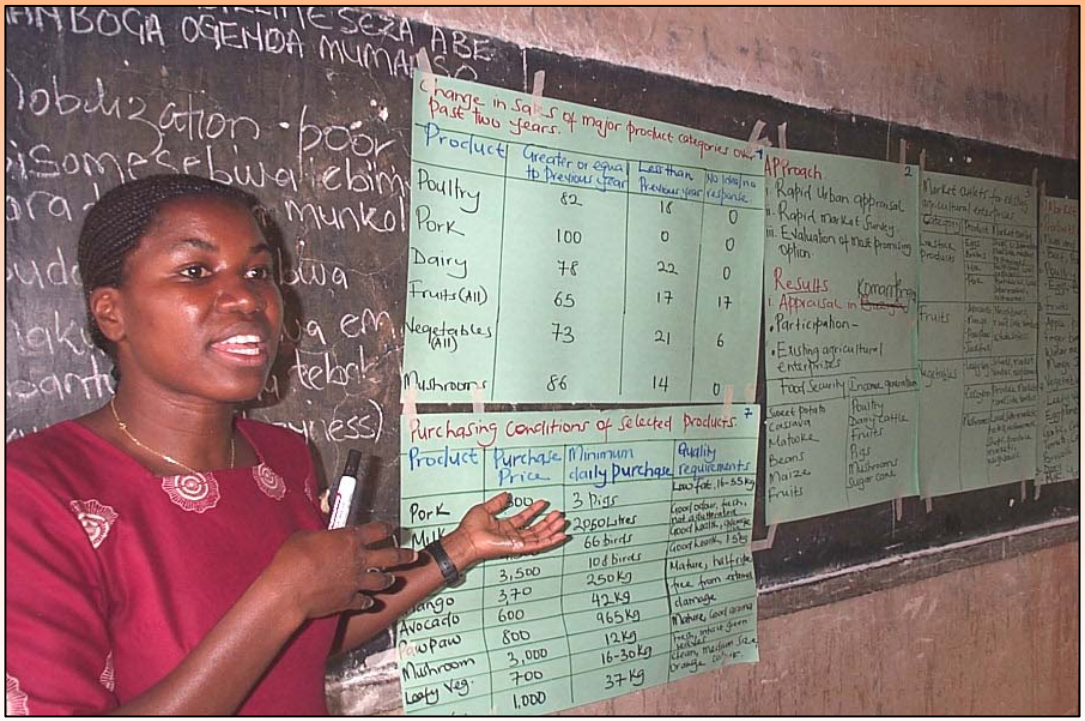
- **Eliminate less-viable options**
- **Collect production and cost data for attractive options and calculate financial parameters**
- **Feedback and discuss options with farmers and make final selection for enterprise development**

Financial characterisation of some product options

Category	Product	Size	Pre-production investment US$	Gross margin US$	NPV at 46% interest US$
Meat	Pork	2 sows	700	210	-86
Dairy	Milk	1 cow	850	170	-210
Chicken	Broiler	300 birds	1,356	950	660
Fruit	Mango	0.5 acre	490	454	210
	Avocado	0.5 acre	430	676	570
	Paw paw	0.5 acre	245	1,073	2,540
Vegetables	Mushroom	1000kg/yr	1,257	470	310
	Leafy veg.	0.5 acre	185	540	1,010

NPV = Net Present Value

Feedback to the community: selection criteria



- **Knowledge of how to produce**
- **Access to resources and inputs**
- **Security in being able to sell**

Feedback to communities: products selected

- **Peri-urban and transition**
  - **Pigs**
  - **Poultry**
- **Urban new and old**
  - **Poultry**
  - **Mushrooms**

Financial characterisation of some product options

Category	Product	Size	Pre-production investment US$	Gross margin US$	NPV at 46% interest US$
Meat	Pork	2 sows	700	210	-86
Dairy	Milk	1 cow	850	170	-210
Chicken	Broiler	300 birds	1,356	950	660
Fruit	Mango	0.5 acre	490	454	210
	Avocado	0.5 acre	430	676	570
	Paw paw	0.5 acre	245	1,073	2,540
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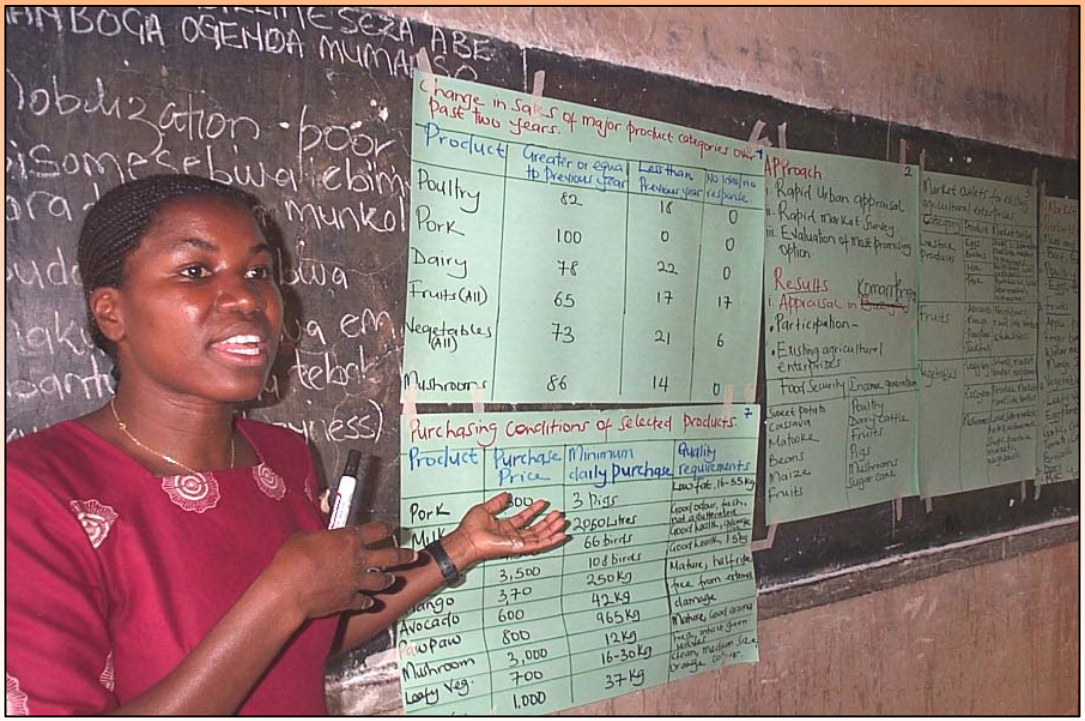
Feedback to the community: selection criteria



- **Knowledge of how to produce**
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Feedback to communities: products selected

- **Peri-urban and transition**
  - **Pigs**
  - **Poultry**
- **Urban new and old**
  - **Poultry**
  - **Mushrooms**

Conclusions

- **Demand for food products is growing in Kampala: opportunities do exist for growth**
- **Relative competitiveness:**
  - **Milk and pork not price competitive**
  - **Poultry, fruits and mushrooms price competitive**
- **Purchase conditions in emerging markets are demanding**
- **Access to information (knowledge), inputs and markets are the criteria that farmers use to select enterprises**

Growth strategies for urban and peri-urban farmers

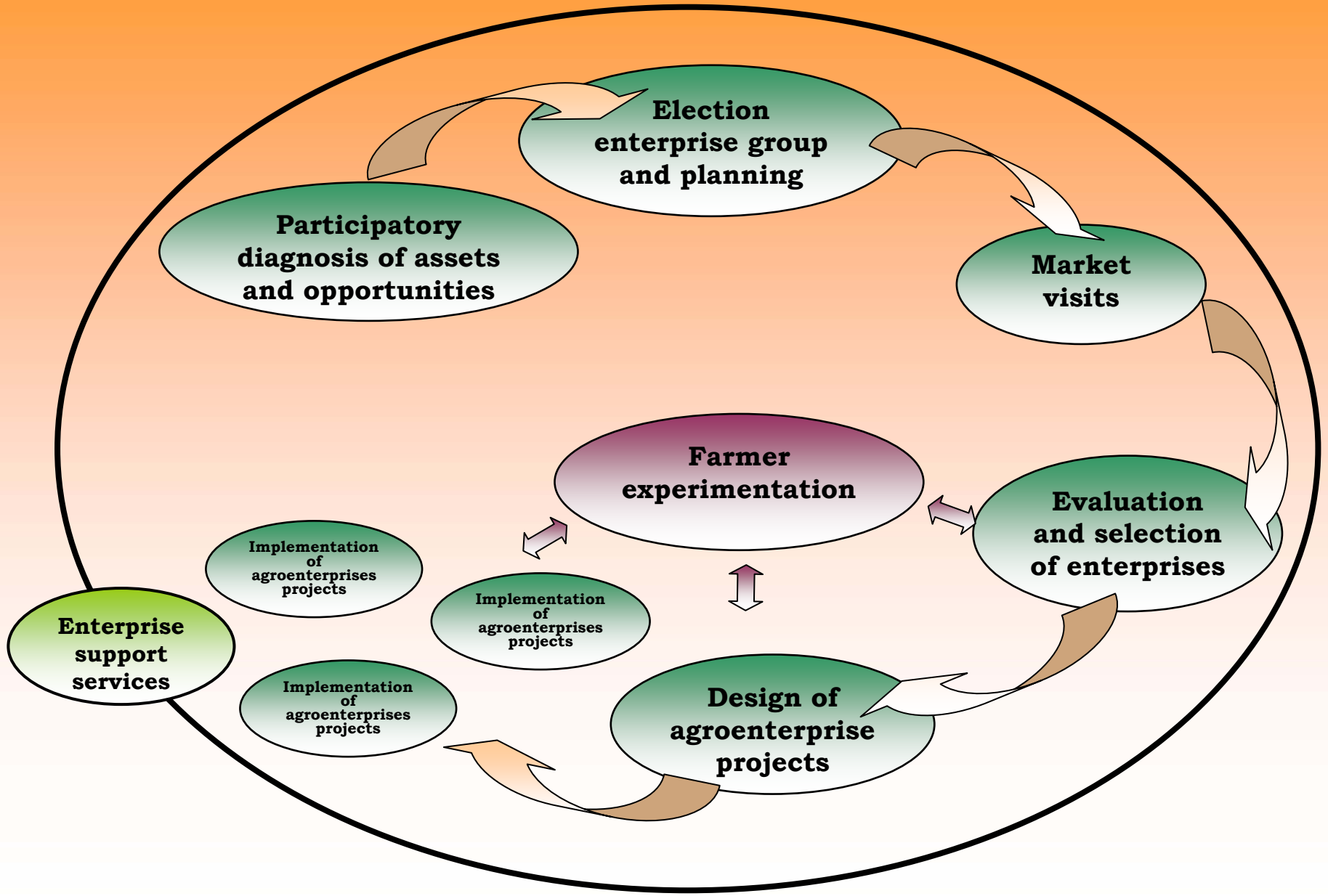
Product-Market Growth Matrix (Ansoff)

	Existing products	New products
Existing markets	Quality and cost	Knowledge, inputs
New markets	Quality, volume and continuity	Knowledge, inputs, organisation

Recommendations

- **Integrated support for urban and peri-urban farmers is required for impact on livelihoods to be achieved through enterprise development**
- **Build local capacity to provide:**
  - **Market information**
  - **Business and technical services, including research support**
  - **Micro-finance**
  - **Collective action**
  - **Supportive legal environment**

Agroenterprise development in pilot parishes



Thank you for your attention

Urban Agriculture Anglophone Africa Regional Training Course
Nairobi, 8—26 March 2004.

Module 3 Case study Nairobi
Introduction
This is a one the three case study to be used in Module 3. The other two will be based in Accra, Ghana and Addis Ababa Ethiopia.

Nairobi City.

One of the best descriptions of the city of Nairobi is given by R.W Moss (2000) in his book: *Nairobi A to Z a complete guide.* Nairobi is the capital of Kenya. In addition its influence extends far beyond its national borders making it the commercial, , financial, manufacturing, communications hub of East Africa.. It is also the largest city between Cairo and Johannesburg.

Nairobi Lies at the height of 1670 metres above sea level at longitude 36 º 50' East and latitude 1º 17' South of the equator. The mean annual temperature is 19º C and the mean daily maximum and minimum are 25º C. and 14º C. respectively. The mean annual rainfall is 1080 mm falling into distinct seasons; the long rains March to May and the short rains between October and December. The oldest lava flow

Nairobi lies at the verge of the Great Rift Valley. During the formation of the Rift valley about 17 million years ago volcanic material was released from the cracks and fissures on the valleys margin and was deposited over the land to the East and West. The oldest lava flow forms the Eastern plains occupied by the Industrial AreaThe north and the west of the city center are dominated by trachyte soils which swing further westward to Karen and langata.

Social background of the target house hold-head.
Mrs. Eunice Mbakasi Ambani was born in 1973 in western Kenya., she went to school upto standard 3. She came to Nairobi Kibera slums in 1995. She has 4 kids one of which is in her rural realtive. In 1997 she went back to the rural home because she could not sustain herself in nairobi as life was too difficult.. In 1998 she returned to the city.

Crops produced.
Bnanas, Cowpeas, Beans , Onions, Millet, Cassava, guavas. The kale , spinacn, okara nad onion anre most frequently consumed at the household compared to other crops.

Resources for crop production.
Land
The land belongs to the National Social security Fund. (NSSF) .It has not been developed and in the meantime, NSSF has made arrangement with the slum dwellers to use the land for food production and they will a receive a six months notice to stop using the land if before the use the land. The farmer has three different plots totaling about three-quarter

of an acre. She was given the first plot by a relative and after farming the money she got was used to acquire the secon plot. She gave kshs 500 for the second plot. Land acquisition is there fore in two ways, one you could from a relative or you can give some little cash to a person who has already cleared a plot and has been using and he /she leaves it to you.

Water

In two of the plots, the farmer uses wastewater while the third is rain-fed. The waste water comes from 2 estates. Masai Mara and Rubia estates. Wastewater is the important source of water for the farmer.

Soil Improvement.

The farmer does not use any artificial fertilizer. She believes the wastewater contains enough nutrients for the soil. Crop waste is also allowed to rot in the solid after harvesting to improve the solid fertility. She also bring manure from her broiler which she uses for the promising vegetable for which there is ready market and hence fast growth is necessary. These include Okra and Kales.

Labour use.

She has hired a youth for Kshs 500 a week. The mother basically provides family labour. The children assist on weekends. However when the need for labor is high especially during the planting and weeding seasons, she employs temporally casuals for about 4 days to do the work. Most of her income comes from the sale crop produce with limited amount from chicken at home.

Major problems with Crop production

Vegetable need specialized Labour during transplanting. Since not so many people can do this without damaging the young seedlings, she is forced to do most of the labour herself during planting, which is very tedious.

Water use conflicts especially during the dry season when water is in high demand. Each person is allocated a time of day in which to open the stream and direct it to his/her plot. But some people do not follow this and want to have all the water at the expense of others. Conflicts are resolved through negotiations and agreement.

There are pests that are resistant to chemicals.

Insecure Land tenure.

There is a ready constant market. It is also possible to grow a diversity of crops, which are always marketable. Some weeds are sold as fodder for rabbit and goats and cattle.

Sustainability
The farmer feels insecure, as she cannot develop the land permanently since it belongs to another organization. In 2000 she had started farming in another part of the city but after two years the plot was taken over by the owner for development. She fears the same will happen to her current enterprise and hence in this context is not sustainable.

LIVESTOCK PRODUCTION
The farmer rears broiler -chicken and rabbit. Chicken is for the mother while rabbit is for her son.

Rabbit Keeping.
At the time of the study the farmer had just sold all the rabbits. It was felt important to cover this enterprise to provide information especially on ht e problems and opportunities.
The rabbit did not need a lot f land and the were a kept in halfa meter square area next to the house in the slums where the farmer lives. They required minimum family labour in feeding and

Available resources
Fodder
The rabbit were fed on weeds from the garden. The weed *Galinsoga parviflora* was the most popular as rabbit feed. Sweet potato vines from the plots were also used.

Problems
The main problem was theft. The slum is highly populated and crime is high. The rabbit pen was always broken and rabbit stolen.

Opportunities
There was always ready market either from neighbors who wanted for food or breeding or from hotel. Waste from the rabbit house was used in the garden to fertilize the soil. The highest number of rabbit kept at one time was 38.

CHICKEN REARING

The farmer had 8-broiler chicken, which were mainly for sale. They were bought as day old chicks at Kshsh 15 per chick. She bought 36 in total 3 of which succumbed to disease and 10 were given to an upcountry relative. Fifteen were sold to neighbors. At two months she sell them at kshs 150 and Kshsh 250 when they are three to four months.
Resources
The chicken are kept in their pen just outside the house during the day and allowed into the main house in the evening to avoid theft. Water is usually purchased from a distribution tap at Kshsh 2 per 20-litre jerrycan. Chicken feed bought from the shop is usually supplemented with vegetables from the garden.

L**abour**

The farmer provides the labour needed to sustain this enterprise. The labor includes preparing the feed, cleaning the house, and watering the chicken. In order to fetch good prices she intends to stop any further sales until the chicken are big enough.

Opportunities

There is ready market and the chicks are cheap to buy. They provide a ready source of income when they mature. The chicken waste is collected in a bucket and is used in the garden for selected crops since it is not so much.

Problems.

During the cold season the young chicks requires a lot of labour and equipment. For example they will need a lump everyday for the whole night. This lamp uses kerosene, which put pressure other meager financial resources.

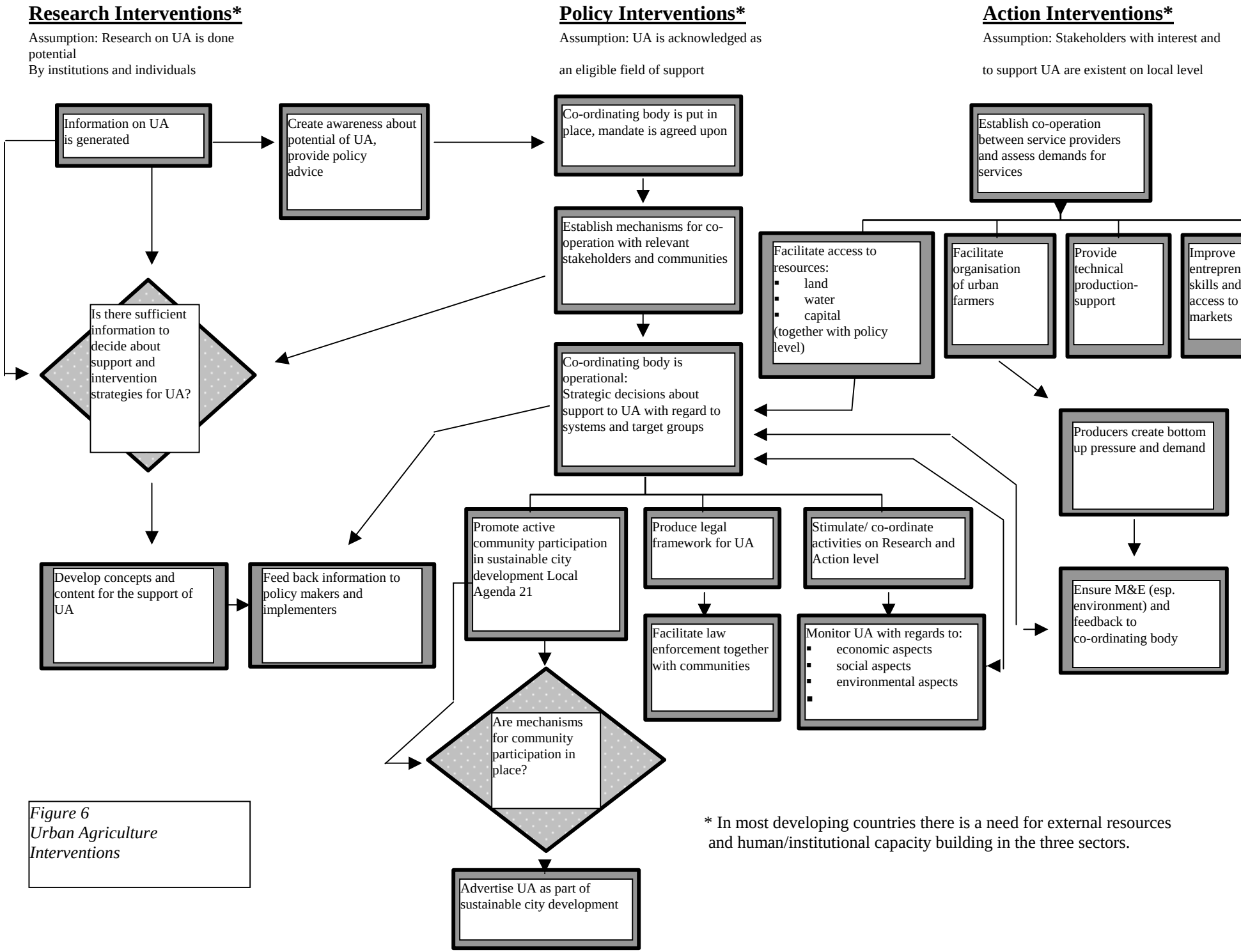
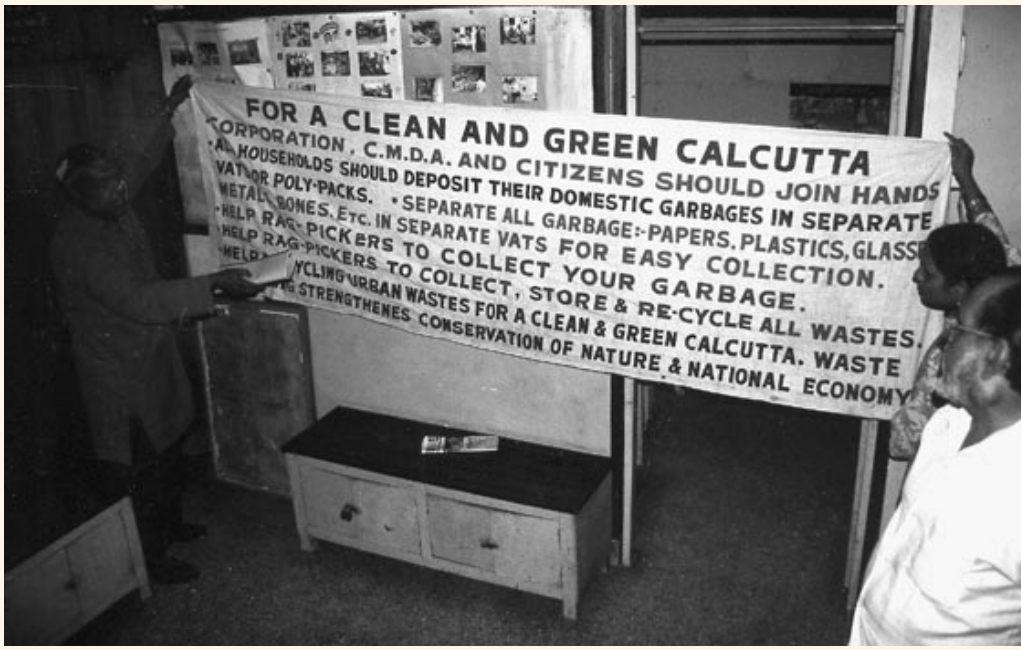


Figure 6
Urban Agriculture Interventions

* In most developing countries there is a need for external resources and human/institutional capacity building in the three sectors.

Reducing Health Risks

of Urban Organic Solid Waste Use



C. Furedy

A CBO in Calcutta (United Bustee Development Association) promotes source separation of household waste

Whereas health concerns received little attention at the beginning of the thrust to promote urban and periurban agriculture in the past five years, progress has been made in articulating the health issues in developing countries. This paper comments further on one aspect related to the issue of health and urban agriculture: the risks of urban organic solid waste re-use.[1] The focus is the relation of health risk management to informal or community-based practices, which are seen as a major challenge for agriculture in the city. Because the capacity of governments to intervene is currently limited, gradual progress in self-regulation or self-limitation of risks is necessary. International projects and experts can assist in developing appropriate standards, research and practical measures.

Obtaining and processing urban organic solid waste for these different purposes involves many actors (see for details Furedy, Maclaren & Whitney 1999). Main uses of urban organic solid waste in cities of developing countries are: the application of untreated organic material from mixed municipal wastes directly to soils (e.g. Hyderabad); cultivation on old garbage dumps (e.g. Calcutta, see: Furedy & Chowdhury 1996); the feeding of animals with wastes and waste-derived feed (containing slaughterhouse wastes - an ubiquitous practice, e.g. in Hanoi, see Le 1995); and the composting of organic material in mechanised and small neighbourhood plants (e.g. in Accra, see Asomani-Boateng & Haight 1999).

The principal problems associated with these activities are:

- survival of pathogenic organisms in residues;
- zoonoses associated with animal wastes;
- increase of disease vectors;
- respiratory problems from dust and gases;
- injuries from sharp fragments; and
- contamination of crops from heavy metal take-up and agro-chemical residues via wastes and their leachates.

The concern is not exclusively with human health, as livestock are precious, and sometimes irreplaceable, resources for low-income farmers.

Most of the activities associated with the re-use of organic wastes are informal or semi-formal. The following chart indicates some of the main practices of urban organic waste re-use. The diversity of activities and actors, and their informal contexts, makes the management of health risks a seemingly overwhelming task.

REDUCTION IN HEALTH RISKS: INTERIM MEASURES

Current limits on regulation

A range of prevention and control measures could potentially ameliorate the diverse risks posed by using urban organic solid waste for food production (see Furedy & Chowdhury 1996). In the developing countries, however, most urban organic waste processing and re-use in urban agriculture is informal or semi-formal, whereas most of the proposed measures entail relatively sophisticated official interventions, new technologies, infrastructure development and re-design of waste management, cultivation and animal-rearing systems. Since there is little immediate prospect of effective intervention in the many informal

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activities, we must take what comfort we can from positive trends of 'self-help' in this field, and seek the easiest avenues for introducing information and low-cost technology at the urban and community level.

Self-regulation
There is evidence to suggest that when municipal solid wastes become seriously contaminated with non-decomposable materials and biomedical wastes, the practice of applying solid wastes to farms declines. Reports from periurban farmers who previously applied solid wastes to their fields around cities like Hyderabad, Delhi and Hubli-Dharwad in India indicate that many have discontinued the practice because they cannot attract sufficient agricultural labour, but also because their draft animals are too often injured by glass and syringes (Nunan 2000).

As levels of education rise in the urban population in general, there is also a better understanding of problems of waste management: concepts of waste reduction, separation at source of organics, and composting are no longer unfamiliar and there is more willingness to pay fees for solid waste management (Lardinois & Furedy 1999). It is rare to find a city now that does not have environmental NGOs with some interest in pollution and waste management, and such groups are well positioned to improve public awareness.

Sorting bone wastes in informal fertiliser plant, Kathmandu

C. Furedy

For instance, in the 1960s and 1970s, most of the pickers on Calcutta's municipal garbage dump worked barefooted, while now all, except perhaps young children, wear rubber or plastic sandals (even if picked from the garbage). More waste pickers are seen to cover their noses and mouths with scarves, and to try to protect their hands from cuts.
Nevertheless, many of the serious risks cannot be 'seen' by those handling wastes.

Further, people are slow to change their behaviours when their livelihood is at stake and public officials are also concerned about employment. Improving informal work is a slow process of education coupled with providing feasible alternatives.

Setting standards
Suitable standards for assessing health risks are required. International collaboration is required to reaching these standards. One area requiring attention is composting, in particular waste-derived compost. There is considerable interest in promoting composting of urban organics on a 'decentralised' or small scale at community sites. Many international and bilateral agencies have funded pilot projects in urban composting (see Hoornweg et al. 1999).

Farmers stop using contaminated solid wastes

A weakness is that few if any of the current projects pay attention to public health risks. The rationales of the projects assume that small-scale composting, and composting in general, will be beneficial to public health. Many questions remain unanswered, though. For instance, whether community-based composting increases rodent populations, and sites for vector breeding (although there are anecdotal reports that it may). In theory, well-managed composting should not have these effects, but small composting projects are rarely so orderly.

Most small-scale composting projects do not test their products (or the liquid wastes) for contamination, but if they did, the testing undertaken would likely be limited to tests of heavy metals such as arsenic, cadmium, lead, etc. This is because most tests of compost are derived from Northern standards (and even these vary remarkably, see Blaensdorf & Hoornweg 1997). The inputs for low-tech composting in urban neighbourhoods are more varied than the green wastes composted in most Northern cities, since source separation is not consistently practised. Furthermore, the temperature levels and maturation times necessary to destroy pathogens may not be consistently maintained in small NGO projects. It will be very difficult to monitor the products of scattered community composting undertakings.

Even in Northern countries, compost standards are being questioned. The Composting Association in the United Kingdom is working towards a voluntary standard for the UK that specifies minimum criteria for "potentially toxic elements, pathogenic micro-organisms and physical contaminants"[3]. Developing countries that are proposing to set compost standards at all, are for the most part adopting the older heavy-metals-based approach. Some scientists believe it is impractical to develop pathogen standards for compost in developing countries, and that the only feasible approach is to control the composting process (Hoornweg et al. 1999). Even if pathogenic standards cannot be applied, however, further work should be done to develop baseline indicators.

A big question mark hangs over "vermicomposting" because this compost is produced at lower temperatures than in the aerobic process. The recommendations in Europe, that the organic material be digested anaerobically before being put in worm beds, is not done in developing countries. In the municipal compost plant in Buenos Aires, however, worms are used to 'mature' compost, a process that adds two months to the production cycle but which should ensure the safety of the compost (Lardinois & Furedy 1999).

REFERENCES
- Asomani-Boateng R & Haight M. 1999. Assessing the performance of mechanised centralized composting plants in West Africa: the case of Teshi Nungua composting plant in Accra, Ghana. WARMER Bulletin 69 (Nov.): 4-6.
- Blaensdorf E & Hoornweg D. 1997. The Use of Compost in Indonesia: Proposed Compost Quality Standards. Washington: World Bank, Urban Development Sector Unit.
- Furedy C & Chowdhury T. 1996. Solid Waste Re-use and Urban Agriculture: Dilemmas in Developing Countries: The Bad News and the Good News. Paper presented at Joint Congress of the Association of Collegiate Schools of Planning, and Association of European Schools of Planning, Toronto, July. (Unpublished). Available at: www.cityfarmer.-org/Furedy.html.
- Furedy C, Maclaren V & Whitney J. 1999. Re-use of Waste for Food Production in Asian cities: Health and Economic Perspectives. In: Koc M, MacRae R, Mougeot L JA & Welsh J (eds), For Hunger-proof Cities (Ottawa: International Development Research Centre), pp 136-144.
- Hoornweg D, Thomas L & Otten L. 1999. Composting and its Applicability in Developing Countries. Urban Waste Management Working Paper Series 8. Washington, DC: World Bank.
-Lardinois I & Furedy C. 1999. Source Separation of Household Waste Materials. Analysis of Case Studies from Pakistan, the Philippines, India, Brazil, Argentina, and the Netherlands. Gouda: WASTE.
- Le TH. 1995. Urban-waste derived compost in Hanoi, Vietnam: factors affecting supply and demand. MSc thesis. Bangkok: Asian Institute of Technology. Unpublished.
- Nunan F. 2000. Urban organic waste markets: responding toe change in Hubli-Dharwad, India. Habitat International 24:. 347-360.
- Rosenberg L & Furedy C (eds). 1996. International Source Book on Environmentally Sound Technologies for Municipal Solid Waste Management. Osaka: International Environmental Technology Centre, United Nations Environment Program.

Some general guidelines for safety standards will only be the beginning: local standards must be devised, to take into account the nature of soils, cultivation methods, the crops grown and local culinary habits.[4]

Low-cost options

In the sectors of sanitation and housing, the great strides in service delivery came with more attention to low-cost options in the 1980s. The same approach can be applied in waste management related to urban and periurban agriculture. The subject of low-cost and small-scale amelioration of risk has not been much discussed and there are few examples of actual interventions. Some first steps are suggested here.

An important area for development is the very small-scale wastewater treatment systems able to achieve a standard suitable for irrigating urban plots. In amending agricultural practices, tried and tested procedures for control measures (for example, in crop selection) can be adapted from the work in small-scale wastewater irrigation projects.

Cities that have created sanitary facilities and health services to waste pickers, can extend the same protections to workers handling organic wastes. Community-based projects should ensure facilities and protective clothing, as well as health risk advice, for all staff. Many of the problems of composting units could be reduced if source separated organics could be obtained.

With regard to infrastructure, since the replacement of most garbage dumps with sanitary landfills is not possible, the creation of separate cells at dump sites to receive biomedical and industrial wastes should be a priority wherever 'mining' for organics and waste picking is present (see Nunan 2000). In community-based composting projects, more attention has to be given to the collection and disposal of leachates from decomposition.

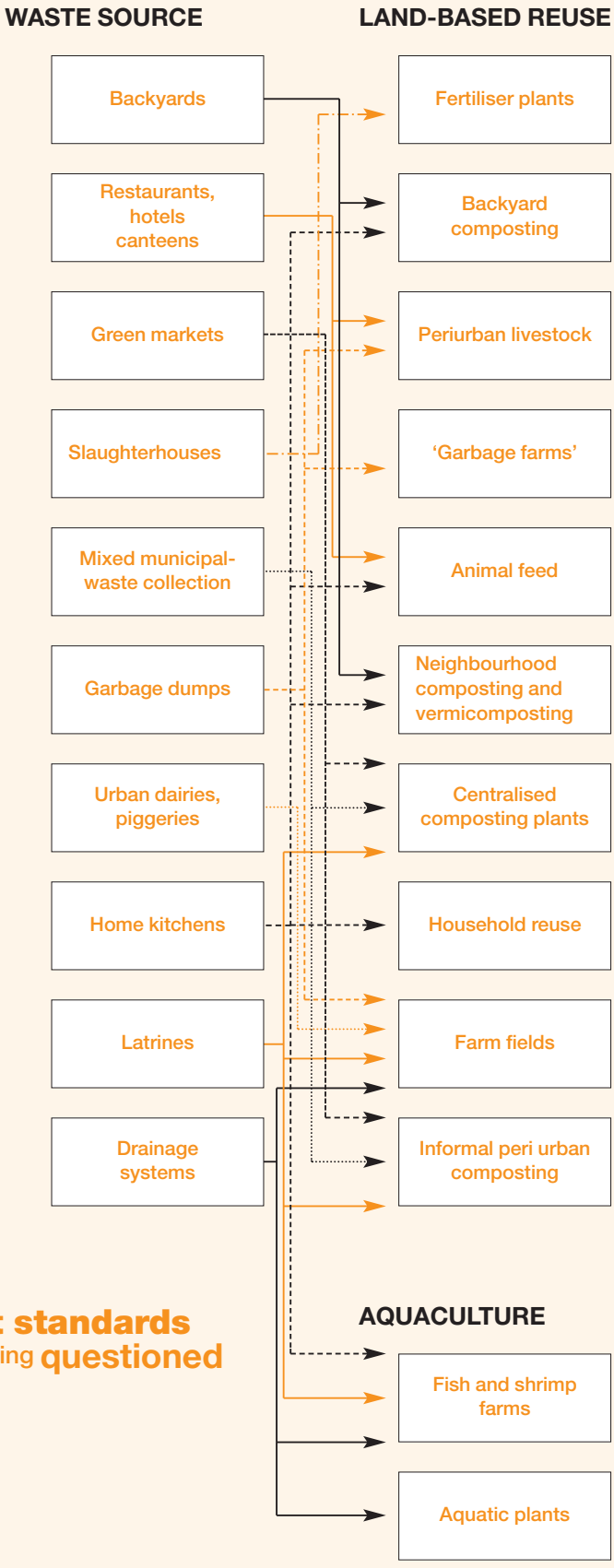
Control and monitoring of urban animals, their products and their slaughtering is a gargantuan task for many cities. Much better education of the public and the keepers of animals can pave the way for relocation, regulation and inspection.

CONCLUSION

Realistically, it cannot be expected that a great deal of research will be done on the specific health risks associated with many informal activities in urban food production. Nevertheless, the range of possible risks cannot be ignored, especially when international agencies are strongly promoting urban agriculture. What is needed is an approach that tries to balance risks and benefits. Development itself brings many improvements in public health and greater awareness among the public. In attempting to reduce risks while enhancing food production, cities will have to rely at first on available low-cost options for soil, water, and waste management. International and bilateral projects bear a special responsibility to foster awareness among the public and urban officials; such projects are the easiest way to convey practical understanding at the local level. At the international level, experts can contribute to progress through discussion of appropriate standards for soils, compost and waste management.

Compost standards are being questioned

Figure 1: Urban organic waste reuse in developing countries.



Source: Adapted from Furedy, Maclaren and Whitney 1999

Notes

1. Human excreta is not included in organic wastes for the purposes of this discussion.
2. It should be noted that far more urban organic solid waste reaches farms via direct delivery by waste collection crews, 'mining' of garbage dumps and the cultivation of old dump sites than from compost plants (Rosenberg & Furedy 1996 pp 72-73, Nunan 2000).
3. See http://www.recycle,mcmail.com/green.htm).
4. The point made by H. Shuval, with reference to WHO standards for wastewater re-use, that they are unnecessarily stringent for developing countries, may also apply to standards for soils and compost.

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Indicators of human health in ecosystems: what do we measure?

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Abstract

Increasingly, scientists are being called upon to assist in the development of indicators for monitoring ecosystem health. For human health indicators, they may draw on environmental exposure, human morbidity/mortality or well-being and sustainability approaches. To improve the rigour of indicators, we propose six scientific criteria for indicator selection: (1) data availability, suitability and representativeness (of populations), (2) indicator validity (face, construct, predictive and convergent) and reliability; (3) indicator responsiveness to change; (4) indicator desegregation capability (across personal and community characteristics); (5) indicator comparability (across populations and jurisdictions); and (6) indicator representativeness (across important dimensions of concern). We comment on our current capacity to adhere to such criteria with examples of measures of environmental exposure, human health and sustainability. We recognize the considerable work still required on documenting environment–human health relationships and on monitoring potential indicators in similar ways over time. Yet we argue that such work is essential in order for science to inform policy decisions which affect the health of ecosystems and human health.
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1. Introduction

After many years of documenting the widespread presence of both natural and anthropogenic chemicals in the environment and in humans, environmental scientists are increasingly being called upon to apply their findings in new ways. Partly on the basis of their work, the extensive connectedness between the natural environment and human beings is being discussed in terms of ecosystems, both by human epidemiologists concerned about the human health effects of widespread ecological changes (McMichael et al., 1996) and by environmental managers and policy makers. Thus, the Canadian Council of Ministers of the Environment (1994), p. 3, adopt an ecosystem approach, 'viewing the basic components (air, land, water and biota—including humans) and functions of ecosystems in a broad context, integrating environmental, social and economic concerns.' Such breadth demands agreed upon ways of monitoring and assessment which cross disciplinary boundaries and permit the utilization of scientific findings for management and policy purposes. The development of 'indicators' has been heralded as the way of responding to these challenges (WHO, 1996).

Yet how can the findings of environmental health scientists be best applied to the development of indicators relevant to human health in particular ecosystems? How can such findings be linked to the broader concepts of healthy communities and sustainability? This paper explores these questions, drawing on our experience in Ontario, part of the Great Lakes Basin. We start with definitions of indicators and their potential purposes. We propose a set of scientific criteria to select indicators. We set out a range of environmental exposure measurements that have been used as indicators of risk to human health. Then we consider measurements of human health status and social well-being that we believe reflect, at least in part, the effects of environmental exposure. We discuss attempts to use these indicators as measures of sustainability. Throughout we comment on the extent to which potential indicators meet our scientific criteria. Finally, we reflect on the challenges for future work in the areas of indicators.

2. What are indicators?

Indicators are measurements selected to represent a larger phenomenon of interest, in our case the relationships between ecosystems or environments and human health. They are shaped by the different models that scientists and policy makers use to understand the links. Indicators therefore reflect the significance of their conceptual bases. We shall consider three different bases for discussion of definitions and purposes of indicators: environmental models, measures of human health and well-being and sustainability indicators.

The 'pressure-state-response' model is an important framework for environmental indicators, developed by Canada and adopted by the Organization for Economic Cooperation and Development (OECD, 1993). Pressures are the underlying causes of change in environmental states, conditions of the natural and human world at varying scales. Responses are actions by human organizations to ameliorate environmental conditions. A similar approach is provided by Hunsaker and Carpenter (1990), with an indicator being 'a characteristic of the environment that, when measured, quantifies the magnitude of stress, habitat characteristics, degree of exposure to a stressor, or degree of ecological response to the exposure'. Underpinning this approach are concepts such as self-maintenance or self-sustainability of ecological systems, sustained use of the ecosystem for economic or other social purposes and sustained development to ensure human welfare. Based on these concepts, the US–Canada International Joint Commission, which governs the use of boundary waters between the two countries, has set out five uses for environmental indicators (Table 1; IJC, 1996). Historically, compliance has been the most important from an environmental regulation perspective but early warning and diagnostic purposes have become more salient as the irreversibility of some ecosystem changes becomes more apparent.

For health planners, human health indicators

Table 1
Suggested uses for environmental indicators

Assessing the current condition of the environment in order to judge its adequacy (i.e. a compliance indicator)
Documenting trends in the condition over time, i.e. degradation or rehabilitation (a compliance indicator or sometimes an early warning indicator)
Anticipating hazardous conditions before adverse impact in order to prevent damage before the fact (i.e. an early warning indicator)
Identifying causative agents in order to specify appropriate management action (i.e. a diagnostic indicator)
Demonstrating interdependence between indicators to make the assessment process more cost-effective and to reinforce political will to make environmentally sound management decisions (i.e. correlations between various indicators)

Source: IJC, 1996, p. 13.

have traditionally drawn on the wide variety of data routinely collected to document vital statistics or administer health care services (Birch and Eyles, 1993). Health indicators are then defined as 'statistics selected from the larger pool because they have the power to summarize, to represent a larger body of statistics, or to serve as indirect or proxy measures for information that is lacking. They are chosen because they are efficient, effective tools for planning, management and evaluation.' (Murnaghan, 1981). Stimulated in large part by national or global strategies such as Health for All by the Year 2000, a wide range of terms and definitions for such measures of health status has been generated (Hansluwka, 1985).

Another approach has been that of public health surveillance defined as 'the ongoing systematic collection, analysis and interpretation of data on specific health events affecting a [human] population, closely integrated with the timely dissemination of these data to those responsible for prevention and control' (Thacker and Stroup, 1994). An initial focus on disease or injury surveillance approach has been expanded to include hazards. Hazard surveillance is 'the assessment of the occurrence of, distribution of, and the secular trends in levels of hazards (toxic chemical agents, physical agents, ... as well as biological agents) responsible for disease and injury' (Wegman, 1992). Closely related is exposure surveillance or 'the monitoring of individual members of the population for the presence of an environmental agent or its clinically unapparent (e.g. subclinical or preclinical) effects' (Thacker et al., 1996). Surveillance is thus built on indicators not only of human disease or injury and its surrogates of health care utilization but also on relevant measures of hazards in the environment and exposures to individuals.

In measuring social well-being, (social) indicators are defined as 'statistics which measure social conditions and changes therein over time for various segments of the population (Eyles, 1994). By social conditions, we mean both the external (social and physical) and the internal (subjective and perceptual) contexts of human existence in a given society'. An indicator is

> 'a statistic of direct normative interest which facilitates concise, comprehensive and balanced judgements about the conditions of major aspects of society. It is in all cases a direct measure of welfare and is subject to the interpretation that, if it changes in the 'right' direction, while other things remain equal, things have gotten better or people are 'better off'' (US Department of Health, Education and Welfare, 1969, p. 97, cited in Eyles, 1994).

Sustainability indicators build on the environmental, human health and social well-being literature (Gosselin et al., 1993). Definitions generated for lay groups working on building healthy communities are more familiar in style. For example, 'Indicators are 'signposts' of change. Monitored over time, they provide clues to the direction the community is heading' (Hellman, 1996); and an 'indicator is a flag, marker or sign that points to a condition you want to measure ... we use indicators to describe conditions or processes in a community' (British Columbia Ministry of Health and Ministry Responsible for Seniors, undated). As part of the strategy to improve 'information for decision making' on sustainability (UNCED, 1992, chapter 40), the World Health Organization has taken the lead in developing indicators related to environmental health

(chapter 6 of Agenda 21) which reflect this active use by lay public (Table 2, WHO, 1996). Indicators are firmly seen as being specified in a model of some aspect of environment or society which affects well-being and demonstrates over time, patterns and variations in the issues of interest to a wide variety of stakeholders. They are goal-related. As noted in a World Resources Institute review, 'Indicators must be more than just a description of conditions or trends … they must help to express progress toward attainment of public policy' (WRI, 1990). Clearly, indicators have a number of socio-political requirements for their use (Eyles et al., 1996, p. 58, for use-based criteria) but what scientific requirements should they fulfil?

3. Criteria for indicator selection

Desirable characteristics of indicators have been dealt with in a variety of ways in different literature. A report on bioindicators for the virtual elimination of persistent toxic substances (Fox, 1994) suggests four criteria: specificity to the substances, placement in appropriate scales, costs of measurement and social relevance/public perception. Of initial importance are scientific issues of data quality. A report on the State of Lake Ontario used quality criteria for the inclusion of different kinds of data, based on critical appraisal questions developed for analytic measurements, toxicologic studies, ecologic studies and epidemiologic studies (Rang et al., 1992). A Community Health Profile document (Community Health Profile Working Group, Ontario Ministry of Health, 1994) examined health data integrity (e.g. completion of records, nature of sampling in brief surveys), geographic coding issues (e.g. postal codes vs. census subdivisions) confidentiality and data access, and data gaps.

Availability of appropriate data is the first scientific criterion for indicator selection (Eyles et al., 1996), as set out in Table 3. The second criterion refers to the closely related concepts of validity and reliability. Questions based on the types of validity include: after evaluating the rationale behind indicator selection, is it a reasonable measure? (face validity); does the measure behave as expected in relation to other related variables? (construct validity); does the measure correctly predict a situation which would be caused by the phenomenon being measured? (predictive validity); and do several measures collected or structured in different ways all move similarly over time? (convergent validity). Reliability is an important component of validity but more easily ascertained through repeated measures in different contexts and at different times provided similar methods are used. The third criterion is responsiveness or the ability to avoid ceiling or floor effects which inhibit documentation of change over time.

Table 2
Role of indicators for sustainability

Provide a common currency or language for information exchange between the many stakeholders concerned with health, environment and development interactions
Help to quantify the situation and highlight its significance
Help to simplify the data and present it in a form directly relevant to the question being addressed
Enable decision-makers to be aware of the choices available, and to evaluate and compare the implications of these choices
Provide the information to the general public, and facilitate external scrutiny of decisions and policies, thus ensuring transparency and accountability

Source: WHO, 1996.

Table 3
Scientific criteria for indicator selection

1.	Data availability, suitability and representativeness (with respect to sampling of populations)
2.	Indicator validity (face, construct, predictive and convergent) and reliability (repeatability across times and sources)
3.	Indicator responsiveness to change
4.	Indicator disaggregation capability (across personal and community characteristics)
5.	Indicator comparability (across populations and jurisdictions)
6.	Indicator representativeness—Coverage of important dimensions of concern

To be informative, indicators should also be able to be broken down by key variables. The OECD (1973) identifies three types of desegregation: by ascribed characteristics e.g. age, sex, race, region; by well-being characteristics e.g. years of education, family income; and by contextual characteristics e.g. size of community, type of occupation. Similarly, indicators should be able to be compared across communities and jurisdictions to satisfy the human desire for ranking and to permit studies to link human health outcomes with environmental conditions in different places. Finally, indicators should cover as broad a range of concerns as possible in ways that do not unnecessarily compromise validity. Such breadth may necessarily involve the inclusion of non-commensurate types of indicators representing different aspects of a phenomena of interest such as human health related to environment. Keeping in mind these criteria, we shall now turn to the options available among indicators of human environmental exposures, related human health impacts and measures of the sustainability of human communities.

4. Human exposure indicators

In choosing indicators of human exposures to toxic agents in the environment, we face a bewildering array of potentially relevant choices, because of the connectedness of different parts of the biosphere. Many exposures potentially have human health consequences (Brooks et al., 1995). Most of these are not as easy to recognize as 'environmentally-related accidents' included in the United Nations Environment Programme's reports on unplanned releases which resulted in injuries and evacuations (e.g. UNEP, 1991, p. 241) or similar short-term events documented by the US Agency for Toxic Substances and Disease Registry in its Hazardous Substances Emergency Events Surveillance System (Hall et al., 1996). Low-level long-term multiple exposure situations pose significant challenges. Environmental policy makers charged with producing State of the Environment (SOE) reports (e.g. Government of Canada, 1991), environmental scientists trying to model environmental processes (e.g. Hauhs et al., 1996) and environmental epidemiologists trying to demonstrate relationships between environmental exposures and adverse human health outcomes (e.g. Armstrong et al., 1992, 1995) have all had to grapple with this challenge. Among the diverse approaches used, we can focus on potential exposure indicators from those areas in which credible exposure–human health effect relationships have been identified through toxicologically-based risk assessments or epidemiological studies.

Inventories of emissions to air, discharges to water or toxic releases to any media can provide information on the magnitude and apportionment of sources of contaminants of relevance to human health (e.g. Canadian Chemical Producers' Association, 1994). They are important components of SOE reports at the national (e.g. sulphur dioxide emissions to air) and municipal levels (e.g. sewage treatment plant discharges of total suspended solids) (Government of Canada, 1991). Pirrone and Keeler (1996) examined trends in air emissions of trace elements in the Great Lakes region and demonstrated corresponding changes in ambient air concentrations. Further, sophisticated dispersion modelling programs have modelled the transport, movement and concentrations of emitted contaminants in particular media over time, e.g. contaminants moving by air currents into the Arctic (McKay and Wania, 1995) and toxics in water–sediment systems of the Great Lakes (US EPA, 1989).

Most models rely on measurements of contaminant levels in different media and biota for initial estimation and subsequent calibration. For the Great Lakes Basin, considerable work went into the synthesis of data and reporting on the presence and potential impacts of toxic chemicals (Environment Canada et al., 1991) with foci on contaminant levels in water and sediments, aquatic biota (mainly fish) and wildlife species (mainly birds) by lake or river (e.g. Lake Superior, Niagara River). For human contaminants, the approach involved first examining contaminants in all the media which form pathways for human exposure (food, drinking water, air and soil) and then setting out data on contaminants in different human tissues (adipose, blood, breast milk and so on). In some sense this reflects the luxury of

focusing on a single species but it also reflects the wider range of locations in which humans spend time and the importance of various types of exposure (e.g. workplace, ambient air, consumable food). Multiple routes of exposure are particularly important for radionuclides, with considerable external sources and potential pathways through fish consumption for which little current monitoring data are readily available (Joshi, 1991).

Exceedances of established international, federal, provincial and state standards of contamination in different media have also been proposed as major environmental indicators relevant to health (Ecosystem Objectives Work Group, 1992). However, two potential problems emerge. First, as newer compounds are documented and their health effects gradually elucidated, no such standards may exist for some time, e.g. alkyl phenolic compounds (Bennie et al., 1997). Secondly, what were thought to be protective levels at one time may no longer be perceived or demonstrated as such over time, e.g. small particles in air (Dockery and Pope III, 1994).

Another important consideration for human exposure is the activities that bring people into contact with a contaminated medium or biota. The distributions of time–activity patterns based on diaries (e.g. Leech et al., 1996) have made important contributions to the risk assessment process for exposure to airborne contaminants. Similarly, dietary surveys combined with measurement of contaminant levels in foods have permitted estimates of contaminant intakes among populations for a limited number of metals and pesticides (e.g. Dabeka and McKenzie, 1995). For fishing and the subsequent consumption of potentially contaminated fish (Stow et al., 1995), a variety of methods have been developed to obtain data (US EPA, 1992) and relate consumption to contaminant intakes (e.g. Kearney et al., 1995).

Related to human activity is the perceived use to which various aspects of the natural environment can be put. For example, bathing beaches are frequently posted due to either measured (via bacterial counts in water) or presumed biological contamination at levels which would be most likely to cause swimming-related illnesses (Rang et al., 1992). Relevant human activity information has often been lacking except when special studies are undertaken (Seyfried et al., 1985a, 1985b). The IJC Indicators for Evaluation Task Force (IJC, 1996) recommended that Swimmability and Fishability both be used as indicators. Fishability requires ongoing assessment of contamination in species-size-location mixes and consumption by people living in the Basin (e.g. Sheeshka et al., 1996). Hence indicators which characterize the environment as a place for human activity must confront the need for the critical information on human use.

Biological measures of absorption often provide summary measures of exposure for contaminants with long half-lives in the human body (Environmental Health Directorate, 1996). Blood lead is the classic biological measure of immense importance in large US cities (Agency for Toxic Substances and Disease Registry, 1988). Although national surveys have been done for persistent organochlorines using adipose tissue (Lordo et al., 1996) or breast milk, plasma or serum have been more commonly used among those with potentially higher exposures such as anglers (Kearney et al., 1995) and First Nations' peoples. Such measurements are often linked to risk assessment-based predictions of potential human morbidity (e.g. Forti et al., 1995).

These different approaches to quantifying human exposure only partially meet the scientific criteria for indicators. Although much of the data has demonstrated validity and can be responsive to change, there is a lack of systematic, repeated, representative data across jurisdictions and over time. Air pollutants and food contaminants show the most promise partly as a result of international attempts to standardize profiles and methods (e.g. UNEP, 1991), yet they must be linked with human activity and morbidity and mortality data to be useful as indicators of human health in ecosystems.

5. Human mortality and morbidity indicators

Data collected through vital statistics systems at provincial/state and national levels have traditionally formed the bases of indicators of human

mortality (Péron and Strohmenger, 1994). Information on rates of death (mortality) by disease, age and sex may prove useful for comparisons across regions when environmental exposures are sufficiently high and regionalised to cause major effects. For example, after adjusting for district measures of mean income, mean car ownership, proportion of illegitimate (sic) births and abortion rates, Hertzman (1994) and colleagues found that the rates of low birth weight, postneonatal morality and infant mortality were all significantly higher in former Czechoslovakia districts with the highest levels of air pollution compared with those with the lowest. Similarly, the declining proportion of live births that are male has been advocated as a measure of the reproductive health of large populations, linked to environmental exposures in Canada (Allan et al., 1997).

Hospital utilization rates by age, sex and disease may also prove useful. A recent Canadian Atlas of Hospital Morbidity in the Great Lakes Region (Bureau of Chronic Disease Epidemiology, 1993) noted areas with higher rates for some diseases which facilitate the generation of hypotheses as to environmental and social causes. Such data have been used to demonstrate associations between levels of aluminum in drinking water and admissions for Alzheimer's disease (e.g. Neri and Hewitt, 1991). Utilization rates are, however, subject to considerable variation based on facility availability and health professional utilization practices in different settings (Roos and Roos, 1989). For example, among Manitoba's elderly patients reporting good or excellent health, the probability of being hospitalized could vary twofold depending on the practice style of their physician (Roos and Roos, 1989). Further, Burnett et al. (1994) using sophisticated time series analyses to link air pollution and hospital admissions, showed the proportion of all hospital admissions attributable to air pollution among those 65 or older was 4.3%. Such a small percentage change could be easily masked by non-random distributions in practice style among physicians in any particular community. Conversely, a large increase in hospital admissions in a community could be inappropriately attributed to pollution effects when the source of variation was physician practice style. One means of overcoming such interpretation problems is to predict the proportion of hospital admissions that would be due to air pollution in a community, based on existing coefficients of relationships in the literature and measured levels of air pollution. For example, a multidisciplinary group estimated that for Hamilton-Wentworth, about 1% of all non-traumatic admissions could be attributed to acute changes in ground level ozone, NO_2, carbon monoxide, particles or sulphates (Pengelly et al., 1997). Such attributable risk estimates may be the best way to predict the potential of environmental exposures to produce human health effects.

Registries of birth defects usually are derived from hospital discharge diagnoses and vital statistics data (Johnson et al., 1992). Increased rates can spuriously come from differences in ascertainment by physicians and coders in hospitals, random variation, combinations of the two, or true differences. Nevertheless in rural Minnesota, the highest rate was found in the major wheat, sugar beet and potato growing region where phenoxy herbicide and fungicide use are greatest and higher rates were only found at the time when the heaviest applications occurred, the spring (Garry et al., 1996). In two heavily polluted industrial cities of Ukraine, average rates of congenital anomalies were 11.7 and 8.8 per thousand live births compared to 3.8 in a less polluted city (Hertzman, 1994). Similar gradients for rates of multiple, dominant and x-linked anomalies (but not recessive anomalies) were documented, indicating that new mutations may be occurring. Such an analysis is relevant to potential effects of environmental pollution yet it is best done by chart review, a time consuming exercise used to compile the British Columbia congenital anomalies database (Darrell Tomkins, personal communication).

Cancer registries must rely on more varied sources and methods of reporting to build as complete a picture as possible of the numbers of new cases occurring each year (incidence) (e.g. for Ontario, Mills and Semenciw, 1992). Although data quality across regions in Ontario has been shown to be good and spatial aggregation occurred for about one-third of the site-sex combinations, considerable work remains to be done on

the wide range of exposures that may be implicated (Walter et al., 1994). Linkages with existing environmental data are possible but usually only as specific case control studies such as those linking chlorination of drinking water with colon and bladder cancer occurrence (e.g. King et al., 1996). Methods for building up detailed exposure histories for population-based case-control studies of cancer have been considerably advanced for occupational exposures to a range of potential carcinogens using expert hygienist coders (e.g. Siemiatycki, 1992). These methods remain to be developed across the range of carcinogens present in the ambient environment, likely due the high cost involved in generating adequate data.

Water-borne infectious diseases have a long history of mandatory reporting to public health authorities. Outbreaks due to parasites and other less commonly controlled organisms like crypto sporidium (MacKenzie et al., 1994) are of particular importance. Surveillance for these infectious diseases and/or the environmental conditions which promote them (high runoff with high water intake turbidity) provide examples of conditions for which indicators can be useful. In keeping with public health criteria for the appropriateness of surveillance, they are relatively simple, specific, feasible, timely and reasonably cheap given the resulting public health benefits (Thacker et al., 1996).

Surveys of determinants of health, health conditions and health care utilization can also provide indicators of health status of a population, though not usually on a regular basis. They may be entirely questionnaire-based, as in the first wave of the Canadian National Population Health Survey (Montano, 1994), or they may include physical examinations and biological samples as in the US NHANES III survey (US National Center for Health Statistics, 1994). Such survey data are based on self-reporting with resulting lack of specificity of diagnoses but they are good for general health concerns and are usually representative of the entire population. Primary data collection on environmental exposures is possible, as in the inclusion of a question on consumption of freshwater fish from Alberta in Alberta's Heart Health survey (Elizabeth Hasselborg, pers. comm.). Respiratory morbidity and health professional visits reported over a specified period of time have been shown to vary with local air pollution levels in Ontario (Pengelly et al., 1993, 1995).

Considerable work has been done aggregating health data and devising indices that provide a better picture of the overall impact of the constituent conditions on the health of a population (Péron and Strohmenger, 1994). The World Bank (1993) has estimated environmental burden of illness using disability adjusted life years (DALYs), which incorporate morbidity and premature mortality, adjusted for severity of illness and stage of life, and converted to monetary units. Community health profiles are another way of summarizing health indicators and their determinants. For example, relevant categories in the version from the US Institute of Medicine's Committee on Using Performance Monitoring to Improve Community Health (Institute of Medicine, 1997) included exposure risk factors such as air quality standards, health status indicators such as age-adjusted mortality rates and functional status measures such as general health. Prime considerations for indicator selection were similar to our proposed scientific indicators. Hence those chosen by the committee have available and representative data, demonstrate validity and reliability, have differential time lines for responsiveness to change, can be desegregated and are comparable across US jurisdictions (though some would not be internationally).

Social indicators may document public perceptions, show particularly vulnerable groups or reflect indirect results of ecosystem changes. Public concern about environmental exposures may generate stress with health consequences as reported in the growing literature on psychosocial effects of waste disposal siting and environmental disasters (Cole and Eyles, 1997). Impacts on the quality of life were one of the major concerns voiced by residents of Hamilton-Wentworth in considering indicators of air quality (Pengelly et al., 1996). Soiling by black soot and the need to clean children, pets, clothes and outdoor furniture were as important as the need to stay indoors on high pollution days because of breathing difficulties. A

striking example of vulnerable groups suffering indirect effects has been the reduction of self-supporting status of the Akwesasne First Nation consequent to the decline of agriculture due to fluoride pollution and fishing due to PCB contamination (Forti et al., 1995).

6. Sustainability indicators

Such outcomes link with the literature on sustainable and healthy communities. Often the terms are used interchangeably or actually combined (Hellman, 1996). Early proposals to monitor progress towards 'healthy cities' set out components for every aspect of municipal activity including both the built and natural environment (York University Centre for Health Studies, 1990, 1991). Municipal SOE reports in Canada were the first step towards a sustainability perspective. In a series of case studies, Campbell and Maclaren (1995) and Campbell et al. (1996) noted a predominant focus on what they term 'biophysical indicators' ($n = 226$) which included land use (e.g. open space), media (e.g. air quality) and stresses and responses (e.g. waste generation and recycling). Social indicators were next ($n = 35$) followed by economic indicators ($n = 21$). Few municipalities included morbidity or mortality variables as SOE indicators. Those that did had general health indicators (5/290) and measures for poisonings, motor vehicle accidents and air pollution effects.

Canadian sustainability indicator development for local communities has built on experience with SOE reports, with a strong emphasis on land-use and ecological integrity/heritage. Initiatives have focused on development of sustainable regions and incorporated planning approaches to documentation of Quality of Life (Dilks, 1996). For example, Hamilton-Wentworth initiated a community visioning process in 1989 to move toward 'Vision 2020: the Sustainable Region' (Bekkering, 1995). A working group involved both area specialists and community members to develop a set of sustainability indicators or 'Signposts on the Trail to Vision 2020' (Regional Municipality of Hamilton Wentworth, Environment Department, 1995). The 29 indicators in 11 theme areas draw on existing information and graphically present both current status in relation to goals and trends. In addition to measures of contamination in media are indicators such as per capita residential electricity consumption, low birthweight babies as a percentage of total births and a rate of meaningful employment. Well-being per se was not included because of concerns that it can quickly include almost all human activity, rendering it inappropriate for comparative purposes.

Yet when trying to assemble information other than morbidity/mortality data, those developing sustainability indicators often face issues of data availability and comparability, because much depends on local government reporting systems and requirements. Validity, reliability and representativeness of the indicators can be more important issues, since routinely collected data often do not match models of sustainability nor the public's major areas of concern about ecosystem–human links.

Nor do ecosystem boundaries often match political boundaries. Responsiveness to change may as yet be uncertain because systematic reporting and implementation of community planning changes are only beginning.

7. Conclusions

We have reviewed a wide variety of perspectives and relevant data on indicators relevant to human health and ecosystems/environments. Human health is clearly multidimensional and our task is to be explicit about the dimensions being measured and devote attention to the scientific issues involved in indicator selection. Overall, natural scientists have made strong contributions in the area of exposure measurement but the links of environmental exposures and ecosystem conditions to human health need to be strengthened for indicator purposes. Human health scientists and practitioners have done well on documenting morbidity and mortality but need to work on adapting the usual systems of health service information and health survey design and reporting to include a broader range of determinants, including exposures. Social scientists and

planners also need to link back to documentation of human activity and exposures to make their work more usable as indicators of human health in ecosystems.

In order to meet the needs of decision-makers at the local, national and international levels for information at the appropriate scale, potential indicators will have to be tested over time among scientists, policy makers and the public (Wills and Briggs, 1995). Environmental health professionals must play an active role in the process of development, testing and eventual reporting of indicators. We understand this process will be arduous at times, particularly as the indicators we advocate are buffeted in the policy and political arenas. We would argue, however, that unless our scientific work appropriately contributes to such arenas, we may eventually lack resources to continue our contributions and decision-makers may unknowingly pay inadequate attention to the complex interplay of ecosystems and human health.

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References

Agency for Toxic Substances and Disease Registry. The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress. Atlanta, Georgia: ATSDR, Public Health Service, US Department of Health and Human Services, 1988, 16 page executive summary and multiple sections with sectional pages.

Allan BB, Brant R, Seidel JE, Jarrell JF. Declining sex ratios in Canada. Can Med Assoc J 1997;156(1):37–41.

Armstrong BK, White E, Saracci R. Principles of Exposure Measurement in Epidemiology. Oxford: Oxford University Press, 1992:351.

Bekkering M. On the trail to a sustainable Hamilton-Wentworth. Focus 1995;20(2):3–4.

Bennie DT, Sullivan CA, Lee H-B, Peart TE, Maguire RJ. Occurrence of alkylphenols and alkylphenol mono- and diethoxylates in natural waters of the Laurentian Great Lakes basin and the upper St. Lawrence River. Sci Total Environ 1997;193:263–275.

Birch S, Eyles J. Need based planning of health care: a critical appraisal of the literature. Can J Public Health 1993;84(2):112–117.

British Columbia Ministry of Health and Ministry Responsible for Seniors, Office of Health Promotion. Health Indicator Workbook. A Tool for Healthy Communities (undated), 64 pp.

Brooks SM, Gochfeld M, Herzstein J, Jackson RJ, Schenker MB. Environmental Medicine. Mosby: St. Louis, 1995:780.

Bureau of Chronic Disease Epidemiology, Laboratory Centre for Disease Control. Atlas III. Hospital Morbidity Atlas, Ontario: 1985–1988. Ottawa: Health Canada, 1993:54 pp. and three appendices.

Burnett R, Dales RE, Raizenne ME, Krewski D, Summers PN, Roberts GR, Raad-Young T, Dann T, Brook J. Effects of low ambient levels of ozone and sulphates on the frequency of respiratory admissions to Ontario hospitals. Environ Res 1994;65:172–194.

Campbell M, Maclaren V. Municipal State of the Environment Reporting in Canada: Current Status and Future Needs. Prepared for State of the Environment Directorate, Environment Canada, Contracts KA 171-3-5512 and K1721-4-0136. State of the Environment Reporting Occasional Paper Series No. 6. Ottawa: Environment Canada, 1995:82.

Campbell M, Spear D, Maclaren V. Measuring Up: A Resource Guide for Municipal State of the Environment Reporting. Prepared for State of the Environment Directorate, Environment Canada. Ottawa: Environment Canada, 1996:70.

Canadian Council of Ministers of the Environment, Ecosystem Health Indicators, Ottawa, 1994.

Canadian Chemical Producers' Association. Reducing Emissions. 1992 Emissions Inventory and Five Year Projections. Ottawa: CCPA, 1994:31.

Cole DC, Eyles J. Combining qualitative and quantitative approaches to assessing impacts of environments on human health and well-being in local community studies. Toxicol Ind Health 1997;13(2/3):259–265.

Community Health Profile Working Group, Ontario Ministry of Health. A Model for Community Health Profiles and

Supporting Data Structures. Toronto, Ontario, 1994:32 pp. and appendices.

Dabeka RW, McKenzie AD. Survey of lead, cadmium, fluoride, nickel and cobalt in food composites and estimation of dietary intakes of these elements by Canadians in 1986–1988. J AOAC Int 1995;78(4):897–909.

Dilks D, of the LURA Group. Measuring Urban Sustainability: Canadian Indicators Workshop. Proceedings. Prepared by David Dilks for State of the Environment Directorate, Environment Canada and Centre for Future Studies in Housing and Living Environments, Canada Mortgage and Housing Corporation. CIVII-IC, Ottawa, 1996:73.

Dockery DW, Pope CA III. Acute respiratory effects of particulate air pollution. Annu Rev Public Health 1994;15: 107–132.

Ecosystem Objectives Work Group. Ecosystem Objectives and their Environmental Indicators for Lake Ontario. Interim Report to the Science Advisory Board, International Joint Commission, Windsor, Ontario, Canada, 1992:61.

Environmental Health Directorate. Summary of the Health Canada Biomarkers Workshop—Ottawa, Jan 9 and 10, 1995. Ottawa: Health Canada, 1996:22.

Environment Canada et al., Toxic Contaminants in the Great Lakes, Ottawa, 1991.

Eyles J. Social indicators, social justice and social well-being. CHEPA Working Paper Series No. 94-1. Hamilton: McMaster University, 1994:108.

Eyles J, Cole D, Gibson B. Human Health in Ecosystem Health: Issues of meaning and measurement. Report to the Science Advisory Board. Windsor/Detroit: International Joint Commission, 1996:73.

Forti A, Bogdan KG, Horn E. Health Risk Assessment for the Akwesasne Mohawk Population from Exposure to Chemical Contaminants in Fish and Wildlife. Albany, New York: New York State Department of Health, Center for Environmental Health, Bureau of Toxic Substance Assessment, 1995:112.

Fox GA, editor. Bioindicators as a Measure of Success for Virtual Elimination of Persistent Toxic Substances. A report based on a workshop held April 28–29, 1992, Ann Arbour, Michigan. Windsor: International Joint Commission, 1994:37.

Garry VF, Schreinemachers D, Harkins ME, Griffith J. Pesticide appliers, biocides and birth defects in rural Minnesota. Environ Health Perspect 1996;104:394–399.

Gosselin P, Bélanger D, Bibeault J-F, Webster A. Indicators for a sustainable society. Can J Public Health 1993;84:197–200.

Government of Canada. The State of Canada's Environment. Cat. No. EN21-5411991 E. Ottawa: Minister of Supply and Services Canada, 1991.

Hall HI, Haugh GS, Price-Green PA, Dhara VR, Kaye WE. Risk factors for hazardous substance releases that result in injuries and evacuations: data from 9 states. Am J Public Health 1996;86(6):855–857.

Hansluwka HE. Measuring the health of populations. Indicators and interpretations. Soc Sci Med 1985;20(12): 1207–1224.

Hauhs M, Neal C, Hooper R, Christophersen N. Summary of a workshop on ecosystem modeling: the end of an era?. Sci Total Environ 1996;183:1–5.

Hellman E. Signs of Progress, Signs of Caution. How to prepare a healthy sustainable community progress report card. Workbook One and Two. Toronto: Ontario Healthy Communities Coalition, 1996:151.

Hertzman C. Environment and Health in Central and Eastern Europe. A Report for the Environmental Action Programme for Central and Eastern Europe. Washington: World Bank, 1994.

Hunsaker CT, Carpenter DE, editors. Environmental Monitoring and Assessment Program. Research Triangle Park, NC: US Environmental Protection Agency, 1990.

Institute of Medicine, Division of Health Promotion and Disease Prevention. Improving Health in the Community. A Role for Performance Monitoring. In: Durch JS, Bailey LA, Soto MA, editors. Washington, DC: National Academy Press, 1997:478.

International Joint Commission—Indicators for Evaluation Task Force (IJC). Indicators to Evaluate Progress under the Great Lakes Water Quality Agreement. Windsor: International Joint Commission, 1996:82.

Johnson K, Rouleau J, Stewart C. Atlas I. Birth Defects Atlas of Ontario, 1978–1988. Ottawa: Laboratory Centre for Disease Control, Health Canada, 1992:21 pp., maps and appendices.

Joshi SR. Radioactivity in the Great Lakes. Sci Total Environ 1991;100:61–104.

Kearney J, Cole DC, Haines D. Draft Report on the Great Lakes Anglers Pilot Exposure Assessment Study. Ottawa: Great Lakes Health Effects Program, Health Canada, 1995:114 pp. and appendices.

King W, Marrett L, Mao Y. Case-control study of bladder cancer and chlorination by-products in treated water. Cancer Causes Cont 1996;7(6):596–604.

Leech JA, Wilby K, McMullen E, Laporte K. The Canadian Human Activity Pattern Survey: report of methods and population surveyed. Chron Dis Can 1996;17(3/4):118–123.

Lordo RA, Dinh KT, Schwemberger JG. Semivolatile organic compounds in adipose tissue: estimated averages for the US population and selected sub-populations. Am J Public Health 1996;86:1253–1259.

MacKenzie WR, Hoxie NJ, Proctor ME, Gradis MS, Blair KA, Peterson DE, Kasmierczak JJ, Addis DG, Fox KR, Rose JB, Davi JP. A massive outbreak in Milwaukee of cryptosporidium infection transmitted through the public water supply. New Engl J Med 1994;331(3):161–167.

McKay D, Wania F. Transport of contaminants to the Arctic: partitioning, processes and models. Sci Total Environ 1995;160/161:25–38.

McMichael AJ, Haines A, Sloof R, Kovats S. Climate Change

and Human Health. An assessment prepared by a task group on behalf of the World Health Organization, the World Meterological Organization and the United Nations Environment Programme. Geneva: WHO, 1996:296.

Mills C, Semenciw R. Atlas II. Cancer incidence in the Great Lakes Region, Ontario: 1984–1988. Ottawa: Health Canada, Laboratory Centre for Disease Control, Bureau of Chronic Disease Epidemiology, 1992:46 pp. and appendices.

Montano L. The National Population Health Survey (NPHS). An update. Public Health Epidemiol Rep Ont (PHERO) 1994;5(6):141–142.

Murnaghan JH. Health indicators and information systems for the year 2000. Annu Rev Public Health 1981;2:299–361.

Neri LC, Hewitt D. Aluminum, Alzheimer's disease and drinking water. Lancet 1991;338:390.

OECD (Organization of Economic Co-operation and Development). List of Social Concerns Common to Most OECD Countries. Paris: OECD, 1973:72.

OECD (Organization for Economic Co-operation and Development). OECD Core set of indicators for environmental performance reviews. A synthesis report by the Group on the State of the Environment. Paris: OECD, 1993:105.

Pengelly LD, Silverman F, Goldsmith CH. Influence of sulphur dioxide (SO_2), coefficient of haze (COH) and ozone (O_3) on health care utilization in Ontario. Am Rev Respir Dis 1993;147(4, Part 1993):A635.

Pengelly LD, Silverman F, Goldsmith CH. Rank ordering of air pollutants related to health effects in Ontario. Am J Respir Crit Care Med 1995;151(4, Part 1995):A281.

Pengelly LD, Cole DC, Eyles J, Silverman FS, Hustler R. Health Based Indicators of Air Quality in Great Lakes Communities. Report to Health Canada. Contract C096. Hamilton: McMaster Institute of Environment and Health, 1996:48 pp. and appendices.

Pengelly LD, Szakolcai A, Birmingham B, Muller P, Cole DC, Bailey S, Bell R, Socha A. Human Health Risk Assessment for Priority Air Pollutants. Hamilton-Wentworth Air Quality Initiative Human Health Working Group. Hamilton, Ontario: McMaster University and Ontario Ministry of Environment and Energy, 1997:104.

Péron Y, Strohmenger C. Demographic and Health Indicators. Ottawa: Ministry of Supply and Services, 1994:216.

Pirrone N, Keeler GJ. A preliminary assessment of the urban pollution in the Great Lakes region. Sci Total Environ 1996;189/190:91–98.

Rang S, Holmes J, Slota S, Bryant D, Nieboer E, Regier H. The Impairment of Beneficial Uses in Lake Ontario. Final Report to the Great Lakes Environment Office, Environment Canada. Institute of Environment and Health, 1992:288.

Regional Municipality of Hamilton Wentworth, Environment Department. Hamilton-Wentworth's Sustainability Indicators. Background Report. Hamilton, Ontario, 1995:30.

Roos NP, Roos LL. Predicting hospital utilization by the elderly: the importance of patient, physician and hospital characteristics. Med Care 1989;27:905–919.

Seyfried PL, Tobin RS, Brown NE, Ness PF. A prospective study of swimming-related illness I. Swimming-associated health risks. Am J Public Health 1985;75:1068–1070.

Seyfried PL, Tobin RS, Brown NE, Ness PF. A prospective study of swimming-related illness II. Morbidity and the microbiological character of water. Am J Public Health 1985;75:1071–1075.

Sheeshka J, Young-Leslie H, Cole DC, Kraft D, Hooper M, Keating L, Schwartz C, Fok C. Sport Fish and Wildlife Consumption Study in Areas of Concern. Interim Report to Health Canada, 1996:80 pp. and appendices.

Siemiatycki J. Review of findings from a registry-like database designed to discover occupational carcinogens. In: McColl RS, editor. Development of Environmental Health Status Indicators. Waterloo, Ontario: Institute for Risk Research, 1992:159–168.

Stow CA, Carpenter SR, Eby LA. Evidence that PCBs are approaching stable concentrations in Lake Michigan fishes. Ecol Appl 1995;5(1):248–260.

Thacker SB, Stroup DF. Future directions of comprehensive public health surveillance and health information systems in the United States. Am J Epidemiol 1994;140:1–15.

Thacker SB, Stroup DF, Parrish RG, Anderson HA. Surveillance in environmental public health: issues, systems and sources. Am J Public Health 1996;86:633–638.

UNCED. The Global Partnership for Environment and Development. A Guide to Agenda 21. Geneva: UNCED, 1992:116.

United Nations Environment Programme. Environmental Data Report. Prepared for UNEP by the GEMS Monitoring and Assessment Research Centre, London, UK in cooperation with the World Resources Institute, Washington, DC and the UK Department of the Environment, London. Oxford: Blackwell, 1991:408.

US Environmental Protection Agency. Green Bay Mass Balance Study Plan: A Strategy for Tracking Toxics in the Bay of Green Bay, Lake Michigan. Working Edition. US EPA Great Lakes National Program Office, 1989.

US Environmental Protection Agency. Consumption Surveys for Fish and Shellfish. A Review and Analysis of Survey Methods. EPA Contract No. 68-C9-0013. Washington, DC: US EPA, 1992:55.

US National Center for Health Statistics. Plan and Operation of the 3rd National HANES 1988–94. Series 1: Program and Collection Procedures. Vital and Health Statistics Report, 1994:1(32).

Walter SD, Birnie SE, Marrett LD, Taylor SM, Reynolds D, Davies J, Drake JJ, Hayes M. The geographic variation of cancer incidence in Ontario. Am J Public Health 1994;84(3):367–376.

Wegman DH. Hazard surveillance. In: Halperin W, Baker EL Jr, editors. Public Health Surveillance. New York: Van Nostrand Reinhold, 1992:62–75.

Wills JT, Briggs DJ. Developing indicators for environment and health. World Health Stat Q 1995;48:155–163.
World Bank. Investing in Health. Toronto: Oxford University Press, 1993:329.
WHO, Regional Office for Europe. Methodology for assessment of exposure to environmental factors in application to epidemiological studies. Sci Total Environ 1995;168:93–100.
World Health Organization. Information for Decision-making in Environment and Health. Geneva: WHO, 1996:4.
World Resources Institute. Environmental Indicators: A Final Report Summarizing the WRI Review of Indicator Research and Development. Washington, DC: WRI, 1990.
York University Centre for Health Studies, Indicators of healthy cities. North York: Mimeo, 1990.

Iron-Deficiency Anemia: Reexamining the Nature and Magnitude of the Public Health Problem

Commentary on "Evidence That Iron Deficiency Anemia Causes Reduced Work Capacity"[1]

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ABSTRACT This commentary assesses the strength of the causal evidence presented by Haas and Brownlie in this supplement and examines the potential magnitude of iron-deficiency anemia on welfare. From both the laboratory and field experiments, the evidence is strong and suggests that the potential magnitude of the effect of iron-deficiency anemia on work productivity is substantial. This commentary briefly discusses some of the limitations of using the estimates of effects on physiological capacity for measuring the effect on the social and economic well-being of individuals and society. Biological data are relevant to social and economic development, but additional field studies may be as important as the laboratory experiments to answer questions that also affect work productivity, household maintenance and child raising activities, and hence affect social and economic development. We extend the critical evidence review of human field studies that received disproportionately less attention than the laboratory studies in Haas and Brownlie. We provide some estimates of the magnitude of effects on well-being based on how this information has been used. Future field studies that examine the effect of iron-deficiency anemia and work output in an economic sense should measure increases in productivity but should complement this information with data on wages, income or some measure of profits to derive a money metric measure of increased productivity. Additional information on individual time allocation in household work, child care and leisure may also be required to capture social benefits deriving from improved work capacity. J. Nutr. 131: 691S–696S, 2001.

KEY WORDS: • *anemia* • *productivity* • *work*

Good evidence exists that anemia and iron deficiency cause reduced physical work capacity. Haas and Brownlie (2001) provide a very useful critical summary of the evidence, especially the laboratory evidence for humans and animals. Their review also provides briefer comments on field studies for humans. It explores different degrees of iron deficiency anemia (IDA)[3] and iron deficiency without anemia (IDNA), and examines a wide range of laboratory (aerobic capacity, endurance, heart rate) and field study (aerobic capacity, endurance, heart rate, lactate, efficiency, economic return and voluntary activity) outcomes.

The main findings from their review are the following: *1*) Diminished maximal physical working capacity (primarily measured by VO_{2max}) and decreased endurance result from IDA in humans. *2*) The evidence is strongest that IDA causes reductions in aerobic work capacity (in both animal and human laboratory studies). *3*) Field studies show that IDA impairs aerobic capacity. *4*) Severe and moderate IDA (SIDA and MIDA, respectively) and IDNA also impair endurance, but most of the evidence comes from experimental animals. *5*) Evidence from animal and human studies suggests a strong causal relationship between all levels of iron deficiency and voluntary physical activity (those studies are limited in numbers).

Some of the key contributions of their survey are the careful distinction between effects of iron deficiency and IDA; the careful distinction between effects via aerobic capacity (related to lower hemoglobin levels) and endurance or other factors affecting work ability such as energetic efficiency (which they relate to tissue oxidative capacity), hence, the link between IDNA and endurance or voluntary work activities and between IDA and aerobic capacity or maximum work capacity; and careful criteria to rate the laboratory studies on animals and humans.

Perhaps most useful, the authors assign causality ratings from a systematic evaluation of the studies, using well-defined criteria for internal validation, plausibility and external validation. Causality ratings were given for both the laboratory

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[3] Abbreviations: IDA, iron-deficiency anemia; IDNA, iron deficiency without anemia; MIDA, moderate iron-deficiency anemia; SIDA, severe iron-deficiency anemia.

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and field studies looking at the effect of anemia or IDA on economic outcomes. These were more useful for evaluating the laboratory studies because the more detailed summaries and a fuller discussion of these evaluations were unfortunately not available for the field studies. Fortunately, some of the literature that was reviewed by Haas and Brownlie has also been the foundation of previous work on the effect of IDA and economic consequences. We shall draw on these studies to discuss how this evidence has been used in the following sections.

The particular strengths of the paper are the contribution from the perspective of highly respected nutritionists focusing particularly on laboratory studies. Writing from the perspective of economists working usually with nonexperimental studies, we will therefore try to complement their review in the following six areas:

1. Identify ways the authors can distinguish between IDA and anemia not accompanied by iron deficiency and why this may have important policy implications; similarly, address why the authors may want to further explore the discussion of IDNA and human endurance.
2. Extend the critical evidence review of human field studies that receive disproportionately less attention than the laboratory studies in Haas and Brownlie, drawing on Ross and Horton (1998).
3. Discuss the use and limitations of using the estimates of effects on physiological capacity for measuring the effect on the social and economic well-being of individuals and society.
4. Provide some estimates of the magnitude of effects on well-being based on how this information has been used to date.
5. Place the results on IDA within the broader context of the economic literature exploring the association between malnutrition and labor productivity.
6. Add some additional suggestions to Haas and Brownlie's useful ideas for future research on the topic.

Iron deficiency anemia, iron deficiency and anemia

The Haas and Brownlie paper clearly distinguishes iron deficiency from IDA. Less time is spent on distinguishing IDA from anemia. It is more costly in the field to test for iron deficiency than for anemia. The former requires measurement of an indicator such as serum ferritin, which is more costly and expensive to do in the field, whereas anemia can be measured inexpensively using capillary blood samples. There is also less agreement on the best indicator of (and the appropriate cut-off value for) iron deficiency than there is for anemia.

We would like to encourage Haas and Brownlie to distinguish between IDA and anemia not associated with iron deficiency. This particular distinction is not clarified in the paper. The paper is at times even misleading; although the paper title states that the topic is iron deficiency and reduced work capacity, in practice in the field studies on human subjects, more than half of the studies examine simply the relation between anemia and work. Table 6 makes the appropriate split (anemia and IDA), but Tables 3 and 4 are misleading. Both of these tables refer to "Effect of SIDA, MIDA and ID"; however, according to Table 6, only 6 of the 13 studies in Tables 3 and 4 have measures of iron deficiency. Thus, what is being examined in the majority of cases is the effect of severe anemia, moderate anemia and iron deficiency, rather than SIDA and MIDA.

Do anemia unaccompanied by iron deficiency and IDA have different effects on function? As nonnutritionists, we do not know, but suspect that they do. If the cause of anemia is not iron deficiency but is related to underlying chronic conditions or infection, then these conditions or infections themselves are likely to have a separate effect on productivity. In some of the cases of an accompanying condition or infection, anemia is not accompanied by tissue iron deficiency, and the productivity effects are likely to be different from those of IDA. For policy purposes, one would also want to mention cases in which anemia is related to excessive iron loss (e.g., from parasite loads) rather than deficient intake. Some discussion of this issue would be useful. This is not to imply that all field studies have to measure iron deficiency as well as hemoglobin—which clearly would be difficult and expensive—but that it has to be clear whether anemia or IDA is being discussed, because the policy implications of the findings differ.

The Haas and Brownlie study does provide the very useful understanding that there are at least two separate mechanisms whereby iron deficiency can affect productivity. The first is via tissue oxidative capacity, which can affect endurance and efficiency, and is related to iron deficiency not necessarily accompanied by anemia. The second is via lower hemoglobin (anemia), which affects maximal work output. The paper effectively separates the different laboratory and field studies of iron deficiency and IDA. It also provides a very plausible explanation of why some studies in light physical work (where VO_{2max} is less likely to matter but where endurance does matter) have found such large productivity effects of iron deficiency on productivity.

However, we encourage the authors to push the analysis further, in particular, to the section on human laboratory studies, which is extremely brief and states "[T]he evidence strongly suggests that ID does not affect endurance capacity." However, this is at variance with several other pieces of the argument as follows:

- Figure 1 (Haas and Brownlie 2001) implies that iron deficiency should affect endurance.
- The animal studies imply that iron deficiency should affect endurance (3 studies).
- The studies of voluntary activity for animals (1 study) and humans (1 study) also support a relationship with iron deficiency.
- One of the four studies examined (Rowland, which scored 4 on the literature rating scale) supports the existence of a relationship between iron deficiency and endurance, although the other three (rated 3, 4, and 4 on the literature rating scale) do not. Of the three studies that do not, one has a sample size of only nine and the other two pertain to U.S. women (one study using healthy endurance runners); one would like to be more sure that the levels of iron deficiency observed in this U.S. population are similar to the levels observed in women in developing countries.
- The authors state that using hemoglobin and serum ferritin levels "is not an accurate indicator of tissue iron status"; this could be a reason for the difference between animal and human studies. In animal studies (in which tissue iron deficiency can be more readily induced and measured), the relation was observed, whereas it was not in human studies. In the discussion section, the authors recommend using measures of tissue iron depletion such as the serum transferrin receptor in future studies.

In the light of this discussion, it is worth expressing the relationship between iron deficiency and endurance more cautiously and recommending further study of this issue. This is an important area for human welfare because IDNA may be a significant share of overall iron deficiency, and effects in light physical activity (related to endurance) may be quantitatively

more significant than effects in heavy physical activity (related to maximal work output as well as endurance).

Human field studies

The Haas and Brownlie paper presents a comprehensive survey of the quality of the laboratory studies and provides a synthesis of the likely size of the effect on VO_{2max}. They conclude that IDA is associated with a 10–50% reduction in VO_{2max}. To extend this to implications for human well-being requires pushing the existing analysis further, both in the discussion of field studies and in giving quantitative estimates of the effect on work and productivity, not just physiological capacity. Obviously this requires the appropriate cautions because laboratory results are better controlled and more precise. The authors' survey in the section entitled Literature Survey devotes half a dozen paragraphs to a discussion of 20 laboratory studies but only one paragraph to the 13 field studies. Extending the discussion of the field studies would be very helpful.

Ross and Horton (1998) surveyed some of the same field studies and evaluate 6 of the same 13. We clarified some of the issues surrounding interpretation of the results. It is much more difficult to fit field studies into an evaluative grid in the same manner as laboratory studies. Nevertheless, such an evaluation is necessary if it is desired to go further and to extrapolate the magnitude of the effects of anemia on measures of well-being. In some field studies, the study design meant that the likely effect on productivity was limited. For example, in the study of Li et al. (1994), although workers were given incentives for higher productivity in terms of quality and quantity of yarn produced, the quantity was largely limited by the speed of the machine. Similarly in the study of Basta et al. (1979), large productivity effects were observed in rubber tappers for whom output was readily measured and tied to pay but not in weeders for whom output was less readily measured. Similarly in the study of Edgerton et al. (1979), workers did not have an incentive to pick more tea—in fact the opposite was true, because they would then have to carry out more tea.

Use and limitations of estimates for measuring social and economic well-being

The Haas and Brownlie paper reviews both laboratory and field studies. These can be used in different ways to extrapolate the likely effects on social and economic well-being. With respect to the laboratory studies, a serious question is how to use these findings on IDA and reduced capacity in an economic evaluation. For instance, Haas and Brownlie report that impairments are proportional to the severity of the deficiency and range roughly from 10 to 50% reductions in VO_{2max}. However, as economists, we wanted to know how this could be translated into a measure of change in increased work activity that could be used for an economic evaluation. For example, what would a 26% increase in VO_{2max} imply for work capacity?

Although the laboratory studies provide strong evidence of causality, the authors themselves warn that extrapolating from laboratory research to economic and social effects is not a direct process. They state explicitly that reductions in physical capacity do not translate into equal reductions in economic productivity. The conceptual framework presented in their Figure 1 helps to explain why laboratory research cannot capture all of the economic and social consequences. Primarily, other factors that affect productivity are not related to IDA and may not even be related to other health or nutritional deficiencies. This is an important issue and has been raised but not adequately addressed in previous research. Levin (1986) pointed out that a person's capacity for work and actual output may differ for many reasons. Not all jobs draw on maximal aerobic capacities even though many of the jobs in developing countries do, at least for short periods. These include jobs in agriculture, industry, manufacturing, transport by foot and household chores such as collecting and transporting firewood and water and preparing foods (e.g., pounding cassava or yams or grinding grain). Although a person's output will depend on intelligence, size, strength and build, incentives and motivation will also play a key role in work performance. Other factors may influence work output, such as weather conditions, alternative employment opportunities in places that have seasonal agricultural production, and availability and type of employment in sluggish economies, especially in urban areas.

However, we were still left wondering whether the physiological evidence could be used at all in an economic analysis. As mentioned, the physiological evidence from human laboratory trials is important for providing the evidence of the causal link and the plausibility of the relationship between IDA and work capacity, but in its current form it is unlikely that this evidence can actually be used in an economic evaluation. Although there might be a conversion factor to translate VO_{2max} to work capacity, the factor will depend on what task is being performed and how physically demanding it is. A single measure, such as aerobic capacity, will not capture the full effect on physical capacity because it omits the effect of IDA on endurance. Even using both aerobic capacity and endurance may not capture the effects of IDNA that might also affect work productivity through other mechanisms. In sum, such a conversion factor is difficult to identify and would be task specific (J. Ross, personal communication, 2000).

This explains why the existing studies exploring the effect of IDA on human welfare depend on the information provided from field studies. According to the causality ratings used by Haas and Brownlie, the economic studies range from 1 (weakest) to 4 (strongest), with the majority of the rated studies falling below 2.5. From the epidemiological criteria, economists appear to be using a set of studies that do not provide evidence on the causal relationship between IDA and work capacity that is as strong as evidence from laboratory studies. The lower ratings may indicate that the field studies have some limitations and could most likely be improved by using more appropriate evaluation designs and sampling methods. This has implications for increasing the number of field studies that examine this issue. It also points to the need for strengthening the methodological design for nonexperimental studies used to evaluate the effect of IDA on productivity.

Effects on welfare

Two major studies contribute to our knowledge on the social and economic consequences of IDA. The first study by Levin (1986) was a cost-benefit analysis of nutrition interventions for anemia reduction. To estimate the costs and benefits associated with supplementation and fortification programs, he had to estimate the effects of changes in hemoglobin on output. To do so, he reviewed eight studies of work output in relation to hemoglobin levels or changes in hemoglobin levels. From these studies he calculated an elasticity of work output with respect to increases in hemoglobin. An elasticity is simply the percentage change in work output given a percentage change in hemoglobin levels. He estimated that the elasticity is between 1 and 2, or that a rise in hemoglobin of 10% is associated with a rise in work output between 10 and 20%. Using this assumption, an increase in an individual's hemo-

TABLE 1

Comparison of estimates of economic costs both including and excluding cognitive effects, selected countries[1]

Country	Pr (child)	Pr (male)[2]	Pr (fem)	Total includes cognitive	Total includes cognitive	Total includes cognitive	Total excludes cognitive	Total excludes cognitive	Total excludes cognitive
	%			*$/capita*	*$ million*	*% of GDP*	*$/capita*	*$ million*	*% of GDP*
Bangladesh	73	60	74	4.19	495	1.90	3.23	362	1.47
India[2]	66	nd	59	4.05	3761	1.27	1.35	1251	0.42
Pakistan[2]	47	nd	37	3.67	499	0.85	0.93	127	0.22
Mali	28	33	27	2.30	9	0.92	1.92	8	0.77
S. Africa	24	42	52	26.92	1116	0.89	15.81	656	0.52
Tanzania	25	15	15	0.95	28	0.68	0.62	19	0.45
Egypt[2]	25.2	nd	17	3.19	198	0.44	0.64	40	0.09
Oman	60	14	32	51.72	114	1.01	9.09	20	0.18
Bolivia[2]	35	nd	16	4.72	35	0.61	0.85	6	0.11
Honduras[2]	17.5	nd	14.3	1.88	11	0.31	0.47	3	0.08
Nicaragua[2]	28	nd	36	2.20	24	0.65	1.02	11	0.30

[1] Source: Ross and Horton (1998); nd, no data; Pr(child), prevalence of anemia in children; Pr(female), prevalence of anemia in women; Pr(male), prevalence of anemia in men. All anemia data from Micronutrient Initiative web page.

[2] Denotes countries for which no anemia data are available for adult men. For these countries, losses would be ~20% higher if male anemia were 85% of that for adult women, the median value in the other countries.

globin of 20% and an elasticity of 1.5 suggests a rise in his output of >30%. Levin's estimated elasticities were based on percentage changes found in the literature and not calculated directly by standard regression techniques. We are aware of only one study conducted by an economist that actually estimates an elasticity of work output with respect to an increase in hemoglobin levels.

Most of the field studies that examine the effect of IDA on economic output measure the changes in productivity as changes in the quantity of the commodity being plucked, picked, harvested or transported by the individuals in the study. However, to fully estimate the costs to society, these must be translated into a monetary value. Levin does this in his study and values the output in both social and economic terms. It is a long road to convert changes in the biological measure (change in hemoglobin status) to the measure of increased or reduced social and economic activity to an actual value of those changes. For instance, once the increase in output is established there is still the issue of assigning a monetary value to that change in output, which is not a straightforward task. Most labor used in rural agriculture comes from family labor. For hired labor, all kinds of formal and informal arrangements affect the going wage rate, ranging from reciprocity arrangements, in which no wages are exchanged, to hiring on a daily basis with a set daily rate and meal provision, to crop sharing, to wage setting by plantation and estate labor. The gender and age of the worker may also affect the wage. Women generally are paid less than men (often doing the same job) and children are paid less than women. Economists have methods for estimating wages for family and hired labor in these types of imperfect labor markets, but they require the use of detailed individual and household data (e.g., demographics, production, time allocation) and sophisticated econometric techniques. In Levin's cost-benefit analysis, he uses estimates of average wages based on literature from the World Bank and the International Labor Office.

The same holds true for capturing the social benefits of additional output (i.e., the increase in home consumption of farm output for self-employed farmers) and other long-term benefits, such as lower morbidity and mortality, improved school performance, increased productivity at home, changes in time allocated to child care and other household activities or improved leisure time. Levin assumes that the social benefit of additional output is equal to half of the increase in earnings associated with greater productivity. For other long-term benefits, Levin assumes that total benefits of an intervention are 1.5 times the value of additional work in the labor market. We relay these somewhat detailed pieces of information to give the noneconomist a flavor of the types of benefits and costs that must be valued as well as the assumptions and analysis that go into estimating these costs.

Ross and Horton (1998) estimated the economic consequences of iron deficiency using a more global approach. They extrapolated from the field studies to try to make estimates of the order of magnitude of the effects of anemia. From the study of Li et al. (1994), they assumed that anemia was associated with a 5% decrease in productivity in light manual work, and from the study of Basta et al. (1979), a 17% decrease in heavy manual labor. They also assumed a 4% effect via cognitive ability (from other studies surveyed by Ross and Horton). **Table 1** (from Ross and Horton) gives estimates for the costs involved for various countries. These costs are not insignificant. For south Asia, for example, the costs amount to $5 billion/y. The costs remain large even if the cognitive effects are omitted to be more comparable with the discussion in the Haas and Brownlie paper. Although the cognitive effects are very large (and tend to become more important in the richer countries), the effects in physical labor are still important (more than three fourths of a percentage of gross domestic product in Mali and as much as 1.5% in Bangladesh).

Note that the estimates in Table 1 are only of orders of magnitude of the effects. To reach these estimates involves a fair amount of extrapolation, going beyond the careful evidence analysis of Haas and Brownlie. In addition, the estimates do not incorporate the effects of iron deficiency (without anemia) that Haas and Brownlie have carefully described.

Extending the work by Haas and Brownlie may allow researchers to estimate the magnitude of the additional effects of IDNA. What would be useful is an estimate of the order of magnitude. One would also like to know about what proportion of anemia is related to iron deficiency (this likely varies by region, being higher in areas where malaria, human immuno-

deficiency virus, thalassemia and other chronic conditions are more prevalent). One would also like to have a rule of thumb, estimating how much IDNA is associated with a certain percentage of IDA. It would also be desirable to have estimates of the relative size of the effects on function of IDNA, IDA and anemia without iron deficiency.

What can we learn from microeconomic studies exploring the association between malnutrition and labor productivity?

Theories linking wages and productivity were developed as early as the 1950s and continued to be refined during the 1970s. However, before the mid-1980s, there were few empirical studies of the nutrition-productivity links in the field of household economics. A recent review of the economics literature on nutrition-productivity links indicates that there are strong associations between nutrition and labor productivity (M. Sur, unpublished data, 1999). Sur's review of the literature covers economic studies that have looked at a number of different indicators of nutrition and labor productivity. A number of economic studies found that energy intake, height or weight for height (a measure for wasting) were significant predictors for wages and farm output (Deolalikar 1988, Haddad and Bouis 1991, Sahn and Alderman 1988, Strauss 1986, Thomas and Strauss 1997). Haddad and Bouis (1991) showed that an individual who was 15 cm taller than average was expected to earn 13% more. However, they did not find that energy intake was a significant predictor of wages. Only one study in Sur's review used regression analysis to test the relationship between nutritional status and productivity, using hemoglobin as the measure for nutritional status (Wogemuth et al. 1982). The study found a weak but positive relationship between nutritional status and productivity. Sur's review showed that although some of the evidence is contradictory, the general picture that emerged was that medium- and long-term nutritional status are important determinants of labor productivity, whereas short-term nutritional status, as measured by energy intake, is less conclusive.

Methodologically, studies that directly estimate the relationship between nutrition and productivity are different from the intervention studies that underlie the analyses carried out by Levin (1986) and Ross and Horton (1998). They are microeconomic studies on the economic behavior of the individual or household and use primary data from detailed household surveys to estimate directly the relationship between nutrition and labor productivity by using regression analysis. Information is collected on individuals' heights and weights, household expenditures, consumption, income, time allocation, assets and other types of social and demographic data.

Microeconomic analysis of individual and household behavior has the potential to shed additional light on the relationship between anemia or IDA and work capacity. Micro-level data from well-designed field studies should be better exploited. For example, IFPRI (1998) collected detailed information on individual and household characteristics (including time allocation data for women) and collected blood samples to measure hemoglobin levels for women and preschool children. The prevalence rates of anemia were high for adult women and preschoolers. The authors used regression analysis to observe variation in the levels of food intakes across individuals and seasons and measured the effect of diet on anemia. It would be useful to use such a data set to look at the relationship between hemoglobin levels and work output while controlling for other confounding factors. These types of studies would make an important contribution to strengthening the global estimates of the effect of anemia and IDA on work capacity specifically and overall well-being of individuals and society more broadly. However, to be comparable with the intervention studies, it would be necessary to ascertain the individual's iron status.

Summary and areas for future research

The bulk of this paper is spent answering two main questions: What is the strength of the causal evidence that has been presented? What is the potential magnitude of the purported effect for the well-being of individuals and society? The evidence is strong and suggests that potential magnitude is substantial. Biological data are relevant to social and economic development, but additional field studies may be as important as the laboratory experiments to answer questions that also affect work productivity, household maintenance, and child-raising activities and hence social and economic development. Without additional information it is difficult to make full use of the biological data generated from laboratory studies.

Haas and Brownlie's conclusions about the adequacy of these studies are that the evidence of the biological link between IDA and work capacity is sufficient and that further laboratory studies are not needed (J. Haas, personal communication, 2000). However, what is needed in developing countries is a test of the causal relationship of anemia to performance with levels of exertion and types of tasks found in rural and urban areas of developing countries.

Haas and Brownlie suggest four useful directions for future research: *1*) laboratory studies with humans, verifying tissue iron status, for example, with the serum transferrin receptor; *2*) more studies of the effect of anemia on voluntary physical activity and standardizing assessment tools to be able to do this; *3*) incorporating the issue of motivation in field studies of anemia and productivity; and *4*) extending the analysis of the effect of anemia into nonmarket work activity, such as child care, household maintenance, and social and leisure activities.

These are useful suggestions. The first issue (tissue iron status) is something that it would be useful to establish in laboratory studies. As mentioned above, we do not have a good idea of the relative magnitude of the productivity loss associated with IDA, anemia (in the absence of iron deficiency) and IDNA. Because measuring these separately in field situations is likely to be impractical in most cases, some guidance from closely controlled field studies would be very useful. It would be particularly useful to obtain an understanding of the relative size of effects on function of IDNA, IDA and anemia without iron deficiency. In addition to laboratory results on function, prevalence data on the relative prevalence of IDNA, IDA, and anemia without iron deficiency would also be useful.

The third issue (motivation) was discussed briefly above. Clearly, it is very important to evaluate motivation in the existing field studies and to examine it carefully in new human field studies. The literature on energy supplementation also confirms that it is very important (offering cigarettes in some of the early energy supplementation experiments proved as strong an inducement as more food for increasing output).

The second and fourth issues are related. Here the field studies of the effects of energy supplementation may be useful because there are more of these than iron supplementation studies. Some of the existing energy studies (e.g., those by Instituto de Nutrición de Centro América y Panamá) have looked at effects on voluntary activity, and existing survey

instruments could be useful for iron supplementation studies. The effects on voluntary activity (nonmarket activity) are likely to be quite large and important for an individual's well-being. The brief survey in Ross and Horton (1998) suggests that the effects of IDA on child care and cognitive development are likely to be large and economically important. Developing countries are shifting to more white-collar work, globalization implies more rapid changes in work environments, and adaptation to change and ability to acquire new skills are increasingly important. The cognitive area (in which both anemia of the child and of the mother matter) is likely to be a promising area for additional work.

Evaluating the economic effect of iron deficiency and IDA on voluntary physical activity and nonmarket activities is a challenging task. Therefore, further work in this area (issues 2–4) would have to be linked to detailed household surveys including information on the time allocation of individuals at the household level by using several outcome indicators related to both aerobic capacity and endurance. As discussed earlier, it might be necessary to measure iron status as well as anemia.

In addition, future field studies that examine the effect of IDA and work output in an economic sense should measure increases in productivity but should complement this information with data on wages, income or some measure of profits to derive a money metric measure of increased productivity. Additional information on individual time allocation in household work, child care and leisure may also be required to capture social benefits deriving from improved work capacity.

How to carry out these studies may be as important as determining what additional studies are warranted. For example, future research should be designed and carried out by multidisciplinary teams comprising both economists and nutritionists. In addition, field studies must be more methodologically rigorous. Randomized evaluation design or quasi-experimental design can and should be used to assess the relationship between IDA and work capacity by using a wide range of outcome indicators. Quasi-experimental design should strengthen the causal evidence because it can assess the effects of a given intervention by measuring the social and economic changes of the target group and systematically isolating the effects of other factors (Valadez and Bamberger 1994).

LITERATURE CITED

Basta, S., Soekirman, S., Karyadi, D. & Scrimshaw, N. S. (1979) Iron deficiency anemia and the productivity of adult males in Indonesia. Am. J. Clin. Nutr. 32: 916–925.

Deolalikar, A. B. (1988) Nutrition and labor productivity in agriculture: estimates from rural south India. Rev. Econ. Stat. 70: 406–413.

Edgerton, V. R., Gardner, G. W., Ohira, Y., Gunawardena, K. A. & Senewiratne, B. (1979) Iron-deficiency anaemia and its effect on worker productivity and activity patterns. Br. Med. J. 2: 1546–1549.

Haas, J. & Brownlie, T. (2001) Iron deficiency and reduced work capacity: a critical review of the research to determine a causal relationship. J. Nutr. 131: 676S–690S.

Haddad, L. J & Bouis, H. E. (1991) The impact of nutritional status on agricultural productivity: wage evidence from the Philippines. Oxf. Bull. Econ. Stat. 53: 45–68.

IFPRI, Bangladesh Institute of Development Studies, Institute of Nutrition and Food Science, Data Analysis and Technical Assistance Research Department of Human Nutrition, Royal Veterinary and Agricultural University (1998) Commercial Vegetable and Polyculture Fish Production in Bangladesh: Their Impacts on Income, Household Resource Allocation, and Nutrition. Report, Vol. 1.

Li, R., Chen, X., Yan, H., Deurenberg, P., Garby, L. & Hautvast J. G. (1994) Functional consequences of iron supplementation in iron-deficient female cotton mill workers in Beijing, China. Am. J. Clin. Nutr. 59: 908–913.

Levin, H. (1986) A benefit-cost analysis of nutritional programs for anemia reduction. World Bank Res. Observer 1: 219–246.

Ross, J. & Horton, S. (1998) Economic Consequences of Iron Deficiency. Micronutrient Initiative, Ottawa, Canada.

Sahn, D. E. & Alderman, H. (1988) The effects of human capital on wages and the determinants of labor supply in a developing country. J. Dev. Econ. 29: 157–183.

Strauss, J. (1986) Does better nutrition raise farm productivity? J. Polit. Econ. 94: 297–320.

Thomas, D. & Strauss, J. (1997) Health and wages: evidence on men and women in urban Brazil. J. Econometr. 77: 159–185.

Valadez, J. & Bamberger, M. (1994) Monitoring and Evaluating Social Programs in Developing Countries: A Handbook for Policymakers, Managers, and Researchers. EDI Development Studies. The World Bank, Washington DC.

Wolgemuth, J. C., Latham, M. C. & Chesher, A. (1992) Worker productivity and the nutritional status of Kenyan road construction laborers. Am. J. Clin. Nutr. 36: 68–78. 360.

The Contribution of Urban Agriculture to Gardeners, Their Households, and Surrounding Communities: The Case of Havana, Cuba

Document(s) 15 of 34

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Introduction

Urban agriculture is actively promoted in Havana, Cuba, to address the acute food-scarcity problems of the Special Period in Peacetime, which developed since 1989 as Soviet aid and trade were drastically curtailed. During the period of 1989–92, average daily per capita calorie consumption dropped an estimated 20%, and average daily per capita protein consumption dropped 27% (Torres 1996). A severe storm that destroyed much of the country's sugar crop in 1993, along with the tightening of United States' blockade in the early 1990s, further exacerbated these conditions (Deere et al. 1994).

In response to these conditions, the Cuban Ministry of Agriculture (MOA) began promoting urban food production in 1991. A number of urban agricultural activities have been under way. An important component of the government's program are gardens grown to provide for the gardeners' own needs. These gardens are cultivated on either private or state land. The gardeners can use state land at no cost. Havana has, according to an estimate, more than 26 000 such gardens (Paez Medina, interview, 1995[1]).

Research was conducted in Havana to trace the contributions of the gardens to the nutritional intake of the gardeners' households and the gardeners' sense of control of their lives and to determine the effects of these gardens on the surrounding communities. Much of the literature on urban agriculture focuses on food security, without much discussion of its aesthetic and therapeutic effects. The findings presented below may warrant a broader focus.

In-depth interviews were conducted with 42 gardeners during the period of July to September 1995. Nine of Havana's neighbourhoods were selected for the study. They represented a range of gardening conditions, from neighbourhoods with highly organized gardening efforts to areas known to have problems with their gardening programs. The researcher divided the neighbourhoods into three categories, based on the level of coordination between the gardeners and the MOA. Neighbourhoods in the first category lacked direct support from MOA. Neighbourhood activists were encouraging

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[1] Egidio Paez Medina, MOA, interview in Havana, Cuba, 1995.

and helped coordinate gardening activities, but they lacked assistance and coordination

from MOA. The neighbourhoods of Los Angeles, Zayas, Pogolotti, and Alturas de Belem were assigned to this category. In the second category were neighbourhoods where gardening activities had just started to receive coordinated assistance from MOA or where MOA extension workers had been somewhat active, but not in a well-orchestrated fashion. The neighbourhood of Alamar was assigned to this category. The third category contained neighbourhoods where MOA activities were well developed. This included the neighbourhoods of Playa, Santa Fe, Diezmero, and La Lisa. Every interview was arranged by an individual involved in gardening promotion, usually one of the MOA's extension workers. No attempt was made to randomize the sample, as the logistical challenge of simply arranging the interviews precluded such a step.

At the time of the study, the MOA was hiring and training agricultural-extension staff to work at the community level in Havana. The MOA was hiring 67 workers to develop agricultural productivity with various types of urban agriculture. Additionally, every municipality in Havana had a staff member to oversee the extension activities. The extension workers helped gardeners to obtain land, encouraged the gardeners to form clubs, answered technical questions about gardening, acquainted the gardeners with available resources, and reported to the MOA. The MOA also worked with a number of Cuban and foreign organizations to coordinate training for gardeners and extension workers and provide materials to the gardeners, such as tools and hoses (Paez Medina, interview, 1995[2]).

This paper presents the results of the study on what nutritional benefits accrued to the gardeners and their households, what psychological benefits accrued to the gardeners, and the contributions of the gardens to their surrounding neighbourhoods.

Study findings

Characteristics of the gardeners

The average age of people for the study sample was 58 years; the age range was 28–80 years. Twenty-eight of the gardeners (67%) reported that they had learned to garden from relatives when they were growing up in the countryside. Eighteen gardeners (43%) indicated that the garden was their first direct experience with horticulture, although some had acquired gardening skills by observing others.

Thirty-eight (91%) of the gardeners were men, and 4 (9%) were women. The agricultural background of many of these men was presumably a factor in the high level of male participation in gardening. Additionally, a Cuban study found that women's household responsibilities in the Special Period in Peacetime allowed little or no time for gardening (Cruz 1997).

Characteristics of the gardens

Most (26) of the gardeners' parcels were individual gardens, although the largest garden in the study included 72 gardeners on 53 parcels. Garden sizes ranged from 18 to 40 000 m^2. Usually, more than one gardener tended the larger plots.

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[2] Egidio Paez Medina, MOA, interview in Havana, Cuba, 1995.

Half (21) of the gardeners had plots adjacent to their homes. Additionally, five gardeners (12%) with distant plots cultivated a second, smaller plot adjacent to their homes. The longest distance a study participant had to travel to his or her garden was 1 km. However, another researcher spoke with gardeners who lived in neighbourhoods that had very little available land. They had to travel across town to reach their plots (Chaplowe 1996).

Thirty-four gardeners (81%) used their land through a system of *usufructo gratutito* (free usufruct); the other 8 owned the land they cultivated. Having the right to *usufructo gratutito* allows the gardeners free use of state land for the rest of their lives (Paez Medina, interview, 1995[3]).

Gardeners chose the crops they grew, constrained only by growing conditions and seed availability. Plantains were the most popular crop, cultivated by 98% (41) of the gardeners, who grew both fruit and viand types of plantain. Other popular crops were cassava, peppers, squash, and yams. Sixty percent of the gardeners (25) raised animals, including chickens, pigs, goats, ducks, rabbits, geese, *guanacos* (similar to llamas), and turkeys.

Food and economic security

The production of plant and animal products was found to significantly increase the quantity and quality of the food available to gardeners' households. An average 5.83 people ate in the gardeners' households, and 9.52 people in their extended families received food from their gardens. If this pattern is true throughout Havana, then more than 1 of every 10 people in the city received some food from these gardens. However, as the sample was not random, no generalizations can be made.

The gardens also had a profound impact on household budgets: they reduced weekly food bills, and gardeners could earn money selling their garden products. Forty one gardeners (98%) indicated that they saved 10–250 CUP per week with their gardens, with the average at 50 CUP/week (in 1998, 20 Cuban pesos [CUP] = 1 United States dollar [USD] [4]). This is a striking figure, as the average household salary reported by the gardeners was 125 CUP/week. Thus, the average savings from the garden was 40% of the average household salary.

Control

A number of themes emerged from the study related to the gardens' role in enhancing the gardeners' sense of control of their lives. Many gardeners spoke about the ways the gardens increased their self-sufficiency, in terms of both household food needs and a direct sense of greater control of one's life.

Produce from the garden represented 5–100% of the households' fruit, vegetable, and viand intake. On average, the garden provided 60% of the households' produce needs. Gardeners from households in which the percentage was lower than this average gave a lower rating than others to the Likert-scale[5] question "I feel more in control of my life now that I am gardening." Further, a chi-square analysis found a

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[3] Egidio Paez Medina, MOA, interview in Havana, Cuba, 1995.

[4] Cuban pesos are not normally sold outside Cuba. The rate for Cubans is 20 CUP per USD; that for foreigners is 1 CUP per USD.

[5] "Likert scaling is a measurement technique based on the use of standardized response categories" (Babbie 1995).

statistically significant relationship between responses to this and the Likert-scale question "Gardening increases the amount of food available to my family." A sense of increased control was also associated with the belief that the garden enhanced the family's nutrition. Lastly, awareness of information sources for gardeners was related to a greater sense of control. Thus, the findings indicated that both the ability of the gardeners to meet household food needs and their success in doing so were linked to their feelings of being in control of their lives.

The gardeners also considered their gardens entertaining and aesthetically appealing environments. Thirty-six of the gardeners elaborated on features of their gardens related to stress reduction, spiritual satisfaction, entertainment, and aesthetic value. Francis (1989) discussed Kimber's 1973 study of Puerto Rican gardeners, which found that "gardens . . . represent social territories in which persons define their own places and express their self images." The most powerful story about the importance of the gardens, from this standpoint, was told by an individual with severe health problems, who was using the garden to help feed the 10 people in his very modest household. He was gardening where a road had been, so the soil was compacted and difficult to work. After discussing what he grew, he spoke at length about the aesthetic aspect of gardening and stressed its significance.

Many of the respondents indicated that gardening helped them relax. Study of the data revealed that these respondents gave relaxation two different but interrelated meanings. First, it meant that the gardens relieved their anxieties about meeting the family's food needs. Second, it meant the gardens were restorative. One respondent expressed both of these concepts: "Sometimes you have a lot of psychological pressure and the garden is a place to relax. Also, the worry of the *canasta familia* [household food supply] is less." Thus, given a measure of control of their families' physiological needs, the gardeners were also able to control their anxiety and experience the additional therapeutic properties of the gardens. Said one, "My nerves are better. I feel more agreeable." Another responded to the question "Are there other reasons why you garden here?" by noting "If you relax beneath a *mata* [grove], it restores you."

Many who had gardens next to their homes spoke of the pleasure of spending time in the garden watching the plants. Kaplan and Kaplan (1989) discussed this notion in *The Experience of Nature*: "Observing is an important form of involvement with nature. . . . Much of the pleasure that people derive from nature comes from such occasions to observe." One gardener expressed this sentiment: "I came today just to watch the garden." Another respondent noted, "Seeing the plants grow makes me feel good." A third commented, "It's a distraction to watch the garden. At sunset it's relaxing." Thus, the gardeners conveyed a fascination with the elements of nature in their gardens.

Many of the older gardeners spoke of the importance of gardening to their health and social life. Those who grew up in the countryside were using skills they had neglected for years. They also spoke of the feeling of being useful in helping to provide their families

and communities with food, and they contrasted their gardening days with an earlier, more idle time. One elderly gardener remarked, “You have to put love into agriculture. It’s great to be able to help the family this way.” In response to the question “Are there other reasons why you garden?”, another gardener remarked, “I have been retired for 11 years and needed a way to feel useful.” A number commented that if they had not been gardening they would be sitting in a corner drinking rum.

The findings illustrate that the gardeners’ perceptions of control were strongly connected to their ability to meet their household needs and their success in doing so. The findings point to a number of ways in which the gardens afforded the gardeners a greater sense of control of their lives: gardening helped to meet food needs and helped the gardeners relax, connect with nature, and experience solitude. Further, the study determined that for the elderly participants, the ability to meet household needs was an especially important benefit of the gardens.

Community enhancement

The benefits of the gardens could also be traced to the surrounding neighbourhoods. Five types of community benefit were identified: a greater food supply, contributions to the country, neighbourhood beautification, improved safety, and enhanced urban ecology.

Greater food supply

The gardeners contributed and sold food to their local communities, enhancing local food supply. Fourteen (33%) of the gardeners sold some of the food they produced. Thirty-three gardeners (78%) donated food to the community, in some cases through their gardening clubs. Donations were often made to schools, nursery schools, and nursing homes. Gardeners also gave to neighbours, especially those who were not very well off.

Contributions to the country

Some of the gardeners characterized the gardens as having the power to contribute, in a variety of ways, to the country at large. A number of individuals spoke of gardening as an important way of solving Cuba’s problems. They indicated that their work in their gardens was a way to help the revolution. One commented that he wanted a farm to “help the revolution with a huge harvest.” Another observed that “work is good for health, spirit, and the revolution.” Asked if gardening had been a positive experience for him and his family, another gardener responded, “Yes, for me, for my family, for the country.” Three gardeners quoted José Martí, a 19th-century Cuban writer, poet, and revolutionary, when they spoke of their work in the garden.

Neighbourhood beautification

Quite a few of the gardeners indicated that they started their gardens in abandoned lots or trash dumps. Gardeners in one of the municipalities in the study constructed impressive walls, usually about 1 m high, with the rocks removed from the once-vacant lots that many of the gardens occupied. A number of the gardens in this area were quite lovely and contained multiple plots.

Improved safety

The gardens also improved neighbourhood safety. A number of gardeners indicated that before the gardens were planted lots were unsafe areas, where people had previously been afraid to walk. Two participants in the study mentioned that the area they

gardened had previously been called the “hill of fear.” It had been restored to a series of beautiful gardens. Turning unsightly landscapes into beautiful gardens was one of the many unintended benefits of a program designed to deal with the country’s food crisis.

Enhanced urban ecology

Gardens are a prominent feature throughout much of Havana. Although many more gardens appear in the peripheral areas than in the city centre, food gardens are a common sight in many parts of the city. Also, farm animals, often kept close to houses as a precaution against theft, are much more conspicuous in Havana than in many capital cities. Thus, food production is very transparent. It is also environmentally sound because it has few transportation and storage requirements. The gardens also bring the multiple aesthetic and environmental benefits of increased vegetation. Further, gardeners who compost their food scraps and garden residue transform them into soil nutrients and divert them from the waste stream.

Cuba has been heralded for its green agricultural practices, which the Cubans developed in response to the striking drop in agricultural inputs and fuel during the Special Period in Peacetime. Much of the success of this approach is attributable to the country’s impressive research capabilities, as well as to the commitment of many Cuban scientists to environmentally sound farming methods (Rosset and Benjamin 1994). Also, MOA, along with many of the organizations it works with, promotes ecologically sound growing techniques. For example, a 1995 request for proposals for *auto-consumos* (gardens for the gardeners’ own needs) from the Consejo Ecumenico de Cuba (ecumenical council of Cuba) listed as one of its objectives “fomenting organic agriculture and application of ecological technologies in the processing of food.”

The food gardens in the study were organic by default. Chemical inputs are not sold on the open market in Cuba (Consejo de Administración de la Provincia de la Ciudad de la Habana (council for the administration of the province of the City of Havana), interview, 1995[6]). The gardeners showed varying levels of attachment to the environmentally benign gardening methods they practiced. One reason for this appeared to be the variation in their skills in managing soil fertility and insect problems. A number of educational efforts were ongoing under MOA and other organizations. Gardeners who knew of composting and pest-control techniques were far more enthusiastic about organic gardening than those who had little or no such knowledge. For instance, when asked about soil conditions, gardeners who had been to training sessions on composting techniques spoke glowingly about the importance of compost in maintaining soil fertility. One gardener explained, “Through enriching the soil I am fostering beneficial organisms.” Other gardeners spoke of the hardships caused by the lack of chemical inputs.

Ten (24%) of the gardeners used compost in their gardens. The gardeners were not asked about the materials used in the compost, but some indicated that they used garden and household food waste. Gardeners who lived in the vicinity of a sugar-processing plant indicated they used sugar by-products in their compost. Twelve (29%) of the gardeners used manure, and 13 (31%) used organic matter, including green manure, on their

gardens.

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[6] Consejo de Administración de la Provincia de la Ciudad de la Habana, interview in Havana, Cuba, 1995.

The gardeners were asked how important improving the environment was as a reason for gardening. The average response was 3.14 on a scale of 1 (not important) to 4 (very important). When asked this question one respondent noted, “I am aware that the environment has to be protected.” Another gardener spoke about his plans to develop a living fence around his garden.

Discussion

Many Cubans recognize the importance of Havana’s food gardens and are committed to continuing to work with them. Thirty-nine of the gardeners (93%) indicated their intention to continue gardening when the Special Period in Peacetime ends. Government officials interviewed for the study indicated the government’s strong support for gardens and their intention to continue the gardening program.

The role of the Cuban government in promoting and supporting urban agriculture is unique from a global perspective and surely accounts for much of the success of the program (Marsh, interview, 1996[7]). The commitment and considerable effort of the gardeners must also be recognized. The study found gardeners’ perceptions of control were strongly connected to their ability to meet their household needs and their success in doing so. The findings point to a number of ways the gardens gave the gardeners a greater sense of control of their lives, through improved household nutritional intake and relaxation, connection with nature, and experience of solitude. The study also traced the gardens’ roles in enhancing the surrounding communities. The gardens provided patriotic inspiration and enhanced the community’s urban ecology, landscape, and food supply. The impressive scope and achievement of Havana’s gardening program should be a inspiration to all adherents of urban agriculture.

References

Babbie, E. 1995. The practice of social research (7th ed.). Wadsworth Publishing Company, Belmont, CA, USA.

Chaplowe, S. 1996. Havana’s popular gardens and the Cuban food crisis. Geography Graduate Group, University of California at Los Angeles, Los Angeles, CA, USA. MA dissertation.

Cruz, M.C. 1997. Urban and community agriculture: cases from Cuba panel. Paper presented at the International Conference on Sustainable Urban Food Systems, 22–25 May 1997, Ryerson Polytechnic University, Toronto, ON, Canada. Ryerson Centre for Studies in Food Security; FoodShare Metro Toronto; International Development Research Centre; Oxfam Canada; Toronto Food Policy Council; Toronto Food Research Network.

Deere, C.D.; Pérez, N.; Gonzalez, E. 1994. The view from below: Cuban agriculture in the “Special Period in Peacetime.” Journal of Peasant Studies, 21(2), 195.

Francis, M. 1989. Control as a dimension of public-space quality. *In* Altman, I.; Zube, E., ed., Public spaces and places. Plenum Press, New York, NY, USA.

Kaplan, R.; Kaplan, S. 1989. The experience of nature — a psychological perspective. Cambridge University Press, Cambridge, UK.

Rosset, P.; Benjamin, M., ed. 1994. The greening of the revolution. Ocean Press, Melbourne, Australia.

Torres, R. 1996. Cuban agromarket study. Geography Graduate Group, University of California, Davis, CA, USA.

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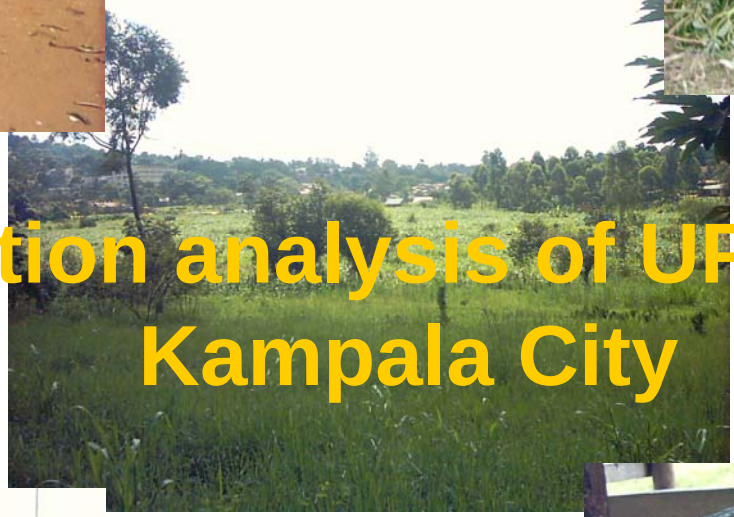
7 Robin Marsh, Senior Research Associate, North American Integration and Development Center, University of California at Los Angeles, Los Angeles, CA, interview at El Cerrito, CA, 1996.



Situation analysis of UPA&L in Kampala City

Land Tenure System in Kampala City

- Approx. 50% of land in Kampala is mailo land
- Approx. 30% is Free hold (Institutions)
- Approx. 20% is lease hold (Public land)
- **Approx. 50% of the land in Kampala is under developed and mainly utilized by UPA&L.**

Where is UPA&L done?

Mainly around homes

Places that are unsuitable for development (e.g roadside verges, drainage channels and wetlands

Private & public land

Status of UPA&L in Kampala

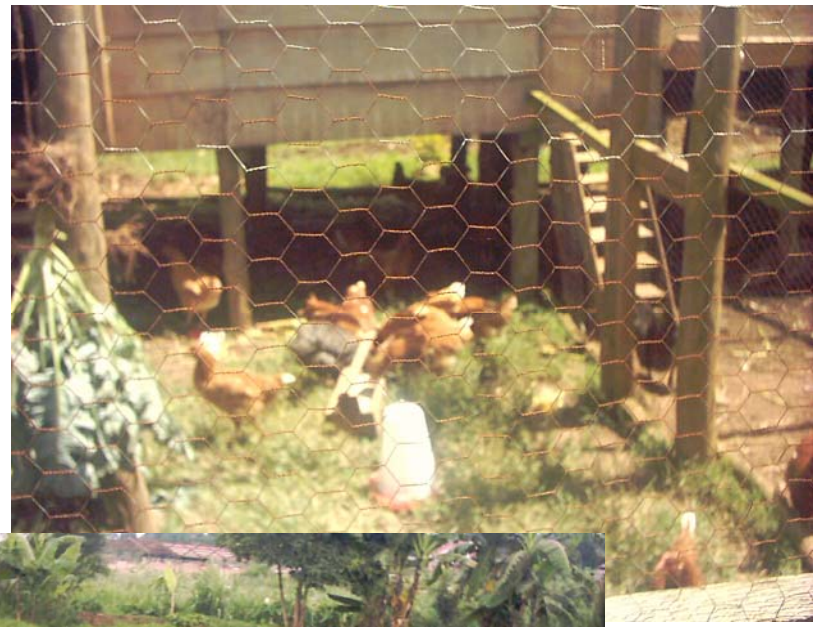
Approx. 30% of Hhd – UPA&L

- 10% between 1-3 acres
- 2% institutions and schools

Farming systems
"Intensive –Subsistence Mixed farming"

- 80% of the farming population is involved in crop production
- 12% in poultry
- 10% goat keeping
- 6% dairy cattle
- 1.9% rabbit keeping
- 1.0% fish, pig and mushroom production

(Muwanga 2001)



Opportunities of UPA & L

- Interested Civil Society
- Market for products easily available
- International Interest
- Institutional linkages
- Research evidence trickling in
- Good political will

Reasons against UPA

- Illegal (Bylaws being processed)
- Economically insignificant
- Nuisance / Degrades / Pollutes the environment
- **A threat to Public Health**

THANK YOU

Anglophone Africa Training Course on Urban Agriculture

8 – 26 March 2004

Opening Ceremony, 8.30 a.m ILRI Headquarters, Uthiru, Nairobi

Keynote Speech by
Dr. Romano M. Kiome
Director, Kenya Agricultural Research Institute

Dr Charles Crissman, the Regional Director of the International Potato Centre, CIP, and Dr Constance Freeman, the Regional Director of the International Development Research Centre, IDRC, Dr Diana Lee-Smith, the Course Director, other distinguished guests, and participants in the Anglophone Africa Course on Urban Agriculture, including Dr D. K Pone, Chief of Station of IRAD, Bamenda, Cameroon, Ladies and Gentlemen.

I am delighted to have been requested to officiate at this opening. Last December, I proposed to CIP that KARI should increasingly undertake research in urban agriculture now that Regional Office of Urban Harvest is located here in Nairobi at CIP's Regional Office.

Ladies and Gentlemen, you realise that there has been a rapid increase in urban population, largely due to rural-urban migration resulting into the naming of this millennium as "Urban Millennium". This rush to the cities is without constraints emanating from rapid increases in population pressurising the available "affordable" food supplies. A majority of urban dwellers in our setting cannot subsist on the meagre wages they earn. This food supply to urban areas cannot be taken for granted, and indeed the poor do not take it for granted, as has been shown by the proliferation of crops and livestock being raised in and around cities. Until recently, there has been quite inadequate research attention paid to the special circumstances, problems and opportunities presented by urban and peri-urban agriculture. Urban Harvest is a novel idea in the array of international agricultural research institutions.

Ladies and Gentlemen, in actuating "Urban harvest" there is an apparent need to sensitise policy makers to embrace urban and peri-urban agriculture. In this regards, it has been my desire that KARI convenes a Stakeholder Workshop on Policy development for Urban and Peri-Urban Agriculture in Kenya. We hope to achieve this in collaborating with Urban Harvest later in the year.

Urban and peri-urban agriculture has become increasingly important in Africa cities, despite the existence in many cases of legislation inherited from colonial period that either technically prohibits it, or sets limits crops, livestock zones. Most of the people in cities are peri-urban areas practice urban agriculture because it provides food for them; for income generation or poverty alleviation because of the proximity of the market; for waste management; as a means of converting by- products into high quality proteins (meat, milk and eggs).

The growth of its importance is probably linked both to the high rate of urbanisation in sub-Sahara Africa over recent decades and to dramatic growth in urban poverty brought about by economic down turns and structural adjustments. This "Urbanisation of Poverty" has underscored the relevance of urban farming as a copying strategy under these circumstances. But the persistence and growth of urban agriculture can also be

attributed to positive aspects of growing cities – the opportunities for income generation afforded by increased demand for vegetables, dairy and meat products.

The projection indicates that within two decades, urban farmers will constitute the majority of farmers in Africa. Half the World's population now lives in towns or cities, and by 2020 the figure is expected to rise to 60 percent. The developing world will absorb most of the additional 1.5 billion urban dwellers. In Africa alone, 50 % of the population will move to cities. Already these trends are having several effects on food security, poverty level and unemployment.

A few examples in Africa of the importance of urban and peri-urban agriculture would help illustrate the aforementioned. Studies have revealed that 20,000 households in Bamako keep livestock in town and thousands more people supply then with the inputs or marketing services; over one-third of households surveyed in Harare keep livestock, mainly chickens but also rabbits, pigeons, ducks and turkeys. In Dar-es-salaam urban farming is the second largest employer and 74% of urban farmers keep livestock; and even in densely populated Cairo, 5% of households keep animals, especially chickens and pigeons. Overall, urban livestock production is characterised by a large variation of livestock systems that occur in and around densely populated areas and that strongly interact with the surrounding wealthy as well as poor human communities in different ways, at several levels of system – hierarchy and with nearby and distant rural areas. The urban crop systems also bear similar characteristics. The interaction of crop and livestock system for optimum agricultural productivity has become real with limited resources within the urban and peri-urban setting.

As we grapple with the pros and cons of urban and peri-urban agriculture there is need to understand the system of production that the urban dwellers adopt to maximum the yields of crop and livestock commodities. Environmental pollution and food safety are some of the concerns that are gaining ground. However, one has to understand that animal keeping, in its various forms, may cause some pollution, but it may actually help to clean the cities. Thus stakeholders should appreciate the benefits that accompany the drawbacks of farming in urban areas.

It is encouraging to note the presence of several expertise, including KARI scientists in this course. I am delighted to note that KARI scientists have been involved in setting agenda for Urban Harvest since 2000, when they participated in a preliminary workshop led by Dr. Gordon Prain, who is the Global Co-ordinator for Urban Harvest. The Urban Harvest research agenda is beginning to take root and their participation in this training workshop will value add on their activities towards peri-urban and urban agriculture.

I understand that the course has brought together regional expertise from Cameroon, Ghana, Senegal, Uganda and Zimbabwe and Ethiopia. There is also expertise from beyond the African region, through back-up from members of the International Technical Advisory Committee.

The organisers of this event have informed me that this is not just a training course but an exercise towards "Knowledge Production". This would have a lasting impact in the productivity of urban and peri-urban agriculture. I take cognisance of the efforts the trainers have put into preparing this course content. I hope that the trainees will seize this opportunity to learn more thorough interaction among the participants.

We applaud IDRC for sponsoring such courses in Latin America and Francophone Africa. I have been informed that plans are underway to do so in the Middle East and North Africa as well. This is a major contribution.

I would like to take this opportunity to welcome the City Teams from the following places:

Accra, Ghana.
Bamenda, Cameroon
Kampala, Uganda
Kumasi, Ghana
Kisumu, Kenya
Nairobi, Kenya and
Musunduzi-Pietmaristzburg, South Africa

I know you have worked hard to get here, through a very competitive process. But the work is just beginning. In the next three weeks you will be taking in a lot of information and using it to develop and polish up your proposals, so that they can be effectively implemented.

This model of cross-cutting teams reflects the principle of encouraging stakeholder and policy dialogue. This is a priority area for Urban Harvest and KARI is pleased to work on this approach. The course will prepare the ground for us as we plan our Stakeholder Workshop on Policy Development later this year.

At the AGM of the Consultative Group on International Agricultural Research (CGIAR) - held in Nairobi last year – both the Nairobi City Council and the Ministry of Agriculture, Nairobi Province, expressed support for the development of Urban and Peri-Urban Agriculture Policy. It is also in line with the regional "Declaration on UPA and Food Security", which was signed by the Ministry of Local Government of Kenya, in Harare last year, as well as by five other governments.

I note that this course has been structured to offer some policy direction for African central and local governments in Africa. It has a set of seven learning modules:

1. History, Concepts and Dynamics of UA
2. Health impacts of UA
3. UA Cropping Systems
4. Urban Livestock
5. Solid Waste Management and UA
6. Waste Water Re-Use in UA
7. Integration of UA in Policy and Planning

Appropriate technologies for Urban and Peri-Urban agriculture offers a major challenge to the NARS and IARCs including CGIAR Centres to undertake research that can be relevant to the production of these technologies. We all cannot assume that someone else will comprehensively address this challenge.

Mr. Chairman, I would like to take this opportunity to wish all the participants well as they undertake this important course. May I therefore take this opportunity to declare this course open.

Thank you.

DFID Department for International Development

LPP

Peri-urban and urban livestock keeping in East Africa -

A coping strategy for the poor?

Scoping study commissioned by the Livestock Production Programme (LPP)

July 2002

Study co-ordinator
Sabine Guendel, NRI

Acknowledgement

This synthesis report is based upon the findings of five city case studies conducted in Nairobi, Kisumu, Kampala, Addis Ababa and Dar es Salaam between March and June 2002. Our thanks go to the following researchers and their field teams:

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"As more and more people make cities their home, cities will be the arenas in which some of the world's biggest social, economic, environmental and political challenges will be addressed, and where solutions will be found"

Kofi Annan, Secretary General of the United Nations, June 2001

Front cover photograph: sheep in doorway, Kibera, Nairobi. Mazingira Institute. Note the feeds wrapped in polythene on top of the shelter

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Summary

Until recently the main focus of agricultural development initiatives has been on rural areas with the view that improved food production in rural areas can supply the expanding urban population. This is especially true for livestock production which has received little attention from research and development initiatives in urban areas. During the International Symposium on Supply of Livestock products to rapidly expanding urban populations (FAO, 1995) peri-urban and urban livestock systems were considered as special cases. The main emphasis was given to rural livestock production systems directed towards urban demand. Consequently, information on urban and peri-urban livestock production is limited.

Data indicates that by 2025 80% of the world's urban population will be in developing countries (UNCHS 1996). Rapid urbanization has not been accompanied by equitable economic growth and has resulted in increased urban poverty. As a result of this worsening of urban poverty, many low-income households suffer from extremely limited livelihood security. The urban poor engage in urban livestock keeping as a response to limited alternative livelihood options and food insecurity. This category of livestock keepers, lacking the control over and access to basic inputs, is seldom able to access support services and is either harassed or ignored by the city planners (Waters-Bayer, 1995).

The aim of the scoping study was to understand the current situation of poor urban livestock keepers in East Africa, and identify areas where future research could make a contribution to the development and promotion of this activity. The main focus of the study was on poor livestock keepers.

Five city case studies were selected in Tanzania, Uganda, Kenya and Ethiopia. The cities were Dar es Salaam, Kampala, Kisumu, Nairobi, and Addis Ababa. Five local consultant teams were employed to conduct the case studies. Purposeful sampling targeting poor livestock keepers and a combination of questionnaires and stakeholder meetings were used to obtain the information required. Secondary information was used to supplement primary data.

The case studies reveal that urban livestock keeping benefits the poor and provides a way of diversifying livelihoods activities that are accessible to vulnerable groups. It also provides a source of locally produced food products for people living in the vicinity of the livestock keepers. However, there are various externalities (zoonoses, environmental contamination, product safety) which require addressing. The following **strengths and opportunities** have been identified from the city case studies:

1 *Multi-purpose activity.* Urban livestock keeping fits different livelihood strategies and contributes to food security, income and employment generation, saving and insurance and social status. It provides easily convertible assets for covering important expenditures (school fees, health treatments).

2 *Higher return per unit of land from livestock compared to crops.* Increasing demand for land in cities for housing favours urban livestock keeping as it

requires less or no land and promises higher returns per unit land utilized.

3 *Flexibility in terms of land use.* Compared to urban crop production, livestock can be shifted easily to other urban areas as they become available.

4 *Use of waste resources.* Urban livestock keeping offers an opportunity to make use of household waste, agro-industrial by-products such as molasses and brewery residues, weed and grass from public lands and crop residues from markets and urban farmers.

5 *Provision of a social safety net for the poor.* The different case studies show that especially vulnerable groups, such as female headed households, children, retired people, widows and people with limited formal education are particularly involved in urban livestock keeping as a form of social security strategy.

6 *Market developments that could favour urban livestock production by the poor.* The urbanization process will lead to increasing demand for livestock products. The proximity to these markets is an advantage for the poor. The case studies indicate that urban commercial livestock enterprises become less competitive due to high input prices (imported feeds and animal drugs) as a result of liberalization and structural adjustment programmes.

The **weaknesses and constraints** which affect urban livestock keepers were identified as,

1 *Inappropriate waste management.* There is strong evidence from all the case studies that animal waste disposal exacerbates the human waste disposal problem and causes environmental and public health dangers, which will become even more severe as urban livestock numbers increase.

2 *Water availability.* At present urban livestock keeping competes for water resources with humans as the demand for water for this activity is not taken into account by the supply services. In many slum areas municipal water has to be bought and, therefore, other water sources, which are often contaminated, are accessed for livestock and men.

3 *Poor livestock health and high cost of veterinary services.* The case studies show that animal health is often poor due to inadequate husbandry practises. Poor livestock keepers seldom vaccinate their livestock, especially smaller species such as goats, sheep and poultry. Due to the high cost of veterinary services and livestock drugs treatment is sub-optimal.

4 *Feed availability and quality.* Feed availability is a particular constraint for larger livestock species such as cattle, which are usually zero-grazed. Feed quality is a problem for free-roaming livestock as there is no, or very limited, control over feed sources. The Nairobi case study shows that foraging at waste dumps is common in the slum areas.

5 *Low production levels.* Due to limited feed availability and quality and poor management practices the production level of livestock is generally low.

6 *Poor networking and organization among poor livestock keepers.* Poor livestock keepers are not organized and can, therefore, not express their demands in a concerted way.

7 *Lack of research and services provision.* Information access and adoption of improved technologies is limited for poor urban livestock keepers. This is made worse by the fact that existing services are not tailored to the needs and circumstances of the poor (e.g. extension services and training courses promote species which are less relevant for the poor).

8 *Limited knowledge of livestock husbandry practices.* As information sources and advice services are lacking, poor livestock keepers often have limited knowledge of livestock husbandry practices.

Research studies are required to assess in more detail the current and potential impact these externalities have on the livelihoods of urban people and to contribute to the development of strategies to overcome or minimise these.

1 *Livestock waste management.* The existing evidence of the negative impacts caused by inappropriate livestock waste management on water resources and public health calls for a more detailed analysis of the problem. A predictive research programme is required to understand how this problem will develop with increasing livestock numbers and over time. Parallel to understanding the scope and dimensions of this problem, research is required to provide improved waste management technologies adapted to the specific circumstance of the poor. An important research component would be the potential for the intensification of urban/ peri-urban and rural linkages in terms of nutrient flow.

2 *Water availability. F*or urban livestock, water supply is another issue which needs to be understood more thoroughly. Currently, city planners do not take into account the demands of urban livestock keepers. This results in competition for resources, over-use and conflicts between neighbours. Studies are needed which quantify the current and future water demand by urban livestock keeping. A participatory and multi-stakeholder approach is needed to identify potential water management strategies.

3 *Zoonoses.,* The existing and potential health risks for humans caused by the transmission of diseases from livestock have to be assessed in more detail. As Mantovani (2000) points out there are a range of local factors involved which may increase the risk of zoonoses and which will put at risk especially vulnerable groups, such as children, pregnant women and poor people in general.

4 *Policy making.* Relevant information is needed to advise policy makers and city authorities on these issues in order to provide guidance for the formulation of pro-poor urban livestock legislation. An aspect related to zoonoses, which needs to be taken into account for the formulation of new legislation is food quality standards and quality control processes.

5 *Empowerment of the poor.* The study also shows that poor livestock keepers are marginalized from existing knowledge and improved technologies. There is a

clear opportunity to improve the current management system through capacity development and information sharing. However, in order to achieve this, organization and networking among poor livestock keepers is required to improve the access to services, information, technologies and markets.

6 *Promotion.* Finally, there is a need to identify appropriate strategies to promote urban livestock keeping to other vulnerable groups who have not yet entered this activity. As a first step a participatory constraint and opportunity analysis with these vulnerable groups is required to identify the potential contribution urban livestock keeping could make to their livelihoods.

1. Why this study?

Recent data indicate that two thirds of the world's poor people will be found in urban areas by 2030 (UNCHS, 1996). Urban population was estimated at about 2.9 billion in 2000, and is projected to reach 4.9 billion by 2030. Most of this increase will be in cities of less developed countries, which had an urban population of about 1.9 billion people in 2000, and are projected to increase to about 3.9 billion by 2030. The increase in most developing countries will partly be due to rural-urban migration, but mostly due to transformation of rural settlements into urban areas added to natural urban population growth (UNCHS, 1996).

Rapid urbanisation has not been accompanied by equitable economic growth and has resulted in increased urban poverty. We can now speak of the "urbanisation of poverty". Today half of the poor are living in urban areas and it is estimated that by 2025, the proportion will have risen to almost two thirds (UNCHS, 1996). As a result of this worsening of urban poverty, many low-income households suffer from extremely limited livelihood security. Access to infrastructure and physical assets is limited. For example, in Nairobi, 55 % of the total population lives in 78 slums, comprising 5% of the total land area of Nairobi (Ishani el al. 2002).

According to a survey in 1999 (CBS, 1999) 29% of Nairobi household members are living below the overall poverty line. In comparison, in Kisumu 48% of the household members are falling below the poverty line.

Until recently the main focus of agricultural development initiatives has been on rural areas with the view that improved food production in rural areas can supply the expanding urban population. This is especially true for livestock production which has received little attention from research and development initiatives in urban areas. During the International Symposium on Supply of Livestock products to rapidly expanding urban populations (FAO, 1995) peri-urban and urban livestock systems were considered as rather particular cases. The main emphasis was given to rural livestock production systems directed towards the urban demand.

Peri-urban agriculture (PUA) is recognised not to be a recent phenomena; however its importance and potential for urban livelihoods has been neglected in the past. FAO (1999) estimates that 800 million urban residents worldwide are engaged in PUA. The status of PUA has changed from illegal to tolerated and only in recent years PUA has begun to receive attention from donors, researchers and development organisations as a "new" development strategy.

Most of the existing PUA studies have focused on crop production in urban and peri-urban areas, leaving to one side the role of livestock production. Others have emphasised the overall importance of PUA without distinguishing between crop and livestock production or social groups. Consequently, information on urban and peri-urban livestock production from a pro-poor perspective is limited.

1.1 Objectives and focus

The DFID Livestock Production Programme (LPP) commissioned the present study to achieve the following objectives:

- To understand better the role and functions of urban livestock keeping and the issues that poor livestock keepers face in urban and peri-urban environments.
- To identify current knowledge gaps and potential research issues of both reactive and predictive nature, which can be shared with policy makers and donors.

In accordance with DFID's agenda on poverty reduction, the study focuses on poor livestock keepers. As mentioned earlier, today half of the poor are living in urban areas and it is estimated that by 2025, the proportion will have risen to almost two thirds (UNCHS, 1996).

1.2 Methodology used

Five city case studies were selected in Tanzania, Uganda, Kenya and Ethiopia. The cities were Dar es Salaam, Kampala, Kisumu, Nairobi and Addis Ababa. Local consultant teams were employed to conduct the case studies. Purposeful sampling targeting poor livestock keepers and a combination of questionnaires and stakeholder meetings were used to obtain the information required. Secondary information was used to supplement primary data. The issues covered in the case studies included the following:

- Characteristics of livestock keepers incl. gender aspects
- Peri-urban and urban livestock keeping
- Reasons for keeping livestock
- Livestock species/breeds and numbers
- Husbandry practices with opportunities and constraints
- Ownership and decision making processes
- Tendencies and trends
- Support services and information sources
- Policy framework
- Environmental and health aspects

The findings and recommendations of this review are based on a cross-cutting analysis of the city case studies.

2. Urban livestock keeping

Results of a comprehensive urban household survey carried out by Lee-Smith and Memon (1994) which covered 6 cities in Kenya, showed that 17% of the respondents kept livestock. The estimated 1.4 million head of livestock kept in all Kenyan towns at the time of the survey were worth about $17 million USD. National statistics quoted by van der Bliek (1992) for the livestock population in Nairobi: 25,000 cattle, 30,00 small ruminants, 30,000 pigs, 8,500 rabbits and 350,000 poultry hint at the important contribution of the sector to protein needs of the urban population.

According to Baah (1994), 25% of the 4.5 million small ruminants in Ghana are raised by people living in and around cities and towns. He indicates that urban producers keep these animals not only to contribute substantially to the animal protein needs of the urban community, but also benefit economically, with a resultant improvement in their standard of living.

A survey carried out by Gefu (1992) in Zaria, a Nigerian university town, reveals that 80% of respondents keep livestock, raising goats, poultry and sheep, primarily to meet immediate household needs, but also to supplement family income.

Centres (1991) also stresses the economic benefit accruing to a large number of people that supply inputs and marketing services to the 20,000 households that rear animals in and around Bamako in Mali.

The findings of the five city case studies confirm the existence and diversity of livestock in and around cities. For instance, the Kisumu study recorded 14 different livestock species kept in urban and peri-urban areas (Onim, 2002). In Ethiopia the livestock numbers in major in urban and peri-urban areas in 2001 were estimated at 169,264 cattle, 64,767 sheep, 22,630 goats 15,886 donkeys and 415,680 chickens (Tegegne *et al*,. 2002). Similar situations were reported from Kampala, Dar es Salaam and Nairobi (Ossiya *et al*., 2002; Lupala, 2002 and Ishani *et al*,. 2002)

2.1. Who are the urban livestock keepers and why do they keep livestock?

As in urban agriculture generally, urban livestock keeping is not only practised by the poor. Different social groups have different reasons to engage in urban livestock keeping.

Control over and access to basic inputs, such as land, labour, and capital mean that middle-income families are often heavily involved in urban agriculture, including livestock keeping, as a commercial activity to supplement household incomes (Bangura and Gibbon, 1992). These livestock keepers receive or can access government and private support services and either receive approval or are at least tolerated by the city authorities (Waters-Bayer, 1995).

On the other hand, the urban poor engage in urban livestock keeping as a response to limited alternative livelihood options and food insecurity. This category of livestock keepers lacks the control over and access to basic inputs, is seldom able to access support services and is either harassed or ignored by the city planners (Waters-Bayer, 1995).

Contradicting opinions exist over who the main urban livestock keepers are. Whereas Foecken (2000) concludes that livestock keeping in urban areas in East Africa is an activity which becomes more common as income rises, Maxwell and Zziwa (1997) note that 72% of those practising urban agriculture and livestock keeping in Uganda fall into the low-income bracket.

It is important to distinguish between the different social groups involved in urban livestock keeping as they face different constraints and opportunities and have different reasons to engage in urban livestock keeping. Whereas for the middle-income households urban livestock keeping can be seen as a response to growing urban demand and markets, for the poor it is in the first place a response to crisis.

The city case studies offer examples for both types of responses. For instance, commercially oriented egg production in Dar es Salaam and Kisumu is catering for a growing urban market. Dairy production in Addis Ababa responds to the increasing urban demand for milk, whereas goat keeping in Nairobi and Kampala slums provides the only safety net and insurance for retired and widowed households.

The case studies show that the middle aged are the most numerous group of urban livestock keepers, followed by those of retirement age (> 60 years). Only in Nairobi a significant number of keepers were below 35 years. The table below presents the age distribution of urban livestock keepers in Addis Ababa.

Table 1 Age composition of urban livestock keepers in Addis Ababa

Age class of respondent	**No**	**%**
<=30	1	5
30 to 50	8	40
>= 50	11	55
Total	20	100

This age distribution pattern may reflect that young people are less depended on urban livestock keeping as they can find alternative formal and informal employment. For people between 35 and 60 years urban livestock keeping seems to supplement other informal or formal employment. For instance, a large group of keepers are civil servants who need an additional source of income and food production to compensate for low wages. For older people livestock keeping provides a coping strategy for retirement.

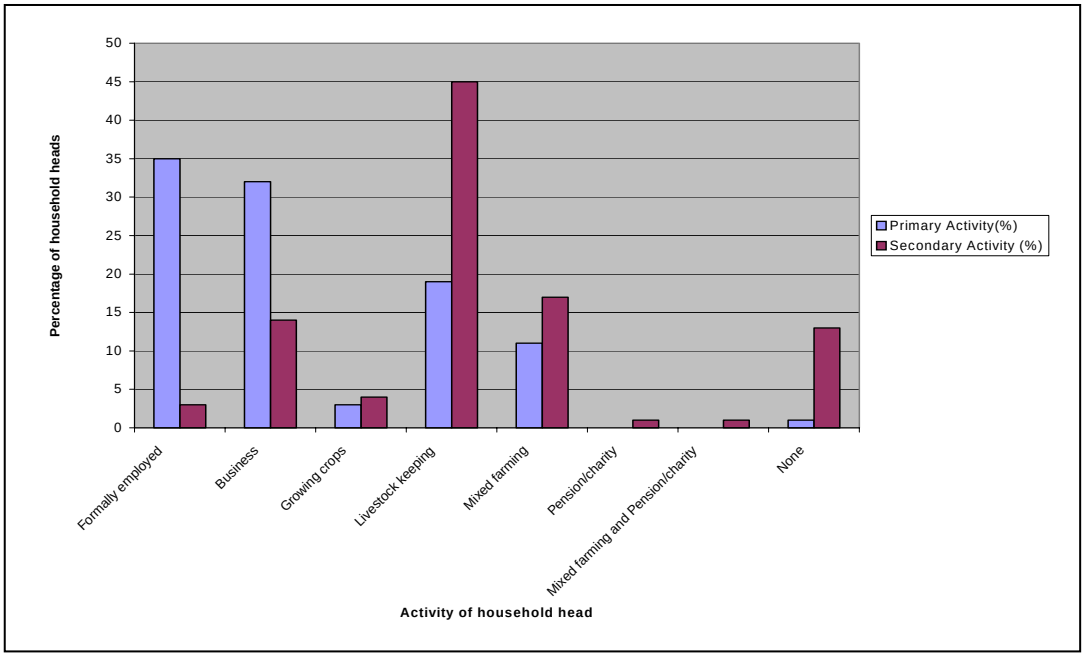
The Kampala case study captured these tendencies very clearly. Livestock keeping was cited by 45% of the household heads as their most important secondary activity and 38% of the households rely on livestock production as their secondary source of income (see Figure 1) . Furthermore, the study revealed significant gender differences

in terms of primary and secondary activity and income source. The predominant primary activity for female household heads was livestock keeping (44 % of household heads) and 42 % derived their major source of income from it. A high proportion of livestock keepers was found to have low levels of formal education. One third of the livestock keepers in Nairobi were reported to have no formal education.

These tendencies were confirmed by the other case studies, pointing out that livestock keeping is usually not the main occupation of households, however in some cases the contribution to income generation is significant. This is especially true for vulnerable groups (eg. women, retired people, people without formal education) who relied more on livestock keeping due to their limited alternative choices of livelihood options.

An interesting variant was reported from Addis Ababa, where donkey transportation enterprises seem to be a common feature of urban livestock keeping. In Addis Ababa donkey transport was reported by 90% of urban household heads to be the most important occupation and primary income source, whereas in peri-urban areas farming takes the first place followed by donkey transportation.

Figure 1 Primary and Secondary Income Generating Activity of the Household Head in Kampala



The case study findings indicate that many urban livestock keepers are also engaged in urban crop production. The Nairobi study found that more than a third of the households engaged in livestock keeping are also growing crops. In Addis Ababa crop production was stated to be the main occupation by 75 % of the livestock keepers. Involvement in urban farming and livestock keeping is particularly relevant when looking at manure management, an aspect that will be discussed further.

In terms of land ownership there were notable differences between the cities. Whereas in Nairobi more then two thirds of livestock keepers are squatters, in the other cities

between 40% and 80% of livestock keepers own the land they use for livestock production. The remainder either rent private land or use public land for livestock rearing. Average land holdings are small, in Addis Ababa half of the households had farm sizes of 0,05 ha or less. Land allocated to livestock was on average 0,02 ha, which shows that urban livestock keeping can be practiced with limited land resources.

2.2. Contribution of urban livestock keeping to the livelihoods of the poor

Improvement in household food security through livestock production is a contribution one would expect. The urban poor have two principle means of access to food, either purchase or self-production, with the latter being important not only for subsistence but also for income generation (Smith, 1992). Considering that households in nearly half of the largest cities in low-income countries spend on average 50 - 80 % of their income on food (PCC, 1990), the purchase option is unlikely to cover all the food requirements of poor households, particularly for higher priced goods such as livestock products.

Many authors have asserted that urban livestock keeping provides an important contribution to the protein needs of urban population (Smith and Olaloku 1998, Lee-Smith and Lamba 1998). However, the focus on urban livestock production as only a contribution to food security is too narrow and has been over-emphasised in the past.

Ellis and Sumberg (1998) reviewed case study material on urban agriculture in sub-Saharan Africa and summarise the reasons for engagement in food production as follows:

(a) as a means of survival for the very poor, this social group being most likely to farm on unused public or private lands and therefore most prone to punitive action by city authorities or private landowners (Sanyal, 1985; Freeman, 1991; Sawio, 1994)

(b) as a personal strategy of women, enabling them to secure a proportion of family food security in the face of insufficient, uncertain or unstable cash allocation by male wage-earning household heads (Maxwell, 1995)

(c) as a contribution to food security more generally, enabling families to withstand declining real wages, unemployment of family members, and variations in cash income from diverse other sources (Freeman, 1991; Drakakis-Smith, 1992)

(d) as a substitute for cash purchases of food, especially for higher value items such as eggs, meat, milk, fruit and vegetables, so that cash can be used for other purposes (Sanyal, 1986; Jamal and Weeks, 1988)

(e) as a means of supplementing the cash earnings of the family and achieving other objectives such as children’s schooling (Freeman, 1991)

(f) as a commercial rather than subsistence activity, undertaken to take advantage of growing markets for high value and import-substituting food and livestock products within cities and towns (Lee-Smith and Memon, 1994).

The city case studies reported here reveal a portfolio of other socio-economic functions urban livestock keeping has for the poor. For poor urban dwellers livestock production is often an "assets strategy", which can provide cash through sales in emergency, or a source of food for consumption on special festival days (Yasmeen, 2001).

The reasons uncovered in the case studies for keeping livestock varied depending on the type of livestock. Whereas goats, sheep, pigs and ducks were kept to obtain income derived from their sale in emergency situations, chickens and cattle were mainly kept to sell or consume their products on a regular basis. Donkey transportation provides a regular service for income generation and to purchase day-to-day household requirements such as salt, sugar and soap.

There exists strong evidence from the different case studies that the education of children was an important objective for the livestock keepers. The sale of animals for the payments of school fees was reported as a common practice. Furthermore, the provision of a safety net for vulnerable groups such as retired people and women without formal employment opportunities, is also important. Taking into account that these people have limited options to access credits, pensions or other social security schemes, livestock keeping provides an accessible option for convertible assets. During a PRA exercise in Kampala the livestock keepers stated that *livestock can be kept in the smallest possible area within the city* and is therefore more accessible for resource poor households than for instance crop production.

It was beyond the scope of this study to determine in quantitative terms the contribution of livestock keeping to food security and livelihood improvement.

2.3. Livestock husbandry practices

2.3.1 Livestock species and breeds

There is no clear trend in terms of the livestock species kept in the different cities. Whereas in Nairobi the most common livestock types were goats, followed by chickens, ducks, cattle and sheep, in Kampala cattle were the most common livestock type to be found. In Dar es Salaam and Kisumu chickens seem to be the most important livestock type followed by cattle, goats and sheep. In Addis Ababa, sheep are kept by more than 50 % of the households, whereas goats by only 13 %. Rabbits, geese, bees and other small species were uncommon in most of the cities. Pigs were rare in Nairobi, but more common in Kampala, Dar es Salaam and Kisumu (see Table 2). Cultural reasons are likely to influence preferences for certain species. For example the Kampala and Addis Ababa studies reveal that the livestock keepers followed their parents tradition in terms of livestock husbandry and species selection.

As a general tendency over the last few years there seems to have been a move away from small-stock to medium size species such as goats. Reasons include the poor

health of small stock and consequently low production levels and loss of animals. The majority of the households in the different cities would like to expand their livestock production. Preferences in terms of the livestock species people would like to have are dairy cattle, followed by small ruminants.

A pattern emerges in terms of local and improved species. There seems to be a tendency toward improved breeds of cattle and chicken, whereas goats, sheep, pigs and ducks tend to be local breeds.

Table 2 Livestock species and breeds encountered in Kisumu

Type of livestock	**Total** No. of livestock	**Grade** No. of livestock	**Crosses** No. of livestock	**Local** No. of livestock
Cattle	199	18	6	175
Goats	272	0		272
Sheep	102	0		102
Pigs	326	0		326
Chicken	1,578	484		1094
Ducks	161	0		161
Turkeys	10	0		10
Rabbits	4	0		4
Others	0	0		0

Men predominantly own cattle, goat and sheep. Men also take a larger share in owning improved species, whereas women more frequently own local breeds. Poultry keeping seems to be dominated by women, who own the larger share of improved and local chickens. The same is true for pig rearing in Kampala, where women own 50% of pigs, men own 35% and the remaining 15% are co-owned. In Nairobi, all livestock is owned jointly, which might be explained by the cultural background of the livestock keepers, who are predominantly of the Kikuyu tribe.

The sources of purchased animals for livestock production in urban areas are mainly urban livestock markets. This finding is important in terms of rural-urban linkages, as it could be assumed that livestock supply depends on existing relations between urban and rural relatives.

2.3.2 Livestock rearing systems

Poor livestock keepers may specialise in one type of livestock, which is explained by the limited resources available and the keepers preference to try to optimise the use of existing resources for one production type, or they keep a mix of livestock species. In Nairobi slightly more then 50% of the livestock keepers interviewed kept only one type of livestock. In Addis Ababa 33 % keep one type of livestock whereas 20 % of keepers have a combination of dairy cattle, poultry, small ruminants and donkey.

Table 3 Types of livestock kept by urban livestock keepers in Addis Ababa

Type of livestock species	No	%
Cattle	9	45
Cattle + Poultry	2	10
Cattle + Small ruminants	1	5
Cattle + Poultry + Small ruminants	5	25
Cattle + Poultry + Small ruminants + Donkey	3	15

Two main types of husbandry practices have been identified across the cities. Livestock is either kept under zero-grazing or scavenging and foraging conditions. The reasons for choosing one or the other management system are diverse and include:

- Level of intensification of management system: livestock kept for more commercial purposes is usually kept under zero-grazing with investment of financial and labour resources. Livestock kept for mainly subsistence purposes is often encountered scavenging and foraging supplemented with household waste. Dairy cattle are most commonly kept under zero-grazing conditions suggesting that it is a commercially oriented activity.
- Resources available: space is a major factor determining where animals are kept. In Nairobi for instance a third of the keepers have their livestock living within their own house due to limited space for the construction of livestock shelters.
- Safety situation of the neighbourhood: in some of the slums the livestock keepers have to confine their animal to protect them against theft.
- Legal situation: In some cities by-laws try to regulate and control free-roaming livestock. However most of the city case studies suggest that law enforcement is relatively weak and very few livestock keepers have been harassed by city authorities. Another aspect related also to resource availability is the security of tenure. Squatters will be more reluctant to invest in permanent structures than people who hold legal titles for their properties.

2.3.3 Feed supply and sources

Feeding practices are a major component of the rearing system. Free-roaming animals feed on whatever they find; observations from Nairobi for instance show that livestock foraged on garbage in dumpsites. Household kitchen waste, left-overs from hospitals, hotels, schools, markets and crop residues are other possible feed sources in addition to grazing on vacant plots and along roadsides. In Nairobi for instance, formal arrangements exist with crop growing neighbours who supply the livestock keepers with kale stalks free of charge.

Other feed sources are grass from peri-urban areas, where people have started to develop informal enterprises to grow or collect grass which is then sold to urban livestock keepers. Grass supply is affected during the dry season as availability of water for irrigation purposes is limited. This has led in some cases to the use of sewage water for grass production as reported from the Nairobi case study.

Example of the collection of fodder from the peri urban areas of Dar es Salaam, Lupala et al

Concentrates seem to be mainly purchased for dairy cattle and intensive chicken production. Goats, sheep, pigs and local chickens have to rely on non-commercial crop sources as most of the poor livestock keepers cannot afford to purchase feed on a regular basis.

Access to clean water was an issue highlighted in the case studies. Whereas in some areas livestock keepers had access to spring water, in others livestock compete directly with humans for consumption. Water sources for livestock included standing water, waste household water and contaminated industrial water.

Sheep feeding on garbage, Kawangware, Nairobi. Mazingira Institute

2.3.4 Waste management

Waste management has been identified as a major constraint and problem for urban livestock keepers. In the case of scavenging livestock waste management is non-existent apart from the manure accumulation over night, when animals are confined in the homesteads. The city case studies reveal that in many cases manure is accumulated and only from time to time discharged into streams or along roadsides. This means that the family members are constantly exposed to the livestock waste. During the raining season part of the excrement will be washed away.

In Addis Ababa much cow dung is made into cakes and sold for fuel or used by the households as plastering material for houses.

It appears that the situation is worse in the inner-urban areas where there is limited demand for manure for crop production and the proximity between people and livestock is closer. In peri-urban areas the manure is more frequently used on crop plots or sold to farming neighbours.

Waste disposal method, Kahawa West, Nairobi. Mazingira Institute

2.3.5 Markets for urban livestock products

Although the majority of poor urban livestock keepers do not keep livestock as a purely commercial activity, the selling of products is part of their livelihood strategy. The case studies show that the larger share of products is sold at farm gate or to neighbours. Only a small proportion is sold through formal market channels. Milk and eggs are the two products that are sold on a regular basis. The Dar es Salaam case study provided evidence for a more organised marketing system for eggs, where informal employment opportunities were created for people transporting the eggs from the producer to urban markets.

Meat derived from goats and sheep is only sold occasionally, especially during festive seasons and in emergency situations. The Kampala case study showed that the goat prices would rise sharply (up to 100%) during festive seasons. As for milk and eggs, meat is mainly sold at farm gate and to neighbours.

The Dar es Salaam case study and the Addis Ababa case study suggest that the current informal marketing strategies of poor urban livestock keepers could possibly be improved by forming market co-operatives for certain products, which would enable the poor to enter formal market channels. This would also contribute to a quality control and increased food safety of products, which currently does not exist.

2.3.6 Rural-urban linkages

It is often supposed that urban livestock systems are closely related to or dependent upon rural resources. Potential linkages with rural areas include the supply of livestock, feed resources and knowledge and information to urban areas. Interestingly, the case studies show clearly that this is not the case for poor urban livestock keepers in East Africa.

All the case studies conclude that livestock keepers are not recent migrants from rural areas. Most of the informants had been involved in urban livestock keeping for more than 10 years. This means that their rural linkages would have weakened and new urban linkages established.

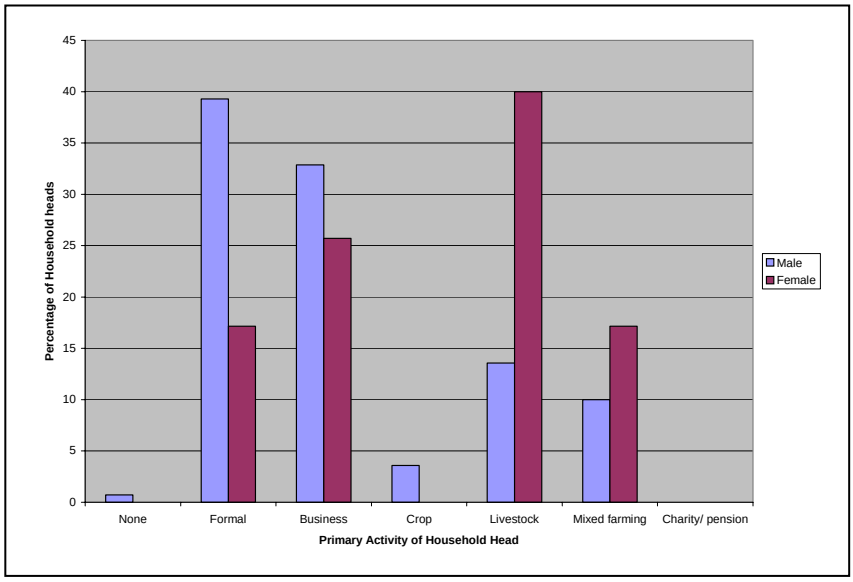
The livestock keepers pointed out that they are too poor to own land in rural areas and that additionally transport costs are too high to access rural feed resources. High transport costs will also limit selling manure to rural crop producers.

The case studies also conclude that livestock is not purchased directly from rural areas. Urban livestock markets account for the major source of livestock. An exception is reported from Kampala, where nearly 25% of the livestock keepers obtain their goats from relatives living in rural areas.

2.3.7 Gender aspects

The information obtained from the different case studies demonstrates that there are gender differences in urban livestock keeping. The Kampala case study showed that for women urban livestock keeping is a more important activity in terms of income generation. As women are also usually in charge of the provision of family food the contribution of urban livestock keeping to food security is more important for them. The case studies also point out that there is a tendency towards a higher workload for women and that child labour, especially girls, is common.

Figure 2 Relationship between sex of household and primary activity of household head in Kampala



In terms of livestock ownership there are also clear gender differences. Whereas men usually own improved breeds and larger livestock, women tent to keep local breeds and small livestock. Only the Nairobi case study reports shared ownership of livestock as common. Men also seem to dominate the decision making processes in terms of livestock management, especially when it comes to economic decisions like buying and selling livestock and products. Again this was different in Nairobi, where decision-making was shared between men and women.

There is not sufficient data available from the case studies or from other secondary sources to analyse the distribution of benefits obtained from urban livestock keeping within the family. This is however an important aspect which would require further investigation.

Female livestock keeper in Kisumu

2.4 Access to support services and information

A critical aspect for many poor urban livestock keepers is access to support services and information (Waters-Bayer, 1995). Although most of the government extension and veterinary services are based in urban areas, they mainly focus on rural agriculture or they do not address the issues faced by poor livestock keepers. In Kampala for instance nearly 60% of the livestock keepers interviewed rely on private veterinary services. However, the poor livestock keepers rank the cost of accessing private services and the cost of veterinary drugs as a major constraint. The case studies show that the majority of livestock keepers prioritise dairy cattle in terms of investing in veterinary services. A high proportion of the keepers vaccinate their dairy cattle, whilst vaccination of goats or chickens is rare. The prioritisation of cattle is also reflected in other service provisions. Organisations offer artificial insemination for improved cattle, credit schemes and extension services directed to intensive dairy production. In Kampala a few farmers obtain services from NGO's (e.g. Christian Children Fund) who provided a cow and free veterinary services to their beneficiaries for a period of one and a half years. Training courses, if available, also focus on dairy production and on commercial poultry production and not on subsistence goat or sheep rearing.

The Nairobi case study revealed that government institutions that work with poor livestock keepers do exist in theory. However, due to resource constraints they do not visit poor households and the majority of poor livestock keepers are unaware of their existence. Many of the poor farmers rely on veterinary pharmacies and the stockist's advice or on traditional remedies.

The major sources of information on livestock production are informal. Livestock keepers rank friends, neighbours and family as main information sources. Government extension and research institutions and printed materials ranked low. The case studies also show that the participation of poor urban livestock keepers in training courses and "urban field days" is very rare. This is due to the lack of organisation among the poor livestock keepers and their reluctance to approach official institutions.

Overall the case studies confirm that there are no organisations in place to represent the needs and aspirations of poor livestock keepers, and no institutions to promote their interests.

2.5 Policy issues

The legal situation in terms of urban livestock keeping ranges from illegal to tolerated. Although the general attitude towards urban agriculture and livestock keeping is changing and city councils are recognising the existence and potential of urban agriculture, the supporting legislation and its implementation is lagging behind. By-laws and regulations often date back to colonial times (Kironde 1992) and are excessive, unenforceable or inappropriate to local conditions. In Dar es Salaam, for instance, a by-law exists which allows a maximum of four cows per keeper. This number seems to be established without any objective foundations, nor are similar numbers in place for other livestock species. A general lack of policy coherence and

coordination has been pointed out by the Nairobi case study, where 5 different ministries are partly responsible for urban livestock keeping.

Land tenure issues are another potential and existing legal conflict. In Nairobi, for instance, many of the livestock keepers are squatters and are living in the slums under an illegal status. In the other cities, livestock keepers use public land for grazing and for dumping of animal waste without permission from the city authorities.

The majority of poor livestock keepers are not aware of the exiting legal frameworks and is also not involved in discussing future changes. Harassment of urban livestock keepers by city authorities continues to exist; however, it is the minority of keepers who are affected. This shows the lack of enforcement of the existing legal framework. Formulating new regulations without the necessary will and power to implement these regulations would thus be a useless exercise.

2.6 Health, environmental, and animal welfare issues

City authorities are concerned about pollution and public health problems caused by urban livestock. The existence and promotion of urban livestock keeping has been criticised as potentially dangerous for the urban population.

Generally farmers are unaware of the public health concerns associated with livestock keeping in confined areas and in close proximity to human beings. There is lack of information on potential health risks. The majority of poor urban livestock keepers only considered the flies and the strong odours as a nuisance. The case studies revealed that hygiene and disease control measures in handling and housing livestock are minimal.

Zoonoses is one important aspect to consider in urban livestock keeping. For example, anthrax, brucellosis, cysticercosis, trichinosis among others are reported to be transmitted from animals to humans through inappropriate management practices for urban pig farming (Santandreu *et al*. 2000). The use of poultry manure which is not stored for long enough to prevent the contamination of food crops (e.g. leafy vegetables) and water with pathogens (faecal coliforms) is reported from Kumasi (Drechsel, *et al* 2000).

A series of factors increase the risk of zoonoses including economic conditions (Mantovani 2000), which makes the poor urban livestock keepers more vulnerable as they are forced to keep livestock in close proximity to humans due to limited space. The Nairobi case study showed that over 30% of livestock are kept inside the keepers' house. Sanitation is poor in most of the slum areas. This means that scavenging livestock have easy access to human waste, which is particularly dangerous if pigs get in contact with it. Often children are involved in cleaning livestock shelters and animal waste disposal, which exposes them to disease.

Another potential health risk is the lack of product safety control. As most of the livestock products produced by poor livestock keepers are either directly consumed by the household members or sold through informal channels there is no control of product safety. For instance, the Kampala case study uncovered that the livestock

keepers are not aware of the importance of a time period between drug administration and consumption of livestock products.

Contamination of water sources through inappropriate livestock waste disposal is another problem which affects public health and the environment. As described in section 2.3.4 the dumping of animal waste in river, dams, etc. is a common practice; however, studies to show the scale and impact of these practises on water quality are lacking. Considering that water is one of the most scare resources for millions of poor people, there is an urgent need for action. Dust pollution especially for intensive poultry production (Ossiya *et al*. 2002; Lupala 2002) is another environmental concern.

Animal welfare issues include inadequate housing, crowding into small spaces, dampness and heat, injuries due to old harnesses for donkey transportation business are uncovered by the city case studies. Unaffordability of drugs and veterinary services and consumption of contaminated drinking water are causing poor animal health and have led to numerous deaths in livestock (Ishani *et al* 2002).

Goats and sheep roaming freely, Kibera, Nairobi. Mazingira Institute

3. Opportunities and constraints of urban livestock keeping

Livestock keeping for the urban poor takes place under challenging circumstances as we have seen from the foregoing description. Resources, such as space, capital and feed are limited and the institutional and legal environments appear to be unfavourable. However, the continuing existence and increasing importance of urban livestock keeping for the poor indicate that the positive aspects of urban livestock keeping outweigh the negative aspects.

The following ***key strengths*** have been identified from the city case studies:

- Market developments that could favour urban livestock production by the poor: the urbanisation process will lead to increasing demand for livestock products. The proximity to these markets is an advantage for the poor. The case studies indicate that urban commercial livestock enterprises become less competitive due to high input prices (imported feeds and animal drugs) as a result of liberalization and structural adjustment programmes.
- Higher return per unit land from livestock compared to crops: increasing demand for land in cities for housing favours urban livestock keeping as it requires less land and promises higher returns per unit land utilised.
- Flexibility in terms of land use: compared to urban crop production, livestock can be shifted easily to other urban areas as they become available.
- Use of existing resources: urban livestock keeping offers an opportunity to make use of household waste, agro-industrial by-products such as molasses and brewery residues, weed and grass from public lands and crop residues from markets and urban farmers.
- Provision of a social safety net for the poor: the different case studies show that especially vulnerable groups, such as female headed households, children, retired people, widows and people with limited formal education are involved in urban livestock keeping as a form of social security strategy.
- Multi-purpose activity: urban livestock keeping fits different livelihood strategies and contributes to food security, income and employment generation, saving and insurance. It provides easily convertible assets for covering important expenditures (school fees, health treatments).

Weaknesses and constraints which affect the present situation of urban livestock keeping are the following:

- Inappropriate waste management: there is strong evidence from all the case studies that animal waste disposal in its current form causes environmental and public health problems, which will become even more severe as urban livestock numbers increase.
- Water availability: at present urban livestock keeping competes for water resources with humans as the demand for water for this activity is not taken into account by the supply services. In many slum areas water has to be bought and therefore other water sources, which are often contaminated, are accessed for livestock.

- Poor livestock health and high cost of veterinary services: the case studies show that animal health is often poor due to inadequate husbandry practices. Poor livestock keepers seldom vaccinate their livestock, especially not smaller species such as goats, sheep and chickens. Due to the high cost of veterinary services and livestock drugs, treatment is sub-optimal.
- Feed availability and quality: feed availability is a particular constraint for larger livestock species such as cattle, which are usually zero-grazed. Feed quality is a problem for free-roaming livestock as there is no or very limited control over feed sources. The Nairobi case study shows that foraging at waste dumps is common in the slum areas.
- Low production level: due to limited feed availability, poor quality and poor management practices, the production level of livestock is generally low.
- Poor networking and organisation among the poor livestock keepers: poor livestock keepers are not organised and can therefore not express their demands in a concerted way.
- Lack of research and services provision: information access and adoption of improved technologies is limited for poor urban livestock keepers. This is made worse by the fact that existing services are not tailored to the needs and circumstances of the poor (e.g. extension services and training courses promote species which are less relevant for the poor).
- Limited knowledge of livestock husbandry practices: as information sources and advice services are lacking, poor livestock keepers often have limited knowledge of livestock husbandry practices.

Opportunities for the future development of urban livestock keeping for the poor are the following:

- Increasing recognition of the importance of urban livestock keeping by donors, NGOs and municipal authorities: in the five case study cities, there was evidence of an increased recognition of urban livestock keeping among different stakeholders. Municipal authorities have in most areas stopped harassing livestock keepers, NGO's have started to provide support through advisory services, and credit and extension services recognise urban livestock keepers as a potential target group.
- Potential of low cost/ high impact interventions: in Kampala and Nairobi, the case study authors conclude that there is an opportunity to achieve substantial impact through capacity development of poor livestock keepers as current production levels are constrained by poor management practices.
- Organisation and networking among poor urban livestock keepers to improve access to information and other services: urban livestock keepers are becoming more aware of the potential benefits of organisation and networking as a means to access information and services and improve marketing strategies.
- Market development: increasing urbanisation and hence demand for food products may have positive impacts on the development of urban livestock keeping.
- Improved animal waste management: available technologies for animal waste disposal (improved composting technologies and biogas production) provide an opportunity to improve current waste management practices. These have

ecological and economic benefits in addition to reducing public health problems.

- Improved urban/ rural linkages: the case studies conclude that current rural-urban linkages are weak or non-existent. However, there is an opportunity to improve these linkages for fodder production and animal waste disposal.

The following ***threats*** have been identified from the city case studies. Some of them do not only affect the urban livestock keepers directly but also represent threats for the general public.

- Increasing land shortage and continuous insecurity of land tenure: space is an increasing constraint in urban areas and as population numbers are raising the problem will increase. But it is not only a lack of land which threatens the successful development of urban livestock keeping, but also the absence of tenure systems which give the poor legal rights to land.
- Limited access to input capital: urban livestock keeping by the poor is carried out with a minimum of external inputs (feed concentrates, veterinary drugs, etc,). This is due to the lack of capital and credit services which provide facilities accessible for the poor.
- Product safety/ zoonoses: public health risks caused by unsafe products and zoonoses may lead to more restrictive legislation for urban livestock keeping
- Environmental contamination: increasing numbers of livestock and continuing inappropriate waste management strategies will lead to further deterioration of the urban environment.
- Lack of pro-poor policies: new legislation and policies may fail to address the specific needs and opportunities of poor livestock keepers.

4. Researchable issues and outlook

The aim of the scoping study was to understand the current situation of poor urban livestock keepers in 5 major East African cities, and identify areas where future research could make a contribution to the development and promotion of this activity. The case studies reveal that urban livestock keeping has significant benefits for the poor and provides a way of diversifying livelihoods activities that are accessible to vulnerable groups. Urban livestock keeping also provides a source of locally produced food, which improves the nutritional basis for livestock keeping households and people living in the vicinity.

The scoping study identified three major intervention areas that are important to address to achieve a more sustainable and pro-poor focused development of urban livestock keeping. The three areas are the following:

- Improved understanding and management of externalities caused by urban livestock keeping;
- Contribution to policy formulation and implementation through generation of policy relevant information; and
- Improved access to information and knowledge for urban livestock keepers to existing technologies and management practices through networking and organisation.

As cities are growing rapidly the number of poor people depending upon informal livelihood strategies is increasing, which suggests that urban livestock keeping will continue to expand. The scoping study reveals that various externalities such as environmental contamination, zoonoses, and lack of product safety are serious threats for the sustainable development of urban livestock keeping. Most affected by these externalities are, and will be, the poor who currently live in urban slums characterised by poor hygienic conditions and deteriorating sanitation services and water supply. However, the negative impacts and the related environmental and public costs resulting from these externalities will affect the city communities in general.

The existing evidence of the negative impacts caused by inappropriate livestock waste management on water resources and public health calls for a more detailed analysis of the problem. Inappropriate waste management leads to the contamination of already scarce water resources and threatens public health. A recent study conducted by Manase *et al* (2002) shows that in South Africa diarrhoea is endemic and kills 43,000 people each year and costs the country half a billion dollars in lost productivity. The consumption of unsafe water is one important cause for diarrhoea and affects mainly the poor who can't afford to purchase safe drinking water.

Related to the above is the existing and potential health risks to humans caused by the transmission of diseases from livestock. As Mantovani (2000) points out there are a range of local factors involved which may increase the risk of zoonoses and which will expose especially vulnerable groups such as children, pregnant women and poor people in general. Livestock product safety plays an important role for the transmission of diseases from animals to humans. The consumption of contaminated eggs, meat and milk products is a real problem, as poor livestock keepers produce and

process their products without quality control and often in environments which are conducive to contamination.

Research can play an important role to assess in more detail the current and potential impact these externalities have on urban people and their environment and to contribute to the development of strategies to overcome or minimise these. It is crucial to understand how these problems will develop with increasing livestock numbers and continuing urbanisation trends.

Specific research aspects include:

- Quantification of impact of current waste management practices on water resources,
- Identification of improved waste management technologies adapted to the specific circumstance of the poor,
- Intensification of urban/ peri-urban and rural linkages in terms of nutrient flows,
- Assessment of current and potential scales and impact of zoonoses, contributing factors and mitigation strategies,
- Development of effective and applicable food quality standards and quality control processes accessible for the poor,
- Policy related research on the legal status/legislative control of livestock keeping in East African cities.

A second intervention area is the development of policy relevant information that is needed to advise policy makers and city authorities on the above issues in order to provide guidance for the formulation of pro-poor urban livestock legislation. The scoping study shows that exiting legislation is outdated and does not take into account the situation faced by the poor. Two major aspects for future policy formulation are land distribution and water availability. Currently, policy makers and city planners do not take into account the demands of urban livestock keepers. This results in unfair competition for resources, over-use and conflicts between neighbours. Studies are needed which quantify the current and future land and water demand by urban livestock keeping. A participatory and multi-stakeholder approach is needed to identify potential land and water management strategies taking into account the specific situation of the poor. Unless policy makers and city planners learn to be more responsive to the needs, demands and interests of poor communities, urban environments are likely to become ever more unsanitary, unsafe and inhuman.

Manase *et al*. (2002) found that in Southern Africa the lack of coordination between government agencies combined with lack of clear policies and conflicting legislation contribute to the general failure to deliver services to the poor. In none of the three countries studied are the urban poor effectively represented. The structure, reporting systems and chains of command for local authorities are vertical and allow only limited community participation. Community based organisations (CBOs) are often regarded with suspicion, even when granted legal recognition.

These findings underline the importance of the third intervention area identified by the present scoping study. Poor urban livestock keepers are not represented by formal or informal organisations, which excludes them from effectively communicating their

demands and opinions. Furthermore they are marginalised from existing knowledge and improved technologies. There is a clear opportunity to improve the situation of poor urban livestock keepers and their management practices through capacity development and information sharing. However, in order to achieve this, organisation and networking among poor livestock keepers and other stakeholders is required to improve the access to services, information, technologies and markets. This can be encouraged through participatory action research processes, which brings together the different stakeholders involved.

Finally, there is a need to identify appropriate strategies to promote urban livestock keeping to other vulnerable groups who have not yet entered this activity. As a first step a participatory constraint and opportunity analysis with these vulnerable groups is required to identify the potential contribution urban livestock keeping could make to their livelihoods.

5. References

BAAH, J. (1994) Selection and evaluation of feedstuffs for urban and peri-urban small ruminant production systems in Ghana - a systems approach. Ph.D. Thesis. The University of British Columbia. Vancouver, British Columbia, Canada. pp. 140.

CBS (1999) Popular version of the first poverty report in Kenya, Government of Kenya. Nairobi. Central Bureau of Statistics and the Human Resources and Social Services Departments of the Office of the Vice-President and the Ministry of Planning and National Development

CENTRES, J.M. (1991) Améliorer l'approvisionnement de Bamako en produits maraichers et en protéines animales. 1. Agriculture et élevage à Bamako, Paris, France, GRET.

DRAKAKIS-SMITH, D. (1992) Strategies for meeting basic food needs in Harare. pp 258-283. In: *The Rural-Urban Interface in Africa: Expansion and Adaptation*. Scandinavian Institute of African Studies, Uppsala, Sweden.

DRECHSEL, P.; AMOAH, P.; COFIE, O. and ABAIDOO, R. (2000) Increasing use of poultry manure in Ghana. *Urban Agriculture Magazine,* **1** (2).

ELLIS, F. and SUMBERG, J. (1998) Food production, urban areas and policy responses. *World Development,* **26** (2): 213 -225.

FAO. (1995) Global issues in the supply of livestock food products to urban populations. In: *Supply of livestock products to rapidly expanding urban populations*, pp. 27-34. *Proceedings of the joint FAO/WAAP/KSAS symposium, 16-20 May 1995, Hoam Faculty Club, Seoul National University, Seoul.* Wilson, R.T. (Ed.)
Rome. 224 pp.

FREEMAN, D.B. (1991) A City of Farmers: Informal Urban Agriculture in the Open Spaces of Nairobi, Kenya. McGill-Queen's University Press, Montreal, Canada.

GEFU, J.O. (1992) Part-time farming as an urban survival strategy: a Nigerian case study. pp. 295 - 302. In: *The rural-urban interface in Africa: expansion and adaptation.* Baker J. and Pedersen, P.O. (Eds.) Scandinavian Institute of African Studies, Stockholm, Sweden.

ISHANI, Z.; GATHURU, P.K. and LAMBA, D. (2002) Scoping study of Urban and Peri-urban poor livestock keepers in Nairobi. Mazingira Institute, Nairobi, Kenya.

JAMAL, V. and WEEKS, J. (1988) The vanishing rural-urban gaps in sub-Saharan Africa. *International Labour Review,* **127** (3): 271-292

LEE-SMITH, D. and MEMON, P.A. (1994) Urban Agriculture in Kenya. In: *Cities Feeding People: An Examination of Urban Agriculture in East Africa,* IDRC, Ottawa, Kenya.

LEE-SMITH, D. and LAMBA, D. (1998) Urban Food, fuel and shelter. CPF 29 A, IDRC Report, Canada.

LUPALA, A. 2002; A scoping study on urban and peri-urban livestock keeping in Dar es Salaam, UCLAS Consultancy Unit, Tanzania.

MANASE, G., MULENGA, M. and BEN FAWCETT (2002) Linking urban sanitation agencies with poor community needs: a study of Zambia, Zimbabwe and South Africa, ID21, DFID.

MANTOVANI, A. (2000) Veterinary urban hygiene in developing countries. *Urban Agriculture Magazine*,.**1**: (2).

MAXWELL, D.G. (1995) Alternative food security strategy: A household analysis of urban agriculture in Kampala. *World Development,* **23** (10): 1669 – 1681.

ONIM, M. (2002) Scoping study of urban and peri-urban livestock keepers in Kisumu City, Lagrotech, Kisumu, Kenya.

OSSIYA, S.: ISHAGI, N.; ALIGUMA, L. and AISU, C. (2002) Urban and Peri-urban livestock keeping in Kampala City – a scoping study, Ibaren Konsultants, Kampala, Uganda.

PCC POPULATION CRISIS COMMITTEE (1990) Cities: life in the world's 100 largest metropolitan areas. Washington DC. PCC

SANTANDREU, A., CASTRO, G. and RONCA, F. (2000) Urban pig farming in irregular settlements in Uruguay. *Urban Agriculture Magazine*, **1** (2).

SANYAL, B. (1985) Urban agriculture: who cultivates and why? A case study of Lusaka, Zambia. *Food and Nutrition Bulletin,* **3** (7): 197 – 207.

SANYAL, B. (1986) Urban Cultivation in East Africa: Peoples response to Urban Poverty. The Food Energy Nexus Programme, United Nations University, Paris, France.

SAWIO, C.J. (1994) Tanzania: who are the farmers of Dar es Salaam. In: *Cities Feeding People: An Examination of Urban Agriculture in East Africa.* IDRC, Ottawa, Canada.

SMITH, D.W. (1992) Urban food systems and the poor in developing countries.

SMITH, O. and OKOLULU, E. (1998) Peri-urban livestock systems. CPF 24, IDRC Report, Canada.

TEGEGNE, A.. SILESHI, Z., TADESSE, M., ALEMAYEHU, M. and WOLTEDJI, D. (2002) Scoping study on urban and peri-urban livestock keeping in Addis Ababa, ILRI, Ethiopia.

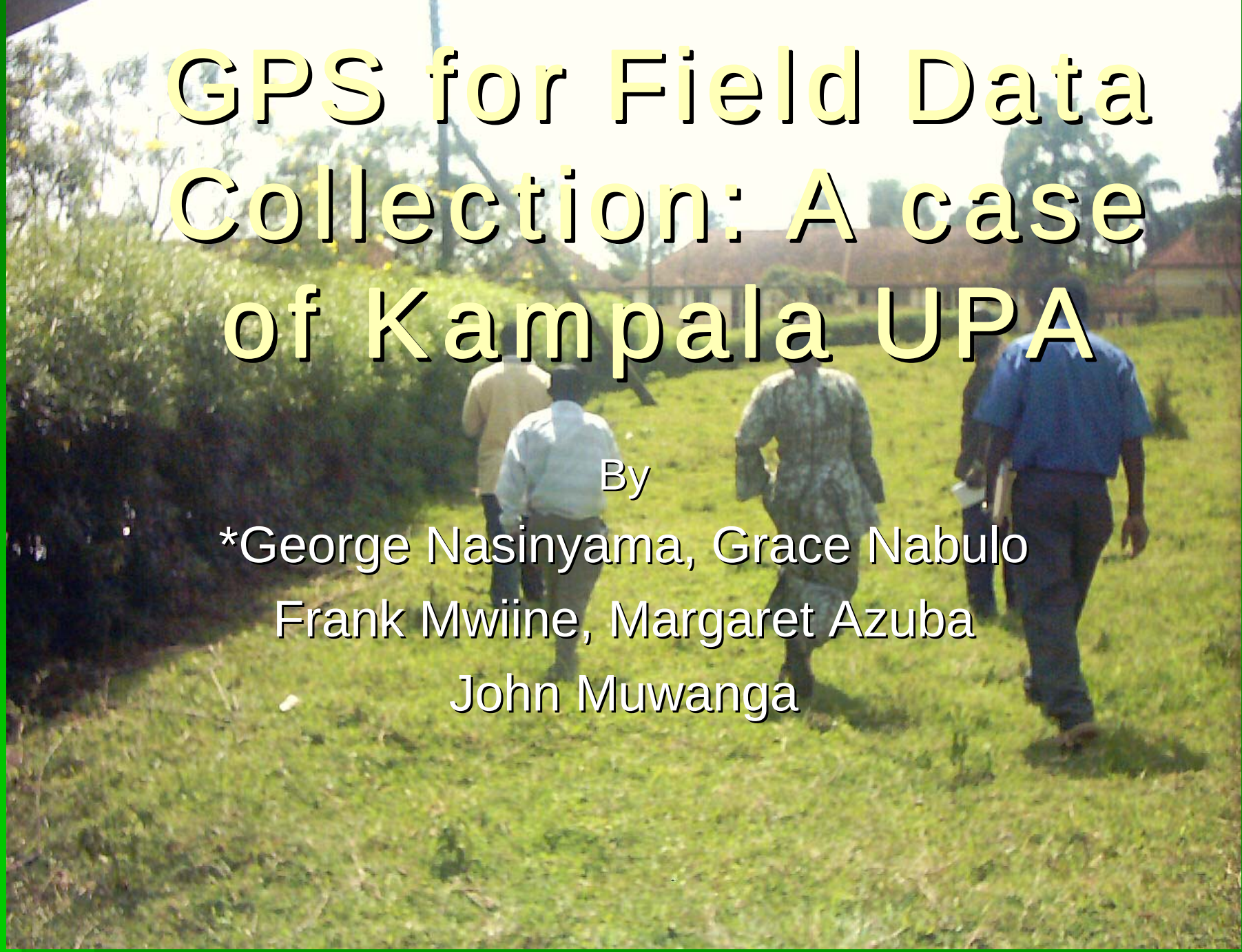
VAN DER BLIEK, J. (1992) Urban agriculture: possibilities for ecological agriculture in urban environments as a strategy for sustainable cities. Leusden, ETC, the Netherlands.

WATERS-BAYER, A. (1995) Living with livestock in town: urban animal husbandry and human welfare. Keynote paper presented at the Eighth International Conference of Institutions of Tropical Veterinary Medicine. Livestock Production and Diseases in the Tropics: Livestock Production and Human Welfare, 25-29 September 1995, Berlin, Germany. ETC Foundation, Leusden, the Netherlands.

YASMEEN, G. (2001) Urban Agriculture in India: A survey of expertise, capacities and recent experiences. CFP 32, IDRC Report, Canada.

UNCHS (1996) An Urbanising World, Global Report on Human Settlements. Oxford University Press, Oxford, UK.

GPS for Field Data Collection: A case of Kampala UPA



By

*George Nasinyama, Grace Nabulo

Frank Mwiine, Margaret Azuba

John Muwanga

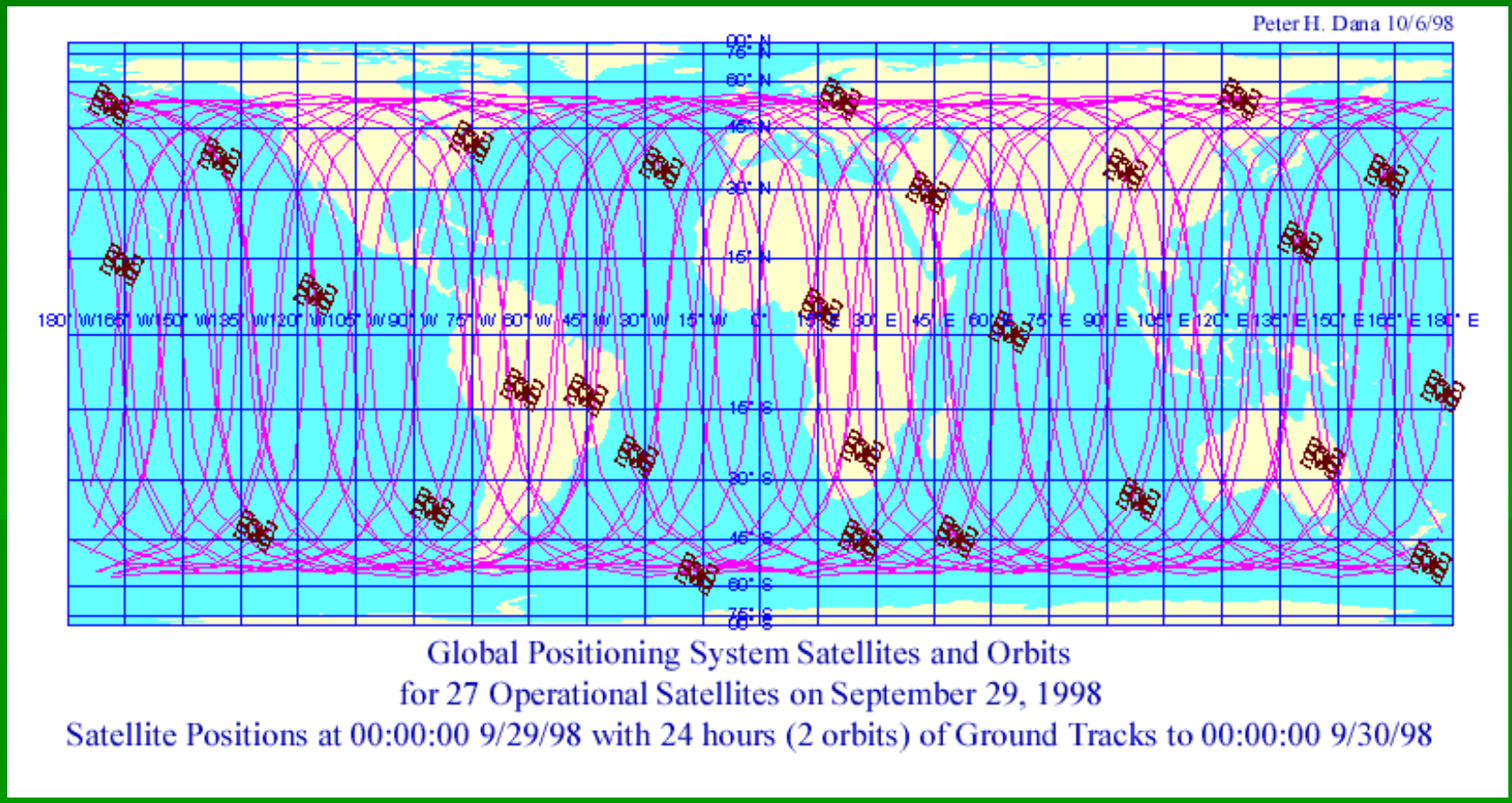
What is GPS?

- Global Positioning System - used for measuring locations on the earth on the basis of known coordinate system
- Owned by the government of United States of America (USA)

Satellite Constellation

- 27 Satellite evenly spaced
- Inclined 55^0 to the equator
- Provide desired coverage at the least expense
- Ensures 4 satellite in good geometry 24 hours
- Up to 10 satellite may be visible at one time
- Altitude 20,000 KM above earth

Satellite Constellation

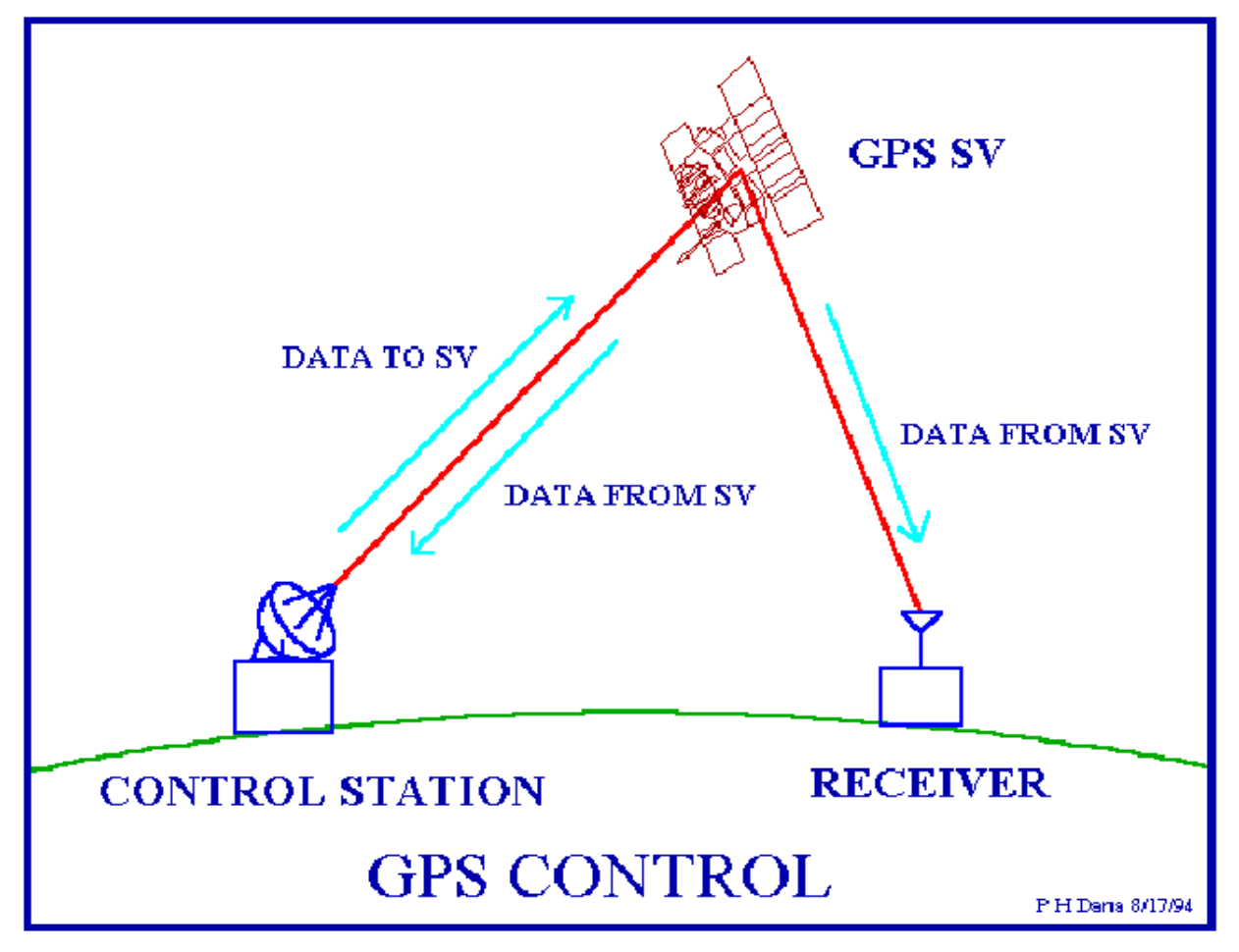


Global Positioning System Satellites and Orbits
for 27 Operational Satellites on September 29, 1998
Satellite Positions at 00:00:00 9/29/98 with 24 hours (2 orbits) of Ground Tracks to 00:00:00 9/30/98

Position Determination

- Requires four Satellites with known position
- Satellite sends signals continuously
- The point on the earth surface is determined by Distance = signal travel time x Velocity of the signal

GPS CONTROL MECHANISM



Terms Used

- Waypoint – Point whose position is recorded (Marked)
- Navigation – Move following provided positions
- Mark – Capture a position during navigation
- Route – capture a series of points along a path
- Tracks – series of points tracking a known position

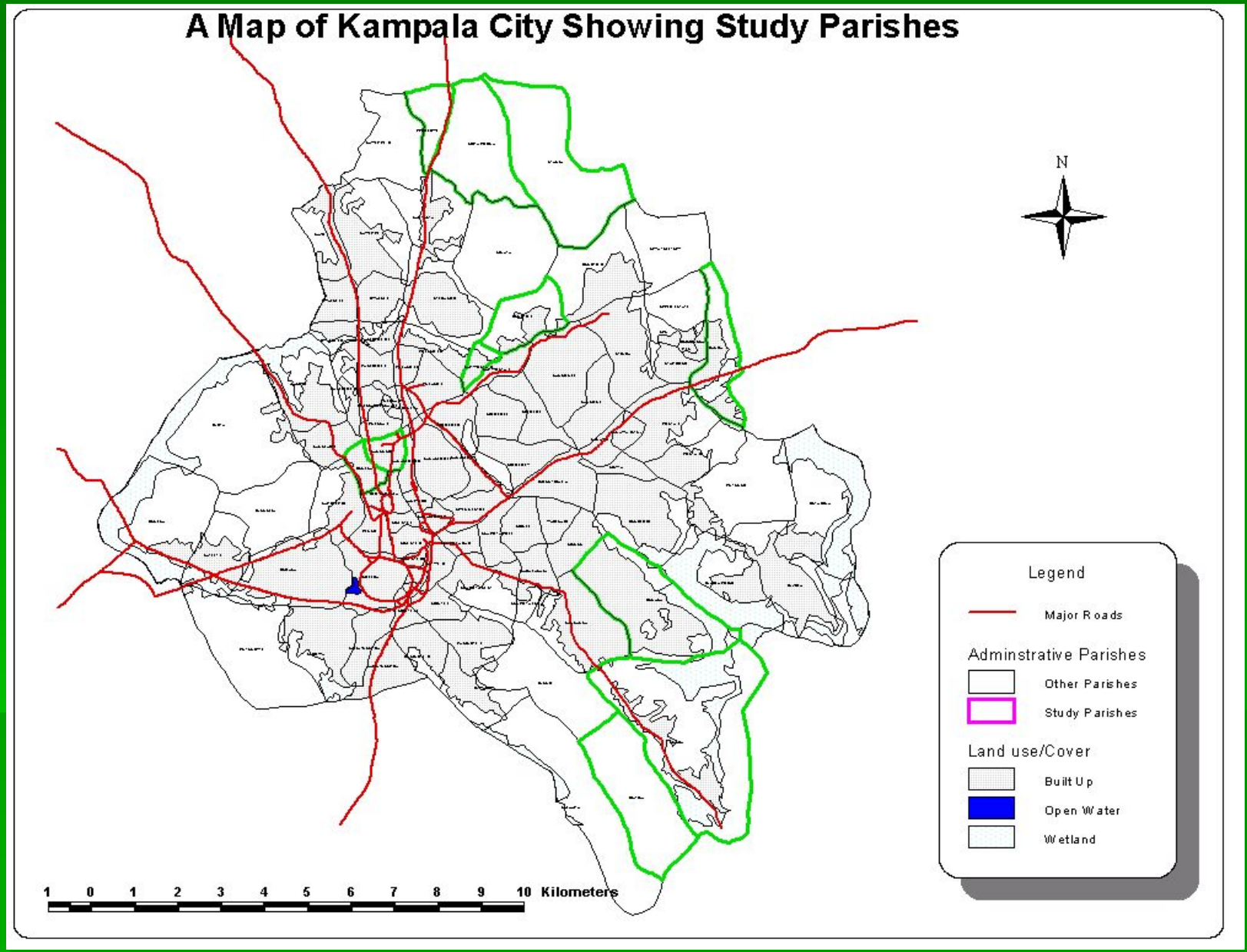
Preparation for Capturing Data

- Set up the GPS
- Check the battery power
- Determine the labeling system to be used
- Determine accuracy level required
- Is Computer Interface cable available (for data downloading)
- Make map prints for the survey area

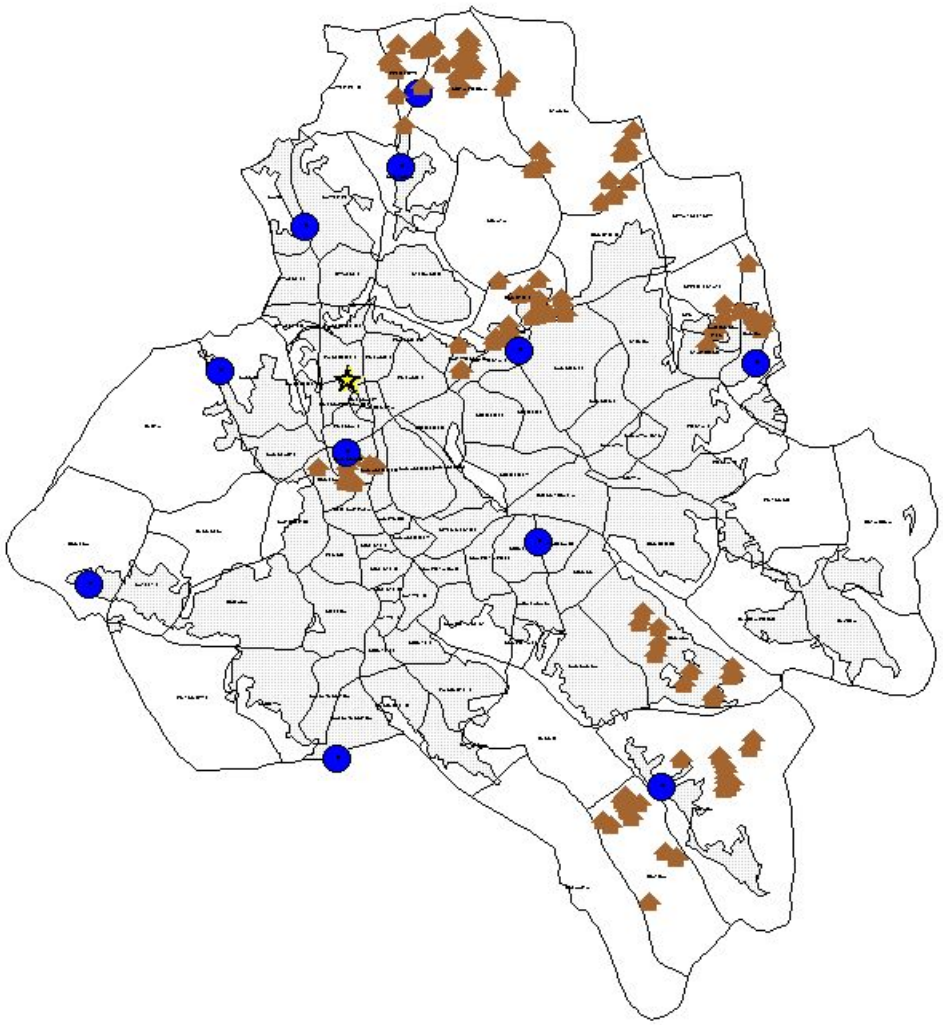
Data capture

- Type Garmin Etrex
- Check setup
- Go to Field
- After field data capture
  - Start waypoint software
  - Configure in units of preference
  - Make sure GPS is on
  - Download data

Capturing study sites: Health Impact Assessment Studies in UPA in Kampala


A Map of Kampala City Showing Study Parishes
N
Legend
Major Roads
Adminstrative Parishes
Other Parishes
Study Parishes
Land use/Cover
Built Up
Open Water
Wetland
1 0 1 2 3 4 5 6 7 8 9 10 Kilometers

A Map of Kampala Showing the Study Sites



N

Legend

Study Sites

Households

Households

Contaminants

Faculty of Vet

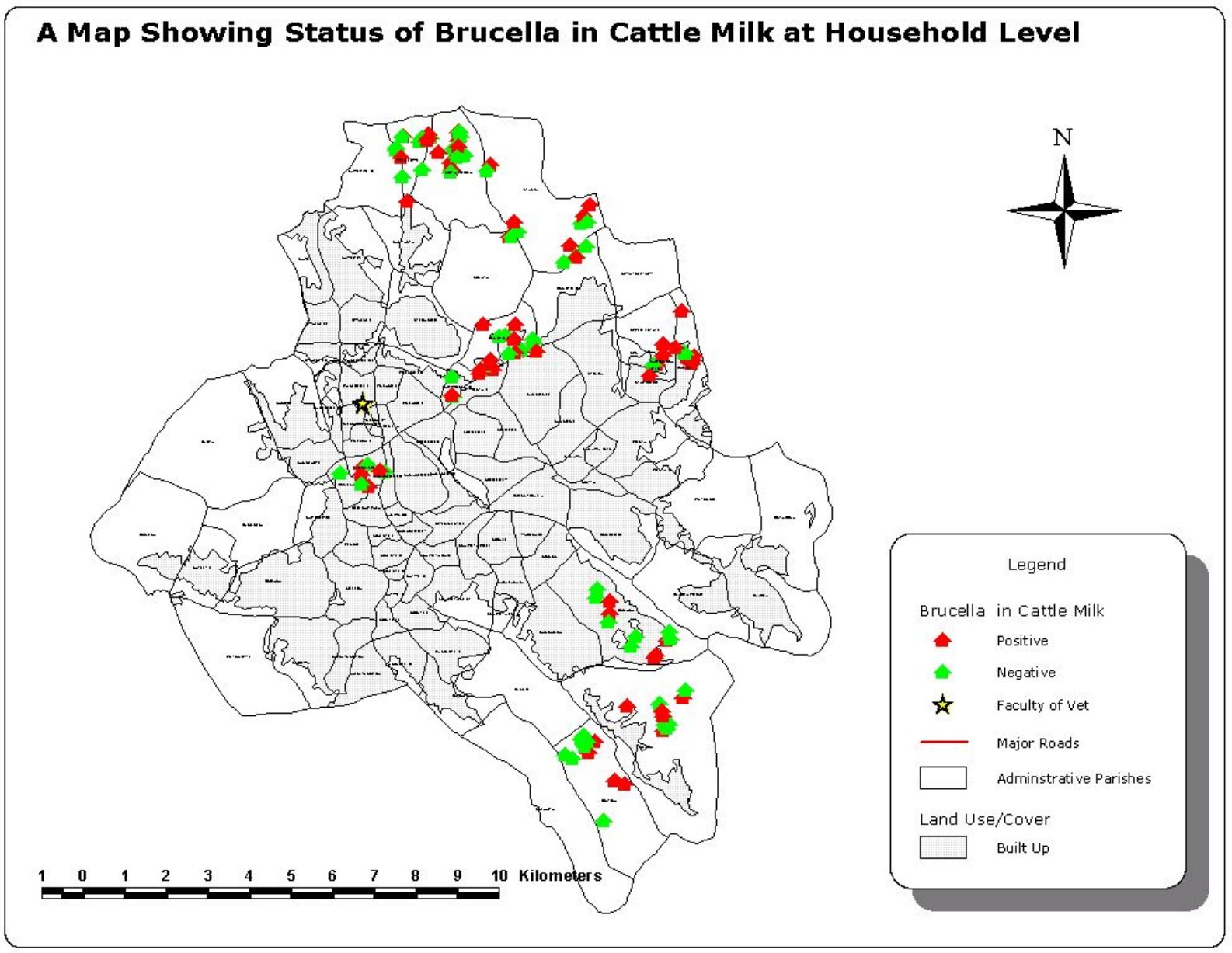
Adminstrative Parishes

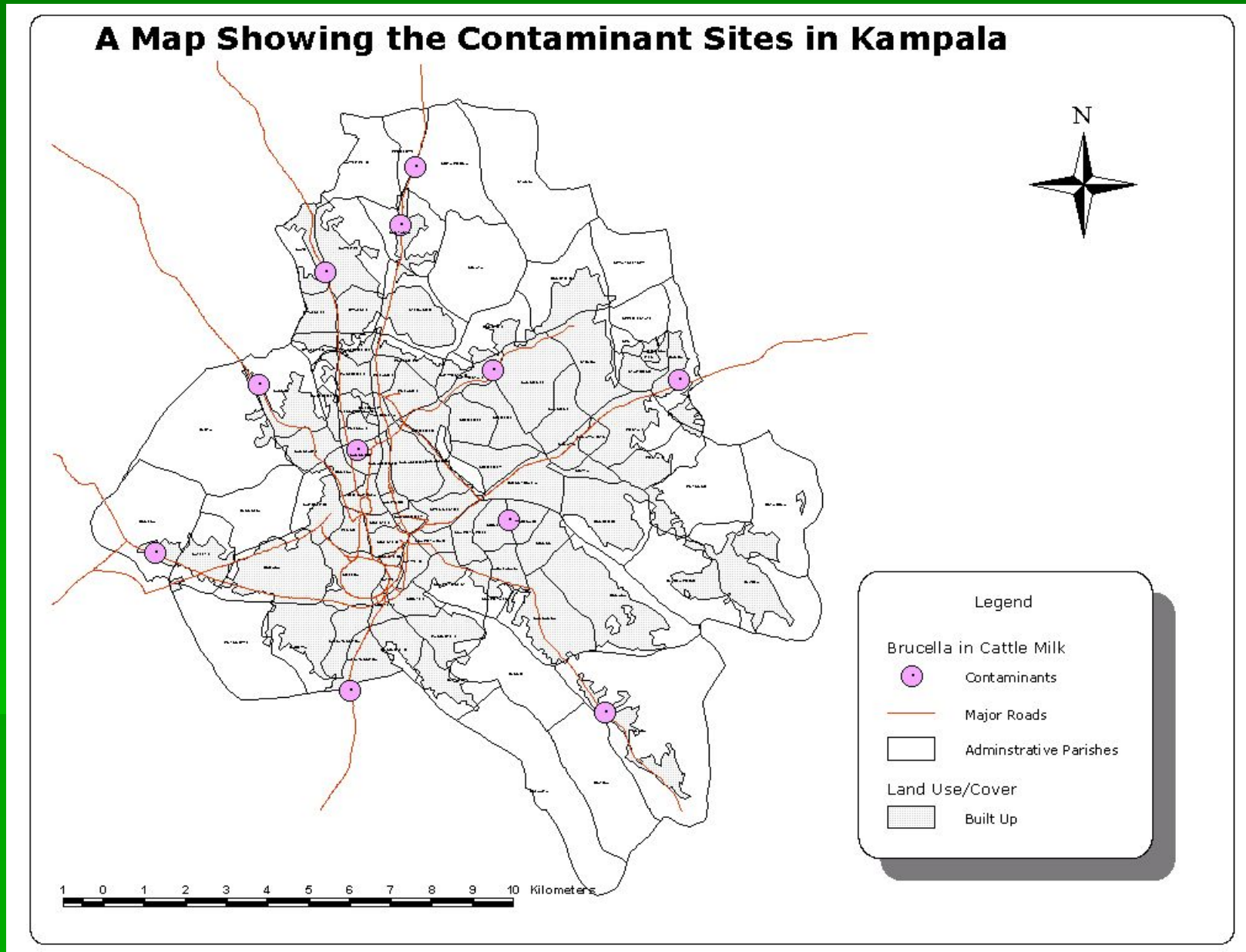
Land Use/Cover

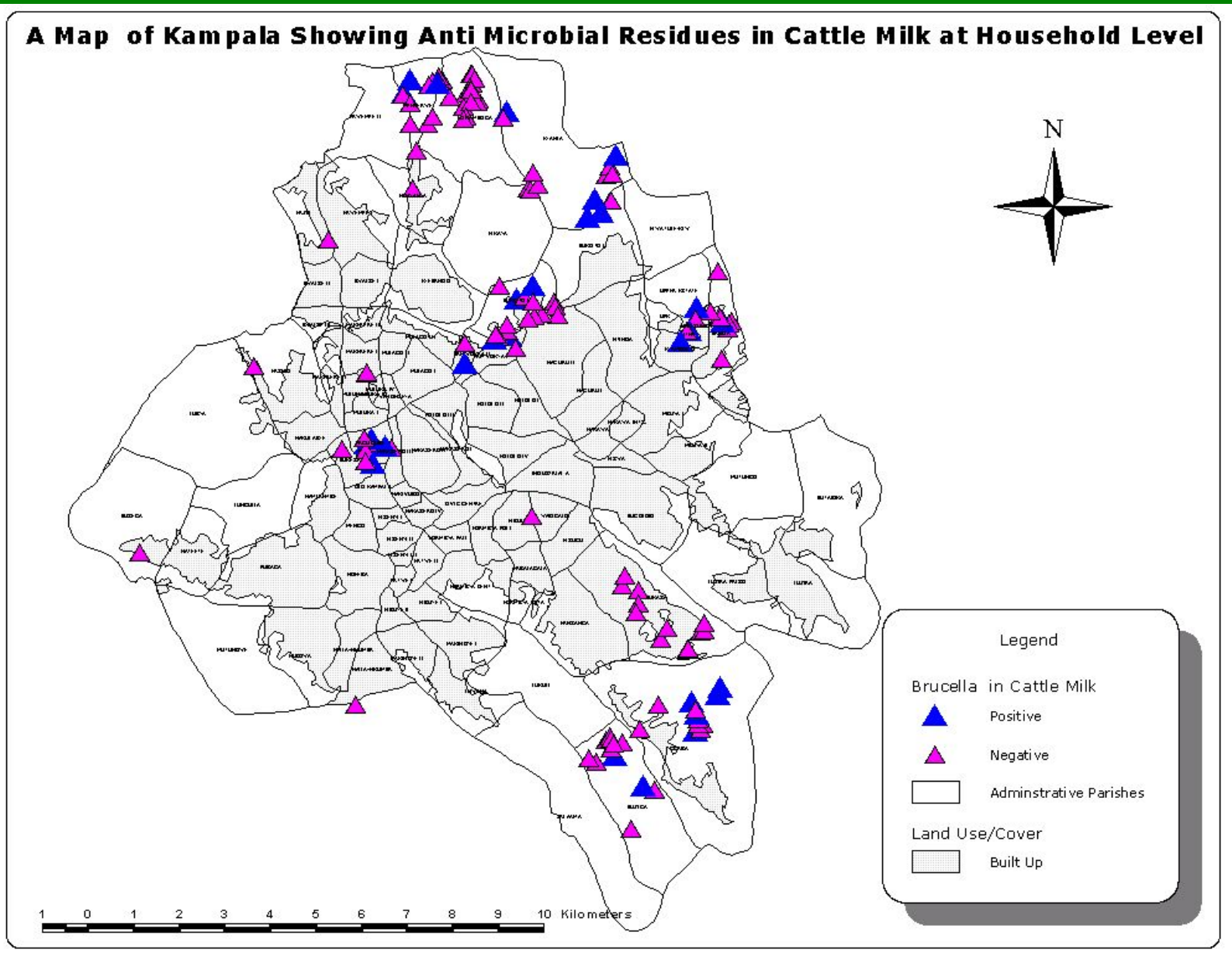
Built Up

1 0 1 2 3 4 5 6 7 8 9 10 Kilometers

A Map Showing Status of Brucella in Cattle Milk at Household Level




A Map Showing the Contaminant Sites in Kampala
N
Legend
Brucella in Cattle Milk
Contaminants
Major Roads
Adminstrative Parishes
Land Use/Cover
Built Up
1 0 1 2 3 4 5 6 7 8 9 10 Kilometers


A Map of Kampala Showing Anti Microbial Residues in Cattle Milk at Household Level
N
Legend
Brucella in Cattle Milk
Positive
Negative
Adminstrative Parishes
Land Use/Cover
Built Up
1 0 1 2 3 4 5 6 7 8 9 10 Kilometers

Way forward

- Capture all sites/households in UPA studies
- Add data on the mapping
- Continuos updating of the data – UPA activities are dynamic

Informal milk Marketing in Kenya: A Case Study

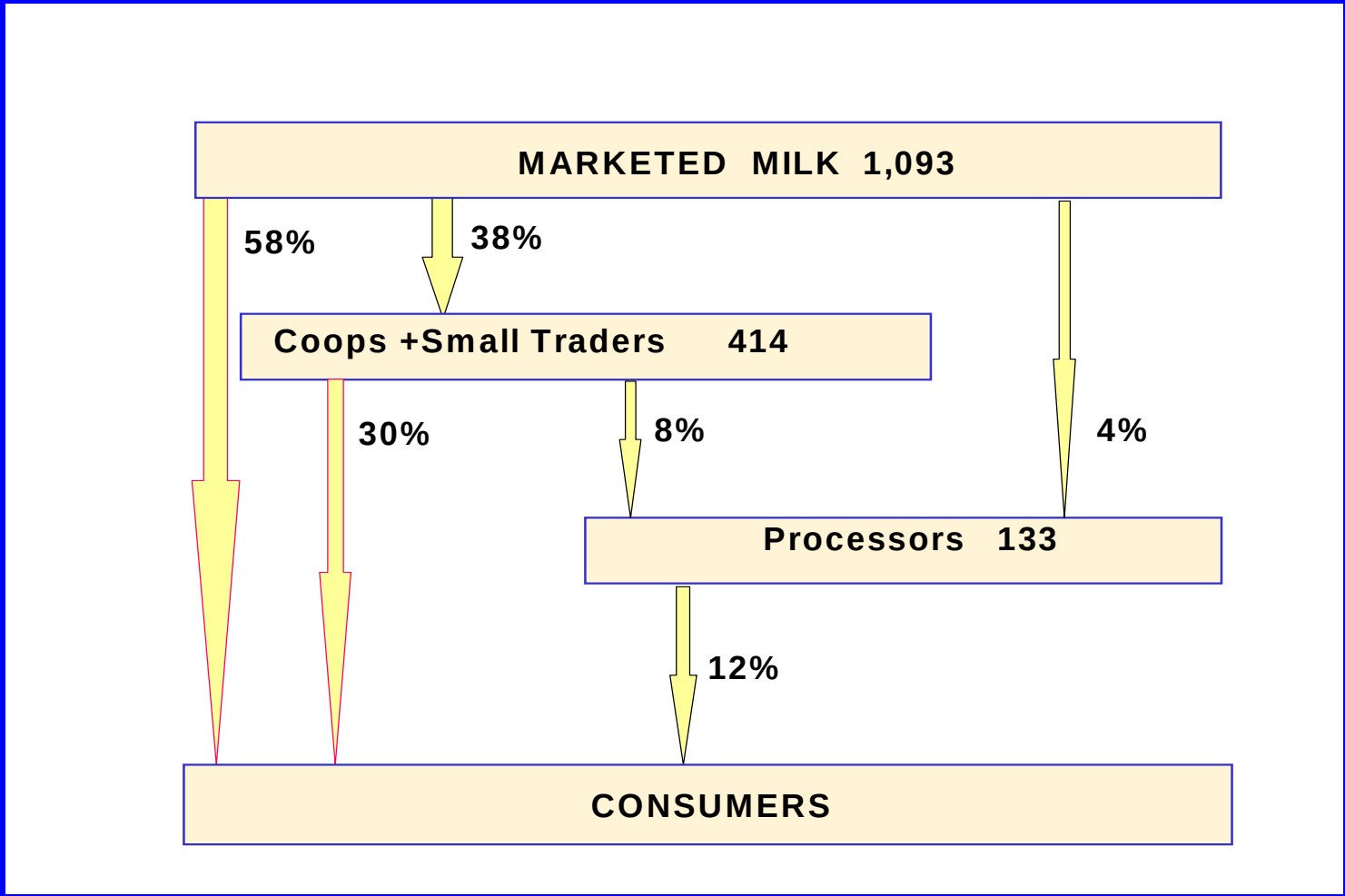
Nasinyama G.W.

Omore A.

Object of Case study

- Understand the risk assessment process used
- Relate the case study to your own cities with respect to:
  - Production
  - Differential costing for milk
  - Hazards identified
  - Management of these hazards
- Lesson learnt from this case study

Market share of informal Raw milk in Kenya



(Omore et al., 1999)

Amount of Informally marketed milk in selected countries in Africa & elsewhere

Sub-Saharan Africa	Percent
Kenya	88
Tanzania	98
Uganda	90
Central America	
Nicaragua	86
Costa Rica	44
South Asia	
India	83
Sri Lanka	40

Typical Small milk trader in Kenya

Setting the scene

Structure of the dairy industry in Kenya (Omore et al., 1999)

- Cow milk production in Kenya in 1997estimated at 1,093 million liters annually
- Approx. 88% of cow milk produced in Kenya is sold raw through informal market channels – [direct to consumers (58%), small scale market agents - kiosks, milk bars (hawkers) (38%)]
- Only 12% (133 million liters) of marketed milk was pasteurized and sold through the formal market channels

Setting the scene: What is the Problem

- Existing milk standards and regulations are not implemented just like elsewhere in developing countries where raw milk sales predominate
- Concern is, therefore, that the informal milk marketing may pose a significant Public Health Hazard

Question….

What is the status of cow milk marketing in your country in terms of:-

- Production

- Raw and pasteurized milk market proportions

- Level of informal milk marketing

- Conformance to standards and regulations regarding milk pasteurization

The research Questions in the Kenyan study

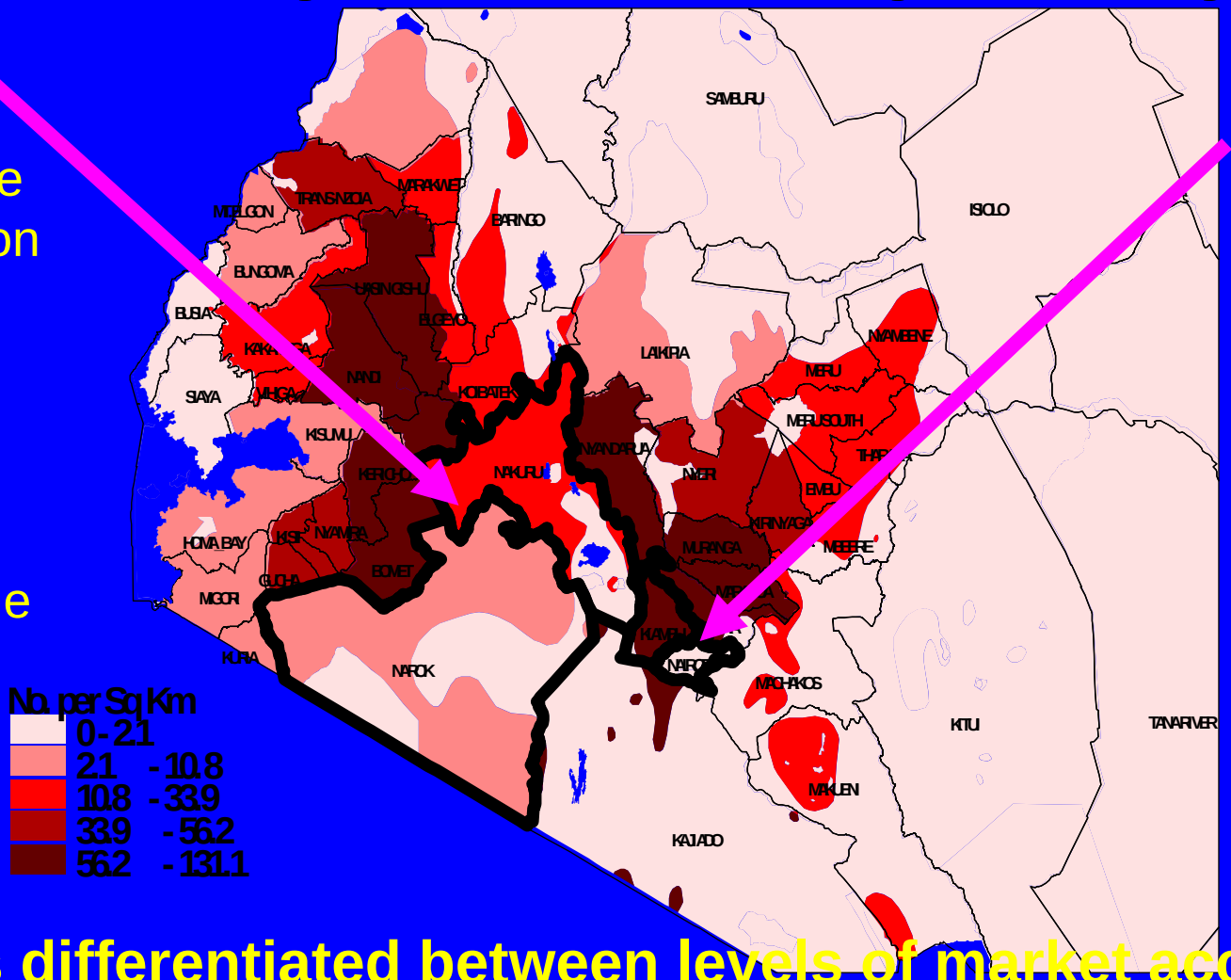
- Lack of accurate information on Milk Borne Hazards in Kenya
- Need to provide practical steps to optimize milk quality
- Define trade off in terms of quality assurance on one hand and cost and restrictions on traders on the other

Assessment of risks

Study sites and Dairy Density

Nakuru/ Narok:

- Extensive production
- Medium market access
- Exotic & Zebu cattle



Nairobi/ Kiambu:

- Intensive production
- High market access
- Exotic cattle

Sites differentiated between levels of market access and production system

Study methods

- Participatory research
- Structured data
- Data collected included:
  - Milk pathways
  - Handling practices by market agents and consumers,
  - Laboratory hazard assessments
  - Economic & GIS

Analytical approaches

Research questions were addressed through the two components of Health Risk Analysis framework, namely Risk assessment and Risk management [Discussed in Module 2]

SO THEN

What is Risk analysis?

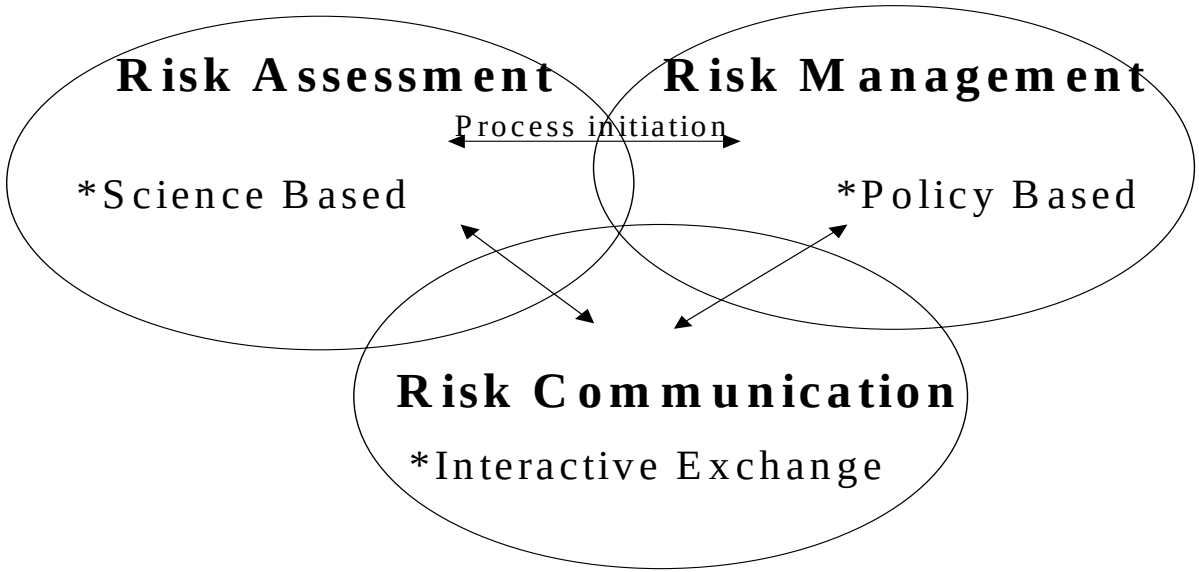
What is HACCP?

Analytical approaches (cont'd)
Definitions: Risk and Hazard

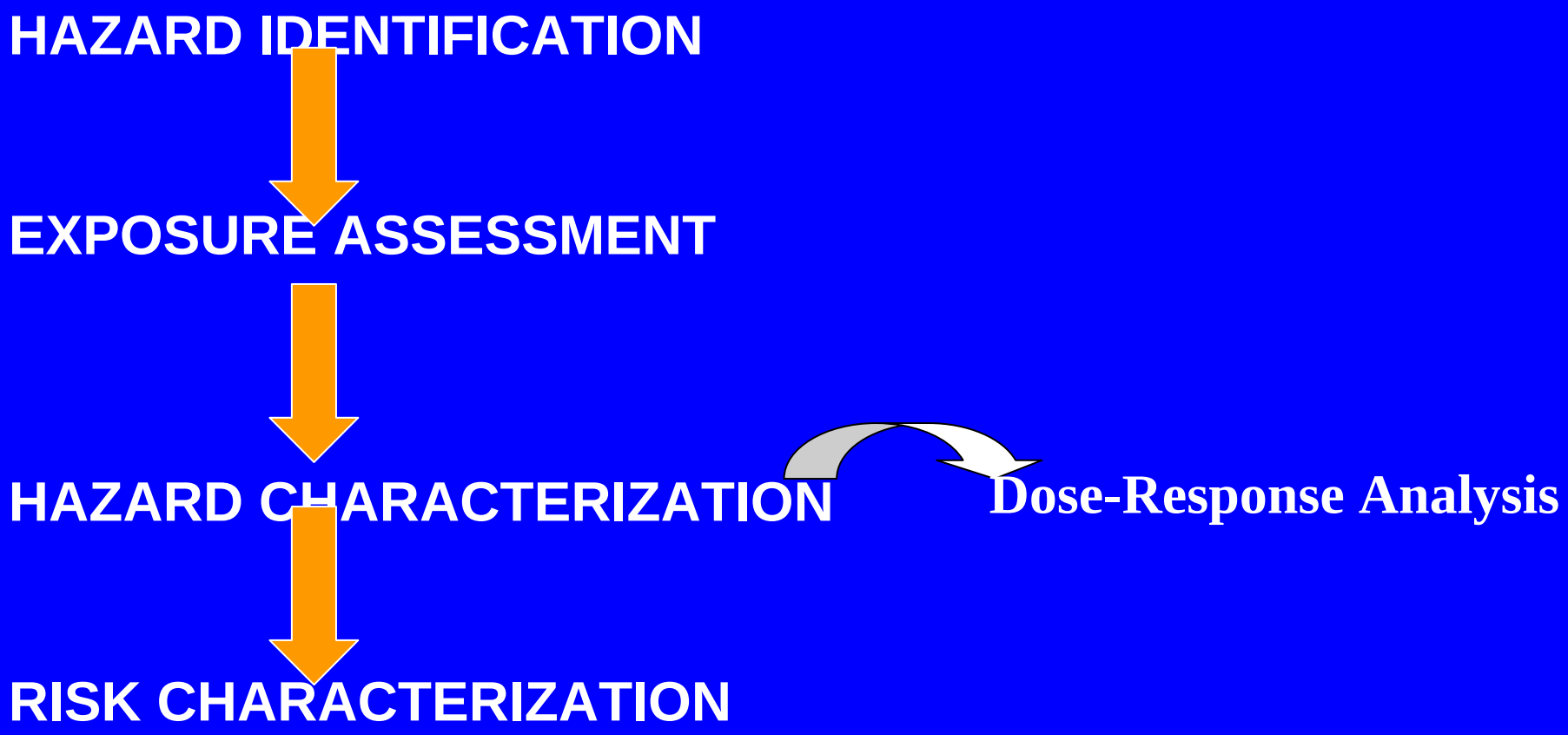
Risk = Fn of both probability (likelihood) & magnitude (impact) of an adverse effect arising from an identified hazard in food

Hazard = A physical, chemical or biological agent in food that may have adverse health effect

The Process of Risk Analysis



A Framework for Risk Assessment



Analytical approaches (cont'd)
And….

1. Risk Assessment = The scientific evaluation of adverse health effects arising from exposure to a food-borne hazard

Comprises of four steps:

- **Hazard identification**
- **Hazard characterisation: qualitative / quantitative / dose-response**
- **Exposure assessment: evaluation of degree of intake**
- **Risk characterisation: integration of above and reference to a population and uncertainties**

Analytical approaches (cont'd)
Risk Management & Risk Communication

2. **Risk Management**: The process of weighing policy alternatives to accept, minimise or reduce assessed risks and to select and implement appropriate options

3. **Risk Communication**: An interactive process of productive exchange of information with stakeholders at all level of risk analysis framework

Analytical approaches (cont'd)
Hazard Analysis and Critical Control Point system (HACCP)

- Originally applied to food for astronauts
- A tool/guideline for risk analysis
- Designed to prevent problems before they occur
- Designed to correct deviations immediately they are detected
- Such preventive control systems with documentation and verification are widely recognized as the most effective approach for ensuring food safety
- HACCP reduces regulatory enforcement costs

Analytical approaches (cont'd)
HACCP Principles

1. **Identify the hazard – Assess hazards in the food chain** (use conceptual flow-diagrams)
2. **Identify critical control points (CCPs): Points for remedial action**
3. **Determine Critical Limits (CL)**
4. **Develop monitoring systems**
5. **Implement monitoring procedures**

   - Corrective action, Documentation & Verification

Challenge: Adapting HACCP concept to informal food market situations

Analytical approaches (cont'd)
Laboratory Hazard Assessment in Kenya

- **Total counts & Coliforms conts** : SPC
- **Butter-fat** : Gerber Method
- **Added water (adulteration)** : Specific gravity
- ***Brucella abortus*** : MRT, ELISA
- ***E. coli* 0157:H7** : Culture & typing
- **Antibiotics & antibacterials** : Charm tests
- **Bovine TB *(M. bovis)* in humans** : Culture and PCR

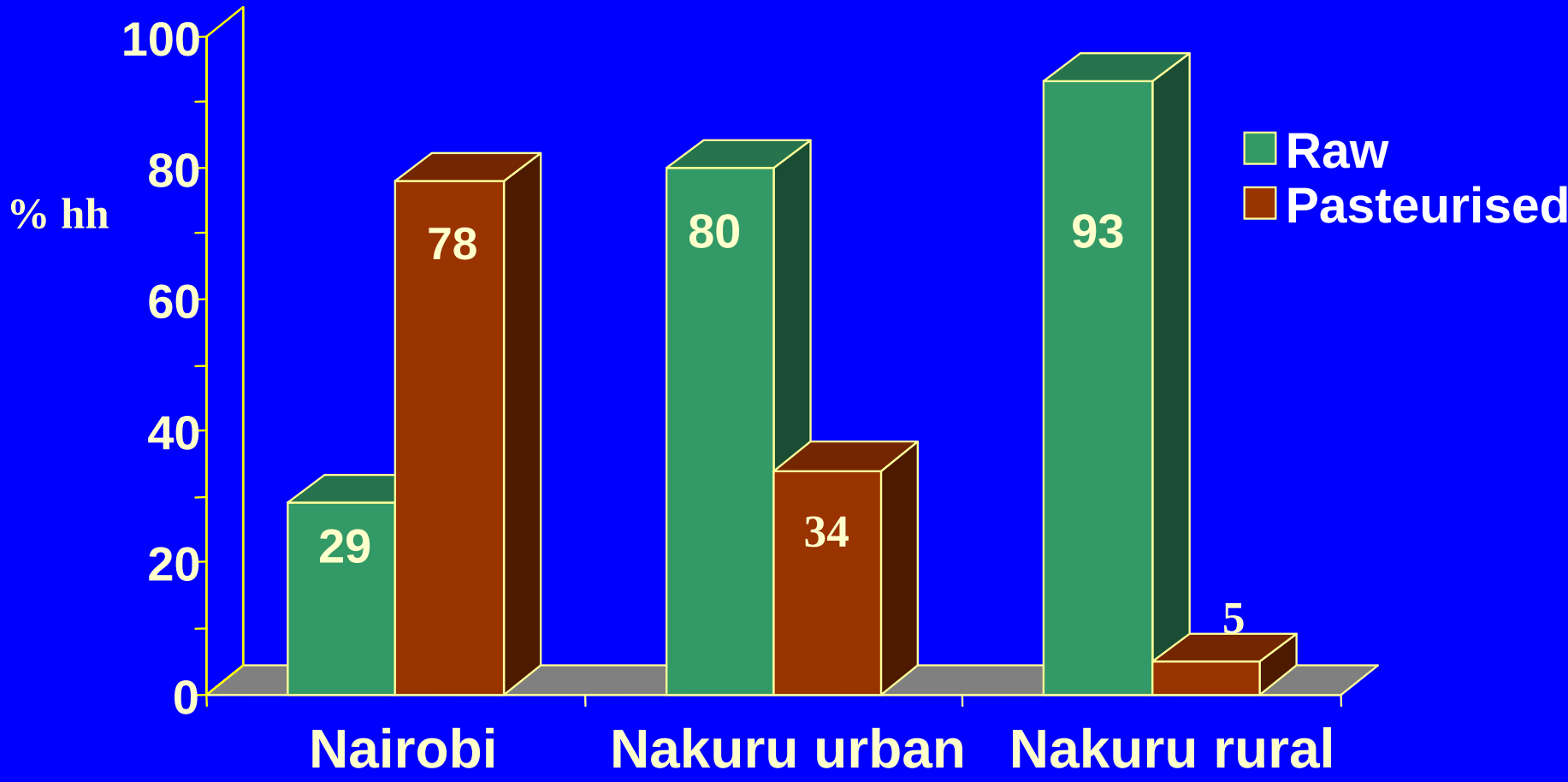
NOTE: Hazards to be investigated were identified at the initial stakeholder consultation

Analytical approaches (cont'd)
Risk factors (Risk characterisation) in Kenya

- Consumer preference, market structure, conduct and performance
- Market margins
- Spatial factors affecting marketing behaviour and performance
- Regression, principal component and clustering of milk quality indicators & profit parameters

Highlights of Results of Risk Characterisation

Percent of Households Buying Raw and Pasteurised Milk in Kenya



Milk prices in Kenya (1999)

Area	Mean Price KSh/Litre(USD$)	
	Raw milk	Pasteurized milk
Nairobi	31.5(40c)	40.0(50c)
Nakuru urban	25.3(32c)	41.0(51c)
Nakuru rural	18.4(23c)	41.0(50c)

Raw milk preferred due to its low price

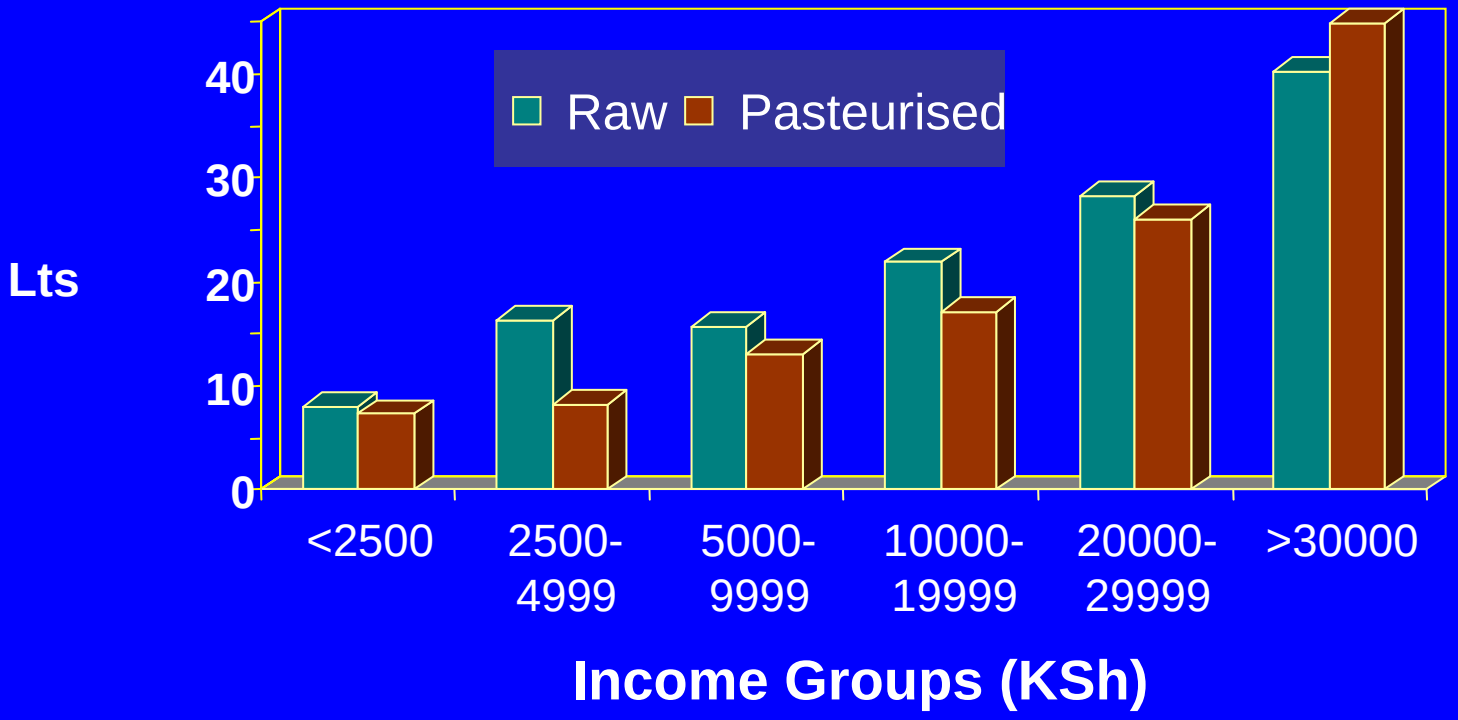
Lower prices for raw milk in rural areas and as distance increases from urban areas

Milk prices Elsewhere

Area	Mean Price KSh/Litre(USD$)	
	Raw milk	Pasteurized milk
Kampala	500(27c)	800-900(43-49c)
Addis	---	----
Dar-es-Sallam	---	---

Is Raw milk still preferred? Why?

Quantity of pasteurised and raw milk purchased in Nairobi, by income groups



- Higher quantities consumed as income increases
- Note: Price is not the only determinant of raw milk consumption [Tastes and preferences count]

Overview of lab. results

Adulteration

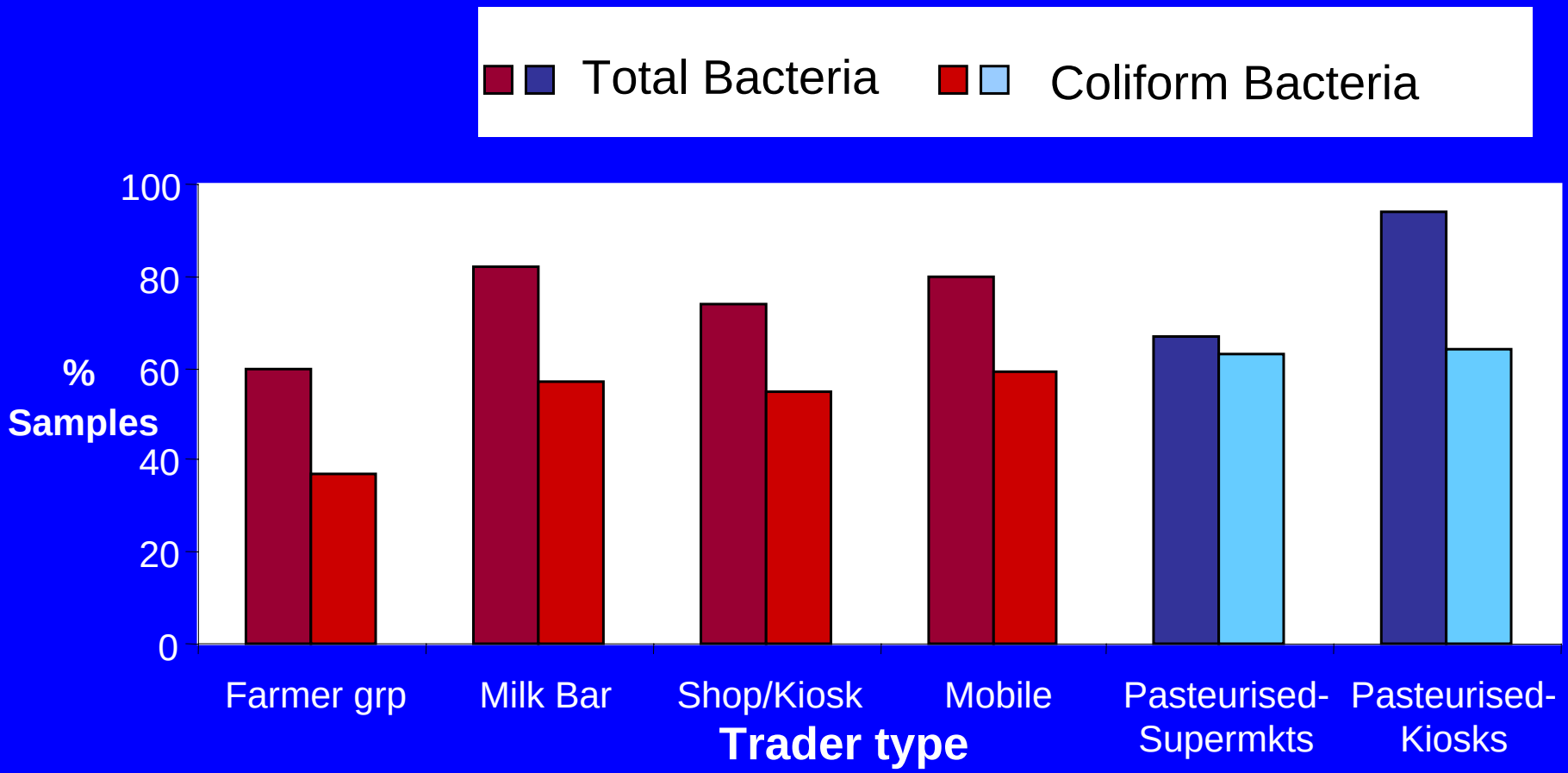
KEBS standards for specific gravity <1.026kg/l (added water) **& >1.032kg/l** (added solids) **applied**

	Added Water %	Added solids %
Consumer hh	5	6
Mkt agents	10	1

- **Adulteration highly variable by season & area**
- **All traders had some adulterated milk**
- **Tendency to add water during periods of low milk supply and high milk prices**

Bacterial counts (cfu/ml): % bad/very bad (KEBS)

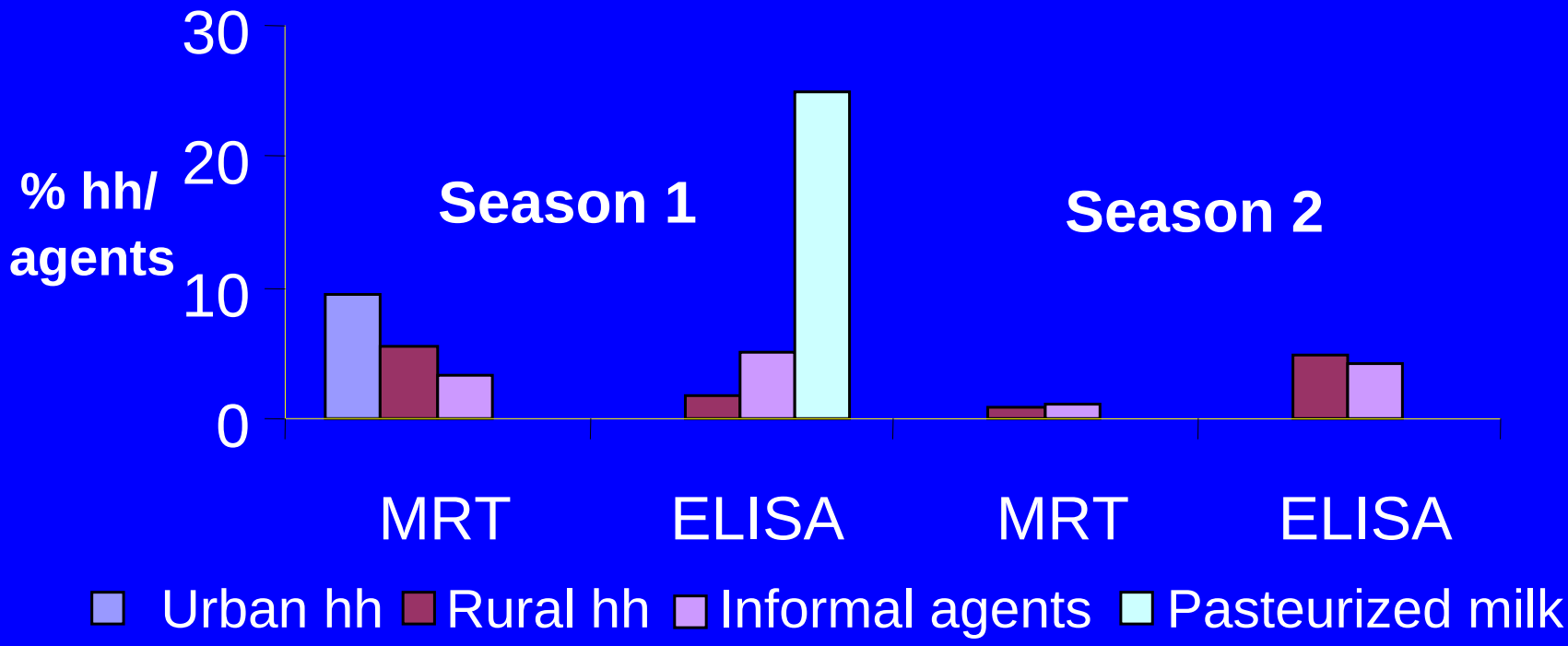
Raw: TC>2M, CC>50,000; Pasteurised: TC>30,000, CC>10



- **High counts in urban; low counts in rural areas**
- **Lack of effective preservation e.g., cooling. Standards?**
- **Significant deterioration before first transaction**

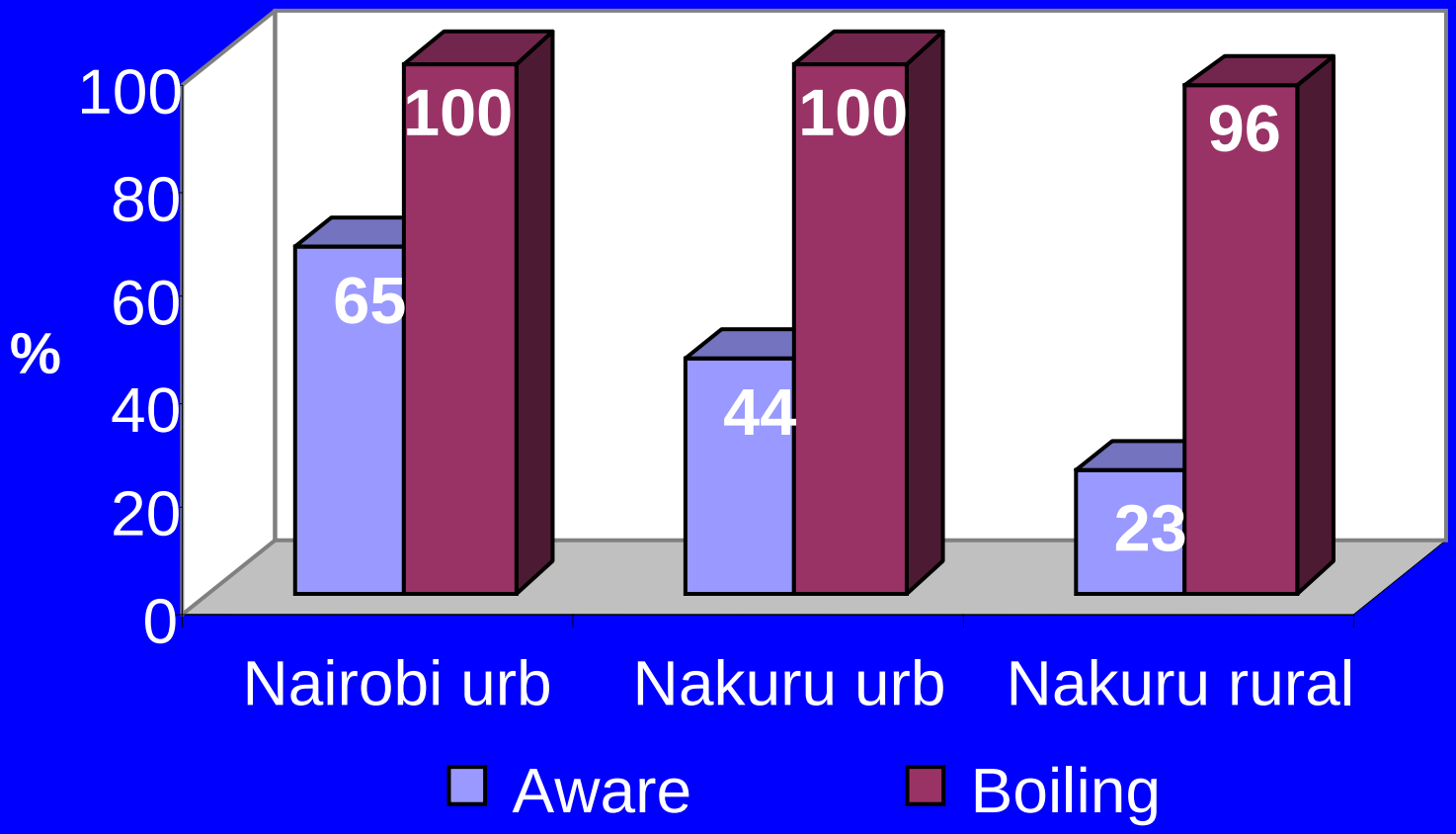
Zoonoses

Brucella abortus seropositivity



- **Bulking of raw milk → higher risk of brucellosis**
- **6% of rural hh consume home-made fermented milk**
- ***E. coli* 0157:H7 → 2 out of 264 (<1%)**
- **No *M. bovis***

Health awareness of milk-borne hazards

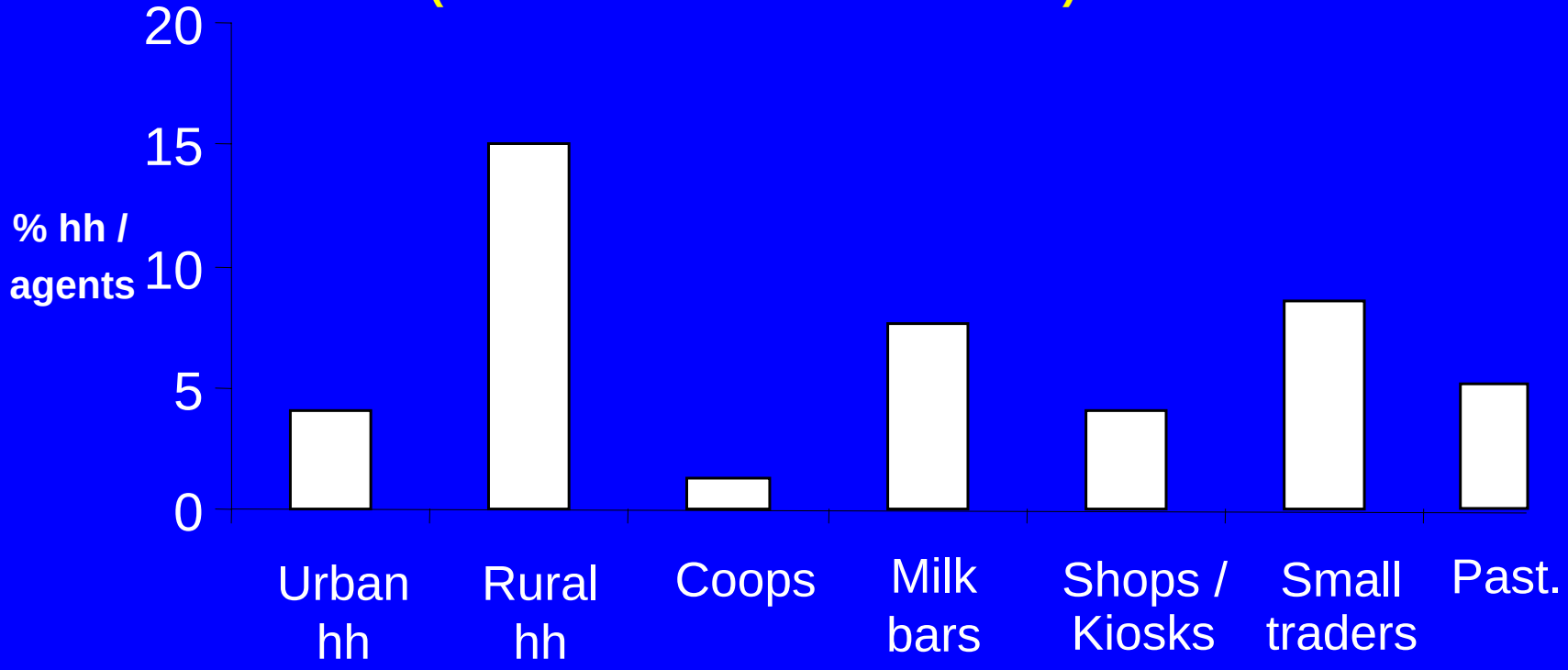


- **Nearly all hh boiled marketed milk prior to consumption but some naturally fermented milk also consumed**

Antibiotics & antibacterials (Charm AIM-96 Test)

% above acceptable limits

(EU/Codex Alimentarius MRLs)



- **All common antibiotics & antibacterials tested** (penicillins, tetracyclines, sulphonamides, aminoglycosides & macrolides)
- **The major health risk found.**
- **An average Kenyan consumer is exposed to milk with unacceptable residue levels twice every month!**

Antibiotics & antibacterials (Charm AIM-96 Test)

Detection levels of Charm-AIM test, MRLs and ADI

Drug	**Min. test Range** μg/kg	**EU/Codex MRLs** μg/kg	**Codex ADI**
Penicillin G	3-4	4	30 μg/day
Oxytetracycline	150-300	100	30 μg/kg bwt

Factors associated with milk quality (OLS)

	Total bacteria	Coliforms	SNF
Nairobi/Kiambu	Strong (+++)		Strong (+++)
Wet season	Strong (+++)	Medium(--)	Medium (--)
SNF	Medium(+++)		N/A
Market Pathways (relative to Farm-coop)			
Farm-Shops/kiosk	Weak (+)	Medium (--)	
Coop-Shop/kiosk			Weak (+)
Mobile trader-Milk bar		Medium (--)	
Milk handling			
Milk preservation		Weak (-)	
Plastic container		Medium (++)	
Scooping vs pouring		Medium (++)	
Piped water		Medium (++)	
Other covariates			
Time since collection	Strong (+++)		
Profit Margin/lt			Strong (---)

Addressing the Major risk factors in milk handling and critical points

Where should control be addressed for:

Antibiotics & antibacterials?

Bacterial risks?

- **Total Bacteria**
- **Coliform Bacteria**
- **Zoonoses [Mycobacteria, Brucella, E.coli O157]**

What conclusions can we draw from the Kenyan Study

- Milk Preference
- Hygiene standards of raw milk
- Consumer handling of milk in households
- Major hazards
- Milk transportation and holding containers in the informal sector
- What can you say about the success of Kenyan milk marketing policy
- Suggest appropriate intervention measures

Collaborative study among the following Institutions

- University of Nairobi
- KEMRI
- Egerton University
- ILRI
- MoARD
- DFID

THANK YOU!

Informal Milk Marketing and Assessing and Managing Milk Borne Health Hazards: A Case Study from Kenya

A. Setting the scene – Structure of the dairy industry in Kenya (Omore et al., 1999)

- Cow milk production in Kenya in 1997 was estimated at 1,093 million liters annually
- Approximately 88% of the estimated 1,093 million liters of cow milk produced in Kenya was sold raw through informal market channels – direct to consumers (58%), small scale market agents - kiosks, milk bars (hawkers) (38%)
- Only 12% (133 million liters) of marketed milk was pasteurized and sold through the formal market channels

The Problem

- Although milk standards and regulations exist in Kenya, they are not implemented just like elsewhere in developing countries where raw milk sales predominate
- Concern is, therefore, that the informal milk marketing may pose a significant Public Health Hazard

Question: What is the status of cow milk marketing in your country in terms of:

- **Production**
- **Raw and pasteurized milk market proportions**
- **Level of informal milk marketing**
- **Conformance to standards and regulations regarding milk pasteurization**

B. The research Questions in the Kenyan study

- Lack of accurate information on Milk Borne Hazards in Kenya
- Need to provide practical steps to optimize milk quality
- Define trade off in terms of quality assurance on one hand and cost and restrictions on traders on the other

The research questions were addressed through the two components of Risk Analysis framework, namely Risk assessment and Risk management

Risk Assessment Questions	Risk Management questions
• Are milk borne hazards present in informally marketed milk and at what prevalence • Do the hazards pose significant health risks • What are the risk factors involved	• Can public be safeguarded without sacrificing efficiency in liberalized dairy markets • Are there practical technical and policy options to safeguard public health in informal dairy markets

In addition, the study also applied the HACCP system focusing on the five main steps of:

i) Hazard identification in the food chain
ii) Determination of the critical control points (CCPs)
iii) Identification of the critical limits for ensuring food safety
iv) Development of a monitoring system
v) Implementation of procedures for verification

The study addressed the first two steps through risk analysis at consumer and market-levels and made recommendations on the latter three.

Therefore, to assess risk, the study was designed to specifically:

- Determine magnitude and evaluate public health hazards transmitted through milk comprising of:
  - Bovine brucellosis due to *Brucella abortus*
  - Bovine tuberculosis due to *Mycobacterium bovis*
  - Fecal coliforms
  - Enterohemorrhagic *E.coli* O157:H7

- Determine the extent of and evaluate the public health hazards of antimicrobials in marketed milk in Kenya
- Evaluate the milk handling and hygiene practices at farmer, milk agents and consumers levels
- Estimate the risk for each hazard (microbial and antimicrobial) in the main raw milk market pathways

C. STUDY DESIGN

Study sites

i) Consumer level studies – Nairobi and Nakuru representing urban and rural populations
ii) Market level studies – Nairobi and Kiambu districts representing intensive cattle production system and high market access; and Nakuru and Narok Districts representing extensive production system with medium market access **[Need map of study sites here]**

Sample size, sampling, data collection and analysis

i) Consumer level studies

Thirty clusters (villages?) were selected from the 120 clusters in each of the districts of Nairobi and Nakuru. Then seven households per cluster were randomly selected to a total of 210 households per district *[Why 30 clusters – 25%? And seven households per cluster?]* . Milk samples were collected from each of the study households once in each of the wet and dry seasons.

ii) Market-level studies

- Respondents were randomly selected from each study site. Ten divisions were selected from site 1 and six from site 2.
- Total of 262 and 270 informal milk market agents in both sites responded during the first wet and second dry seasons, respectively.
- Market agents that bulk large quantities of milk were included (dairy cooperatives, self-help groups)
- 145 pasteurised milk samples were collected during the first wet season to assess adherence to standards

Attempts were made to collect survey questionnaire data and milk samples during the tow seasons from selected households. Where it was not possible, a replacement was selected from within the same locality. The proportion of non-repeat respondents at household level was 69 (16%) and at market agent level was 142 (27%).

Laboratory Analysis

- Milk samples submitted to the laboratory under ice within 5 hr of collection
- Milk collected in 50 ml sterile bottles for microbiology and antimicrobial residue analysis and in 250 ml non-sterile bottles for analysis of butter fat content and adulteration
- Tests requiring fresh milk samples included Total Viable Counts, fecal Coliform counts, Specific Gravity for adulteration, Butter fat content and Milk Ring Test for brucellosis.
- Collected fresh milk samples and then frozen were later analysed for brucellosis, antimicrobial residues.

Data analysis

i) Descriptive statistics
   - Milk quality characteristics
   - Consumer perceptions on quality of milk
   - Handling practices by market agents

ii) Assess associations between milk quality and identified public health hazards

iii) Identify CCPs for each hazard along the market chain by area, season, trader.

iv) Conduct regression and multivariate analyses to evaluate risk factors for each health hazard and identify associations among principal components and clusters.

D. RESULTS

i) Level of adulteration of milk

- Adulteration means addition or subtraction of any milk components -- Addition of water (reduces SG)
  - addition of solids e.g flour or sugar (increases milk SG)
  - removal of butterfat (increases SG)
- SG of milk at 20^{o}C is normally 1.026 – 1.032 Kg/liter
- Overall, 4.7% and 10.4% of milk samples from consumer households and market agents, respectively, had SG below KEBS of 1.026kg/l
- Those registering SG above the KEBS of 1.032 kg/l were 5.9% and 1.0%, respectively, for the same groups.
- Urban centers (Nairobi and Nakuru) had substantially (50% & 33%, respectively) more milk samples recording lower BF content than the KEBS standard for BF content for whole milk of >= 3.25%

ii) Bacteriological quality of milk

Table 2: Consumer level: Log geometric mean bacterial counts by location of households

	Nairobi		Nakuru urban		Nakuru rural		Overall	
Parameter	n	log mean	n	log mean	n	log mean	n	log mean
Total Plate Counts/ml	102	5.5	113	4.3	217	3.1	433	4.0
Coliform counts/ml	98	1.7	113	1.3	215	0.0	427	0.7

What do we learn here:

- **Milk samples from Nakuru rural area depicting short market chain had markedly lower bacterial counts (TPC and Coliform counts) than milk collected from consumers in urban areas depicting long market chain.**
- **Higher proportions of milk from urban areas had strikingly unacceptable TPC and Coliform counts of 61-84% and 39-69%, respectively compared to Nakuru rural with TPC and Coliform counts of 27-35% and 11-17%, respectively.**
- **[KEBS standards for TPC and Coliform counts are 2 million cfu/ml and 50,000 cfu/ml, respectively]**

Table 3: Market-level: Mean Geometric bacterial Log Counts by market agents

	Farmer group		Mobile trader		Shop/Kiosk		Milk bar		Overall	
Parameter	**n**	**mean log**	**n**	**mean log**	**n**	**mean log**	**n**	**mean log**	**n**	**mean log**
Total Plate Counts/ml	68	6.9	106	7.6	128	7.6	158	7.9	471	7.6
Coliform counts/ml	70	4.2	111	4.8	135	4.8	158	5.0	485	4.7

What do we learn here:

- **The TPC and Coliform counts from Farmer groups were much lower than the overall average counts and to the other market agents.**
- **Bacterial counts appeared to increase as you moved up the market chain from Cooperatives/milk collecting centers → to milk bars → milk shops/kiosks → Small mobile traders irrespective of season**

Therefore:

- **There appears to be a positive relationship between increasing bacterial counts observed and hence milk quality with the number of intermediaries through which milk passes**

Comparison of pasteurized and packaged formally marketed milk with informally marketed milk

- KEBS standards for TPC and Coliform counts for pasteurized and packed milk is 3.0×10^4 and 1.0×10^1 cfu/ml, respectively.
- Nairobi:
    - 82% (n=82) of the milk samples had TPC above KEBS standard
    - 59% (n=63) samples of milk had coliform counts above the KEBS standards
- Nakuru
    - 89% (n=63) of the milk samples had TPC above KEBS standard
    - 70% (n=63) samples of milk had coliform counts above the KEBS standards
- Overall, there was a significant difference ($p<0.05$) between the proportion of samples non-conforming with respect to TPC from kiosks and shops compared to those from the supermarkets. This difference could be due to benefits of keeping milk chilled after pasteurization
- Although 60% (n=126) of the samples had coliform counts above the KEBS standards, there was no significant difference as to source of samples.

Zoonotic bacterial agents

- Bulked raw milk was at higher risk of testing Brucella positive compared to non –bulked raw milk
- Approx 6% of rural households consume fermented milk products
- E. coli O157:H7: <1% (2out of 264 samples were positive)
- Mycobacterium bovis was absent in all samples tested

Drug Residues in milk tested by rapid test kits

Conclusion

- **Irrespective of the milk pathway (formal Vs informal), the majority of the milk traded in both Nakuru and Nairobi does not adhere to the respective KEBS standards**
- **Advocate for review of the milk standards in Kenya**

Anglophone Africa Regional Training Course on Urban Agriculture
Nairobi, Kenya, 8-26 March 2004

MODULE 4 BLOCK 5

INFLUENCING POLICY IN URBAN AND PERI-URBAN AGRICULTURE AND LIVESTOCK (UPA&L) IN UGANDA: A CASE STUDY OF KAMPALA CITY.

1. Introduction

Kampala, the Capital City of Uganda is the hub of political, administrative, commercial, industrial and transport activities in the country. It is the only urban district in Uganda and has the largest population of 1.2 million people, which is approximately 5.0% of the total population of Uganda. The City covers an area of 195 square kilometres, with a population density of 4,581 persons per square kilometre, and 282,597 households. Kampala City is experiencing an ever-increasing population growth of 4.1% annually, which is a result of natural growth and most significantly rural urban migration.

According to the Kampala City Hand Book, 2000, approximately 50% of Kampala District/City is under-developed and used for agricultural purposes, 6% forests and wetlands and approximately 30% residential areas, (with 60% of the population living in slum areas and wetlands).

The administrative structure of Kampala City comprises of both the political and technical arms.
The political arm (Council) is headed by His Worship the Mayor. It is mandated with the roles of;

- Policy formulation.
- Overseeing the implementation of Central Government and Council Policies.
- Monitoring of all Council's Development programmes.

The technical arm is headed by the Town Clerk who is charged with the responsibility of;-

- Overseeing the day-to-day overall administration of the City.
- Implementation of all lawful decisions taken by the Council.

Administratively, the City is divided into 5 Divisions, each of which is a body cooperate with its own chairperson, a council and a Principal Assistant Town Clerk and Technical Staff.

2.0 Poverty Situation in Kampala.

Over 80% of the population in Kampala City is in the low-income bracket, and about 40% of the people live in absolute poverty. Therefore ensuring for them adequate food supply at affordable cost is one way of cushioning the effects of urban poverty. This is evidenced by;

- Receipt of food supplies from rural areas. Although most of the food supplies are adequate in the markets, the people in the category of absolute poverty cannot afford to buy it.

- Increased engagement in Urban and Peri-Urban Agriculture and livestock (UPA&L) especially by the urban poor as a survival strategy.

3.0 National policies and programmes related to agriculture

The National policies governing agriculture are rural focused; and do not promote farming in urban areas as a poverty eradication strategy. In the same vein, UPA&L is not being addressed under the Plan for Modernization of Agriculture (PMA) because it is an illegal activity under the "Town and Country Planning Act. 1964" and the "Public Health Act.1964".

PMA is a policy framework, designed to transform agriculture from predominantly subsistence production to market oriented or commercial production in rural areas. The end goal is to increase incomes, food security and exports through, among other things, enhanced agricultural productivity and marketing.

4.0 Urban and Peri-Urban Agriculture and Livestock (UPA&L).

As in many other towns and cities around the world, (UPA&L) has been in existence in Kampala City for many years. The development of this activity in the City was enhanced by the following factors;

- Farmers with large tracts of land who were engulfed by urban development. (The city boundaries were expanded in 1968)
- Migrants from rural areas who migrate to Kampala City with their farming cultures.
- Increasing cost of living in the city caused by the economic decline in the 1970s.

5.0 Status of UPA&L in Kampala City

- Approximately 30% of the households in Kampala City are seriously engaged in UPA&L, 75% of which are owned by women.
- 2% of the farming activities are located in institutions (schools, prisons, army barracks, Kabaka's Palace, religious institution, and higher institutions of learning)

Approximately 83% of the farming households have backyard gardens of less than one acre, 10% between 1-3 acres, and 5% with more than 5 acres of farmland. 71% of the farming population is involved in crop production, 12.6% Poultry 10% goat keeping, 5.8% dairy cattle, 1.9% rabbit keeping, 1.0% other production enterprises like fish farming, pig farming, mushroom growing and rice. (Muwanga 2001)

6.0 Benefits of UPA&L in Kampala City.

The benefits of UPA&L include among others,

- the supply of nutritious food to the city residents,
- supplements household incomes and provides employment particularly to women,
- contributes to the recycling of household/ domestic waste,
- a training tool for urban school children,

- a source of Tax Revenue to Kampala City council, especially from livestock products, and
- contributes to the greening of the environment and acts as a carbon sink.

7.0. Concerns about UPA&L

Despite its positive contribution, UPA&L in Kampala City is an activity that is considered to be illegal, a health hazard and economically insignificant. Some of the concerns raised about the activity are;-

- Creating an enabling environment for;
    - Breeding of mosquitoes, lice, mites and fleas.
    - Harbouring vermin's such as rats, snakes and lizards.
    - Transmission of zoonotic diseases such as TB, Brucellosis, plague and Jiggers
- Food grown on polluted toxic sites such as abandoned landfills, scrap yards, roadside gardens and wetlands is contaminated with toxic chemicals (heavy metals), industrial effluents and fumes from vehicle exhaust emissions.
- Obstructs visibility of road users and a source of silt which block roadside drains and other drainage channels.
- Roaming and stray livestock obstruct traffic flow and cause accidents. They drop dung all-over the place, destroy city floral gardens, food in gardens and markets.
- Pollutes the environment in residential neighbourhoods, through noise, awful smells from poorly managed livestock units and poor disposal of livestock waste on road verges and on farmer's premises.
- Tall and bushy plants are believed to pose a security risk to the public. They act as hiding places for thugs and other wrong doers.

In view of the above concerns, UPA&L activities were banned in the city under the "Public Health Act. 1964", and "The Country and Town Planning Act. 1964". Hence the need for policy reviews through legislation, in order for the activity to be carried out legally with minimum risks, while being controlled, regulated and guided.

8.0 Initiatives to influence policy review on UPA&L in Kampala City

A number of formal and informal initiatives to recognise UPA&L, have been going on in the last decade. These were in the following areas;

- Under sections 39 and 41 of the "Local Government Act. 1997", Districts were given autonomous decision-making and legislative powers. Basing on that Act. Kampala City Council in the year 2001, engaged a consultant to review its by-laws governing development activities in the city. .
- In May 2002, a regional Conference on "Food Security in Urban areas in the Horn of Africa" which took place in Addis Ababa Ethiopia made a declaration on Food Security in Cities. Some of the Key recommendations of the declaration were to;-
    - Develop multi-sectoral policies, strategies and programmes for urban food security.
    - Involve the private sector and other actors in the design and implementation of urban food security policies.
    - Give greater priority to urban food security in regional, metropolitan and urban planning.

- Monitor environmental health risks related to urban food production, marketing and processing, and take appropriate actions to reduce them.
- Review and revise laws, by-laws and regulations, to promote effective food production, supply and distribution activities in the city.
- Ensure that food security is adopted as part of the international agenda.

- In May 2002 Regional Land Management (RELMA) supported a workshop for Kampala City Policy Markers on UPA&L in Kampala. The workshop recommended, among other things that the existing by-laws governing UPA&L should be reviewed and enacted.
- In September 2002, DFID supported a scooping study on urban livestock keeping in Sub-Saharan Africa. Some of the recommendations made during the workshop to disseminate the findings of the study were that;-
  - Laws governing Urban Livestock keeping in cities be reviewed.
  - Research should be carried out on the health risks of urban livestock keeping.
- In March 2003, a workshop on urban livestock keepers in Sub- Saharan Africa drafted action plans and established Focal Points in five cities, Kampala inclusive. The plan for Kampala City Focal Point Office included advocating for adequate and effective legislation, through consultations, review of existing legislation, sensitisation and enforcement.

In August and September 2003, the Kampala City Focal Point Office in Collaboration with the Kampala Urban Food Security, Agriculture and Livestock Co-ordination Committee (KUFSALCC), spearheaded the consultative process of re-examining the Draft Bills for Ordinances, related to UPA&L in Kampala City.
The composition of KUFSALCC includes among other, KCC technical officials, officials from Ministries of Agriculture Animal Industry and Fisheries and Health, Makerere University, National Agricultural research Organisation, Farmers, Urban Harvest, and the Media.

8.1 Other ongoing initiatives

- In 2003, the Ministries of Agriculture Animal Industry and Fisheries and Lands, Water and Environment, Makerere University, Kampala City Council physical Planning Department and other Stakeholders in the Private Sector, started on the process to review the National Land-use Policy. UPA&L as a land-use is among the issues being deliberated on.
- The “Town and Country Planning Act. 1964” is being reviewed. Sustainable UPA&L as a land-use category is proposed for inclusion in the new Law.

9.0 The Kampala City Process of Re-examining the Draft Bills for Ordinances on UPA&L.

A number of gaps, were identified in the “Kampala City Draft Bills for Ordinances 2001”related to Urban Agriculture and Livestock by some stakeholders, who advised that they should be re-examined and be made more user friendly.
District and Divisional Stakeholders’ Workshops were organised and held, to further generate stakeholders’ inputs to the Draft Bills for Ordinances.

9.1 Objectives of the Process.

- To raise awareness of stakeholders on the existence and content of UPA&L and related Draft Bills for Ordinances.
- To subject the Draft Bills for Ordinances to a discussion, in order to generate stakeholders inputs to the proposed legislation.

9.2 Organization of the Process.

This participatory process was carried out with the involvement of both the political and technical staff of Kampala City council.

9.2.1 The Consultative Process.

- The Kampala City Focal Point office and the Urban Agriculture research teams, held meetings to plan how to organised Division and a District workshops. During the meetings, potential participants, resource persons and Divisional entry points were identified and also came up with the workshop programmes.
- Consultative meetings were held with the Divisional authorities to;-
  - seek their consent to hold the workshops,
  - identify potential participants within their respective Divisions, guests of honour and convenient venues for the workshops.

Five workshops were conducted at the Divisional level and one at the District Level. The participants represented the farmers, Food processors, Councillors,
representatives of Civil Society Organizations, Division Extension workers, representatives of Research institutions, representatives of higher institutions of learning, and representatives from the Ministry of Agriculture Animal Industry and Fisheries.

9.2.2 Workshops modalities.

During the workshops;-
Paper on topical issues on UPA&L and Research findings were presented. Thematic working group discussions were also conducted, with each group addressing one of the Draft Bills for Ordinances, depending on area of interest and specialization. These were;-

- “Kampala City (Urban Agriculture Ordinance), 2001”
- “Kampala City (Maintenance of Law and Order Ordinance), 2001”
- “Kampala City (Fish Processing and Sale Ordinance), 2001”
- “Kampala City (Meat Ordinance), 2001”
- “Kampala City (Sale of Milk and Milk Products Ordinance), 2001”
- “Kampala City (Registration and Control of Dogs Ordinance), 2001”

The recommendations / inputs from the group discussions were finally presented to the plenary for debate and adoption.

Note: Recommendations / Inputs generated from the Divisional workshops, formed a major basis for discussion at the District workshop.

9.2.3 Some of the recommendations from the Consultative Workshops.

- The Public should be sensitised about the Ordinances
- Permits should be introduced to all UPA&L activities in the city to ensure a systematic control and regulation of the activity.
- Changes to be made in the Draft Bills for ordinances with respect to;-
    - Some of the titles and the amalgamation of some ordinances
    - Introduction of Preambles to all Bills for Ordinances
    - Addition of more interpretations and exhausting some of the existing ones
    - Shifting some clauses from one Draft Bill of Ordinance to another, e.g all the clauses on "Livestock and crop practices to be removed from the "Maintenance of Law and Order Ordinance" and be dealt with separately; and All laws dealing with Dogs to be restricted to the "Registration and Control of Dog Ordinance"
    - Introduction of new clauses to some Bills for Ordinances, e.g. to include "the disposal of agricultural waste" in all the Ordinances and to include "Poultry and Poultry Products" "Slaughter of pigs and sale of Pork" in the "Meat Ordinance"
- Penalties should come out clearly and distinctive in the ordinances; e.g
    - Proposed heavy penalties on the capture of premature Fish and Fish poisoning e.g. Payment of 100 currency notes and banning from fishing for life.
    - Introduction of the "Community Service" penalty, other than Custodial sentence.
- Need to formulate a national policy on UPA&L.
- Need to develop regulations and guidelines to control the activity.
- Need for a gender survey to assess the differential impacts of the laws on men and women involved UPA&L.

9.3 Approval of Inputs generated

- In November 2003, recommendations / inputs from the District Workshop, were forwarded to the KCC Sector Standing Committee and recommendations made to Council for final approval.
- The Sector Standing Committee is comprised of the Sector City minister as chairperson, some Councillors and Sector technical officials.
- In December 2003, Council approved the recommendations / inputs to be incorporated into the Draft Bills for Ordinances with minor amendments, such as; -
    - coming up with a new Draft Bill for Ordinance known as "The KCC Livestock and Companion Animals Ordinance".

  The Council, comprises of His Worship the Mayor as chairperson, all City Ministers, Councillors and KCC technical officials.
- The City Advocate in collaboration with the KCC Technical team will handle the final incorporation of all the recommendations / inputs into the approved Ordinances and then forward them to the Attorney General's Office for further review and alignment with the National Legislation.

All efforts to promote UPA&L activities and to ensure user-friendly policies in the city were contributed to by the good political will in council, the vigilant civil society organisations, the increasing numbers of interested farmers, the technical guidance by KUFSALCC, and the technical staff plus the financial support by the Regional, Local and National Funding Institutions.

10.0 The way forward.

Kampala City Council intends to document and regulate all aspects of UPA&L to the benefit of residents and the city population in general. It is the intension of Council that while protecting public health, to document and support UPA&L activities and enterprises in order for them to be upgraded and to operate sustainably.

In the interest of effective regulation, Kampala City Council will;

- Pilot the Ordinances
- Publish and popularise the Ordinances
- Develop guidelines to be followed by urban farmers.
- Organize the listing of all farming, processing and marketing activities
- Enact and enforce the Ordinances
- Promote public Discussion of the finalized Ordinances (awareness including the dissemination of guidelines)
- Popularise the “Community Service” Penalty other than the “Custodial Sentence”

10.1 Funding requirements

There will be need for funds to carry out the following activities;

- Piloting of the Ordinances in the first two parishes, then one Division and finally the whole city.
- Development of Guidelines
- Impact Assessment of the piloting activities
- Gender Survey on the differential impact of the Ordinances on women and men

Urban livestock keeping in sub-Saharan Africa

Report of a workshop held on 3–5 March 2003 in Nairobi, Kenya

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Edited by Wyn Richards and Sarah Godfrey, NR International, UK

Organised by

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Editors' preface

This report summarises the presentations, discussions and working group sessions of a workshop on urban livestock keeping (ULK) in sub-Saharan Africa held at the International Livestock Research Institute (ILRI), in Nairobi, from 3-5 March 2003.

In response to the increasing number of poor people in developing countries living in cities, the Department for International Development (DFID)'s Livestock Production Programme (LPP) commissioned five in-country teams to carry out scoping studies into the opportunities and constraints faced by urban livestock keepers in the following East African cities: Addis Ababa, International Livestock Research Institute (ILRI); Dar es Salaam, University College of Lands and Architectural Studies (UCLAS); Kampala, Ibaren Konsultants; Kisumu, Lagrotech Consultants and Nairobi, Mazingira Institute. The studies were co-ordinated by Sabine Guendel of the Natural Resources Institute (NRI), UK. Terms of reference for the scoping studies can be found in Annex 1. Presentations were also given on gender relations and livestock keeping in Kisumu, and a study on urban livestock keeping in the Congo, a study funded by the Belgian Government.

Although this was a new study area for the LPP, we realised that we were only one of many players, hence the presence of Urban Harvest, the Resource Centre on Urban Agriculture and Forestry (RUAF), Prince Leopold Institute of Tropical Medicine (ITM), and the Food and Agriculture Organization of the United Nations (FAO) at the workshop. We realise that we did not include all organisations working in ULK at the workshop, and extend our apologies to those not invited.

The studies highlight the fact that ULK is on the increase, especially among the poorest section of society, that there are few, if any, institutions representing the needs of resource-poor urban livestock keepers, that ULK is perceived to be illegal and a public health threat by most city authorities, that this is often accompanied by harassment, and the idea that there are strong rural-urban linkages is not necessarily the case.

The workshop participants, around 60 in number, consisted of a wide range of stakeholders from the five aforementioned cities including: representatives from the Ministries of the Environment and of Planning; the City Council Minister for Social Improvement for Community Development from Kampala; researchers; NGOs and other civil society groups; and urban livestock keepers. Participants included the study teams who had carried out the scoping studies and the Project Leader of a longer-term urban agriculture/livestock scoping study in Brazzaville, Congo (supported by the Belgian Government). A list of participants can be found in Annex 2.

The workshop began with presentations on the scoping studies followed by questions and general discussion. Participants were asked to break into 4 city groups (Addis Ababa, Kampala, Kisumu, and Nairobi), to address the following questions:

1. Where are we now? What is the state of current knowledge and issues that need to be addressed?

2. Where do we want to be? Realistic aspirations on knowledge/issues to be addressed over the next 5-10 years.

3. How are we going to get there? Processes, actions, policies that need to be changed and/or implemented.

It was decided to limit the number of working groups to four; hence the lack of working groups discussing ULK in Brazzaville or Dar es Salaam.

A field visit to two slums in Nairobi (Kibera and Maili Saba) covered in the scoping study took place on the afternoon of the second day of the workshop.

This report has been organised by city, rather than chronological order of the workshop; thus presentations, questions and answers, and working group discussions relating to Addis Ababa, Kampala, Kisumu and Nairobi appear first; followed by presentations and discussions relating to the Dar es Salaam study and the synthesis presentation, then the study on Brazzaville. Background information on the site visits to Kibera and Maili Saba, two slum areas of Nairobi, has been put at the beginning in order to set the scene for the reader.

The CD at the back of the report contains the full scoping study reports (Addis Ababa, Dar es Salaam, Kampala, Kisumu and Nairobi, plus the synthesis report). References have not been given in the presentations, but can be found in the full scoping study reports contained in the CD.

In editing the contributions made by the speakers and participants some omissions and misinterpretations of the facts may have been inadvertently made. For these the editors apologise.

Wyn Richards and Sarah Godfrey

Acknowledgements

For funding, thanks should be given to: Commission of the European Communities, Technical Centre for Agriculture and Rural Co-operation (CTA) for their sponsorship of twelve of the participants at the workshop; the Food and Agriculture Organization of the United Nations (FAO) for contributing towards the cost of the workshop; and the UK Government's Department for International Development (DFID)'s Livestock Production Programme for funding the five case studies, contributing towards the cost of the workshop and funding the report of the workshop[1]. In addition, the following individuals and institutions deserve thanks for contributing towards a successful workshop:

All staff at the Mazingira Institute for organising the workshop and for their hospitality

Edward Ndewgwa, of Silanga Ya Ngombe Group for organising the very informative field visits

The International Livestock Research Institute (ILRI) for hosting the workshop

Urban Harvest and the Resource Centre on Urban Agriculture and Forestry (RUAF) for their input into the workshop, and subsequent involvement of Urban Harvest in the Kampala city stakeholder workshop.

The scoping study authors and co-ordinator ILRI Addis Ababa; University College of Lands and Architectural Studies (UCLAS) Dar es Salaam; Prince Leopold Institute for Tropical Medicine (ITM); Ibaren Konsultants, Kampala; Lagrotech Consultants, Kisumu; Mazingira Institute and the Natural Resources Institute (NRI) for producing such informative studies

All participants of the studies for their time in contributing to new knowledge.

All participants at the workshop for working together in such a co-operative manner and for bringing forward so many new ideas.

[1] This publication is an output from the Livestock Production Research Programme of the UK Department for International Development (DFID), for the benefit of developing countries. The views expressed are not necessarily those of DFID Livestock Production Programme.

Acronyms and abbreviations

Acronym	Full name
CBO	Community Based Organisation
CIAT	Centro Internacional de Agricultura Tropical
CTA	Commission of the European Communities, Technical Centre for Agriculture and Rural Co-operation
DFID	Department for International Development
FAO	Food and Agriculture Organization of the United Nations
FHH	Female-headed household
IDRC	International Development Research Centre
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
KCC	Kampala City Council
LPP	Livestock Production Programme
MHH	Male-headed household
MI	Mazingira Institute
n	Number
NRI	Natural Resources Institute
PMA	Plan for Modernisation of Agriculture (Uganda)
PPLPF	Pro-Poor Livestock Policy Facility
PRSP	Poverty Reduction Strategy Paper
PRSP	Poverty Reduction Strategy Paper
RPLK	Resource-poor livestock keeper
RUAF	Resource Centre on Urban Agriculture and Forestry
SAPs	Structural Adjustment Policies
SWOT	Strengths, Weaknesses, Opportunities and Threats
UA	Urban agriculture
UCLAS	University College of Lands and Architectural Studies (Dar es Salaam)
ULK	Urban livestock keeping
ULP	Urban livestock production

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Executive Summary

Increasing numbers of people in developing countries are moving from the rural to the urban areas and this is an ongoing trend. Rapid urbanisation has resulted in **increased urban poverty**. People in urban areas keep livestock for a number of reasons including income generation; household food supply, and security in times of hardship.

Relatively few studies have been carried out on the **opportunities** and **constraints** faced by urban livestock keepers. Studies were commissioned by the UK Government's Department for International Development's (DFID) Livestock Production Programme (LPP) into urban livestock keeping in five East African cities: Addis Ababa; Dar es Salaam; Kampala; Kisumu and Nairobi. Local teams were contracted to carry out the work with the study being co-ordinated by the Natural Resources Institute (NRI), UK.

The workshop provided an opportunity for the five scoping studies, plus a study on gender and livestock keeping in Kisumu, and a study on urban livestock keeping in Brazzaville (the latter funded by the Belgian Government) to be presented to and debated by, an audience consisting of a **wide range of stakeholders**: provisional and local leaders; decision makers; representatives of poor livestock keepers from slum areas; non-governmental organisations (NGOs) and extension agents; researchers; donors and other supporters. The presentations acted as a stimulus for the four (Addis Ababa, Kampala, Kisumu and Nairobi) working group discussions on: **analysis of the situation so far**: discussion of **where we want to be**, and finally; **how to get there**.

The studies found that urban livestock keeping **benefits the poor** and provides a way of diversifying livelihood activities that are accessible to vulnerable groups, as well as providing a source of locally produced food projects for people living near the livestock keepers. There are, however, issues such as **access to clean dinking water, product safety**, **environmental contamination** and the **risk of zoonotic diseases** that need to be addressed.

The working groups reached different levels of agreement and at times had to work through seemingly opposing stakeholder perspectives before coming to any agreement. Each working group produced a vision and mission statement for their city. There was agreement by each group that these statements should be discussed at a wider city stakeholder level.

It was agreed that each city should identify a city focal point (an organisation represented by an individual present at the workshop) to organise city-specific stakeholder workshops, and to liaise with the other city groups.

A regional forum on urban agriculture and livestock keeping would be created. The forum would e open and informal and would include representatives from each city.

Donor and supporting organisations should work together to support these activities and avoid duplication of effort.

Setting the scene: visits to Kibera and Maili Saba[2]

The site visits took place on the second day of the workshop. The visits helped focus the participants on the purpose of the meeting; and that is why they have been placed at the start of the workshop report, to help focus the reader.

Descriptions of the areas

Kibera

Kibera is the largest slum area in Nairobi (229 hectares), and the second largest in all of sub-Saharan Africa. There are eight villages that make up Kibera: Makina; Mashimoni; Laini Saba; Kisumu Ndogo; Silanga; Lindi; Gatwikira and Soweto.

Although official estimates place the population of the area at around 500,000, most people agree that this is conservative figure and that the actual population is nearer to 700,000. This means that anywhere from a quarter to a third of Nairobi's population lives within Kibera. The population is increasing rapidly. In 1993 the area had a population of 248,000, which increased to 317,000 in 1998.

Life expectancy in Kibera is 10 years lower than the area next door. There is higher infant mortality in Kibera than in the neighbouring area.

The planning and zoning byelaws of the city do not recognise Kibera (as it is constructed on public land) so any construction that takes place there is regarded as only temporary, if it is recognised at all. Most of the buildings are constructed of very basic materials such as low-grade wood, mud, corrugated iron or cardboard.

Many of Kibera's residents survive on less than Ksh 80 per day (one USD) per day. Most are either unemployed or work in the informal sector, although skilled labour does exist in Kibera. There are also a number of resident university graduates and other highly educated individuals. These factors contribute to the state of the environment in Kibera. Almost half (49%) of residents are self-employed, 38% are in formal labour and about 26% engaged in urban agriculture.

Few dwellings possess running water. Most residents obtain their water from communal standpipes, water kiosks or wells near the river, which is often severely contaminated.

Due to a lack of formal planning a build up of waste occurs in many areas since waste removal is often not taken into account during construction. This indiscriminate construction has also led to a lack of accessibility for service vehicles in most of Kibera. Poor accessibility, difficulty in collecting service fees, and Kibera's informal status have prevented the Nairobi City Council (as well as private agencies) from organising any refuse collection services in Kibera. Thus, most residents resort to throwing solid waste into open drains. The railway track and the river are the primary dumping grounds. Kibera is believed to be on one the largest contributors to the high pollution levels in the river and Nairobi dam.

The villages have no sewered toilets and simple pit latrines (often incredibly derelict) serve many households. Up to 150 people may share the same latrine. When a pit

[2] Descriptions of Kibera and Maili Saba based on text put together by the Mazingira Institute and distributed at the workshop prior to the site visit.

becomes full, a passage is opened up so that when it rains, the contents flow into one of the drainage channels, thereby partially emptying the pit. Visitors to Kibera are advised to look out for 'flying toilets' – plastic bags containing human waste being thrown from homes into the street.

Photo credit: Mazingira Institute

Pictures of Kibera

Maili Saba

The Maili Saba slum is about 15km east of Nairobi city centre, bordering Dandora area 5km to the North and Saika Estate to the South. The only road to the area forms the Western boundary.

The slum consists of three villages, namely: Maili Saba, Mwengenya and Silanga. The area used to be part of a sisal plantation whose workers later settled on the land. They were then joined by scores of migrants from the rural areas. In the early 1980s the area had a population of about 10,000 people with around 68% practicing farming.

A survey in the late 1990s indicated that the area is among the poorest of Kenya's slums, with an average income of Kshs 700-1,000 per month. There is also minimal infrastructure and severe environmental degradation.

The majority of area residents are within the active working age range of 20-39 years. Studies have shown that a large proportion of the population is single (62%) and most of the adults do not have paid employment. The area has a very low rate of school attendance and about 68% of the children living there suffer from malnutrition or have worm infestation.

Shelters in Maili Saba are mainly made of mud and wattle with corrugated iron roofs. Homes are severely congested. However in Silanga, dwellings are made of mud block walls and are well spaced. In this village the soils range from rocky/murram to red loams.

While there is little or no farming activity in Maili Saba village due to congestion, many households in Silanga have kitchen gardens, keep pigs (a major activity in the are), goats, chickens, ducks and turkeys as well as indigenous and dairy cattle. The farmers in Silanga seem to favour planting maize and beans in their compounds. The village in general, although recently settled, seems to be well planed and maintained, when compared to its two neighbouring villages.

In Silanga there are eight Christian churches of varying denominations, two children's centres, two informal primary schools and several water pipes. The area has no

medical facilities. For administrative purposes, small sections within each village are headed by a chairman who reports to an overall village chairman.

In a nearby valley, farmers use sewage water to grow an assortment of crops including maize, beans, cowpeas, bananas, pigeon peas, amaranthus, pawpaws, tomatoes, sugar cane and arrowroots.

Recently, the area was 'reallocated' to the residents and all former sewage-irrigated farms turned into settlements. However, the owners have no legal documents to prove they own the land they are currently using.

A very small proportion of farmers have attempted to grow flowers for export and keep dairy cattle. This is an indication that farming can be a profitable activity in the area.

In Mwengenye village, the main crops grown are similar to the Silanga area, but goat keeping seems to dominate in the village. Open spaces (adjacent to the village) where sewage irrigation is not possible are being used to grow maize and for construction of hosing units.

The livestock sector wholly depends on farming activities and the local hotel industry. While most pig farmers are concentrated in the Silana area, poultry and goat farming was observed to be mainly in the Mwengenye village, which is the oldest section of Maili Saba.

According to the crop farmers interviewed, livestock farmers buy the animal feed form them and later sell milk to the local families. Pigs are either sold to Farmer's Choice Ltd or to local pork butchers. Livestock farmers also sell manure to the crop farmers, thereby completing the nutrient cycle and preventing severe environmental degradation.

The Maili Saba area is believed to be one of the best illustrative cases of waste and nutrient recycling in an urban setting.

In Maili Saba, youths are active in crop production (compared to other slum areas). However, the majority of youths still seem to be employed in informal businesses outside the area. Discussions held with some of them indicate that they view farming as a less rewarding activity than construction or hawking.

Feedback from site visits

Participants found their site visits informative as well as shocking, and recommended that those carrying out legislation for Nairobi should visit these sites.

Kibera

People were 'completely stunned' by the observation that human beings can survive in such an environment and felt that attention should first be spent on improving the subhuman environment that the people live in before focussing on the animals. Participants said they had never seen such poor sanitation with such high risks of zoonoses and cysticercosis.

They observed that animals were kept in such poor conditions and even if people had good husbandry techniques, the environment in which they were living was very insecure and unhygienic.

Livestock keepers said they were not keeping livestock for pleasure but for necessity. Urban livestock keeping is an indication of a population in crisis – it can be viewed as people using their creativity to survive, rather than a totally negative situation

Mali Saba

This site visit was not such a 'shocking' one. People visited were living in a recent settlement. It would be very easy to provide technical back up to assist these people because they have already started to organise themselves, however they lack extension advice. The people visited experience problems of local gangs eg control over the sale of manure.

The visitors realised that advisers need to understand the aspirations of the urban livestock keepers and respond to them, rather than impose 'expert advice'. They realised that if extension advisers met with people at the beginning of their activity they would be able to provide the most appropriate advice to the urban livestock keepers. The following positive observations were made about Maili Saba:

- There was a high level of biodiversity within a small area eg maize, banana, sugar cane, fodder sources
- It was good to see the confidence the livestock keepers had in themselves
- The group were brought together by the land and by the Church, not by tribal links
- The farmers are innovative
- Participants were impressed by the quantity of manure, it was different to that in other urban and peri urban areas. Lots of farmers add to manure eg sawdust, but this group had pure manure

Suggestions arising from the site visit

- There is a need to investigate the minimum standards required in order for hygienic urban livestock keeping to take place
- Urban livestock keeping should only be encouraged in certain restricted areas
- The infrastructure needs to be improved to help people in Kibera
- There is a need for animal hygiene
- People (policy makers, researchers etc) need to visit the areas urban livestock keepers are living in
- Access to Kibera in terms of security needs to be addressed. For example extension workers do not visit due to the danger of the area, thereby not building up the knowledge of local inhabitants.
- In Kisumu, livestock are recognised as contributing to the economy of the city. A pro-poor agricultural policy for urban centres is needed for the city planners.
- Agriculture should be viewed as an enterprise so planners can plan for livestock housing just like they do for trade stalls in the city.
- Plans should be based on policies and should cover issues such as land tenure.

Introduction and comments from supporting organisations

The workshop was opened by Dr W Thorpe on behalf of the Director General, Dr C Sere of the International Livestock Research Institute (ILRI). Participants were welcomed to ILRI and thanks were given to the funding agencies for supporting the workshop. The topic of urban agriculture is an important one for ILRI to learn from. Thanks were given to ILRI for hosting the workshop.

Comments from representatives of organisations supporting the workshop

Wyn Richards, DFID Livestock Production Programme (LPP)

I would like to thank ILRI for hosting the workshop. The issue of urban livestock keeping is a relatively new issue for both livestock research and ILRI. There has been interest in urban agriculture for over 10 years, but the emphasis has been on crops and urban gardens, rather than urban livestock keeping. In putting together this workshop we have tried to invite as wide a range of stakeholders as possible: national, provisional and local leaders, decision makers, representatives of poor livestock keepers from slum areas, non-governmental organisations (NGOs) and extension agents, researchers, donors and other supporters. What we get out of the meeting depends on what we put in, so we would like people to contribute their thoughts as much as possible.

The Livestock Production Programme is one of ten renewable natural resources programmes funded by the UK Government's Department for International Development (DFID) but, apart from work funded by the Crop Post Harvest Research Programme on urban street markets, we are the only one dealing with urban agriculture. The majority of research commissioned by DFID has focused on the rural areas. However, with the rapid increase in urbanisation in the developing world we see a need to commission research on livestock keeping in urban areas. The scoping studies presented at the workshop are a first step in identifying issues which research might help.

Henk de Zeeuw, Resource Centre on Urban Agriculture and Forestry (RUAF)

I am very happy to be here to discuss the topic of urban livestock, which in my view is a very critical issue for sustainable urban development. Urban livestock is often not discussed so it is good that we are holding a workshop on this important topic and I h hope we can look at the opportunities it provides. RUAF is a programme that facilitates the uptake of urban agriculture into city policies, mainly by exchanging information between different policy makers etc from different countries. We also do this by producing a magazine, organising electronic conferences and workshops. Some of the magazines are on display here. We don't have any money to fund activates in the south, but we can bring you into contact with people who do have the money. Our work is mainly information exchange.

Katinka de Balogh, Pro-Poor Livestock Policy Facility (PPLPF) of the Food and Agriculture Organization of the United Nations (FAO)

The Pro-Poor Livestock Policy Facility (PPLPF) became operational at the FAO in 2002. This DFID-supported facility is based at FAO Headquarters in Rome, Italy and is embedded within the Animal Production and Health Division.

The facility envisages contributing to poverty reduction through the formulation and promotion of international and national livestock policies that ensure equitable, safe and clean livestock farming. For this, the facility collects, analyses and disseminates information/data and sets out studies to fill existing information gaps; this is with the aim of assisting policy makers in the decision-making process. In addition, the existing policy processes are analysed and stakeholder consultation and advocacy for the poor is promoted.

Due to the differences of regional/local differences, a number of regional "hubs" are envisaged. In the first instance they will cater for South-East Asia, Southern Asia, the Andean Region, East Africa and West Africa and will address specific issues of importance for poor livestock farmers in the respective regions. Furthermore, a number of actions address issues across geographical zones; these correspond to the delivery of livestock services, public health and food safety issues, dairy production as well as access to international markets. The facility liaises with a wide spectrum of local, national and international players

This workshop is very relevant to us and we are looking forward to hearing your recommendations to see how we can integrate them into our further activities.

Diana Lee Smith, Urban Harvest (formerly the System Wide Initiative on Urban and Peri Urban Agriculture – SIUPA)

Urban Harvest is a system wide activity of the Consultative Group on research. Although there has been research on urban agriculture for a couple of decades, it was more along the lines of socio economic research and not agricultural research. It came to people's attention gradually that due to increased food security etc the issue of urban agriculture needed to be addressed. Urban Harvest is hosted by the Centro Internacional de la Papa (CIP) but works closely with the Centro Internacional de Agricultura Tropical (CIAT) in Kampala, the International Institute of Tropical Agriculture (IITA) in Cameroon, the World Agroforestry Centre and the International Livestock Research Institute (ILRI), both in Kenya. I think the value added of this activity to the agriculture research system is that it brings in new partners. Participants at this meeting represent a new dimension. It is unusual for the CG centres to relate to the ministries of local government, planning and health etc. It is a very exciting area of work. There are opportunities to make very interesting scientific breakthroughs. My own personal interest (in Urban Harvest) is that we are working on a number of initiatives and it is good to meet new partners. We also want to carry out collaborative work with all of you on making it possible to have an exchange of information at a more rapid rate in the region and to do more training. Future plans include a regional health workshop with the International Development Research Centre (IDRC).

Scoping study on peri-urban and urban livestock production in Addis Ababa, Ethiopia

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[1]International Livestock Research Institute (ILRI), Debre Zeit, Ethiopia

[2]Ethoipian Agricultural Research Organisation (EARO), Addis Ababa, Ethiopia

Background

Addis Ababa is the capital city of Ethiopia and was founded in 1886. The city's total land area is around 54,000 hectares. The human population is 2.7 million with a population growth rate of over 5%. Administratively, the city is dived into 6 zones: 28 *Woredas* and 328 *Kebeles* (this arrangement is currently under revision)

The table below shows the projected increase in population size and demand for food types in Addis Ababa.

Table 1 The projected population and food demand for Addis Ababa

Year	Population (million)	Cereals (million tones)	Meat (million tones)	Milk (million tones)
2000	2.40	5.62	0.52	115.57
2010	3.33	7.49	0.70	154.15
2020	4.25	9.55	0.89	196.67
2030	5.08	11.45	1.07	235.63

Table 2 The livestock population in major urban and peri-urban centres in Ethiopia

Species	No	Remark
Cattle	169,264	40,000 crossbred
Sheep	64,767	
Goats	22,630	
Donkeys	15,886	Pack animals
Chicken	415,680	

Source: MoA, 2001

Materials and methods

The study was conducted in Addis Ababa and Debre Zeit town. This report covers Addis Ababa only. Twenty farmers were involved in the study. The following zones were covered in the study: Zone 2: West, Jimma Road; Zone 3: Northeast, Debre Berhan Road; Zone 4: North, Gojam Road; Zone 5: North West, Wellega Road.

Study approach

The team reviewed relevant published literature (proceedings, annual reports and scientific findings); collected analysed secondary data from research and development organisations, NGOs and public organisations; carried out field visits and undertook group discussions with representatives of government, NGOs, private and smallholder farmers; collected data from selected farmers using a questionnaire.

The following tables show the characteristics of livestock keepers, their education and occupation, type of farm and farm size, livestock species kept and details of livestock husbandry issues.

Characteristics of livestock keepers

The following tables illustrate the characteristics of livestock keepers in Addis Ababa. In general, they are most likely to be older than 30, (95%), married (80%) and male (55%). They will not have a diploma or degree and are slightly more likely (35%) to have received primary or secondary education rather than being illiterate (30%). They are more likely to be a part-time farmer (85%) combining farming with other income-generating schemes. They are most likely to keep cattle (45%), having an average of 8 cattle. They are most likely to have a long experience of livestock keeping (50% having over 40 years); reflecting the fact that 55% of livestock keepers are over 50. It is most likely their parents kept livestock (90%). They are most likely to look after the livestock themselves (50%). Stall feeding is more popular than grazing for both cattle (90%) and small ruminants (67%), whereas poultry are equally as likely to be scavenging or enclosed (both 36%), with the remainder (28%) being both. Livestock are most likely to be given supplementary feed consisting of home mixed agro-industrial. In married households, the decision maker is most likely to be the husband (55%).

Table 3 Age, marital status and sex of livestock keepers

Category	No	Per cent
Age		
<30	1	5
30-50	8	40
>50	11	55
Marital status		
Married	16	80
Widowed	4	20
Sex		
Male	11	55
Female	9	45

Table 4 Education and occupation of livestock keepers

Category	No	Per cent
Education		
Elementary	7	35
Secondary	7	35
Diploma	0	0
Degree	0	0
Illiterate	6	30
Occupation		
Civil Servant	1	5
Retired	4	20
Farmer	15	75
Trader	0	0

Table 5 Type of farm and farm size

Type of farm	No	Per cent
Full time	4	15
Part time	17	85
Farm size, ha		
< 0.05	6	3
0.05 - 0.10	10	5
> 0.10	4	2

Table 6 Livestock species kept

Category	No	Per cent
Cattle	9	45
Cattle and Poultry	2	10
Cattle and small ruminants (SR)	1	5
Cattle, poultry and SR	5	25
Cattle, poultry, SR and donkey	3	15
Cattle	9	45

Table 7 Livestock holdings by species

	Dairy	Sheep	Poultry
Mean	8	6	12
Minimum	3	2	1
Maximum	19	10	29

Table 8 Experience in livestock keeping

	No	Per cent
Years of Livestock keeping		
<20	6	30
20 to 40	4	20
> 40	10	50
Did your parents keep livestock?		
Yes	18	90
No	2	10

Table 9 Labour utilization for livestock management

	Number	Per cent
Children	1	5
Hired labour	2	10
Owner	10	50
Owner + Family	3	15
Owner + Hired labour	3	15
Relatives	1	5

Table 10 Type of livestock management systems

	Number	Per cent
Dairy		
Stall feeding	18	90
Grazing	2	10
Small ruminant		
Stall feeding	8	67
Grazing	3	25
Both	1	8
Poultry		

	Number	Per cent
Scavenging	4	36
Enclosed	4	36
Both	3	28

Table 11 Types of supplementary feeds used for livestock production

Supplementary feed	Number	Per cent
None	2	10
Commercial concentrate	2	10
Home mixed agro-industrial products	14	70
Both	3	15

Table 12 Decision maker on the sale of livestock and livestock products

Decision maker	Number	Per cent
Husband	11	55
Wife	4	20
Both	5	25

Summary

- Livestock keeping is an important economic activity
- Women and children play an important role in urban livestock keeping
- Livestock keepers generally have a low level of education
- There is a shortage of land and space for livestock
- There is no adequate legal support
- There is no adequate extension service

Recommendations

- Assess potentials and constraints of urban livestock production systems
- Identify policy support and strategic approaches with the objective of integrating it in urban planning
- Establish, promote and strengthen producers/marketing associations, unions and federations
- Avail adequate land to producers

- Improve market information system
- Support enterprises through finance and training services
- Pay attention to environmentally sustainable production system
- Ensure access to employment, credit and income generating opportunities for women
- Provide and implement sanitary inspection and quality control
- Train and improve awareness of producers, processors and traders on the importance of quality and safety of food
- Strengthen institutional capacity of livestock and products markets, food inspectors and regulators
- Capacity building in planning, managing and implementation, and monitoring and evaluation of development programs
- Establish new markets, upgrade and expand markets in terms of transport systems, space and sanitation facilities
- Establish animal products processing units, increase the number of slaughter houses and support the participation of the private sector

Research Issues

- Policy issues (recognition, land, price, quality, financing, etc)
- Zoonoses and public health
- Animal management (housing, care, etc)
- Feeds and water
- Waste handling and management
- Quality control and food safety
- Market structures
- Animal genetic resources

Discussions, questions and answers on the presentation

What definition of poor was used in the study? The presentation gives an average of 8 animals per person, so was this defined as poor in a wealth ranking exercise?

The study team did not carry out any wealth ranking in the household survey and suggested that the definition of the poor, along with the definition of the urban and peri urban areas, were topics that could be discussed at the workshop.

Have you included any study on the welfare of animals? There is evidence of poor handling of animals in Addis

Azage Tegegne (study member) is a founding member of the Addis Animal Welfare organisation so can provide up to date information on the welfare of the animals kept by urban livestock keepers. It was agreed that the issue of animal welfare needs to be looked at.

On the topic of institutional involvement, are the different institutions involved in urban livestock keeping and agriculture working together?

In Addis Ababa in February 2003 the government set up the Urban Agriculture Office (Diribu Jemal, participant at the workshop is Head of the Office). This is a giant step as far as the Addis Ababa study team are concerned. The new office in Addis will be able to co-ordinate the different institutions supporting or not supporting livestock.

Some of the sites in the study are very small and yet the study recommendations appear to be derived from elsewhere

The study team did not just focus on the survey but also carried out a literature review, so recommendations are a synthesis of all the research carried out.

The recommendations are targeted at different actors as they vary and touch a number of areas, so has the study identified the contribution of urban livestock to the economy.

Were the constraints identified by the participants?

The stakeholders were interviewed individually but the study team did not have time to organise a stakeholder workshop.

Results from working group discussions for Addis Ababa

Developing an understanding of the present situation: where are we now?

The level of understanding had been very limited and non-systematic. The scoping study has shed some light on the situation. Future improvements include the following:

- There should be better co-ordination between research and development, and also better policy co-ordination
- Research and development plans should be based on the needs and participation of the key stakeholders (ie the farmers themselves)
- There needs to be recognition of urban agriculture (and integration of urban livestock into urban agriculture), and the contribution of urban livestock to the urban economy needs to be recognised
- Urban agriculture needs to be understood as a response to crisis and transformation of economic activity
- There needs to be improved market integration for resource-poor urban livestock keepers
- The institutional set-up needs to improve
- There is currently no continuum of production to consumption
- Livestock mapping (poor, non-poor, vulnerable, urban, peri-urban) should take place
- Co-ordination of urban agriculture stakeholders and networking (nationally and internationally)

The government has recently recognised the importance of urban agriculture and is committed to improving work in this area, for example, an Urban Agriculture Office has recently been established.

The desired future position: where do we want to be?

Issues raised by stakeholders include:

- Production efficiency (animal management, breed types, productivity)
- Institutions – co-operatives, unions delivery systems, extension work
- Environment/waste management
- Policy issues – land, enabling urban livestock environment (taxes)
- Marketing and processing
- Technological options

Institutional empowerment needs to include

- Development of guidelines and minimum standards of livestock keeping in agriculture to cover:
    - Management
    - Quality control
    - Delivery systems
    - Environmental management
    - Animal health
    - Marketing
- Central information / data management
- Focal group to be established for urban agriculture

Policy issues

- Development of guidelines and acts on
    - Waste management
    - Animal movement
    - Water quality and requirements
    - Animal feeding, management and health
    - Land tenure
    - Safety nets / risk management
    - Food safety and quality
    - Utilisation of public land for feed

The route from the present situation to the desired future position: how do we get there?

Vision

Better quality of lives for all

Mission

Sustainable and systematic research and development on urban agriculture

Goal

To improve the wellbeing of people through efficient, sustainable affordable, equitable and environmentally friendly urban livestock production systems

Objectives

1. To develop policies and an institutional framework that creates a conductive and enabling environment to enhance urban livestock production and development in a health and environmentally friendly way

2. To improve access to information, inputs and services, concerning urban livestock production

3. To enhance urban livestock production to contribute to poverty reduction and economic development

4. To provide quality and safe livestock products

5. To enhance the competitiveness of national and regional enterprises or urban livestock production (through markets, technical options and added-value)

Strategies

Objective 1: To develop policies and an institutional framework that creates a conductive and enabling environment to enhance urban livestock production and development in a health and environmentally friendly way by

1.1 establishing a strong network including all stakeholders

1.2 conducting participatory policy research to provide policy options

1.3 learning from others (workshops, tours etc) and capacity building

1.4 (re)formulation of rules, norms, standards and regulations

1.5 establishing mechanisms for monitoring and evaluation if impacts or urban livestock development

Objective 2: To improve access to information, inputs and services, concerning urban livestock production by

2.1 promoting private input providers/services

2.2 developing and disseminating urban livestock technical options

2.3 enhancing and promoting indigenous knowledge in livestock production

Objective 3: To enhance urban livestock production to contribute to poverty reduction and economic development by

3.1 developing social maps with a focus on poor livestock keepers

3.2 enhancing efficiency of urban livestock production systems

3.3 developing appropriate safety net mechanisms/risk management

Objective 4: To provide quality and safe livestock products by

4.1 applying the norms and standards defined in the policy framework

4.2 training and education for producers and consumers

4.3 establishing/implementing functional quality control services

4.4 setting up a well-designed waste management system at different levels

4.5 developing and applying appropriate animal management and care to ensure welfare and safe production of animals

4.6 institutionalising the monitoring and evaluation of quality assurance

Objective 5: To enhance the competitiveness of national and regional enterprises or urban livestock production (through markets, technical options and added-value) by

5.1 enhancing post-harvest technology and processes to meet different market needs

5.2 enhancing the cost effectiveness of the system

5.3 enhancing product quality and marketability

5.4 promoting co-operativeness and small-scale enterprise

5.5 developing and implementing reward systems

5.6 exploring market opportunities

5.7 developing entrepreneurship

Urban and peri-urban livestock keeping among the poor in Kampala City

Sarah Ossiya, Nelly Isyagi, Lucy Aliguma, Charles Aisu

Ibaren Konsultants, Kampala, Uganda

Historical background of Kampala City

Kampala City dates back to 1350. It was originally known as Kibuga, the seat of the Kabaka. It became a colonial settlement in 1890. The city merged into Greater Kampala (Kampala and Kibuga) in 1966. It is the largest urban centre in Uganda, 13 times the size of the next town (Jinja) and is home to 42% of the total urban population of Uganda. However, its prominence is diminishing with the current decentralization. Kampala City is also a district, with five divisions: Rubaga, Kawempe, Nakawa, Makindye and Central. The population pattern is diurnal, consisting of 1,500,000 people by day and 1,000,000 people by night. It is predominantly a young population, with 67% below the age of 24.

The rural comes to urban: livestock keeping in Kampala - a growing phenomenon

"In Kampala, where besides the city centre most empty spaces are covered by perennial crops, one gets the feeling that the rural sector is overtaking the city instead of the reverse"
(Bigsten and Kayizzi-Mugerwa (1992))

Urban livestock keeping and urban agriculture in general, are becoming increasingly common phenomena in Kampala, with livestock scavenging on refuse dumps, and "road-runners" or urban chicken being common sights.

Before the crisis periods of the 1970s and 1980s, most urban dwellers relied on rural food supplies. However this now appears to be changing.

Entry into urban livestock keeping reflects both rapid urbanization (responding to market demand) and the severe economic crisis, brought on by structural adjustment policies (SAPs), which have resulted in massive retrenchment, devaluation of the Uganda shilling and an increase in the cost of imported inputs.

There are gender differences in the major reasons for keeping livestock: men keep livestock mainly for income generation whereas women tend to keep it for food security and household welfare.

Entry into livestock keeping: a reflection of economic hardship

The graph shows that at times of major political upheaval, an increasing number of people in Kampala kept livestock. For example, there are peaks in the early 1970s (the start of Idi Amin's reign), the late 1970s/early 1980s (the end of Idi Amin's reign), the mid 1980s (Milton Obote's reign ends) and the late 1990s (structural adjustment policies causing over 26% of Uganda's civil servants to be 'retired').

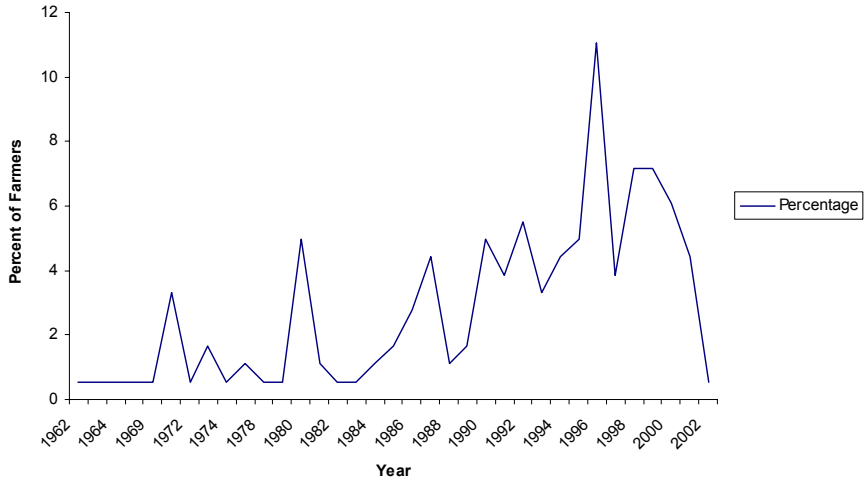

Fig 1 Graph mapping the percentage of people keeping livestock in Kampala against political upheavals

Who are the poor urban and peri-urban livestock keepers in Kampala?

As a result of focused group discussions and interviews with the 184 representative households surveyed during the scoping study the following observations were made about the poor urban and peri urban livestock keepers in Kampala.

Table highlighting characteristics of urban livestock keepers

Characteristic	Observations
Poverty	Poverty is an overarching characteristic, with over 72% of livestock keepers in Kampala in the low-income bracket.
Male or female headed households	The majority (80%) are male headed; of the 20% female headed households, 65% of these are headed by widows and 11% headed by married women. Livestock keeping is seen as a social safety net for widows.
Age	Most are aged between 30-60 years
Education	Urban livestock keepers had some education, with only 4% (mostly women) having no education; 25% had primary education; 35% had secondary education and 15% had tertiary education.
Tribe	Most livestock keepers are from the Baganda tribe, which dominates Central Uganda
Employment	35% are employed in the formal sector, 32% in business or are self-employed, 19% employed in livestock, 11% in mixed farming and 35% in crop farming
Main income source	For 31% of people surveyed it was salary; 25% said business profits and 25% relied on livestock
Secondary income source	For 38% of households this was livestock
Age differentiation of income	Younger people (aged 21–30) business, 31-60 formal sector, over 60 livestock keeping. Therefore urban livestock keeping can be said to be a social safety net for retired persons
Gender differentiation of income	42% of female-headed households are dependent on livestock and 22% relied on business. 34% of male headed household relied on the formal sector, and 25% relied on business
Access to land	61% of urban livestock keepers owned land, 27% rented land, 5% had access under customary tenure and 5% utilized City Council land. Most owned less than 0.25 acres
Urban-rural link	This was found to be a myth. Only 40% and 27% of male and female household heads respectively, owned land in the rural areas i.e., 60% and 73% of male and female household heads, respectively, are urban poor – rural landless. Only 17 % and 14% of male and female livestock keepers respectively, owned livestock in the rural areas. For all livestock species except goats, urban livestock keepers received less than 10% of their stock from relatives in the rural areas (goats 25%) The strongest rural-urban linkages were found to be the passing down of the tradition of livestock keeping and livestock keeping information

Ownership demographics: gender matters

Table showing male, female and joint ownership of different livestock species

Livestock type	% Households keeping	Male ownership	Female ownership	Joint ownership
Improved cattle	60	**64**	9	6
Local cattle	21	**58**	34	8
Improved sheep	3	**62**	25	13
Local sheep	26	**34**	50	15
Improved goats	2	**50**	**50**	0
Local goats	4	**67**	33	0
Improved pigs	14	35	**50**	15
Local pigs	12	35	**50**	15
Improved chicken	27	21	**75**	0
Local chicken	27	31	**51**	0
Improved rabbits	3	**71**	29	0
Local rabbits	3	**67**	17	0

The figures in bold show the most dominant type of ownership. The larger stock plus rabbits are more likely to be owned by males rather than females.

Livestock husbandry practices and strategies

Women performed most of the routine, day-to-day tasks, men mostly concentrated on more specialized, occasional activities

The list below shows the types of feed fed to different types of livestock. The feed type is listed in order of popularity (ie for cattle, elephant grass is the most common feed, followed by commercial feed).

Cattle — Elephant grass, commercial feed, crop residues, household waste, improve grasses and legumes, brewery waste, salt/lick supplements

Shoats[1] — Crop residues, household waste, elephant grass, improved grasses and legumes, commercial feed

Pigs — Household waste, commercial feed, crop residues, elephant grass

Poultry — Commercial feed, improved grasses and legumes, elephant grass, household waste, brewery wastes, crop resides

Rabbits — Crop residues, improved grasses and legumes

[1] Sheep and goats

Constraints

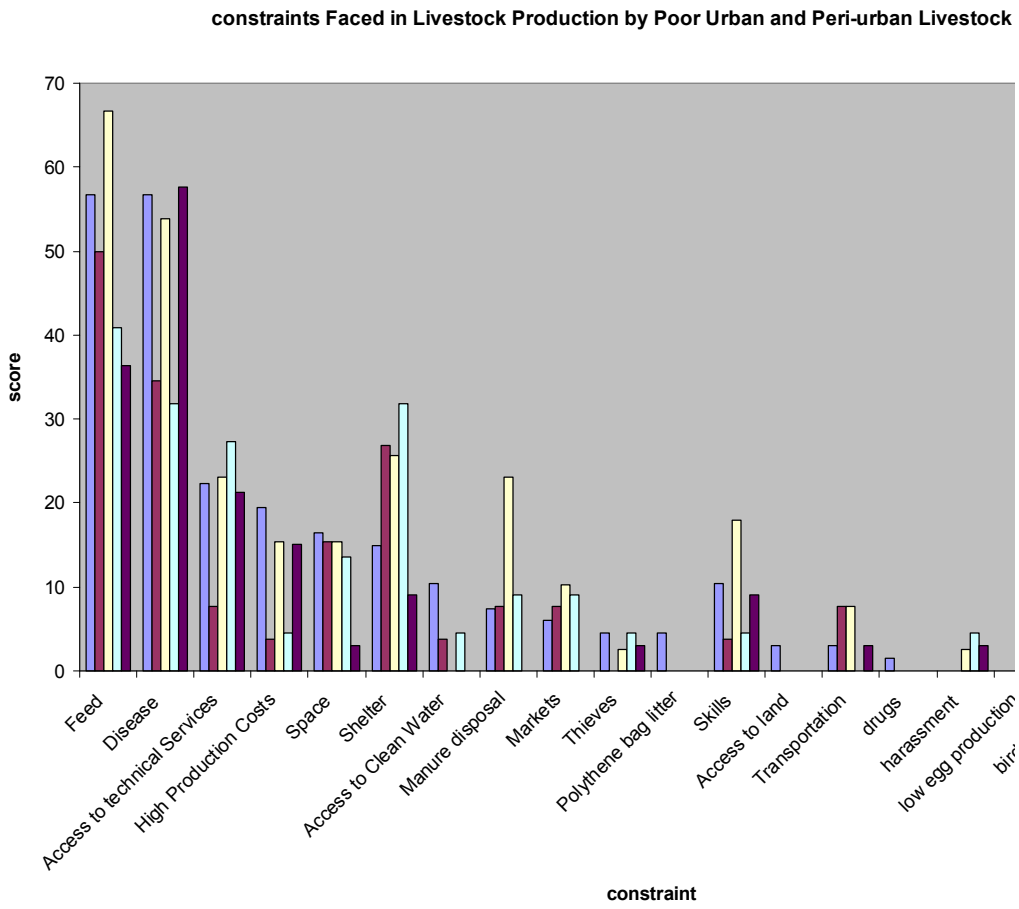

Fig 2 Graph showing constraints faced in livestock production according to livestock species

Key:

Cattle = blue

Goats – red

Pigs = yellow

Rabbits = pale blue

Poultry = dark red

The graph illustrates that the top two constraints identified are feed and disease.

Services and institutional support

Veterinary services

Most veterinary services are provided by private veterinarians (this is the case for 58% of the households). The Government and Makerere University staff also prominent

service providers. Seventy eight per cent of households had access to a drug stockist in their vicinity. However, constraints were found to be:

- Expensive drugs
- Expensive services
- Adulteration of drugs
- Few qualified vets
- High transport costs
- Expired drugs
- Slow response to service request
- Unethical service providers

Information sources

Male and female livestock keepers have similar information needs for modern methods, treatment, feeding, disease diagnosis, and poultry management. The graph below shows the preferred source of information.

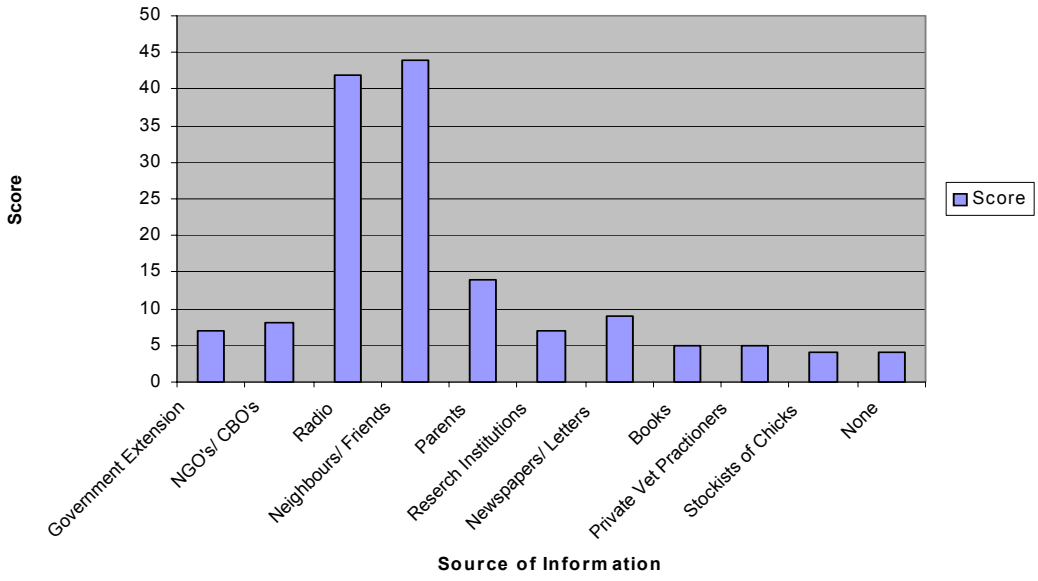

Fig 3 Graph showing the preferred source of information of urban livestock keepers in Kampala

Training

Prior to 1996, almost no women were trained in husbandry techniques. After 1996, the number of people in general trained in these techniques increased drastically, and the majority of those trained were women.

Extension services

The pie chart below illustrates the lack of contact the urban livestock keepers had with extension services. This was a point confirmed by the other city studies.

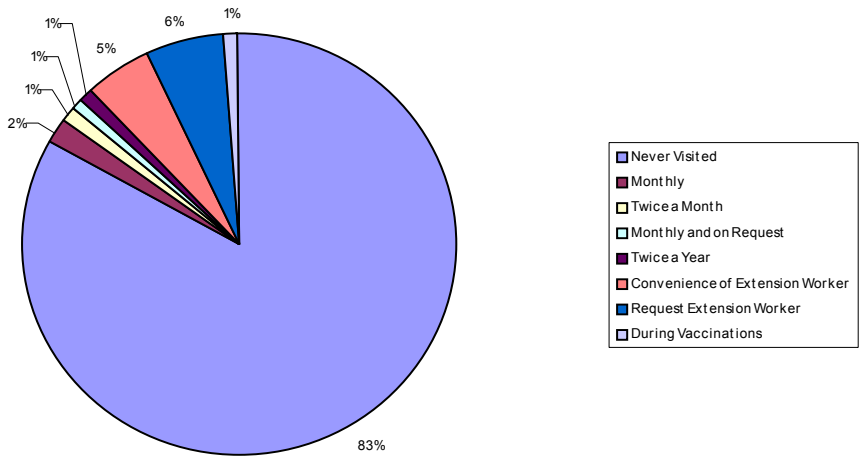

Fig 4 Pie chart illustrating the lack of contact between extension workers and urban livestock keepers

Credit

Very few households used credit despite 46% of households having credit facilities in their vicinity. Of the 42% of households who had access to credit facilities, 52% felt there was equal access for men and women and 48% said there was a bias towards women. Men and women were felt to face similar constraints in using credit, which included: high interest rates; pressure to repay the loan increasing the sense of risk in livestock keeping (ie making it less secure); the pay back time being on an unrealistic weekly basis meaning that credit would need to be repaid before the investment became productive; insecurity in livestock keeping may make it more difficult to repay the loan.

Policy support and networking

There are currently no policy institutions specifically targeting urban and peri-urban livestock producers which means they fall under the general livestock sector. Livestock policies are in line with overarching government targets such as poverty reduction, diversification, liberalizations and privatisation, and the move from subsistence to commercial production.

The study did not find evidence of networking or urban farmer associations.

Legislative framework pertaining to livestock keeping

Implementing and enforcing authorities

Legislation dates as far back as 1922, some laws are still in effect, some were reviewed in early 1960s. The laws do not reflect the prevailing realities “colonial regulations and by-laws are excessive, unenforceable or inappropriate to local conditions.” Kironde (1992). Legislation should be reviewed given the changing climate of urban livestock keeping, particularly the following Acts: The Public Health Act, The Cattle Grazing Act, The Cattle Traders Act, and The Animal Straying Act.

Kampala City Council (KCC) is the major implementing authority. Up until 1995 the KCC prohibited and restricted livestock production in urban and peri-urban Kampala often resulting in harassment of urban livestock keepers. The KCC has now revised official position to recognize existence and benefits of urban agriculture. The KCC has included elements of urban agriculture in Kampala City Structural Plan, and solicited government and academic departments to submit recommendations. The Kampala City Structural Plan has yet to be made public.

Understanding and compliance by livestock keepers

The majority of livestock keepers were unaware of most of the laws and regulations governing livestock keeping in urban/peri-urban areas. Those that were known of and complied to were those that were enforced and exacted penalties for not following. The livestock keepers indicated that the regulations they knew of made common sense, but often their lack of resources affected their capacity to comply

Some lower level local councils also had their own by-laws, which were often better enforced. These were often discussed with local council members

Public health concerns

Public health concerns included the following:

- Animal waste disposal
- Zoonotic diseases
- Public Nuisances
- Withdrawal period after drug therapy
- Environmental and animal welfare issues

Knowledge deficiencies and research opportunities

Technical issues

These include: animal health, reproduction and breeding, feeds and feed production, shelter, training, extension and information packaging, small scale processing of by products, public health issues

Socio-economic issues

These include: institutional support, policy and interest groups, systems cost-benefit analysis, gender, social safety nets and networking

Challenges and potential of livestock keeping in urban and peri-urban Kampala

Challenges

Challenges identified during the study (some of which have been mentioned earlier in this presentation) include:

- Space Limitations
- Lack of research and service provision

- Shelter and housing
- Feed costs and availability
- Feed quality
- Costs of veterinary services
- Access to input capital and credit
- Lack of support institutions
- Lack of definitive and published supportive legislature and policies
- Poor networking among livestock keepers

Potential

Despite the many constraints faced by urban livestock keepers, there are potential advantages to resource-poor people living in the city to keeping livestock. Opportunities and advantages identified by the study include:

- Market shifts that favour livestock production by the poor
- Space limitations that favour livestock keeping over crop production
- Employment opportunities for auxiliary service providers
- Production of non-traditional livestock products
- Provision of a social safety net for vulnerable groups
- Opportunities for response to low cost/high impact interventions

Recommendations

- Full recognition of urban livestock keeping and the creation of definitive legislative and policy support
- Participatory planning and implementation
- Accessible and responsive services (credit, veterinary, extension, training, network support, information provision) to be made available to resource-poor urban livestock keepers
- Institutional support to be provided to resource-poor urban livestock keepers
- Knowledge gaps between research and extension to be closed
- Lessons learned to be documented
- Networking with other cities

Discussions, questions and answers on the presentation

Why has research at Makerere not focussed more on urban agriculture?

Research at Makerere is funded by Danida and their emphasis is on rural agriculture rather than urban agriculture.

Most urban livestock farmers are of the Baganda tribe. Maybe there is no rural urban link because people have no historical links with the urban areas.

Of the urban livestock keepers questioned (regardless of tribe), 64% said they were originally from the rural areas.

Did the researchers come across any participants commenting on the influence of politicians? For example, it has been heard of politicians encouraging people to go into rabbitries, when politicians themselves have no knowledge of rabbits or market for rabbits.

Politicians often want to start income generating activities, but may act without technical information. The conflict on income generation as opposed to eg household food security may cause conflict over stakeholder (household) resources.

Are backyard gardens being replaced by livestock or have they been integrated? They are Important for waste management

Backyard gardens in the 1970s with the growing of tomatoes and onions. Urban agriculture has now increased to include the keeping of large stock. Urban agriculture has changed because of people's economic needs, with lots of people entering urban agriculture to counteract the negative effects of the Structural Adjustment Policies (SAPs). Waste management practices are generally very poor, but people do not realise this. Waste management is mainly carried out by the women, although it is the men who attend the training courses.

Lots of the crop residues are now used for feeds so increased livestock production is changing the make up of waste (ie crop residues decreased but animal waste increased). Poultry manure is seen as a new feed for pigs.

Is there any way of comparing urban to peri urban within the sample of 184 households?

It was often difficult to define whether households were within the peri urban or urban areas, but the study team will re-examine the data to see if it can be disaggregated.

Results from working group discussions for Kampala

The desired future position: where do we want to be?

Vision

Healthy people, healthy livestock, and a healthy environment in the urban and peri-urban areas of Uganda.

Mission

Ensuring a systematic sustainable urban livestock production system for a better nutrition, health and income of the urban and peri-urban people.

Goals

Three goals based on stakeholder interests were identified as follows:

1. Appropriate policy framework in place
2. Establish responsive support and service systems
3. Implement research and production system priorities

Specific objectives

Goal 1 Develop and promote appropriate policy framework in place

1.1	Promote Pro-poor policies
1.2	Integrate Urban Livestock Production (ULP) in existing policies including the Plan for the Modernisation of Agriculture (PMA) and Poverty Reduction Strategy Papers (PRSPs)
1.3	Establish minimum standards for ULP systems
1.4	Incorporate measures for better public health
1.5	Promote Adequate and effective legislation/regulation
1.6	Incorporate ULP in urban planning
1.7	Develop and promote effective taxation system

Goal 2 Establish responsive support and service systems

2.1	Promote better marketing systems
2.2	Develop and disseminate of appropriate technologies
2.3	Establish effective information channels
2.4	Enhance networking among UL stakeholders
2.5	Enhance Networking among UL farmers
2.6	Support to UL farmers groups

2.7 Promote Education and training – urban livestock production at all curriculum levels

Goal 3 Implement research and production system priorities

3.1 Quantify in urban livestock production:

- Urban livestock production (including monetary dimensions and contribution)
- Nutrient flows/waste management
- Employment
- Zoonoses burden

3.2 Understand livestock values and perceptions

3.3 Link crop-livestock production systems

3.4 Develop and enhance better waste management systems

3.5 Enhance better animal and human health

3.6 Improve food security through the ULP system

The route from the present situation to the desired future position: how do we get there?

Goal 1 Appropriate policy framework in place

Objective 1.1 Promote pro-poor policies

Strategies

1.1.1 Develop national policy on UA (crop, livestock, fisheries)

Actions

1.1.1 Advocacy

1.1.2 Identify gaps in existing policies

1.1.3 National workshops

1.1.4 Wide consultation

1.1.5 Exchange within and between countries

Objective 1.2 Integrate UA in existing policies

Strategy

1.2.1 Participatory process and advocacy

Actions

1.2.1 Identify existing policies

1.2.2 Identify gaps

1.2.3 Wide consultation

Objective 1.3 Establish minimum standards for urban livestock production systems

Strategy

1.3.1 Research, stakeholder consultation

Actions

1.3.1 Meetings, consultations

1.3.2 Review existing standards

1.3.3 Targeted research

1.3.4 Sensitisation

Objective 1.4 Adequate and effective legislation/regulation

Strategy

1.4.1 Develop national legislation on UA through consultative processes

1.4.2 Develop good hygienic practices and best practices in urban livestock production

Actions

1.4.1 Consultations

1.4.2 Review existing regulations

1.4.3 Lobbying and advocacy

1.4.4 Sensitisation

1.4.5 Enforcement

Objective 1.5 Incorporate ULP in urban planning

Strategy

1.5.1 Urban planning as a participatory process

Actions

1.5.1 Zoning to include UA

1.5.2 Involve LCs in urban planning

1.5.3 Formation of interest groups

Objective 1.6 Effective “taxation” systems

Strategy

1.6.1 Consultative process with Stakeholders

Actions

1.6.1	Review of current taxation system on UA
1.6.2	Sensitisation
1.6.3	Broad consultation
1.6.4	Surveys of affordability and willingness to pay

Goal 2 Establish responsive support and service systems

Objective 2.1 Better marketing systems

Strategy

2.1.1	Study of market systems and information dissemination
2.1.2	Sensitisation
2.1.3	Capacity building

Actions

2.1.1	Assessment of existing market systems regulations and bye laws to identify gaps and opportunities
2.1.2	Sensitisation
2.1.3	Mobilization and training of farmer associations
2.1.4	Assessment of rural-urban maker linkages

Objective 2.2 Development and dissemination of appropriate technologies

Strategies

2.2.1	Participatory Action oriented research and participatory technology development
2.2.2	Client oriented information dissemination

Actions

2.2.1	Assessment of existing/available technologies and gap identification
2.2.2	Research and participatory development of appropriate, affordable and sustainable technologies
2.2.3	Characterize and assess benefits and health risks of ULP from farm-to-farm
2.2.4	Participatory development and dissemination of information materials
2.2.5	Establish model/extension link farmers

Objective 2.3 Establish effective information channels

Strategies

2.3.1 Empowerment of farmer groups/associations

2.3.2 Cultivation of specific information channels

Actions

2.3.1 Development of a farmer database

2.3.2 Lobbying and Advocacy for information infrastructure

2.3.3 Farmer competitions and shows

2.3.4 Participatory development of electronic and print media channels including Internet, radio, TV, newspaper, video and posters

Objective 2.4 Networking among stakeholders

Strategies

2.4.1 Capacity building

2.4.2 Intercity/town and regional cooperation

Actions

2.4.1 Stakeholder analysis

2.4.2 Mobilization and sensitisation

2.4.3 Meetings, visits and exposure

Goal 3 Implement research and production system priorities

Objective 3.1 Quantification of ULP (including economic-monetary value), nutrition flows/waste management, employment and zoonoses

Strategy

3.1.1 Commissioning of studies

Actions

3.1.1 Undertaking studies to provide data for decision making in the areas of:

- Economic- monetary value of ULP [benefits]
- Nutrition flows/waste management
- Employment
- Zoonoses [risks]

3.1.2. Wide dissemination of results across stakeholders

Objective 3.2 Understanding livestock values and perceptions

Strategy

3.2.1 Participatory consultations and sensitisations

Actions

3.2.1 Documentation of existing indigenous knowledge and perceptions

3.2.2 Strategic interventions to influence perceptions

3.2.3 Sensitisation

Objective 3.3 Linking crop-livestock production systems

Strategies

3.3.1 Participatory systems research

3.3.2 Capacity building

Actions

3.3.1 Identify appropriate interventions e.g. urban-rural linkages

3.3.2 Identify optimum mix of crop-livestock production in ULP

Objective 3.4 Better waste management systems

Strategies

3.4.1 Review the waste management ordinance

3.4.2 Intercity and inter-country collaboration

3.4.3 Capacity building

Actions

3.4.1 Assessment of situation and gap identification

3.4.2 Highlighting the positive contribution of livestock in waste management

3.4.3 Exchange/exposure visits

3.4.4 Development and dissemination of options

3.4.5 Training in appropriate waste management alternatives

Objective 3.5 Better animal and human health

Strategies

3.5.1 Operationalising the minimum standards

3.5.2 Capacity building

3.5.3 Sensitisation

Actions

3.5.1 Developing user-friendly information packages

3.5.2 Translating information into common language

3.5.3 Training of farmers and extension workers

Objective 3.6 Better food security through ULP systems

Strategies

3.6.1 Promotion

3.6.2 Capacity building

Actions

3.6.1 Assessment of crop/livestock contribution to food security

3.6.2 Assessment of rural/urban contribution to food security

3.6.3 Assessment of nutrition and health issues in Uganda ULP system

3.6.4 Promotion of ULP systems in urban settings

3.6.5 Documentation

Strategic actions agreed upon by Kampala working group

Strategic Action 1 Focal Point for urban livestock farming in Uganda

A focal point for urban livestock farming will be located in a secretariat headed by the Kampala City Council District Extension Office. The focal person will be the District Extension Coordinator Kampala, who is presently Ms. Margaret Ssemuwanga Azuba.

The focal point will be constituted of a number of stakeholders including the following persons/representatives:

1. The District Extension Coordinator Kampala
2. Stakeholders
3. Farmers, farmers groups
4. Local government
5. Central government
6. NGOs
7. Academia
8. Research
9. Service providers (e.g. Urban Harvest)
10. Private sector
11. Donors, supporters

The Kampala Working Group agreed on three other members of the focal point:

1. Dr. Ayo-Odong Julius – vice focal persons

2. Secretary – Dr. Julius Kyaligonza

3. Member/farmer representative – John Sseruwanga

Strategic Action 2 Study visits/exchange visits with other cities in the region

The Kampala Working Group agreed on the basic modalities of the study/exchange visits with other cities in the region

1. Kampala will be represented by a multi-stakeholder team (a maximum of 7 persons)

2. The visits will include discussions on key issues/concerns as well as field visits. A national workshop may be included in the program

3. There will be inclusion of other urban centres in Uganda other than Kampala

4. Focus of the outward visit i.e., what Kampala/Uganda urban centres can learn from other cities would include waste management and other topics to be identified

5. Issues that Kampala and other urban centres in Uganda could offer other cities include the decentralization process, review of legislation, urban livestock keeping as a social safety net, and institution of urban agriculture issues into the education system. Some production concerns that Kampala City could demonstrate are the use of chicken manure as feed, and pig farming and marketing in urban areas.

Strategic Action 3 Formation of core lobby and advocacy team

The Kampala Working Group also identified the formation of a Core Lobby and Advocacy Team as a strategic priority. This team would be charged with getting the concerns and aspirations of urban farming (both urban livestock keeping and crop farming) on key policy and develop agendas. The team, which would be separate from the focal point, would be constituted of representatives of:

1. Farmers, farmers groups

2. Local government

3. Central government

4. NGOs

5. Academia

6. Research

7. Service providers (e.g. Urban Harvest)

8. Private sector

9. Media

10. Donors, supporters

Scoping study of urban and peri-urban poor livestock keepers in Kisumu

Moses Onim

Lowland Agricultural and Technical Services Limited (Lagrotech), Kisumu, Kenya.

Introduction to Kisumu

The city of Kisumu is on the shores of Lake Victoria, the second largest fresh water lake in the world. It has an area of 395 square kilometres of which 36% is covered by water and a mean population density of 835 people per square kilometre.

The city is bordered to the northwest by the Nyando Escarpment, Lake Victoria to the Southwest, Kano Irrigation Schemes to the East, and Miwani-Kibos sugar plantations to the east.

The areas with the lowest incomes are the ones with the highest population densities, namely Kondele and West Kolwa.

Study team

Lagrotech Consultants specialise in the supply of seeds and other agricultural implements. The study included feed producers and butchers.

Study findings

Larger families (6-8 children) can be found as you move away from the city centre. There are at least 14 different kinds of livestock in Kisumu including ducks, quails, guinea pigs, fish, and bees. Only 3% of cattle in the city were exotics whereas 60%of pigs and 64% of turkeys were exotics. Most exotic cattle were kept by the richer individuals. The main impediment to livestock keeping included the high cost of housing and drugs. Although cattle are much fewer than poultry in numbers, they are much more significant in terms of biomass.

Livestock housing was a major constraint on livestock keeping in the city. The majority of sheep and goats (78%) were housed at night, but 73% of these scavenge. Pigs were also housed at night but scavenge.

Most respondents started rearing livestock in the last 20 years.

Ownership of livestock

Table 1 Ownership of different types of livestock

No. of families owning the type of livestock	Type of livestock	Husbands %	Wives %	Adult sons %	Adult daughters%	School going sons %	School going daughters %	Relatives %	Institutions %
573	Cattle	65.0	29.8	3.6	0.2	0.2	0.2	0.0	1.2
232	Goats	70.5	24.5	2.9	0.0	0.0	0.0	0.4	1.8
182	Sheep	66.7	27.8	2.5	0.0	1.0	0.0	0.0	2.0
92	Pigs	62.3	18.4	17.5	0.0	0.0	0.0	0.0	1.8
587	Poultry	32.3	61.6	4.6	0.6	0.3	0.3	0.1	0.7
17	Rabbits	5.3	0.0	26.3	0.0	63.2	0.0	0.0	5.3
4	Guinea fowls	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Bees	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Fish	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Means for the family		**66.9**	**18.0**	**6.4**	**0.1**	**7.2**	**0.1**	**0.1**	**1.4**

The number of families studies was 736.

The table shows that for all types of livestock apart from poultry and rabbits, husbands owned more than wives who owned more than anyone else apart from:

Poultry: where wives owned almost double the amount that husbands owned

Rabbits: where school-going sons owned two thirds of the rabbits, adult sons owned approximately one quarter of the rabbits and the remainder were split between husbands and institutions.

It is important to note that both the adult daughters and school going daughters virtually own no livestock. This is setting a very weak investment base for the daughters.

Recommendations

Very little up to date information on urban livestock keeping exists so this needs to be improved

The city bye-laws for livestock in the city need updating as they are out of date, they were last updated more than 50 years ago.

Donors have attempted to fund livestock programmes in the city, but these programmes were only of benefit to the rich as the poor could not afford to buy the equipment (supplements, medication etc) for the exotics. Future projects on livestock in the city of Kisumu should target the poor, and project managers should make sure the project is not diverted away from the poor.

Poultry, goat and pig farming should be strongly encouraged in the city since there is a large range of cheap feeds from by-products of food milling and processing. This study shows that poor livestock keepers readily kept poultry, goats and pigs.

Urban and peri-urban livestock keeping should be given adequate the priority it deserves, and information and reporting on this subject should be treated like any others in the rural administrative units like Divisions and Districts.

Extension and veterinary services should be improved for better livestock production in the city. However, private extension and veterinary services are too expensive for the poor city livestock keepers.

Livestock production in the city should be strongly supported by the city and government authorities since it has a big potential. Large quantities of livestock products like milk, meat and eggs are imported into the city from far off districts, and even other countries.

Vaccination for livestock should be emphasized as the first line of defence against killer diseases, such as Newcastle disease (affecting chickens), since vaccines are cheap and very effective in disease control. This is very important for the poor livestock keepers who often, for example, lose all their chicken to these diseases.

A thorough follow-up study should be conducted on the benefits of the urban and peri-urban livestock for poor and unemployed families in the slums.

City planning should also provide for the safe disposal of animal manure, for example, for crop production, and charge the livestock farmers a minimum fee for the service.

To improve on their services and production, the city livestock keepers should have a network or an association that can help them with better bargaining powers for marketing and services.

Observations

- There is general laxity among city authorities to enforce the byelaws which could result in, for example, the increase in transmission of zoonotic diseases
- Nearly 70% of animals are freely grazed or are scavenging
- Livestock are one of the largest economic activities in Kisumu city, with the bulk of economic contribution coming from cattle
- As with other cities, expensive animal health care is an impediment to exotic livestock rearing in the city
- Livestock rearing may be important informal employment for unemployed people

Discussions, questions and answers on the presentation

Why do people in the urban areas not have the agricultural knowledge people in the rural areas have? Is this because people keeping livestock in Nairobi and Kisumu are born in the urban areas, rather than moving there from the rural areas?

The studies found that most people were resident in urban areas for a long time so had either lost their linkages with the rural areas or had been born in the urban areas. A lot of knowledge was being lost with people moving to the urban areas.

Have religious and marital practices (ie polygamy) had any impact on livestock keeping, possibly the type of livestock kept?

The study did not find religious practices influencing any livestock keeping practices. The polygamy status in Kisumu is 37%.

What are the types and sources of feeds of urban livestock in Kisumu?

Many of the livestock are free grazing in the city and quite a few of them scavenge. Dairy animals are kept in zero grazing units. Feeds for cattle and poultry are available from industrial manufacturers.

The scoping study focused a lot on the peri urban fringe, which happens to be the ideal location for most marginalized groups. However there are certain planning ideals regarding public health and space that may constrict urban livestock keeping. How should livestock keepers interact with their livestock in terms of the space that should be available? Is there enough space available to look after livestock? There is competition between the needs of urban livestock keepers and the aesthetic nature of the city. Kenya has an Urban Environment Act that entitles everyone to a hygienic environment.

The government needs to come up with acts that can protect the livestock keepers in Kenyan cities. There is no clear policy in Kenya re livestock keeping within the cities. This is an area where work needs to done. It can be economical to keep livestock within the cities as it can improve the standard of living.

Scoping study on interactions between gender relations and livestock keeping in Kisumu

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Introduction

Information from a limited survey of communities was gathered, through a questionnaire, and case studies from 55 respondents in six urban and peri-urban areas of Kisumu. Men and women were interviewed separately. Thus both quantitative and qualitative data was gathered. The six areas selected were: Manyatta, Bandani, Nyawita, Kibos, Nyalenda and Migosi. Migosi is middle-low income whereas the others are low-income areas.

The focus of the study was the improvement of gender-based division of labour, inequalities between males and females in power and resources and gender biases in rights and entitlements.

Findings of the study

Livestock keeping aspects

Characteristics of the livestock keepers in terms of age, sex and marital status

Over half of the livestock keepers were older than 45. Close to two-thirds were married, one-fifth were widows and over a tenth were single women. Twenty nine per cent of the respondents were members of female-headed households (FHH).

Different types of livestock kept by male (MHH) and female-headed households (FHH)

In general, the most common type of livestock kept was goats but in terms of numbers, chickens were the greatest.

In FHH households, the most common type was goats. In MHH it was pigs. Pigs were not common in FHH because the work involved in pig keeping was heavy and the women found pigs to be dirty animals. Other livestock not commonly kept by FHH were turkeys, geese, guinea fowl and pigeons (not traditional animals).

Work is involved in livestock keeping

Not much care was required as the livestock were of the local variety and mostly roamed about. Where the livestock were kept indoors, most of the work was done by hired labourers.

In MHH households, men claimed that they shared the work with their wives, but the wives indicated that they were the ones who did most of the work.

In MHH, men were involved in animal health care. Routine work of feeding and cleaning was done by women.

Children were not involved except in waste disposal and collection of eggs. Girls were rarely involved. In FHH, the mother and sons took care of the animals, especially concerning the health of the animals.

Main source of income in FHH and MHH?

One third of the MHH depended on livestock for their main source of income compared to only one eighth of FHH.

Almost half of the FHH depended on rental income compared to one tenth of the MHH. Reasons could be that the FHH were mostly elderly and did not have the energy to look after the livestock. Also, the houses had been left by their husbands and could be rented out. The MHH, on the other hand, were young and did not have the resources to build rooms for rental but could afford to keep a few livestock. Also the MHH knew that the women would look after the livestock.

Table 1 Main reason for keeping livestock in female-headed households

	Manyatta	Bandani	Nyawita	Kibos	Nyalenda	Migosi	Total
Commercial	0	1	0	0	2	0	3
Subsistence only	1	0	1	0	1	0	3
Emergency	1	0	0	1	0	1	3
Occasions	1	0	1	1	0	0	3
Supplementing income	1	0	0	0	1	0	2
Total	5	2	2	2	4	1	16

Table 2 Main reason for keeping livestock in male-headed households

	Manyatta	Bandani	Nyawita	Kibos	Nyalenda	Migosi	Total
Commercial	0	2	1	0	9	0	12
Subsistence only	0	0	0	0	0	0	0
For sale and subsistence	1	2	0	4	1	1	10
Emergency	0	0	1	1	1	1	4
Occasions	1	0	0	0	0	0	1
Supplementing income	3	1	1	2	0	6	13
Total	**5**	**5**	**3**	**7**	**11**	**7**	39

Livestock as property

Different classifications of property, ownership and control

Different types of property can be distinguished: financial; consumption and production.

Gender relations are contextual. In MHH, in all three cases, men have the upper hand. In FHH, women had the upper hand.

"**Ownership"** in this case is defined as the right of possession (of livestock, house, land or other property).

"**Control"** in this case is defined as the power to direct or determine the use of a resource – that is who is the decision maker on how the resource (livestock) was to be used.

In FHH, women had absolute ownership and control over their property. Women were free of the constraints imposed on their counterparts in MHH. They exercised their will regarding financial, consumption and production property (even where there were adult sons and their families living in the same compound). Sometimes the sons were consulted but not the daughters.

In MHH, men predominantly owned and controlled livestock. Women had ownership and control over small livestock. Even where the woman had bought the livestock, she did not own or control the livestock – in these cases, there was joint ownership and control. This was for cultural reasons.

There was some joint ownership in MHH, over one tenth and also about one tenth of the wives owned the livestock. However, control of the livestock was in male hands.

Table 3 Ownership of livestock in male-headed households

	Manyatta	Bandani	Nyawita	Kibos	Nyalenda	Migosi	Total	Total %
Head of household	9	4	2	6	11	6	**38**	**69**
Spouse	0	2	1	0	2	0	**5**	**9**
Son	0	0	0	0	0	0	**0**	**0**
Daughter	0	0	0	0	0	1	**1**	**2**
Other relative	0	0	1	1	0	0	**2**	**4**
Joint	1	1	1	1	2	2	**8**	**16**
Total	**10**	**7**	**5**	**9**	**15**	**9**	**55**	**100**

Acquisition of livestock

Table 4 Acquisition of livestock in female-headed households

	Manyatta	Bandani	Nyawita	Kibos	Nyalenda	Migosi	Total
Inheritance	3	1	0	1	2	0	**7**
Bought	0	1	2	1	2	1	**7**
Friends	1	0	0	0	0	0	**1**
Dowry	1	0	0	0	0	0	**1**

Table 5 Acquisition of livestock in male-headed households

	Manyatta	Bandani	Nyawita	Kibos	Nyalenda	Migosi	Total
Inheritance	2	0	1	1	2	1	7
Bought	2	4	2	5	9	7	29
Friends	0	0	0	1	0	0	1
Dowry	1	1	0	0	0	0	2

Role of inheritance in the acquisition of property, including livestock

According to Luo custom, male heirs inherit property (including livestock). Wife inheritance is customary. However, in Kisumu, inheritance of property by male heirs was not clear.

In general, 64% had bought the livestock; 25% was through inheritance; 7% from dowry and 4% as gifts.

In FHH, inheritance and purchase played an equal role. This was surprising, as female heirs do not inherit yet in Kisumu; the wives had inherited their husband's property. 2 respondents had received the livestock as dowry when their sons got married. Therefore norms are changing but further research is required.

The daughter-in-law had control (not ownership) of the property if she was widowed and living in the same compound and living with the mother-in-law.

In MHH, 74% had bought the livestock and only 18% had inherited the livestock.

Impact of HIV/AIDS on traditional inheritance practices

Widows are not inherited by the brother–in-law, but their property could be – more research is required.

In FHH, the mother-in-law looked after her widowed daughter-in-law and the grandchildren. More research is required.

Who should inherit livestock?

Forty two per cent of households said that they would leave the livestock to their sons; thirteen per cent said to their spouses and thirty six per cent were undecided.

Inputs and outputs

Inputs used and products generated

Commercially bought feed was rare. Only those with large numbers livestock bought the feed. Most of the livestock keepers allowed their livestock to roam freely (including pigs). Shelter and water were adequate in most cases – space was not a problem in Kisumu. The main problem was a lack of know-how in the treatment of the animals. Traditional medicines were used to treat livestock.

The most important product was eggs. Milk for sale was not common as the families were large and the milk produced was for home consumption. Meat was not consumed regularly – only during special occasions.

Main constraints faced by livestock keepers

One half of livestock keepers questioned said that they faced no constraints. This was probably due to the fact that they used traditional methods and did not have knowledge on modern methods of rearing livestock.

Other constraints were theft of livestock and nuisance to neighbours.

Representatives of FHH mentioned lack of veterinary services; lack of knowledge in treating the animals and MHH cited financial resources and lack of information.

Socio-economic aspects

Socio-cultural networks and their function in FHH and MHH

In FHH networks were firm and not fluid. In MHH the networks were loose and not strong. FHH were members of both formal and informal groups whereas very few MHHs were affiliated to any groups or associations.

Objectives of FHH joining associations included obtaining funds for small businesses and for the purchase of household goods. Very few took money for production purposes.

Men said that merry-go-rounds (rotating credit systems) were “women’s things”.

None of the livestock keepers were part of livestock groups or associations as they had not thought of forming such groups and did not view livestock as a high priority asset.

Credit

Credit for livestock was insignificant. Only 2 respondents had taken credit. Reasons for not taking credit were: fear of defaulting, lack of information on credit organizations, high interest rates and misuse of loans by family members.

Lending institutions for livestock were non-existent.

Government or private sector research and development strategies targeted at the livestock keepers

No evidence of this was found. No training programmes had ever been carried out by the government. Government extension workers rarely visited the farmers, if at all.

One private company, UNGA, has started a programme for the livestock keepers very recently. Community Based Organisations (CBOs) for livestock keepers in Kisumu did not exist.

Sale and marketing of livestock and products

Where large numbers of livestock (cows, pigs, broiler chickens) were kept for commercial purposes, the livestock were sold to butcheries.

Those who kept goats and sheep found ready buyers within their area of residence.

In FHH, women were the ones involved in marketing. Children were not involved (even married ones).

In MHH, both the husband and wife were involved but the wife could not sell without her husband’s authority.

Products were not sold in large quantities. Less than a dozen eggs were sold, in most cases to neighbours. Milk was also sold to neighbours. The production of milk for commercial purposes was not found.

Environmental and health pollution

Sixty four per cent of respondents cited no environmental problems resulting from livestock keeping. Eleven per cent mentioned animal waste as a hazard as it attracted a large number of houseflies.

It was observed that the waste was dumped in the compound and some littered the living areas as the animals were kept indoors. However, it was also observed that the livestock keepers tried to clean the areas.

There were no safety measures taken in the handling of the livestock or products. Livestock was not inspected after slaughtering and proper hygienic measures were not undertaken for milk production. No cooperatives or organized bodies for regulating livestock products were found.

An interview with a veterinary doctor indicated that common zoonotic diseases are: salmonellas through consumption of eggs; water borne diseases through drinking water

contaminated with livestock faeces; anthrax through from consumption of uninspected meat; and brucellosis from drinking raw, untreated milk.

The respondents cited malaria and typhoid as common diseases. Malaria and brucellosis have common symptoms. Typhoid is caused by drinking contaminated water and consumption of contaminated food such as vegetables.

Discussions, questions and answers on the presentation

The findings are interesting but how can they be used at the policy level?

This study looked at livestock as property, rather than livestock *per se*, then carried out a gender analysis on access/ownership to property (livestock) and the customs inhibiting women's control of property (livestock). If the study had looked at livestock purely as livestock the lessons on property ownership would not have been learnt. For example, in a household where the husband and wife both earn money, the woman would not be allowed to use her own money to buy something for herself or her children whereas the man would. Patriarchal customs are still very much in place. There are laws promoting gender equality, but there are still customs and attitudes against this.

The livestock keepers in Kenya seem to be so much older than the livestock keepers in Uganda. What are the entry points? Why is the age bracket so small? Age captures knowledge, wealth etc, so what can we do with this? In Kampala, men entered in their 20s, and women in their 30s, so what is keeping other people out?

The study looked at the issue of age. In Nyanza province the life expectancy is 48. This raises the question of why are people keeping livestock so far at the end of their life cycle. From discussion with study participants it became apparent that livestock is kept as a retirement policy, which highlights the lack of social security.

Some people said they wanted to keep the livestock so that they could be slaughtered for their funeral. You cannot keep livestock when you are a tenant so maybe that is why younger people do not keep livestock (have not yet bought their own property).

There seems to be a lack of concern about hygiene conditions relating to public health. For example, slaughtered animals are not investigated. Why is this the case?

A lot of people carry out the slaughter themselves or take it to the local butcher. Slaughtered animals must be inspected but some areas are very difficult to access. It is illegal for people to sell meat if it hasn't been inspected. So if people are found selling un-inspected meat they are meant to be arrested, but security in the slum areas is difficult. At a funeral the meat inspectors are meant to inspect the meat, but because of the cost enforcement can be difficult. Pigs with cysticercosis are not inspected so that they cannot be confiscated.

What is the incidence of HIV/AIDS in Kisumu?

There is a high incidence of HIV/AIDS in Kisumu.

There appear to be different definitions of poor between cities. For example, people in the study have been described as 'poor' yet they have a number of livestock, which by Ugandan standards would mean they were not poor.

The people in the study had not seen their livestock as an asset, thereby considered themselves poorer than they potentially were.

We need to look at what are people's goals and aspirations, because people in Kisumu appear to view livestock as something cultural, and therefore find it difficult to translate it into a business. Maybe this is because people view it as something to pass on as a legacy or dowry. Therefore we need to translate this into policy. This will then affect the type of enabling environment created to assist these urban livestock keepers.

Results from working group discussions for Kisumu

Developing an understanding of the present situation: where are we now?

The group listed the following as priorities. Please note they are not necessarily listed in order of priority.

- Bye laws, enforcement
- Extension knowledge
- Animal health care
- Capital/credit/housing
- Gender/ownership
- Waste management
- Theft

The desired future position: where do we want to be?

- Farmers - within 2 years would like to have information on animal husbandry and marketing structure, have a fair price for quality produce, and access to micro-credit available
- Central Government - self-sufficiency in livestock products for the whole urban population; and enabling but controlled environment for keeping livestock in urban location available
- City Council - a food-secure community deriving optimal benefit from local agricultural resources within a well-planned environment
- NGOs - prosperous livestock keeping which is environmentally-friendly and sustainable; and an institutional structure specifically for UA dealing with policy formulation and regulation of poor urban farmers with interface with relevant coordination bodies in order to make UA an activity which is viable and environmentally friendly

Policy issues of stakeholders

- CG - need national policy on urban agriculture (livestock) which encourages urban agriculture with controls
- City Council – need to harmonise bye-laws to reflect dynamics of the day and the CG policies; to include elements of enforcement
- Farmers – controls acceptable especially on confinement; extension services, water and sanitation

Researchable issues

- Intensive pro-poor livestock production systems and environmental impact

- Alternative/traditional livestock feed sources eg fishmeal, lake weeds etc
- Zoonotic diseases, brucellosis, TB, anthrax
- Optimal use of restricted land size for crops/livestock
- Update information on livestock numbers, contribution of livestock to local economy
- Institutional framework for supporting UA

Non-researchable issues

- Provision of credit system
- Greater sensitisation of local and national authorities on UA and urban livestock keeping

The route from the present situation to the desired future position: how do we get there?

Overall Vision

Improved well-being and welfare in urban and peri-urban areas through socially-acceptable and environmentally sustainable urban agriculture.

Goals

Improved livelihoods of the urban poor through promotion of pro-poor environmentally favourable livestock production systems

Objectives/outputs

- Strengthened stakeholder institutional capacity
- Improved voice/bargaining power for resource-poor livestock keepers (RPLKs)
- Improved service delivery system (on extension/environment/animal welfare) to RPLKs
- Access of micro-credit to RPLKs

Strategies

- Formulate a national policy on UA through consultative process
- Review and up-date (laws, bye-laws and standards) to provide a conducive environment for urban farmers (including livestock)
- Form urban (and peri urban) farmer associations in order to lever service delivery and micro-credit
- Educate stakeholders on urban livestock issues
- Establishment of a steering committee on urban agriculture and livestock

Scoping study of urban and peri-urban poor livestock keepers in Nairobi

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Introduction

Information was obtained from a limited survey of representative communities, through case studies, using a questionnaire; information from stakeholders through interviews, using checklists and through stakeholders brainstorming; using Strengths, Weaknesses, Opportunities and Threat (SWOT) analysis and information from official and grey literature. The study was carried out in eight urban and peri-urban slum areas of Nairobi – Soweto-Kahawa, Kibera, Kangemi, Maili Saba, Silanga, Kawangware, Bulbul–Ngong, Kinyago and Sinai.

The aim was to determine the issues facing poor livestock keepers in the urban and peri-urban environs of Nairobi.

Concerning institutions representing needs of poor livestock keepers

There are hardly any institutions representing the needs of poor livestock keepers in Nairobi. Provincial livestock extension services are available but out of reach of the poor livestock keepers. The livestock keepers are not aware of these services and do not know how to access them. The provincial officers said that they are constrained by lack of resources.

Recommendation

The possibility of forming a “network association” therefore exists. A cooperative could also be formed which could deal with marketing of livestock/products, purchase of inputs, accessing and sharing of information.

Concerning characteristics of poor livestock keepers involved in the study

The average age of the livestock keepers was just below 40 years. One third had no formal education and none of them had reached university level. One third worked in the informal sector.

Two thirds of the households were male-headed households (MHH). In MHH livestock was said to be jointly owned and controlled. There was joint responsibility in the care of the livestock, although women tended to take on a larger burden than men. Decisions were also jointly made. The reason could be that the ethnic group in these areas was the ‘Kikuyu’. The Kikuyu woman is considered to be “the keeper of the home”.

One-third of households involved in the study were female-headed households (FHH). In FHH, the women were responsible for the care of the livestock. They were reluctant to involve their children, especially male children. In Kikuyu culture, men look after the

livestock. In the urban setting, women have tended to take over the roles and responsibilities of men as men look for formal employment.

Recommendation

More research is required in the area of gender relations and interactions in livestock keeping in Nairobi.

Concerning livestock species and constraints

Table 1 Number of livestock kept

Type of livestock	Location								Total
	Kangemi	Maili Saba	Kawangware	Kibera	Kinyago	Sinai	Bulbul	Soweto	
Cattle	18	37	4	10	0	0	0	4	73
Sheep	5	4	36	5	0	0	0	9	59
Pigs	0	5	7	4	0	0	0	13	29
Goats	29	0	2	79	57	4	64	0	255
Chickens	39	5	50	11	30	1	23	26	185
Ducks	4	0	15	32	25	0	0	18	94
Rabbits	20	2	0	0	0	0	0	0	22
Geese	2	0	0	5	0	0	0	0	7
Turkeys	13	0	0	4	0	0	0	0	17
Others	0	0	2	0	0	0	0	0	2

Livestock species

Local goats and sheep featured most prominently. Reasons given were that there was less work involved in keeping goats and sheep, initial investment was low/affordable, demand was high and returns were good.

A study carried out in 1985 by the Mazingira Institute (MI) study showed that small livestock were preferred. In this study (2002), small livestock, especially chickens, were not preferred because of problems of theft and diseases. Even the poorest livestock keepers said that if they had money they would keep goats and sheep.

Pigs were fewer as they were considered ‘dirty’ animals and the workload was considerable. In the earlier MI study pigs were not kept. The costs and benefits of pig keeping were not clear to the farmers.

Generally the livestock were not kept for commercial purposes. The number of livestock kept was small and only milk, as a product, was for sale. The space for keeping livestock was inadequate.

The type of rearing practice (zero grazing or free range) was dependent on the availability of space and security of the animals. In Kibera and Kawangware, the animals were not herded and roamed freely to and from their homes, finding their own way home. At night they were locked up in sheds. Where theft was a problem, the animals were zero-grazed, as was the case in Kangemi.

Constraints

Insecurity of land tenure in most poor areas inhibits the expansion of many activities, including livestock keeping.

Constraints cited include inadequate space, lack of money and theft of livestock. Disease was a factor in pig, chicken and duck keeping. In the stakeholders 'brainstorming' session, the livestock keepers ranked health (diseases) and environmental hazards as the number one threat to livestock.

Recommendation

Knowledge on animal husbandry and health was poor. This is an area which needs to be looked at. There is opportunity for improving the knowledge, information and skills of livestock keepers.

Table 2 Ownership of premises

Type	Kangemi	Maili Saba	Kawangware	Kibera	Kinyago	Sinai	Bulbul	Soweto	Total
Own	5	0	2	2	0	0	0	0	**9**
Rented	1	0	1	1	1	0	0	0	**4**
Squatter	3	6	1	6	9	2	3	2	**32**
Other	1	0	0	0	0	0	0	1	**2**
Not indicated	3	1	3	0	1	0	0	1	**9**
Total	**13**	**7**	**7**	**9**	**11**	**2**	**3**	**4**	**56**

Concerning policy associated with livestock keeping

Respondents were not aware that livestock keeping was illegal. The last time the Nairobi City Council had harassed them was in 1998.

Livestock keeping falls under five government ministries: Agriculture and Rural Development, Local Government, Lands and Settlements, Environment and Natural resources and Public Health. It was found that there was lack of policy coherence and coordination.

In the SWOT workshop, officials from the Ministry of Agriculture said they support urban agriculture (UA) but there is a need to legalise and regulate it.

Concerning knowledge deficiencies

Although the livestock keepers did not express any serious knowledge deficiencies, a closer examination showed that there is much scope for improving the knowledge of livestock keepers. This was the case for all sites studied.

Education and dissemination of information is vital. There was a knowledge deficiency even in some basic, necessary information.

Further research

There are diverse opportunities for reactive and proactive research.

Reactive research topics include: health and environmental risks of livestock keeping; unsafe and unhygienic animal feeding and handling of products; effects of random waste disposal and improving productivity given the constraints.

Proactive research is required to provide policy-relevant information such as the extent of livestock keeping nationwide and how to create an enabling environment for the stabilisation and specialisation by the poor.

Concerning environment, public health and animal welfare

According to the livestock keepers, there were no problems in keeping livestock.

Public health concerns include the consumption of garbage by the animals; animal waste throughout the streets due to the animals roaming around; random waste disposal and contamination of water.

Random disposal of waste in rivers, dams, open drains and dumping grounds has implications for the environment and particularly impact on health of both people and animals.

The incidence of zoonotic diseases could not be ascertained as a more scientific study needs to be undertaken

Differences between urban and peri-urban livestock keeping

Feature/Issue	Difference between urban and peri-urban livestock keeping
Associations representing the interests of livestock keepers	None in urban or peri urban areas.
Social characteristics of the areas	No significant difference.
Livestock keeping	More widespread in peri urban areas, due to increased space availability.
Number and type of livestock kept	Larger stock (cattle and pigs) and higher numbers kept in the peri urban areas due to more space and security of tenure.
Share of total household income from livestock	Higher in the peri urban areas, although it was difficult to determine the actual share of income from the livestock, compared to earnings from other activities
Female livestock keepers	More in the urban areas.
Reasons for keeping livestock	These were the same in both areas: supplementing income and contingency purposes. The poor livestock keepers were unable to make livestock keeping a commercial activity in either the peri urban or urban areas.
Knowledge deficiencies	These were apparent in both areas, thus location did not have anything to do with information and skills. In one area, Kahawa West, there were some livestock keepers using very hi-tech equipment and modern methods of rearing livestock but the livestock keepers surveyed had no idea of what was happening in their neighbourhood.
Government support services such as veterinary and	These were non-existent in both areas. Only -one area, Bulbul, had support as the area is opposite a livestock

Feature/Issue	Difference between urban and peri-urban livestock keeping
extension services	research centre.
Cleanliness and sanitation facilities	Random waste disposal was found everywhere. There was little recycling of waste. Peri urban areas were generally cleaner and had better sanitation facilities than the urban areas.

Other observations

The high-income peri-urban areas of Nairobi have some very sophisticated livestock systems. This was not the case in the areas surveyed as the areas were low-income ones.

Milk was the only product sold on a regular basis in the peri-urban areas but as a proportion of total household income, it did not seem to contribute much.

In general, none of the respondents cited health problems related to livestock keeping. In one peri-urban area, Sinai, the health of the residents and the animals appeared to be very poor. Jiggers were a common sight in both animals and humans.

Findings of the SWOT workshop

Threats	Opportunities	Weaknesses	Strengths
Health and environmental Hazards	Livestock for obtaining cash/subsistence	Lack enough knowledge and skills for livestock keeping	Have cash coming it from livestock keeping
Competition in selling of livestock/products	Forming networks	Lack enough time and own labour to tend livestock	Have enough place for livestock keeping
Worry about loss or theft of livestock	Suitable environmental conditions for diverse types of livestock	Lack enough space for livestock keeping	Get food from livestock
	Outlets for selling of livestock products	Lack outlets for selling livestock/products	Have enough time and own labour to tend livestock
	No interference from the administration	Lack capacity to expand livestock keeping	Have some knowledge and skills for livestock keeping

Discussions, questions and answers on the presentation

Why did the study not mention urban deforestation or reforestation?

These issues had not been mentioned in the terms of reference of the study

Why do people in the urban areas not have the agricultural knowledge people in the rural areas have? Is this because people keeping livestock in Nairobi and Kisumu are born in the urban areas, rather than moving there from the rural areas?

The studies found that most people were resident in urban areas for a long time so had either lost their linkages with the rural areas or had been born in the urban areas. A lot of knowledge was being lost with people moving to the urban areas.

Is there a rural urban linkage? It is surprising to see there are only local breeds in Nairobi as in Kampala there are improved livestock.

Improved livestock is too expensive for the resource-poor livestock keepers living in Nairobi.

Nairobi working group discussions

Summary of different stakeholder perspectives on the Nairobi scoping study and urban livestock keeping in general

Central government

- We have the figures on urban agriculture for the past 15 years but we need to do something with these figures
- Not enough information exists on urban livestock keeping
- Policy and legislation are fragmented (involving more than one Ministry) and this needs to be addressed
- Nairobi is the only city in Kenya to offer extension services, through the Ministry of Agriculture, to urban farmers including livestock farmers. There are different styles of extension services, one of which is demand-driven
- Important discussions on urban livestock keeping took place in Addis Ababa May 2002 where a memorandum of understanding was developed and the Ministry of Agriculture was officially recognised as providing extension services to farmers including urban livestock keepers
- A disciplinary stakeholder committee has been set up to look at issues like waste management.
- The main concern is space. Even if urban livestock keeping is viewed as a good thing, it has to be promoted in the appropriate areas to avoid problems of public health or aesthetics

Local government

- The scoping studies have done a good job
- Urban livestock keeping is a new concept and we need more information/statistics for example, on where it is taking place
- In this forum we can only come up with recommendations. It is not our role to make policies
- Issues for inclusion in city bye-laws include the recognition of poverty alleviation through urban livestock keeping

Livestock keeper

- The byelaws of the former government make poor livestock keepers live like slaves. Now we have started cultivating land on the sides of the road. People in power take land for greed but poor people use it for survival.
- The group of urban livestock keepers who took part in the stakeholder workshop at the Mazingira Institute had not realised they were breaking byelaws by keeping livestock, but were interested to be recognised by local government.
- A local group negotiated on behalf of the livestock keepers with local government to provide land for the livestock keepers so they could build shelter for their animals. The livestock keepers rely on their livestock for their income so need the sheds, but are still waiting to hear back from local government.

NGO

- This NGO integrates livestock keeping into planning using 'participatory environmental planning and management
- There is concern over conflict between local and central government concerning polices which makes it difficult for the NGO to carry out its work eg local government might be supportive but central government might prevent and vice versa. Smaller towns tend to have a more accommodating policy environment
- The NGO is part of a waste management committee looking at how to cut through policy issues

Pro-Poor Livestock Policy Facility (PPLPF) of the Food and Agriculture Organization of the United Nations (FAO)

- The role of the PPLPF is to look at how policies (rather than technologies on their own) can help poor livestock farmers to improve their livelihoods.
- The PPLPF is interested in seeing how polices are made and changed in Kenya? For example, what information is required to change policies?

Urban Harvest

- Urban Harvest's activities currently include the linking of waste management groups, for example links between livestock keepers (manure suppliers) and composting groups which can be income-generating for the livestock keepers and can provide compost groups with better compost
- There is need for support on private waste management, there is no-one to follow up on dumping of waste, people need to be made more responsible for their actions

University of Reading

- In 1999 a study was carried out on the supply of veterinary services to poor livestock keepers. Very few studies appeared to have been carried out on urban livestock keepers. More research has now been done, and researchers need to more away from eg baseline surveys to more adaptive research that needs to be carried out in a holistic way

Summary

In Nairobi there was a situation of denial of urban livestock keeping which is now moving to acceptance

All accept urban livestock production should be viewed in a holistic way

Next steps

The next steps involve:

- Policy issues, which require:
  - Taking action, which requires resources; and
  - Outcomes, which requires understanding the policy process

Nairobi city policy issues

Public health

The Community Based Organisation (CBO) has said there is a difference in what large landowners can do compared to what landless livestock keepers can do, they need to use land that belongs to others

There is conflict between different types of poverty alleviation: in the interest of public health (and poverty alleviation) people should not be allowed to share rooms or live in small areas with their livestock. However by preventing people from doing this you may not be alleviating their poverty.

The Ministry of Agriculture has stated that one of its biggest concerns about urban livestock keeping was public health. However, the discussion group felt that as long as the city council recognises that people keep livestock to alleviate poverty, other organisations (including other ministries) need to provide the appropriate infrastructure eg health and sanitation

Access to land

One solution might be the temporary leasing of land to urban livestock keepers. However, where would this land be leased from? The Department of Environment itself has a shortage of land with nowhere to take the city rubbish. As well as needing access to land, people need permission to use the land for agricultural purposes.

Policy process

- How does city hall make decisions? Do they demand facts or do they wait to be supplied with them?
- Why are city hall and local government not demanding facts?
- Urban livestock keeping is not in the vocabulary of the city government

The planning department said that information on urban agriculture is non-existent. The planning department needs to be shown the contribution of agriculture to livelihoods so that it can feed this into city planning.

- What is the entry point for urban livestock in the planning department?
    - Poverty Reduction Strategy Papers (PRSPs)
    - Need for the planning department to refocus at the micro level.
    - Very few people realise that cities feed people
- The new Bill of Rights in the new constitution will provide people with more rights
- The logic behind the acts needs examining: for example; was livestock keeping banned in order to prevent disease?
- Need new institutional frameworks (rules of the game) need to be set up
- There needs to be an increased awareness of urban livestock keeping
- Government needs to be aware of livestock keeping – why people are doing it (poverty alleviation, forced into it through lack of alternatives); how many people

are doing it; what the trends are; economic contribution of urban livestock keeping to the city

- Planners need to be involved from the start in the policy process so they are aware of the needs of the urban livestock keepers
- Urban livestock keeping is now on the policy agenda (has taken 17 years)
- Issues of space, public health and different stakeholders can now follow

Observations

Other groups eg hawkers have been able to organise themselves together to campaign for better treatment. Why has this group been able to? Is it because they can demonstrate their economic contribution? As urban livestock keeping is illegal, does this make it harder for people to group together as they may not want to admit to keeping livestock?

There is the perception of livestock as a 'nuisance'. In some areas (rural) non-livestock keepers do not consider them a nuisance, as they know they are the source of their cheap milk and manure.

Resource-poor urban livestock keepers face either the short term threat of starvation or the long term threat of Zoonotic disease

Where do we want to be?

If alternatives were provided to poor urban livestock keepers eg more jobs, more opportunities in the rural areas, they might not keep livestock.

Livestock keeper

- Harmony and co-operation between different stakeholders
- Not to be in urban livestock keeping, or else to be doing it in a better place
- Want to own land (not be tenant)
- Want to make a profit and have no public health problems
- Want livestock to be protected
- Do not want animals to have to scavenge
- To carry out livestock keeping in safety with support from City Hall

Environment Department

- To have a healthy population with no dangerous foods or communicable diseases
- Urban reforestation with no conflict from other stakeholders
- Green and appealing environment, good trees, safe water

NGOs and CBOs

- To be more advanced

- To have more members

Central government

- As a service delivery organisation would want a legal framework through which services can be delivered to be monitored by local councils
- Wants more awareness of technologies generated to encourage urban livestock keeping. Wants groups of urban livestock keepers to be more empowered and active
- NGOs and CBOs could strengthen the groups

Local government planning department

- Stakeholders accepting each other
- Special zones for livestock keeping, developed in a more sustainable way
- Cities to be more responsive to the needs of their communities in an integrated and harmonious way

Research

- New forms of governance eg more transparent self-regulation on common property
- Enjoyment of human development
- More agreement
- Reframe production systems in the city; look at the difference between subsistence and commercial
- Do not under-conceptualise livestock production system
- Participatory system of setting policy agenda for the city
- Formal understanding of livestock and crop production on city policy agenda This will mean the city is being responsive; the government cannot just rely on research reports
- Need to look at wellbeing, and the allocation of determinants of wellbeing
- Need to develop more understanding by poverty maps

Urban Harvest

- More research carried out on health and zoonotic diseases
- More research on livelihoods; the contribution of livestock at household level and accessibility of keepers to livestock
- Marco information including marketing
- Positive attitude towards livestock keeping
- Strengthen partnerships between research bodies and Nairobi City Council
- Dissemination of research findings to farmers via dissemination

How do we get there?

Vision

A well-governed, enabling, equitable, participatory, healthy, sustainable, nourishing, secure, people-centred city and environment

Goals and objectives (not ranked)

- Improve wellbeing of poor urban population
- Sustainable and healthy environment
- Better waste management: animal waste and sustainable waste management
- Influence the policy agenda regarding livestock production
- Positive management of livestock
- Make livestock keeping and livestock products safe
- Legitimise livestock keeping and recognise it as a livelihood strategy
- Improve communication between stakeholders as participation in decision-making creates platforms for the exchange of views
- Civic strengthening of urban livestock keepers
- Broader governance moving from conflict to cooperation amongst stakeholders
- Acceptance of each other by stakeholders
- Well-informed livestock practitioners
- Review governance of urban common property resources
- Review formal institutional framework governing livestock marketing and products
- View the city as being a producer of food
- More research on health, wellbeing, role of livestock in the household

Actions, strategies and actors

The actions below are *examples* of those that could come under the strategy. The actor refers to the strategy not the action

Strategy	Action	Actor
Promotional	Create awareness of importance of urban livestock farming of improving food security	Central government Others
Technology	Promotion and development of biogas	Central and local government, NGOs, researchers, multi-sectoral
Institutional frameworks	Review of laws and bye-laws	Central and local government
Conflict resolution	Resolve conflict between livestock and non-livestock keepers and between different stakeholders	All stakeholders including city government
Common property resource strategy	Sustainable waste management	
Collective action		
Knowledge creation (and application?)	Poverty maps Sustainable extension services Dynamic knowledge	
Livestock extension services strategy		

Next steps

- Meet together as national stakeholders on next steps
- Formalise this team so it can share information with others
- Have a few more meetings then present at a wider workshop
- Design the processes for outcomes

Outcomes

- Action plan
- Co-ordination mechanism
- Forum of different stakeholders
- Commitment of stakeholders to work for urban livestock keepers

Urban livestock keeping in Dar es Salaam

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Introduction

The diversity and numbers of livestock in cities in Tanzania have been increasing over years due to their unique ability to utilize empty plots, and rubbish, provide fresh food and generate cash for low income residents. On the other hand, they contribute to pollution and environmental degradation and can be a nuisance to the public at large. The city of Dar es Salaam is estimated to hold just over three million inhabitants. Since 1867 (date of first population record) the city population growth rate has resulted in a doubling of the population every decade, one of the highest in urban sub-Saharan Africa.

Land holdings

About 80 per cent of the respondents (that is, the livestock keepers) in the city are plot owners. Land prices are relatively low and, therefore, affordable. However, tenants can barely afford to keep livestock in urban areas. The scoping study emphasised the importance of land tenure arrangements with regard to urban livestock keeping. Livestock are kept under free range and zero grazing systems.

Importance rural urban linkages

Listed below are examples of rural urban linkages identified in the scoping study:

- Surplus livestock is often transferred to farms in the peri-urban area.
- Fodder is collected from the peri-urban areas and taken to the urban areas
- After harvesting, peri-urban households supplying maize to relatives keeping livestock in urban area, usually free of charge.
- Manure collected from the peri-urban area is used for gardening in the urban areas

Access to medical goods and feed

The study found that 82%of the respondents indicated that they have no problem with the location of these services but they were unable to benefit from them because they are too expensive.

Table 1 Access to medical and food supply

S/N	Degree of accessibility	Per cent (%) (n = 71)
1	Located nearby but cannot afford	82
2	Partly accessible	12
3	Accessible	6
	Total	100

Table 2 Acceptability of keeping livestock by neighbours of livestock keepers

S/N	Degree of acceptability	Per cent (%) (n = 71)
1	Acceptable	55
2	Not acceptable	45
	Total	100

Table 3 Adjustment made by livestock keepers to market strategies

S/N	Adjustment Strategies to markets	Percent (%) N=71
1	No problem (largely keeping goats), so no need to revise strategy	27
2	Selling on credit	16
3	Expanding the number of customers by increasing the distance to reach new markets (customers)	16
4	Reducing the price	15
5	Selling produce to relatively large-scale livestock keepers	12
6	Scaling down production, especially for broilers	6
7	Selling through livestock unions	4
8	Doing nothing	4
	Total	100

Characteristics of livestock keepers

Table 4 Age of livestock keeping respondents

As with Addis Ababa, the majority of livestock keepers were older, over 50 in this case, and again, there were slightly more men than women.

S/N	Age	Percent (%) N=71
1	18-26	5
2	27-34	14
3	35-42	10
4	43-50	21
5	Above 50	51
	Total	100

Table 5 Sex of livestock keeping respondents

S/N	Sex	Percent (%) N=71
1	Male	52
2	Female	48
	Total	100

Table 6 Reasons of keeping livestock

S/N	Reason for keeping livestock	Percent (%) N=71
1	Supplementing household income	39
2	The only economic activity to engage	20
3	As a security against household problems	13
4	To reduce domestic expenditure by consuming part of it (product)	8
5	Commercial and meet some cash requirements	6
6	As agricultural heritage (village lifestyle in the urban)	6
7	Best way of optimising prime land uses	4
8	Readily available meat during special holidays and ceremonies	4
	Total	100

From the citywide case studies and the two specific cases, it is clear that livestock keeping from the poor household's point of view is mainly for income generation and rarely as a hobby.

Table 7 Contribution of livestock keeping to household incomes

Contribution to household income	Percentage (%): N=71
Very Little	6
Little	13
Moderate	78
High	3
Very High	0
Total	100

Table 8 Decision-making on keeping livestock in the city

Decision makers	Percentage (%): N=7
Women	48
Men	19
Household Members	16
Men and women	13
Extension officer	2
Friends and labourers	2
Total	100

It was revealed that in the urban settlement of Mabibo 90% of the people in charge of keeping livestock were reported to be women.

Table 9 Livestock keepers with access to infrastructure.

S/N	Type of service	Percentage (%) N=71
1	Water	63
2	Electricity	66
3	Road	66
4	Telephone	4

Table 10 Sources of Capital

S/N	Source of capital	Percent (%) N=71
1	Accumulation through monthly revenues	58
2	Terminal benefits	17
3	From other economic projects/activities	10
4	Inheriting	7
5	Credit facilities	4
6	Gifts	4
	Total	**100**

Table 11 Labour

S/N	Type of labour	Percent (%), N=71
1	Employing a labourer	56
2	Households labour is enough	44
	Total	100

Problems and constraints facing poor livestock keepers

- Lack of space
- High cost of livestock treatment
- Inadequate forage
- Unreliable market for animal products
- Inadequate knowledge of livestock keepers
- Diseases
- Theft
- Prejudice against certain livestock

Needs for poor livestock keepers

- Medicine and food for their livestock
- Stable markets sell their livestock products
- Basic education on livestock keeping
- Access to credit facilities

Environmental impacts of livestock keeping

- Destruction of trees
- Pollution
- Eroding the river by using marginal lands

Recommended areas for future research

Animal husbandry

- Better husbandry practices identified taking into account the constraints of restricted space, poverty and land ownership
- Look at ways of transferring and adapting lessons learnt from peri urban livestock keeping to urban livestock keeping
- Map the resources flow (technology, manpower and innovations) from urban and peri urban zones
- Analysis of the distribution of benefits accruing from livestock keeping
- Conditions required for instituting credit facilities for the urban poor especially in the peri-urban and urban zone
- Health and safety issues relating to foraging and waste management

- Extent of child labour in urban livestock keeping particularly in animal feeding and foraging

- Improved understanding of the relationship between livestock keeping under poverty and the environment

- Improved efficiency in marketing livestock products with increased focus on the flow of market information

Institutional framework

- Investigate whether existing by-laws condoning or prohibiting certain types of urban agriculture activities are relevant to urban livestock keeping today and in the foreseeable future

- Investigate whether livestock keeping can continue to be carried out in residential areas of very high population density

- Search for ways through which networking among institutions involved in livestock keeping can either be established or enhanced and properly coordinated.

- Investigate the minimum standards required for integrating informal groups in livestock keeping into policy making

Discussions, questions and answers on the presentation

The sale of manure to intensive farmers is a source of income for livestock keepers in Kisumu. However, manure can be a nuisance; Lots of people are not aware of the health problems it causes. How is the sale of manure co-ordinated? By the government or individuals?

Manure is a source of income. A good number of larger farmers who use manure in the urban setting often get it from the peri urban setting. They carry it using their own vehicles to help with their gardening. This is more applicable to the rich than the poor.

The presentation stated that a lot of research has been carried out on minimum standards for urban livestock keeping and creating associations. Have any inroads been made?

In 1991 there was a sustainable agriculture project in Dar es Salaam, resulting in a lot of studies; however the focus was on farming and not specifically on livestock keeping. The following studies have not been co-ordinated which is a loss.

There are currently no minimum standards in Dar es Salaam however there are attempts by urban planners in Dodoma to bring together the planners and other stakeholders to work out standards that could be appropriate for integrating urban farming. Some standards were set up. Part of the implementation was hampered by a lack of infrastructure eg water supplies

What are the health concerns given the space restrictions?

Policies state that people are not meant to keep more than 4 cows on their plot, but the size of the plot is not specified, so it is difficult to implement this byelaw.

Health is seen as a big issue. Dar es Salaam is unique in Tanzania because there is still fairly cheap land available in the peri urban areas. The problem is how much land you need and for what purpose.

People often refer to Dar as a flagship city for urban livestock keeping, so are there any lessons learnt from Dar the other cities can learn from?

Although a lot of work has been carried out in Dar es Salaam regarding urban livestock keeping, the lessons learnt have not been co-ordinated.

Institutional Frameworks, including standards and norms, are often functions of policy, so what policy recommendations are there arising from the research?

The policy recommendations will be subject to further discussion

Peri-urban and urban livestock keeping in East Africa: summary findings from a scoping study

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Objectives and focus

- To understand the roles and functions of livestock kept by the poor in urban and peri-urban settings in East Africa
- To identify gaps in current knowledge and research issues of a reactive and predictive nature
- To identify issues which might be sensitive to policy changes
- To focus on poor livestock keepers and poverty reduction strategies

Methodology

Five cities (Addis Ababa, Dar es Salaam, Kampala, Kisumu and Nairobi) were identified for a case study approach. The studies were carried out by local consultant teams, with the overall study being co-ordinated by Dr Sabine Guendel of the Natural Resources Institute (NRI), UK

Teams were asked to: use purposeful sampling and checklists; hold stakeholder meetings; and review secondary data – all within a short deadline. The terms of reference for the study can be seen in Annex 1.

Why focus on urban livestock keepers?

There are significant increases in the proportion of the poor living in urban areas – it is predicted that up to two thirds of the world's poor will live in cities by 2030. Currently around 30% of Nairobi household members are living below the poverty line. Very many of these keep livestock as a livelihood strategy. Urban livestock keeping has received little attention in research and development in contrast to urban agriculture. Urban livestock keeping is often viewed as undesirable by local authorities, but maybe the question should be asked: **Can urban livestock keeping make a larger contribution to poverty alleviation in cities?**

Who are the urban livestock keepers?

In the five East African cities, livestock keepers tended to be older (30-60 years), more likely to be male, with some basic education. Men generally see livestock as additional income whereas women see it as a source of household food security. Livestock are kept as social safety nets, retirement policies, deposits for funerals, sources of food and income.

The example below shows details of the wealth ranking exercise carried out in Nyaleneda slum, Kisumu.

Table 1 Results of wealth ranking exercise from Nyaleneda slum, Kisumu

Wealth ranking category	Percentage of people within this category	Relevance of livestock to the group or number of livestock generally kept
Rich (Jamoko)	15%	Livestock are not permanent proof of, and do not contribute to, wealth
Middle	25%	Households tend to have 10-40 animals in all, cattle, goats or pigs, poultry
Poor	40%	3-5 cattle or goats, 1-2 pigs and 2-10 chickens
Destitute	20%	A few chickens

To whom is urban livestock keeping particularly relevant

Urban livestock keeping is of particular relevance to very vulnerable groups, such as female-headed households, children, retired people, the sick and widows. People with limited formal education are particularly involved in urban livestock keeping. Urban livestock keeping is of great relevance to those in need of a social security strategy.

What are the benefits of urban livestock keeping?

- Provision of a social safety net
- Bank accounts for the poor – livestock can be used to facilitate credit services
- Sale of/access to, animal protein
- Utilisation of local resources
- Provision of transport/haulage services
- Livestock are flexible in terms of land use

Potential research contribution

- Understand scope and dimension of the waste management problem and provide improved low-cost technologies
- Quantify current and future water delivery mechanisms and demand for urban livestock keeping and identify mechanisms for improved management
- Assess potential and existing health risks for people and livestock

The case studies were carried out by the following people:

Nairobi – Ishani, Gathuru and Lamba, Mazingira Institute

Kisumu – Onim, Lagrotech Consultants

Kampala – Ossiya, Ishagi, Aliguma and Aisu, Ibaren Konsultants

Addis Ababa – Tegegne, Sileshi, Tadesse, Alemayehu and Woltedji, ILRI

Dar es Salaam – Lupala, UCLAS Consultancy Unit

Discussions, questions and answers on the presentation

Poverty, peri urban and urban livestock keeping

In defining 'poverty', 'peri urban' and 'urban' areas, each study team came up with different interpretations. It would be useful if a common definition could be used.

It was agreed that a common definition would be useful, however given the time constraints of the workshop it was felt advisable to use the definitions applicable to each case study report.

If we are to encourage livestock farming are we concentrating on the urban poor or are we also interested in the rich?

It is good to target the poor, but it would also be useful to look at livestock keeping within the more affluent areas for lesson learning.

Waste management

The benefits of biogas should be an area for further research

A lot of work has been carried out on biogas systems in East Africa. For instance, scientists in Uganda have been working on it for at least 15 years. Very advanced biogas units have been developed so technically there is no reason why they cannot be used. The main constraint will probably be cost as they have been designed for use by rural farmers with 'large' numbers of animals. They could be targeted for community use in urban areas.

The management of urban waste presents an opportunity for urban livestock keepers. There is a high proportion of organic matter in animal and household waste that could be disaggregated into soil supplements that would make it of great benefit for both composting and manure. Urban Harvest is currently carrying out research on this in Nairobi.

Technical issues and areas for further research

In Kampala people use indigenous knowledge of local herbs for animal husbandry/health; however not enough is known about the correct ratios to use, so further research should be carried out.

This is an important issue. A wealth of knowledge exists on plant materials for controlling worm burdens, including research commissioned under the LPP sheep and goat cluster[1]. A lot of indigenous knowledge has been forgotten because many people who followed those practices have since died or else out of favour by 'modern thinkers'.

A lot of livestock keepers are using concentrates or fodder from rural areas, so what environmental impact does it have?

In India there are strong urban rural links. For example, on a daily basis forage is brought in to urban centres from rural areas, and dung is taken back to rural areas. This is a system that East African cities should look at.

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[1] For more information please contact the Programme Manager, Livestock Production Programme, NR International, Park House, Bradbourne Lane, Aylesford, Kent, UK, lpp@nrint.co.uk

The production of milk is low compared to the population but there is also a shortage of milk due to marketing and handling.

Maybe the most important issue at the moment is the quality assurance side eg milk. Blood / milk contamination exists so milk contaminants need to be looked at.

> In East Africa people boil milk, which makes it a lot safer to drink. The International Livestock Research Institute (ILRI) carried out a study looking at the formal and informal milk sectors in Kenya. Milk supplied by hawkers (informal sector) has a higher bacterial level, but can get rid of that by boiling, whereas milk produced in the formal sector has higher levels of antibiotics that cannot be removed.

I want to emphasise the need for good breeding practices in cities. There is currently random breeding leading to inbreeding which needs to stop. This is an area for further research

Education

This forum should address the issue of education. In Uganda agriculture has been made an examinable subject for primary schools.

> I am delighted to hear that agriculture is now on the school syllabus for primary schools. There has been great frustration in the livestock research sector that schools have not taught animal husbandry, appropriate or otherwise. At the university level, the DFID Livestock Production Programme (LPP) is commissioning a new textbook on appropriate animal husbandry for smallscale livestock keepers in developing countries.
>
> *Waste management should be included in primary education. It would be important to also include it in secondary and tertiary levels. There are several groups in Nairobi already carrying out composting. In order for it to be of good quality it needs to be improved. There is a mixed range of education in the composting groups but still have limited knowledge on good compost.*

Policy

Where are the policy recommendations arising from the study?

> One of the policy actions is meeting today. It is only through influencing and providing knowledge.

There is concern as to where urban agriculture sits in the statutory framework of countries. For example in Kenya, who should be the main target person? We need to think about the desired lobbying and advocacy strategy in order to influence policy and urban planning.

> The Aba Liden Dairy Co-operative in Addis Ababa fought for 3 years to get their legal certificate. It took 40 years to get land for their cooperative. From a practical point of view, policy recommendations are not enough. We have to fight the policy makers convincingly to give every opportunity for livestock keeping in urban areas.

One of the research areas should be linkage between urban systems and urban livestock. Unless we know the linkages to eg the economy we cannot provide sufficient policy recommendations.

Most of the cities have problems with regulations, existing laws not being maintained etc, so maybe a small group could put together guidelines on what should be included in their policies

> The Kenya Poverty Reduction Strategy Paper (PRSP) has a very clear focus on food security in the urban centres. It is important to look at livestock and fisheries etc as a contributor to urban food security

The issue of livestock farming is being accepted slowly by policy makers, but we need to look at how waste management is incorporated into institutional frameworks.

Extension services

In some cities extension services are felt to be inadequate. It is not just a question of extension but also of technologies. The whole issue has been about enterprise because livestock farming needs to be commercialised. Issue of security as far as extension services in the city might be under estimated.

We should sharpen our thinking in two areas: identify an information package for urban farmers and an information package for urban communities

An LPP-funded project (reference R8110), led by Claire Heffernan of the University of Reading, is working on providing information packs for urban farmers. The project focuses on Kenya, Bolivia and India.[2]

[2] For more information please contact Dr Claire Heffernan, Department of Agriculture, University of Reading, RG6 6AL, UK, c.l.Heffernan@reading.aco.uk

Urban livestock keepers in Brazzaville, Republic of Congo: Results of the surveys of 2001-2002

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Introduction

Brazzaville is the capital of Congo and is on the right bank of the Congo stream. There are approximately one million inhabitants and 100,000 households. The city consists of 7 districts. The city has an equatorial humid climate.

This study is part of a larger one which includes a study on Wagadougo. The findings of the study on Brazzaville only are presented here. The study was put together to help the Belgian Agency put together a better strategy on urban agriculture in the Congo. The population of Congo as a whole has been more involved in crops and less in livestock; people tend to work more with smallstock rather than cattle.

The study used a sample of 2,800 people. A cross-sectional study of the city took place rather than case studies. The sample was split into 4 groups: those not practising agriculture, crop only farmers; livestock only farmers; and crop livestock farmers.

Table 1 The number of livestock keepers

	No agricultural activities	Agricultural (crops)	Livestock	Both	Total
n	1,852	660	92	153	**2,757**
%	*67.2*	*24.0*	*3.3*	*5.6*	*100*

The table shows that 9% of the households keep livestock, 63% combine crops and livestock, but 67% of households do not carry out either type of urban farming

Effects of civil war on urban livestock keeping

Brazzaville has experienced several civil wars. The study investigates the effect of these.

A small ruminant keeper survey was carried out in 1993. This study tried to follow up the participants of the earlier study, and found the following results:

- Only 90 (36%) could be identified, the rest having died, moved or assumed missing
- 68% no longer possess livestock
- 28% possess livestock only, 3.3% practise mixed farming
- 45% of the livestock keepers shifted from larger stock to poultry

Civil war has led to a dramatic decrease in the number people keeping livestock, particularly larger stock, and the increased role that urban poultry keeping will have to play in the reconstruction process.

Table 2 Current figures of livestock kept in Brazzaville

Breed	%
Birds	77.9
Rabbits	8.6
Guinea pigs	3.7
Pigs	8.6
Small ruminants	1.2

Is livestock a survival strategy for poor dwellers?

The table below illustrates the living standards of people in Brazzaville and is broken down by agriculturalist (crop farmer), livestock keeper and non-urban farmer.

Table 3 Various resources available to different types of inhabitants in Brazzaville

Group	**Durable house (%)**	**Water available (%)**	**Electricity available (%)**	**monthly income (USD)**
Agriculturists	81.5	59.8	33.7	137
Livestock keepers	80.6	57.9	39.0	157
No producers	91.0	77.8	54.0	190

Urban farmers (whether focusing on crops or livestock) tend to have lower living standards (using the indicators in the table). Livestock keepers have slightly better access to electricity and higher monthly income than the agriculturalists.

Livestock was considered as important by all urban dwellers in terms of a survival strategy. The main motivation for keeping livestock is income generation (52%) followed by food (33%), tradition, tending to be bride price rather than sacrifice (10%) and savings for retirement (5%). In 1993, the average of livestock keepers was 54 years old.

Livestock tends to be kept by people who had experience of livestock keeping before the war (pre 1997). The use and sale of manure tends to be carried out by those livestock keepers with more experience, and those located in districts with important plant production.

Constraints

The cost of fodder is expensive as the feed mills were destroyed during the civil war, meaning that commercial feed has to be imported from Kinshasa and Cameroon, thus increasing the price.

Table 4 The main constraints to livestock keeping identified by the livestock keepers

Main constraints	%
Feed (cost and availability of fodder)	42.7
Thefts	18.5
Lack of financial resources	14.6
Animal diseases and drug availability	12.7

Conclusions

The studies on Brazzaville and Wagadougo concluded that there is a real urban and peri urban continuum; ie what is now peri urban will become urban. Urban livestock production has to be considered in a rural/peri-urban/urban continuum. Urban livestock systems have many interactions, as illustrated by the diagram on the next page. There are various flows of animal products and by-products, for example produce flowing from the rural areas to urban markets.

The increase in fast food is affecting the meat market. Increased urbanisation means space availability for urban orchards and forestry is decreasing so there is greater competition for resources.

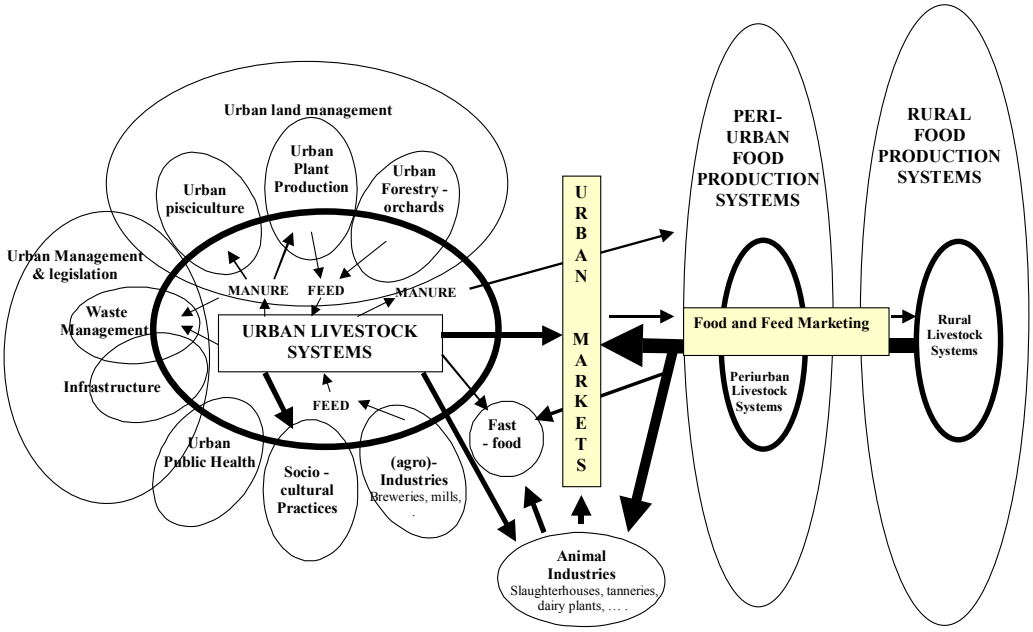

Figure 1 Diagram showing the many interactions of urban livestock systems

Discussions, questions and answers on the presentation

That study was carried out on a much larger scale (both in time and funding) than the East African ones. It illustrates the dynamic nature of agriculture and the importance of studying crop livestock systems, as well as just livestock systems.

Are urban farmers taxed on land ownership or livestock ownership or both? This could have implications for the types of urban farming carried out, as is the case in Addis Ababa.

Livestock are recognised as being important in Ethiopia which is probably why there are taxes relating to them. In the Congo their importance is not recognised and so there is no tax on their ownership.

Land tenure can be a problem particularly regarding livestock keeping, but if you have property you can keep livestock inside the compound so people try to get as large a compound as possible.

There are currently no bye-laws on livestock keeping in Brazzaville.

The model is very useful for giving an overview of the production systems. It was surprising that that animal diseases and drug availability ranked lower than the other factors, so is this a good reflection on the animal health delivery system in Brazzaville? With the emphasis on poultry keeping, it would be expected to see Newcastle disease identified as a problem, so how do the farmers cope?

Lack of feed is ranked as the major constraint because it is so difficult to get access to good feed. Therefore it becomes an even higher priority than drug availability and animal health, rather than drug availability and animal health not being particular problems.

As there are such low levels of livestock ownership in Brazzaville, how representative and useful is the framework?

The framework was derived from a number of studies. Brazzaville has low livestock ownership but that is a result of the war. We have no figures on the period before the war on numbers of livestock or livestock keeping practices, so that is why such a large sample size was used in the study. At the time of civil war, the population of the city had to flee, leaving behind their animals even their poultry. When they came back they found the army had killed all the livestock, thus destroying the urban livestock production system, which now needs to be increased.

Suggestion for lobbying policy makers in Kenya

I want to commend the presenter for his presentation and model. If I was to put the case for Kenya, I think those carrying out the research have a lot of lobbying to do with the government because we are more concerned with crop production than livestock.

If the researchers could use this model to sell urban livestock keeping to the policy makers they could be more successful. Urban livestock keeping needs to be viewed more holistically, ie as a waste management issue as well as a food production one.

Study visits

The topic of study visits was discussed by the workshop.

The cities represented at the workshop had different features that could be of interest to others, for example: Addis Ababa could teach others about its policy interventions; Kampala and Entebbe could show the effect of the decentralisation process on non-Kampala urban areas ie Entebbe; Dar es Salaam could show the benefits of the Dairy Development project.

After discussion, it was suggested that a desirable study visit would be a mulit-stakeholder one consisting of 7 stakeholders. The visit would therefore need to include elements of interest to all 7 viewpoints. An exchange visit between two cities should capture the broad range of interest. This means that the organisation of the visit becomes more complicated. The visit should be seen as both a learning and disseminating experience.

If visits were limited to around 7 people, it was suggested that national workshops could be organised as a follow-on activity, so that the lessons learned on the visit could be shared with a wider audience. Groups should take the opportunity to learn from failures as well as successes. Prior to the study team going on their visit, they should be sensitised to the area they are visiting, so as to maximise learning potential once they are there. The study team could take a video camera with them to film their observations.

It was suggested that study visits could focus on the difference in innovations between the cities for example, policies in Addis Ababa as opposed to those in Kampala. One representative of each city group should be responsible for arranging study visits.

Their model is as follows: exchange visits are reported back to national workshops and training sessions. The visits include an action research component with the communities being visited. This means that the study visits have an important role in capacity building.

Summary and next steps

Representatives of the supporting organisations gave their views on the next steps for the issue of urban livestock keeping.

Department for International Development (DFID) Livestock Production Programme (LPP)

The purpose of the meeting was to bring together the different stakeholders potentially involved in urban livestock issues. This seemed to work, but what is not so clear is what can be done at the regional level. The Livestock Production Programme (LPP) would like to become more involved as independent arbitrators in the city meetings. If someone in for example, a ministry is identified as someone to convene the workshop, then vested interests might be perceived by others, therefore there may be a need for independent arbitrators. We could fund an independent person to be involved in these meetings.

Regarding regional activities, the ball is very much back into the courts of the cities. Regional activities become more political and are maybe for Urban Harvest rather than the LPP to promote. City groups should now develop documentation on who to lever in their countries to direct the products of this meeting. Maybe the PPLPF regional office could comment on the regional initiative. Issues identified within each city eg byelaws and researchable issues to be addressed. We would like to source support from other donors for urban livestock keeping, this is a new phenomenon for donors. DFID has offices in each city represented here and they should support city activities; the LPP supports generic activities. In some countries, DFID provides direct budgetary support to government, and therefore the DFID in-country office is unable to provide financial support to local initiatives. In these cases however, the DFID national office has a monitoring role and should be approached to liaise with the government.

FAO Pro Poor Livestock Policy Facility (PPLPF)

The PPLPF is looking to set up a regional facility in Nairobi that will cater for the East African region. We would be specifically interested in recommendation on how policies etc need to be changed to cater for urban livestock farming. Originally the PPLPF was not going to look at urban agriculture, but following this workshop it is likely that it will now be included.

Urban Harvest

The LPP and FAO have clarified some opportunities. Urban Harvest can be a contact between the cities and donors. Donor co-ordination is very key which is where Urban Harvest can help. The cities have a lot of power and the donors want to hear what the cities plan to do.

RUAF

Most of us are not actually donors but are programmes with a specific mandate. What can RUAF do? First by linking up with cities with similar experiences eg idea of city forum also came up in Latin America. City network has been established with key issues identified then small working group set up for each issue. In other parts of Africa and Latin America they have developed policy briefs – you shouldn't copy these because they are specific to each city, but it gives you an impression of the type of documents produced. Issue of norms and regulations – partners in the RUAF programme have agreed to start sharing norms, regulations and bye-laws. Electronic conference could be set up to look at bye-laws etc and other issues and explore them with others. Study visit has already been discussed. Very concrete possibility is using what you've already done to put in an issue of the RUAF magazine. So, we can help in

capacity building, regional development, could get support for organising own process in your city.

The person in charge in the Ministry in Holland suggested cities contact Dutch embassies in their countries, so need to be aware of urban agriculture. RUAF can then put pressure on the government to put pressure on the embassies. RUAF will send copies of the magazine issue on this workshop to the embassies to sensitise them.

Next steps

The cities should establish contact individuals (focal points) to take the whole issue forward to identify own priorities and cross-cutting issues, support from local government etc then link up with regional institutions and donor communities on regional issues.

It was suggested that the donors and supporting organisations should form a support group consortium and invite others to join. However it was emphasised that the city groups should not wait to hear from the donors before planning their next steps.

It was felt that on a regional level, the minimum requirement was a cities forum on urban agriculture and livestock keeping. The forum should be informal and open, but should include key representatives from each city. There would then be a relationship between the cities form and donor consortium.

Each city stakeholder group to nominate a person to be a representative member of the core group, whilst cities constitute the forum. The person nominated is responsible to the city stakeholder group.

People identified were: Addis Ababa, Diribu Jemal Kampala, Margaret Azuba, Urban Harvest representative; Kisumu, Moses Onim and Esborne Baraza, Lagrotech Consultants; Nairobi, Davinder Lamba, Mazingira Institute.

The cities could approach respective national DFID offices or FAO for regional issues. It would be good to have a template for city approaches. It would be good to create a standard proposal for each city. The standard proposal could be generated by the city focal points.

Conclusions

The workshop brought together a wide range of stakeholders with different experiences in urban livestock keeping: some had been working in the urban agriculture field for a long while; some were familiar with the theory behind urban livestock keeping but had not actually seen it in practice; and some were very familiar with the every day reality of urban livestock keeping, but were not aware that there were organisations with interest in it.

Although the scoping studies had followed generic guidelines, the differing natures of the cities meant that different issues were studied: for example, the Kampala study has a focus on HIV/AIDS and the Dar es Salaam study looks at the issue of land tenure in greater detail. It is important to remember that the East Africa studies are *scoping* studies carried out under a short period of time.

The table below summaries the statements put together by the working groups.

City	Statements
Addis Ababa	**Vision** Better quality of lives for all **Mission** Sustainable and systematic research and development on urban agriculture **Goal** To improve the wellbeing of people through efficient, sustainable affordable, equitable and environmentally friendly urban livestock production systems
Kampala	**Vision** Healthy people, healthy livestock, and a healthy environment in the urban and peri-urban areas of Uganda. **Mission** Ensuring a systematic sustainable urban livestock production system for a better nutrition, health and income of the urban and peri-urban people. **Goals** Three goals based on stakeholder interests were identified as follows: 1. Appropriate policy framework in place 2. Establish responsive support and service systems 3. Implement research and production system priorities
Kisumu	**Overall Vision** Improved well-being and welfare in urban and peri-urban areas through socially-acceptable and environmentally sustainable urban agriculture. **Goals** Improved livelihoods of the urban poor through promotion of pro-poor environmentally favourable livestock production systems
Nairobi	**Vision** A well-governed, enabling, equitable, participatory, healthy, sustainable, nourishing, secure, people-centred city and environment

Stakeholders from Nairobi and Kisumu, the city focal points of those cities plus those of Addis Ababa and Kampala, a representative from Dar es Salaam and members of the

supporting group will meet together at the end of September 2003 to discuss the next steps with regard to the regional forum on urban agriculture and livestock keeping.

This report will be circulated widely to those working in the field of urban livestock keeping, and urban agriculture.

Details of the organisations represented at the workshop, plus a limited number of other like-minded-groups (LMGs) can be found in Annex 3. The websites of Urban Harvest (www.cipotato.org/siupa/urban_harvest_home_page.htm) and RUAF (www.ruaf.org) details of additional LMGs.

Urban livestock keeping is on the increase and cannot be ignored. We must work together to maximise its strengths and opportunities, minimise its constraints and weaknesses and thereby provide a better quality of life for all.

Annex 1

Generic terms of reference: Scoping study of urban and peri-urban livestock keepers

In general:

To compile information on issues facing poor livestock keepers living in urban and peri-urban environments in East Africa

Specifically:

1. In Dar es Salaam, Nairobi, Kisumu, Kampala and Addis Ababa, identify and source appropriate information from official and grey literature; and undertake a limited survey of representative communities in each of these cities.

2. Compile information under the following sub headings:

- Institutions (public, private and civil) which represent the needs of (speak for) poor livestock keepers in these environments
- Numbers and characteristics of livestock keepers in these cities: age and sex of the keepers; reasons for keeping livestock; linkages with relatives/friends in the P/U and rural environments.
- Number and species of livestock; constraints to livestock keeping – feeding, shelter, disease, governance, access to clean water etc;
- Knowledge deficiencies and research opportunities of both reactive and predictive nature
- Policy issues associated with livestock keeping in urban and peri-urban areas. Is there legislation re-keeping of animals?
- What are the existing / potential public health, environmental and animal welfare issues?

Annex 2

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Annex 3

Like-minded groups

Organisations involved in the scoping study and like-minded groups

Organisation name and description	URL
Cities Feeding People Program	www.cityfarmer.org
Commission of the European Communities, Technical Centre for Agriculture and Rural Co-operation (CTA)	www.agricta.org
Department for International Development (DFID)	www.dfid.gov.uk
Food and Agriculture Organization of the United Nations (FAO)	www.fao.org
International Development Research Centre (IDRC)	www.idrc.ca
International Livestock Research Institute (ILRI)	www.ilri.org
Livestock Production Programme	www.lpp.uk.com
Mazingira Institute	www.mazinst.org
Natural Resources Institute (NRI)	www.nri.org
Natural Resources International Ltd	www.nrinternational.co.uk
Prince Leopald Institute of Tropical Medicine, Belgium	www.itg.be
Resource Centre on Urban Agriculture and Forestry (RUAF)	www.ruaf.org
Support Group on Urban Agriculture	www.ruaf.org/sgua.html
University College of Lands and Architectural Studies (UCLAS)	www.uib.no/udsm/udsm/uclas/
Urban Harvest	www.cipotato.org/siupa/urban_harvest_home_page.htm

Urban livestock keeping… a coping strategy by poor people with no other alternative? A much needed food supply for a growing urban population? A threat to public health?

However you view it, it is here to stay

This workshop on urban livestock keeping in sub-Saharan Africa (predominantly East Africa) brought together stakeholders from Kenya, Uganda, Tanzania, Ethiopia, the Netherlands, Belgium, Italy and the UK.

The workshop debated the many opportunities and constraints posed by urban livestock keeping, as identified in scoping studies carried out in Addis Ababa, Brazzaville, Dar es Salaam, Kampala, Kisumu and Nairobi and led to the creation of city focal points and a regional forum on urban livestock keeping.

nr international

www.nrinternational.co.uk

LIVESTOCK KEEPING IN URBAN AREAS

A REVIEW OF TRADITIONAL TECHNOLOGIES

An FAO report
based on
field experiences and literature

December, 2000
Hans Schiere & Rein van der Hoek

With contributions from
Alessandro Finzi, B.M.A. Oswin Perera, Cheryl Lans, Hannie Koch, Harm de Vries, Jaap de Winter, Katrien van t Hooft, Max Laplanche, Peter Fellows and Roel Bosma

Picture of frontpage : the keeping of cattle in Bangalore, a form of animal production that is both part and parcel of local life and culture. Cattle are providing milk products and income, at the same time they can be seen as a threat to public health.

LIVESTOCK KEEPING IN URBAN AREAS

A REVIEW OF TRADITIONAL TECHNOLOGIES

TEST VERSION —LIMITED CIRCULATION

An FAO report
based on
field experiences and literature

December, 2000

Hans Schiere and Rein van der Hoek

with contributions by
Alessandro Finzi, B.M.A. Oswin Perera, Cheryl Lans, Hannie Koch, Harm de Vries, Jaap de Winter, Katrien van t Hooft, Max Laplanche, Peter Fellows and Roel Bosma

La Ventana Agricultural Systems A&D
jb.schiere@binele.nl

"the Food and Agricultural Organisation of the United Nations was founded in Quebec on October 16th, 1945 as an agency for International Action to fight poverty, malnutrition and hunger"

(plaque on the wall of a room at FAO headquarters)

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FOREWORD

Livestock plays an important but variable role in human society, in rural and urban societies. Animals use products that are left over by man, kitchen wastes, hotel leftovers, grass from roadside and empty plots, residues from agroindustry etc. crop residues. The animal gives multiple products in return, such as meat, eggs, milk, income, fibres, etc., it provides emotional attachment, it plays a role in social stability and it affects public health both positively and negatively. Still, traditional systems of animal keeping are not static. They adapt to changing circumstances like increased population pressure, use of fertilisers, changing consumption patterns, new regulations etc. Livestock keepers, governments and (inter)national agencies have each different roles in this change, among others by keeping track of developing technologies and management practices that might be useful for development. The farmers expertise lies in the fact that they know their own conditions best while the expertise of the (inter)national agencies lies in their access to information from different areas elsewhere in the world. The exchange of experiences between livestock keepers, consumers of animal produce and institutions at (inter)-national level is necessary. It helps to generate and apply appropriate technologies and management techniques that serve to keep farmers in business. And to complicate matters one should keep in mind that a technology accepted and used in one place is not always adapted or suitable in another place or under changing circumstances.

The FAO is an international agency that has unique access to experiences regarding agricultural change across the world. Together with the Japanese government it decided to compile experiences from different places in the world, categorised per farming system. That will make it easier for interested people to select ideas for their own circumstances. This publication presents a sample of such technologies, specifically meant for livestock keeping in urban areas. It is accompanied by another publication on traditional technologies for livestock in mixed farming systems. The combination of these two volumes should give a broad overview of technologies to be chosen from in different conditions.

This publication describes the livestock production system in traditional sectors and it identifies constrains to livestock production. It also provides suggestions for improved production in the livestock sector. No book can precisely tell what should be done in local conditions, but we hope that this publications serve to give an idea of choices and options in development. A literature list is added for further reference. We hope to get comments and suggestions from the readers because that will help us to continuously upgrade our materials.

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Animal Production and Health Division
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Solid Waste Management and Urban Agriculture

Urban Harvest
International Water Management Institute

Compost Demand
Who is interested?
Experience & perceptions?
Compost product requirements?
Ability & willingness-to-pay?
Cultural constraints to compost use?
Likely demand & seasonal variations?

Nutrient Recycling Loop

Waste Supply
What organic waste is produced?
Where produced/disposed?
Waste treatment?
Quality (soil fertility value)?
Seasonal variations in availability?
Waste ownership?
Current use & competing uses?
Market demand & economic value?
Health & safety constraints?

Legal, Institutional & Communal Settings

Official plans, regulations, by-laws & policy constraints or support?
Land availability constraints for compost stations?
Official attitudes & recommendations at all levels?
Involvement of local key groups & stakeholders?
Local stakeholder commitments, inputs & costs?
Management settings & instruments (M & E)?
Inter/intra-sectoral cooperations?

Food Security & Environmental Protection

Urban and peri-urban agriculture offers the potential for a classic win-win situation in which one of the major urban management problems, i/e waste disposal, can be tackled at the same time as increasing food security through exploitation of the nutrient potential of the 'wastes' (Drechsel and Kunze, 2001).

Composting Scales

Centralized

Decentralized

Backyard

intervention

Preferred

Composting
Most appropriate methods?
Appropriate technologies?
Production capacity?
Transportation costs?
Public perceptions?
Running costs?
Sustainable?
Subsidies?

References
Drechsel, P. and Kunze, D. (Eds.) (2001) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa.* IWMI, FAO and CABI Publishing, UK.
Drechsel, P. (Ed.) *Closing the rural-urban nutrient cycle. Options for municipal waste composting in Ghana. Final Report on IDRC project 100376.* IWMI, West Africa Office, Accra, Ghana.

Poster produced by Abdullah Adam-Bradford, February 2004, Centre for Developing Areas Research, Royal Holloway, University of London (contact: abdullahbradford@hotmail.com).
Acknowledgments: Pay Drechsel, Nancy Karanja and Mary Njenga for poster contents and layout. Jenny Kynaston for software assistance.

Efficient and Safe irrigation of urban vegetables through the use of groundwater

Location: Accra and Kumasi

Acolor **Esther**- Urban Extension Officer

Opare **Emmanuel**-Urban Farmer

Danso **George**- IWMI

National Farmers Awards Day in Ghana (yearly)

Urban Agriculture in Accra ????

What is the Problem?

Confirmed Project Partners

Council for Scientific and Industrial Research(CSIR)

- **International Water Management Institute(IWMI)**
- **Water Research Institute(WRI)**
- **Ministry of Food and Agricultural(MoFA)**
- **Kwame Nkrumah University of Science and Technology(KNUST)**
- **Enterprise Woks(EP-NGOs)**
- **Municipal Departments-Health**
- **Farmers and consumers Association**
- **MEDIA and AKUAT**

Objective:

Reduce health risks and enhancing livelihoods of farmers and consumers of vegetables through safer groundwater in urban farming

Sub-objective:

- To evaluate the availability of safer groundwater and how to provide it to the farmers
- To monitor farmers' reaction and acceptability of groundwater use
- To evaluate perceptions, costs, risks and benefits of groundwater use in comparison with other water sources for irrigation

Activities and methodology

1. To explore the availability of safer groundwater and to provide it to the farmers

- Groundwater resource evaluation, Well drilling by WRI,EP, Universities
- Technical feasibility and observatory studies
- Opportunities and Constraints associated with Groundwater use in the cities
- Focus group discussion with farmers with gender consideration
- A study tour with selected farmers(male/female) to UPA areas in Lome
- Strengthened farmers Association and Urban extension services

2. To monitor farmers' reaction and acceptability of groundwater use

- Water sampling and analysis
- Crop quality sampling and analysis
- Participatory on-farm water management methods
- Groundwater with treadle pump, motor pump or bucket system and watering .
- Individual and focus group discussion using matrix ranking to assess acceptability
- Farmers with and without access to groundwater will be compared

3. **To evaluate perception, costs, risks and benefits of groundwater use in comparison with other water sources for irrigation**

- Perception, economic, health and social impacts, analysis will be carried out:
  - ❖ Groundwater with treadle pump, motor pump, hand pump, bucket and watering cans
  - ❖ Wastewater with watering or other lifting devices
  - ❖ Gross margins, cost/benefits, valuations(WTP/ATP)
  - ❖ SWOT

  Multi-stakeholder workshop

Expected Outputs

- Study sites identified,
- GW resources evaluated
- Farmers exposed to better alternative water sources, lifting and distribution devices
- Water lifting and application devices installed
- Decision support on health risks reduction options
- System monitoring (farmers' perception, maintenance, financial gains)
- Workshop report, publication and Fact sheet

Beneficiaries and impacts

- The consumer will benefit from safer vegetables
- Policy revision and formulation alternative to banning urban agriculture
- Urban agriculture and its stakeholders reputation and improve livelihoods(mostly women)
- The participating institutions benefit from collaboration in applied research with immediate result to the public.
- Overall risk reduction strategies and recognition of UA

Dissemination strategies

- Extension division of MoFA,
- Stakeholders forums in the cities
- Farmers, market women, consumers association and networks
- Media, Press, NGOS
- Publications and Website linkages-**AGAUAN**

Monitoring and evaluation plan

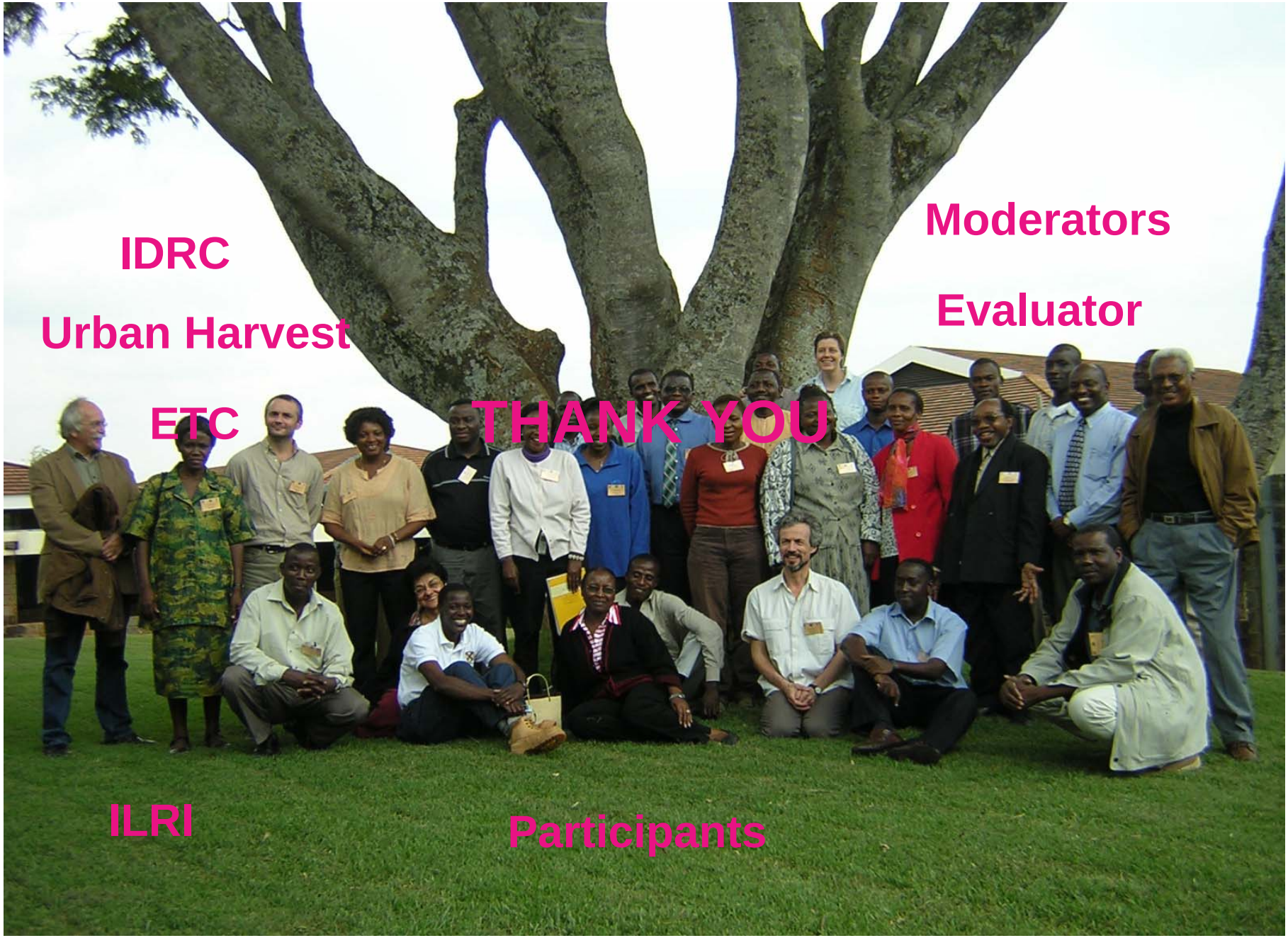
- **Project results and impacts will be monitored at various levels:**
- a) Lessons learned and impacts produced (positive or negative, planned or not), which can be attributed to this project and its chosen methodology
- b) Changes in attitudes and behaviour of various project partners (Outcome Mapping)
- C). Contribution of the project to the Millennium Development Goals

Budget- 2 years(2003-2005)

Total Budget: **USD 63,000**

Matching funds: **USD 50,000**

- **Request Funds**: USD 13,000


IDRC
Urban Harvest
ETC
THANK YOU
Moderators
Evaluator
ILRI
Participants

Submission to the Anglophone Africa Training Course on UA

Title: Efficient and safe irrigation of urban vegetables through the use of groundwater

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Location of the project: Accra and Kumasi

Total time period: 2 years

Total Budget: USD 63,000
Matching Funds: USD, 50,000
Request Funds: USD 13,000

Project partners: Council for Scientific and Industrial Research (CSIR), Policy Research Instutite, Ministry of Food and Agriculture (MoFA), Water Research Institute (WRI), Enterprise Works (EP Works), IWMI, Students from Kwame Nkrumah University of Science and Technology (KNUST), Farmer Associations, Consumers Association, Metropolitan Health Departments, Media

Key words: wastewater, groundwater, vegetables, stakeholders, health risks, productivity, livelihoods,

1. Background and Justification

In 1996, UNDP estimated that about 800 million people are engaged in urban and peri-urban agriculture (UPA) worldwide and contribute about 30% to the world's food supply. This is increasingly becoming a common expression of most urban areas in developing countries and is seen as important means of attaining balanced diets and urban food security.

In several African cities, between 50 and 90% of vegetables consumed are produced within or close to the city (Cofie *et al*., 2003; Moustier, 2001; Nugent, 2000). The proximity of UPA to consumers ensures freshness of the vegetables and likeliness to have higher nutrient contents than those stored and transported for long periods. This is especially important in Sub-Saharan Africa where refrigerated transportation and cool storage are scarce. UPA also offers jobs for the poor, often especially women, and is an effective way to overcome poverty (Cofie et al*.* 2003). Studies of KNUST and IWMI have also showed that dry-season irrigation of vegetables especially, could allow farmers to go over the poverty line (Danso *et al.,* 2003).

In many African countries, 65% of the people involved in UPA as farmers or traders are women (WFS 1996). In Ghana, UPA is a common phenomenon and is mainly characterized by backyard farming, commercial poultry keeping and small-scale open-space irrigated vegetable farming. In West Africa, gender issues differ from one farming system to another. In Ghana, open-space irrigated vegetable farming is mainly carried out by men, while marketing of the produce is predominantly a women domain (Danso and Drechsel, 2003). UPA has significant contributions to livelihoods and food security; for example, more than 12,000 farmers are involved in dry-season vegetable farming in and around Kumasi (Cornish *et al.,* 2001) and urban farmers grow up to 90% of the main vegetables eaten in the city (Danso *et al*., 2003). Vegetable farming is done on virtually every open space more close to water sources in almost all major cities and urban centers in the country.

However, most vegetables produced are contaminated with pathogens through the use of highly polluted irrigation water, and rampant application of poultry manure and pesticides. Previous analysis from sampled vegetables shows high levels of faecal contamination in lettuce and cabbage leaves ranging from 1×10^7 to 1×10^9 faecal coliforms per gram, which is comparable to levels in raw faeces (Keraita *et al*., 2002; Mensah *et al.*, 2001;and Armar-Klemesu *et al.*, 2000). According to Cornish *et al.*, (1999), though there is some

post-harvest contamination, most of it occurs on farms partly through poultry manure application but more significantly through the use of polluted water or wastewater.

Wastewater use in UPA is not a new phenomenon. In the informal settlements of Kibera, Nairobi, 35 farmers (25 men and 10 women), have been using wastewater for crop production for over 20 years now and it has been the source of their livelihood. These farmers also provide partial treatment of the wastewater before it enters the nearby stream (Field Survey, 2004). With increasing scarcity of high quality water, wastewater use in UPA will not only lessen the pressure on water resources but will also increase water productivity through its reuse of water and make use of nutrients, which may be otherwise a nuisance to the environment.

Farmers in Kenya and Ghana do not perceive health risks usually associated with the use of untreated wastewater for crop production. Nevertheless, some outbreaks of diseases like typhoid in Santiago, Chile and helminth infections in Egypt and Jerusalem that have been associated with crop contamination from wastewater irrigation. Significant ascaris and hookworm infections have also been reported in sewage farmers in India (Blumenthal *et al*., 2000). Health concerns are mostly related to crop contamination with pathogens from faecal matter while heavy metal levels are in tolerable limits due to the low industrialization of Ghana's inland cities where most UPA takes place.

Municipal authorities and government ministries often raise concern regarding the potential health risks from wastewater irrigation in UPA to consumers, sellers and farmers without considering the added benefits such as income generation, employment creation and secured livelihoods. To safeguard both, public health and farmers' livelihoods' there is the need to explore all possible strategies that can help in reducing public health risks. Such a project is currently underway by IWMI and partners. This proposed project will contribute to the broader one by exploring the provising of safer groundwater as alternative to polluted water. This is an initative of the Centre for Scientific and Industrial Research (CSIR), Ghana, who have allocated matching funds of USD 50,000 for this project with a political support from the Government of Ghana. Moreover, most of the farmers are interested in on-farm particpatory action research in achieving safer vegetable for urban consumers. Supplementary support has been promised by Enterprise Works, IWMI and MoFA.

2. Main Objective:

Reduce health risks and enhancing livelihoods of farmers and consumers of vegetables irrigated with polluted (or waste) water through provision of safer groundwater (GW) in urban farming areas of Accra and Kumasi.

2.1. Sub-objectives:

- To evaluate the availability of safer groundwater and how to provide it to the farmers
- To monitor farmers' reaction and acceptability of groundwater use
- To evaluate perceptions, costs, risks and benefits of groundwater use in comparison with other water sources for irrigation

3. Methodology and Approach:

The study will be carried out in the cities of Kumasi and Accra. Various activities and methodologies will be employed.

3.1. To explore the availability of safer groundwater and to provide it to the farmers

a. Well drilling and water quality analysis will be carried out by WRI, and Enterprise Works will assist with tube wells down to 7m. In addition, EW will provide treadle pumps and basic water application devices. Different institutions such as IWMI and KNUST will help to analyse and recommend appropriate water application systems and rates in corresponding field trials. Other analysis will be on electrical conductivity (EC) analysis to check for groundwater salinity (only Accra). Technical feasibility and observatory studies (using terrameters, piezometers etc); will be applied to find out the areas that can yield shallow water and getting appropriate locations to avoid on-farm pollution. Further data on groundwater (GW) will be provided by Water Research Institute (WRI).

b. Selection of farm sites will be based on farm size, number of farmers (male/female ratio), sources of water, type of crops and farmer willingness to co-operate. Primary data on farmers from IWMI-Ghana library will also provide additional information on the different sites in the cities. Focus group discussions will be carried out with farmers in each selected farming sites to understand the main farming practices during both dry and wet seasons. Participatory assessment will be adapted to' expose farmers to water lifting devices, irrigation water and health implications. After this, a study tour with farmers to UPA areas in Lome and Ada/Keta area will be organised with Enterprise works (EW), IWMI and MoFA to expose our farmers to other UA farmers actually using wells and

pumps through groundwater. The efficiency of the systems will be discussed between the farmers from the two cities. One of the important issues to explore with the farmers will be the rationing of water among farmers. Participatory training for MoFA extension staff and farmers will help in the dissemination of low-cost water lifting technologies and personal on-farm hygiene education. Joint effort will be made to strengthened farmers associations in the cities (Accra and Kumasi) through the Accra Metropolitan Assembly and Extension Division of the Ministry of Food and Agriculture. Participatory training for MoFA extension staff and farmers will help in the dissemination of low-cost water lifting technologies.

3.2. To monitor farmers' reaction and acceptability of groundwater use

Two Ph.D students (partly funded) and the MOFA will be in charge of scientific and social monitoring of devices, water application rates and assessment of farmers' perception and adoption constraints as well as economics, agronomic and water use**.** Specific activities are:

Part 1a). Water sampling and analysis using standard methods (APHA, 1989). This will be done in close intervals during rainy and dry seasons over one year. Water samples will be taken from irrigation water sources. Analysis will be done for the following physiochemical and microbiological characteristics:

- Total Suspended Solids (TSS), Total Dissolved Solids (TDS),
- Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), pH, Electrical Conductivity, selected heavy metals and plant nutrients.
- Population sizes and composition of Helminth eggs, total and faecal coliforms, faecal streptococci and other pathogenic bacteria.

1b. Crop quality sampling and analysis using standard methods and procedures. Samples will be collected in two-week intervals in both dry and rainy seasons over one year at farm gate on representative major farming sites. Analysis will be done for the following parameters

- Population sizes and composition of Helminth eggs, total and faecal coliforms, faecal streptococci and other pathogenic bacteria, and heavy metals.
- In collaboration with the pesticide laboratory of WRI, also pesticide residues will be analysed periodically.

1c. Participatory on-farm risk management methods (together with the farmers):

Trials using sedimentation ponds, sand filters, filters connected to pumps and other methods. Risk reduction will be attested through irrigation water quality changes. Again, any innovation will only be tested after participatory pre-assessments and agreement with the concerned farmer collaborators.

4. To evaluate perception, costs, risks and benefits of groundwater use in comparison with other water sources for irrigation.

In concrete examples per city, economic, health, social impacts feasibility studies will be carried out in view of safer irrigation water sources like (shallow) wells and pipe water, drain, stream, groundwater and related water lifting devices. NGOs, like Enterprise Works with an already related approved USAID project on treadle pumps will join in. Gender-specific focus group discussions will be used to record and analyse farmers' perception and acceptability. The overall results will be evaluated with different economic, social, agronomic indicators in multi-stakeholder workshop, which will be organized prior to the end of the project. It will be done with wastewater management agencies, local authorities, health departments, MoFA and associations representing farmers, sellers, and consumers to (i) share the result and its implications (ii) learn about awareness levels and perceptions on water pollution, vegetable contamination and options for health risk reduction, and (iii) the way forward. Opportunities and constraints for health risk reduction will be identified and ranked using semi-quantitative methods and SWOT analysis.

Table 1. Summary of the Tentative Work plan

Activities	**Time Period (Months)**											
	2	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**
Study sites identification, Networking												
GW resources evaluation												
Farmers exposed to alternative water sources, lifting and distribution devices												
Study tour to Lome/Ada												
Water lifting and application devices installation												
System monitoring (farmers' perception, maintenance, economic and agronomic,												
Decision support for optimised soil water use												
Salinity monitoring in soils and water												
Training of farmers & extension staff in water lifting devises and efficient irrigation												
Final multi-stakeholder workshop and analysis												
Final Technical report write-up												

4. Expected Outputs

- Study sites identified,
- GW resources evaluated
- Farmers exposed to better alternative water sources, lifting and distribution devices
- Water lifting and application devices installed
- Decision support on health risks reduction options
- System monitoring (farmers' perception, maintenance, financial gains etc.)
- Acquisition and dissemination decision support for optimised soil water use
- Acquisition and dissemination salinity monitored in soils and water
- Capacity Building of the farmers, extension division and several institutions.
- Workshop report and Fact sheet

5. Beneficiaries and impact

The main target groups of the project are farmers and consumers but also those authorities in charge of food safety and public health.

The project will lead to improved awareness on vegetable related health issues in Ghana and actively contribute options for the reduction of diseases related to wastewater irrigation. Some of the impacts on stakeholders are:

- As most vegetables found in urban markets are produced with wastewater, the consumer will benefit from safer produce.
- Policy makers will benefit from alternatives to banning Urban Agriculture, which can be considered in policy revision and formulation.
- Urban Agriculture and its stakeholders (farmers, traders, market sellers) will benefit from a better reputation and can continue (now with public support) to maintain their contribution to urban food security, creation of employment opportunities and (own) poverty alleviation. This will be of special benefit to all vegetable sellers who are mostly women.
- The awareness material and guidelines for training will be made available to other projects addressing similar situations.
- The participating research institutions will benefit from their collaboration in a project of applied research of immediate benefit to the public in a developing country.

6. Follow Up Dissemination Strategy:

- Stakeholders involved in the research process will be having first-hand information from the activities and workshops. Through the developed guidelines on improving productivity, innovative farmers (who were participants in the research process)

from the two cities will be trained further together with extension agents to relay and practically demonstrate the information to their fellow farmers. The developed guidelines will be written in farmer-friendly booklets and in local languages, which will be made available free to the farmers and a demonstration plot will be acquired in each selected farming site. The extension service and NGOs working with UPA vegetable farmers will be involved.

- The overall project will incorporate the Groundwater Alternative in its portfolio of risk reducing strategies and use different training and awareness program with individual modules (with stakeholder specific demonstration workshops, joint farm/market visits, awareness material, poster, videos etc. in local languages) will target farmer groups, consumer groups, market women, and authorities for result dissemination.stakeholder. Leaflets, awareness material, poster, videos etc. in local languages and other.
- KNUST is running a training program for MoFA extension staff and will incorporate information from this subproject on water lifting devises and smallholder irrigation efficiency.
- Through the press, Media, local NGOs and collaborating (consumer, women) associations for the general public
- Other ways will be IWMI's website and the Urban Agriculture Magazine as well as the RUAF network, Urban Harvest website, Anglophone Africa urban Agriculture Network (**AGAUAN**) website.

7. Implementation and Management (Strategies envisaged to ensure transdisciplinarity)

Lead institution: Accra Metropolitan Assembly Food and Agriculture Department (AMA-MoFA) jointly with IWMI.

Accra Metropolitan Assembly Food and Agriculture Department (AMA-MoFA) of Accra: is an institution directly under the Ministry of Food and Agriculture with the responsibility to provide an enabling environment for sustainable agricultural development that would ensure food security, higher employment and incomes of the people within the Metropolis through policy formulation and their enforcement. **Mrs. Esther Acolor** is of the key urban agriculture extension officer in the Accra metropolis she will facilitate most of the meetings

and will supervise all the issues of the proposed project related to farmer organisations and regular monitoring of the project.

IWMI, West Africa has offices in Accra and Kumasi and agreed to jointly coordinate the project with the Ministry. **George Danso,** an agricultural economist with a strong foundation in urban agriculture and an agropolis awardee (2001) will inspire and provide the necessary technical assistance in support of the project. Apart from working for IWMI on urban agriculture he also served as consultant for GTZ and FAO on the subject as well. Mr. Danso has his own farmer association in Kumasi and this will facilitate the participation of farmers in Kumasi. The local IWMI team has worked on urban agriculture since 1995 (then under IBSRAM) and has a recognized expertise in this field as RUAF focal point and through Dr. Drechsel who is in the steering committee of the System-wide Initiative on Urban and Peri-urban Agriculture (SIUPA).

Mr. Opare has good working experience in urban agriculture. He is a core member of the **La farmer association** in Accra. Mr. Opare has a long history in marketing and production of exotic vegetables in urban Accra. He will coordinate and arrange most of the meetings with the farmers and follow up activities and dissemination strategies since he is working with the farmers as well as the market women.

8. Monitoring and evaluation plan

Project results and impacts will be monitored at various levels:

a) Lessons learned and impacts produced (positive or negative, planned or not), which can be attributed to this project and its chosen methodology

b) Changes in attitudes and behaviour of various project partners (Outcome Mapping)

c) Contribution of the project to the Millennium Development Goals

i. **Research activities monitoring:** Various research activities will be monitored by different members of the team and institutions according to profession as explained under implementation and management. For logistic purposes, the three team members will oversee activities in the project areas. Professor Quansah together with MOFA extension division will be in charge of Kumasi. Mr. Alan Brewis of Enterprise Works and Dr. Sackey for Accra. The necessary technical assistance will be provided by Dr. Pay Drechsel.

ii. The project team members will monitor the installation of water lifting devices through monthly visit to the beneficiary farmers. They will also include observations, and regular feedback from the farmers after every three month.

iii. Indicators will be develop to monitor the use of groundwater and the likely increase in the livelihood of farmers and consumer acceptability of urban vegetables. Survey, filed visits, focus group discussions with the farmers with and without access to groundwater will be carried out. There will be monthly meetings for project farmers and the core project team members till then the end of the project. The involvement of team members and institutions with complementary expertise is a pillar of the project. Regular meetings involving all the team members from the participating institutions/association and other key stakeholders will be held for planning and reviewing of on-going activities. There will be quarterly review and feedback meetings from stakeholders.

iv. **Institutional and human resource development:** The project leader will monitor institutional capacity strengthening run a gender sensitive analysis. Supervisors from participating learning institutions will monitor actors involved. There will be regular meetings and field reporting involving relevant actors, supervisors etc. to monitor and evaluate their progress.

v. **Research and output quality:** Some activities are dependent on outputs of others and team leader will ensure that they check the quality of what they give out or receive. Advances in scientific and methodological activities and added value to multi-disciplinary approach will be regularly assessed. There will research report, workshop proceeding and fact sheet.

vi. **Outcome Mapping:** Changes in attitudes and behaviour of various project partners.

Apart from monitoring “changes in the condition of state” (e.g. impacts on the income of urban farmers), it is proposed to apply a complementary approach to monitor also “social processes of changes in the behaviour of strategically selected organisations”.

This latter process, denominated Outcome Mapping respond to the key question: how will people behave after the programme?

It is proposed to focus attention on the strategic partners that work on boundary of the projects influence, in our case urban farmers, municipal authorities.

For these “boundary partners” an *Outcome challenge* will be elaborated together with them, describing the behavioural changes we expect to see in each of them; the ideal state; what we desire to see them **doing** in order to contribute to the vision of the programme. Related a series of ***Progress Markers*** will be developed, being milestones or

statements describing progress in change of behaviour (actions, development of capacities and relationships). Progress markers enable to determine how the partners are progressing on the path towards the desired outcome.
They permit ongoing and participatory assessment of the progress in our partners and enable to make mid-course corrections and improvements in the strategies.

Finally ***strategy journals*** will be developed that support monitoring of effectiveness of different strategies applied on the behavioural changes in the boundary partners.

vii. MDGs: As described in the project background, urban agriculture relates to different Millennium Development Goals and its specific objectives. However, no clear understanding exists of the impact and concrete contribution that UA makes (or could make) towards the different MDGs at local level. It also has to be understood better how UA contribute to the MDGs (what are the contributing elements) and why (through which processes). Local actors and cities have to be sensitised in these issues, and their capacity has to be strengthened in measuring and monitoring local impacts.

It is therefore proposed to monitor and understand in the 2 project cities, in collaboration with local government and other local actors, the local impacts and concrete contributions of UA on the different MDGs. An analytical and methodological framework for doing so will be developed with them.

9. Budget Breakdown

Output	Co-funded by	IDRC input
Farmers meetings and preliminary site selection and Networking	MoFA, Farmer Associations, IWMI	Ca. 500 USD
Well drilling tests* (final site selection), water quality analysis, installation of water lifting devices **	EP Works, IWMI, CSIR/WRI	Ca. 4000 USD
Study tour for farmers and extension staff	CSIR, IWMI	Ca. 3000 USD
Monitoring of farmers' feedback, devices, and water application rates	IWMI, MoFA	
Recommendation on appropriate water application rates	IWMI	
Training of farmers & extension staff in water lifting devises and efficient irrigation	MoFA, IWMI	Ca: 3,000 USD/two cities
Operational costs (both research partners and non-research partners)***	CSIR, IWMI, MoFA	Ca: 2,000 USD/two cities
Monitoring and Evaluation (M &E)	IWMI, MoFA, Farmers Association	Ca. 500 USD

Total	50,000 USD	Ca. 13,000 USD

* Costs depend on drilling, GW exploration.
** EP Works (Enterprise Works) would supply treadle pumps (USAID grant).

10. Reference:

APHA (1989). Standard Methods for the Examination of Water and Wastewater. 17th Edition, American Public Health Association, Washington DC. 1,268 pp.

Armar-Klemesu, M., 2000. Urban agriculture and food security, nutrition and health. In: Baker, N. *et al*. (eds.) Growing cities, growing food. DSE, Feldafing, p: 99-113

Blumenthal, U.J., A. Peasey, G. Ruiz-Palacio and D.D. Mara (2000). Guidelines for wastewater reuse in agriculture and aquaculture: recommended revisions based on new research evidence. WELL study No. 68 part 1, June 2000. London.

Cofie, O.O, Rene van Veenhuizen and Pay Drechsel, 2003. Contribution of Urban and Peri-urban Agriculture to Food Security in Sub-Saharan Africa. Paper presented at the Africa session of 3rd WWF, Kyoto, 17th March 2003

Cornish G.A, J.B. Aidoo and I. Ayamba (2001). Informal irrigation in the peri-urban zone of Kumasi, an analysis of farmer's activity and productivity. *Report OD/TN 103,* Feb. 1999. UK: HR Wallingford.

Cornish, G. A, Mensah, E, and Ghesquire, P, 1999. Water quality and peri-urban irrigation. An assessment of surface water quality for irrigation and its implications for human health in the peri-urban zone of Kumasi, Ghana. Report OD/TN 95. HR Wallingford, UKCofie, O.O. and P. Drechsel. 2003. Water for Food in the Cities: The Growing Paradigm of Irrigated (Peri)-Urban Agriculture and its Struggle in Sub-Saharan Africa. African Water Journal Vol. 1 (1). Submitted.

Danso, G., P. Drechsel, T. Wiafe-Antwi and L. Gyiele. 2002. Income of farming systems around Kumasi, Ghana. Urban Agriculture Magazine 7: 5-6.

Danso, G.K., P. Drechsel, S.S. Akinbolu and L. A. Gyiele. 2003. Review of studies and literature on the profitability and sustainability of urban and peri-urban agriculture. FAO Final Report (PR 25314). Mimeo.

Keraita B., P. Drechsel, F. Huibers, L. Raschid-Sally (2002). Wastewater use in informal irrigation in urban and peri-urban areas of Kumasi, Ghana. Urban Agriculture Magazine 8:11-13.

Maxwell, D.G. 1994. The household logic of urban farming in Kampala. Cities Feeding People. An examination of urban agriculture in East Africa. IDRC, Ottawa, Canada (pp. 47–66).

Mensah, E., P.Amoah, P.Drechsel, R.C. Abaidoo.2001.Environmental Concerns of Urban and Peri-urban Agriculture: Case Studies from Accra and Kumasi. In: Drechsel, P and Kunze, D (eds). Closing the nutrient cycle for urban food security and environmental protection.IWMI/FAO/CABI:Wallingford Oxon, UK, Pp.55-68

Moustier,P. 2001. Assessing the Socio-economic Impact of Urban and peri-urban Agricultural Development. Paper submitted to Workshop on Appropriate Methodology in Urban Agriculture Research, Planning, Implementation and Evaluation, Nairobi, Kenya. Organized by CIP-SUIPA and ETC-RUAF

Nugent, R.A. 2000. The Impact of Urban Agriculture on the Household and Local Economies. In: Bakker, N., M. Dubbeling, S.Guendel, U. Sabel Koschella, H. de Zeeuw (eds.). 2000. Growing Cities, Growing Food, and urban agriculture on the policy agenda. DSE Germany, 67-97.

UNDP (1996): Urban Agriculture: Food, Jobs and Sustainable Cities. United Nations Development

WFS (1996). World Food Summit, Rome, Italy. *http://www.fao.org/docrep/003/w2612e/2612e07c.htm*.

Bamenda Project proposal on Urban and peri-urban agriculture

1. **Title:** Urban agriculture: A strategy for poverty alleviation in Bamenda municipality, Cameroon.

2. **Project leader:**

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4. **Third team member::**

Name: Sikod Rose Afor
Institution: Provincial Delegation of Agriculture, Community Development Service
Job title: Community Development Animator
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5. **Total estimated cost of the project (First phase only):** 31,700 US$

6. **Duration of the project:** One and a half year

7. **Location of project:** Bamenda Town, North West Province, Cameroon.

8. **Key words:** Urban agriculture, survey, constraints, dissemination, improvement packages, sustainability, extension and training.

9 Background

The importance of urban and peri-urban agriculture (Mougeot, 2000; Smit et al., 1996) to the overall livelihood strategies of its practitioners is not well understood and consequently policy makers have little basis for making informed decisions. At the time when urbanization is increasing, coupled with urban poverty and food insecurity, followed by environmental pollution, it has become urgent to understand the dynamics of UPA in the city of Bamenda (the forces that interplay in the production system).

Bamenda has witnessed in the last two decades a sudden surge in its population growth from about 100,000 inhabitants in the 80's to about 400,000 today, suggesting a population growth rate of about 7-8%, which is more than the one experienced by the capital city Yaounde (6.5%).

Generally, a typical urban agricultural and livestock enterprise should generate revenue for men and women. We, however, do not have a clear picture of who does what in the UPA production system and their implications for poverty reduction. Dry season cropping is carried out mainly on wet lands within the urban and peri-urban neighborhoods. The solid wastes generated at consumer's level are dumped indiscriminately on land fills around town. Collection of these wastes is not timely and not properly done.

10 Problem statement

The problem is mainly the lack of sufficient knowledge on agriculture and livestock production systems in relation to poverty alleviation in Bamenda and policy frameworks for these operations.

11. Goal

The purpose of this project is to alleviate poverty through the promotion of urban agriculture and livestock production in Bamenda. This will be done in two phases: The first phase will focus on evaluating the present UA activities in the city including constraints and opportunities with gender considerations, the creation of awareness and developing the stakeholder data base. The second phase of the project will lay emphasis on the dissemination of UA technologies through capacity building and demonstrations.

12. Specific Objectives

12.1 Research:

To conduct exploratory research to document what has been done before and make a qualitative evaluation of urban agriculture and livestock production. We shall also find out and evaluate farmers' perception on the constraints and opportunities for UA and Livestock practices.

12.2. Awareness:

To educate and sensitize key actors and municipal planners on the need for a broad based stakeholder participation.

To seek to enhance the legitimacy and integration of UA in municipal policies and land use planning.

12.3. Dissemination of tested and recommended urban agriculture information and technology:

- Capacity building for pilot farmers;
- Establish pilot farmers on demonstration sites;
- Follow-up and supervise the activities of pilot farmers on demonstration sites, who will serve as farmers' trainers (FFS's).

Four partners will be involved in the realization of these objectives viz:

1) The Bamenda Urban Council (BUC) who is the principal partner, especially in the achievement of the second phase. However, during the first phase they will contribute for transport for meetings.
2) BUGH-SUH ORGANIC FARMERS
3) IRAD
4) FARMERS concerned.

13. Project activities: Phase one

13.1 Research (Twelve months):

Research activities will be exploratory and will start with literature review. Who are the actors and what is the historical knowledge about UA in Bamenda and elsewhere? These activities will involve the mapping out of UA land use and make pictures of the existing situation. Research will also be on farmers' perception of constraints and opportunities of UA and livestock, information gaps that hinder UA as well as potentials for improvement.

Research will also be conducted to evaluate the socio-economic situation of the active population (employed and unemployed) involved in UA and Livestock. The evaluation will characterize and collect data on production levels and the contribution of farms produce to the overall household budget.

Research will investigate sources of health risks in UA and find out what happens to organic wastes and ways to recover them. Gender disaggregated data will help to

determine what men and women perceive and what they do in UA and Livestock productions.

13.2 Awareness creation (Six months)

Activities on awareness will include consultative meetings with municipal officials and city planners, producers, contractors, trainers and consumers. Awareness creation will take a broad based dimension, including administrative officers, NGO's, Common Initiative Groups (CIG's), CBO's, technical ministries concerned, consultants, traders, etc. This will culminated in a workshop, which will be the highest point of consultations.

14. Project activities: Phase two (Two years)

14.1 Capacity building:

This activity will begin with the identification of practitioners with particular attention on gender.

Training and mobilization:

- Identification of the actors of UA with gender considerations;
- Focus discussions with targeted stakeholders for the identification and prioritization of specific training themes;
- Identification of resource persons for training and follow-up activities amongst UPA farmers;
- Promote networking amongst trainees and between them and various stakeholders.

15. Expected results

1) Research results will improve stakeholders' knowledge on the urban food system, including production constraints and provide indices for further research. Furthermore, this will provide a reliable base for municipal authorities to make informed decisions on improving UPA and Livestock.
2) It is hoped that the consultative meetings and workshops will open up awareness for a continuous process of addressing the issues of policy development and the integration of urban agriculture in land use planning.
3) Another outcome of the project will be to further open awareness for examining innovative and critical issues on urban challenges such as confine spaced farming technologies, environmental and health risks assessment, solid and liquid wastes management, and urban policy on land tenure.
4) The project will facilitate dialogue between municipal administrators, social workers and producers and initiate support in the design and implementation of urban agriculture policies and project at the municipal level.

16. Methodology

16.1. Research aspects:

A literature review will be carried out by collecting information about UPA (Agricultural census, export-import statistics, published and unpublished papers, laws, decrees and ordinances, appropriate Internet sites, etc.) especially in line with city policies, agricultural zooming, history, institutional linkages, various stakeholders and relevance of UPA from country developmental goal. Other information will be collected from key informants, leaders of targeted farming groups, NGO's, with specific focus on UPA set-up in Bamenda city.

Complement to literature search, other information will be collected from key informants and various groups' leaders and NGO's, Government and private institutions. Focus group discussions will be used to come out with important constraints, including health risks and environmental hazards related to UA.

A pre-tested questionnaire will be administered to sampled households falling within the bracket of poor farming communities. Random sampling techniques will encompass choosing i) along the four major axes crossing Mankon area from City Chemist round about; ii) along the four major axes crossing Kwen area from Foncha Street Junction; and iii) along the Mezam stream that spirals through the city providing many swampy spots.

16.2 Awareness and sensitization

Meetings will be arranged with individual actors involved in UA. Furthermore, identified stakeholders will be invited to attend a consultative workshop. The aim of this restitution workshop will be to sensitize the participants while allowing them to prioritize keys areas for possible interventions during the second phase.

16.3 Capacity building to disseminate findings to the various stakeholders

In the second phase of the project, emphasis will be laid on training. One or two of the prioritised interventions during the first phase will be implemented. These will focus on practical aspects, pertaining to the training of selected pilot farmers' groups on efficient UPA farming methods and their involvement on viable, environmentally and socially accepted technologies likely to increase their productivity. Farmers Field School (Demonstration – Methods and results) approach will be used. Pilot farmers will participate actively in the development and testing of the selected technologies. One of the training options will be the empowerment of women in technology generation, dissemination and adoption.

17 Who will benefit?

The direct beneficiaries will be urban farmers who fall between the poor and middle classes. They raise livestock and grow crops to feed their families in the city Bamenda. Emphasis will be laid on women and youths who are more active in the urban agricultural food production system. Benefits are largely economic.

However, non- market benefit are also important functions of the project such as food security, better nutrition of the poor, recycling of urban organic wastes, urban greening and better urban micro climate, recreation, urban landscape management, etc. These are benefits that will accrue indirectly to the community.

The urban poor will also benefit from the proximity of urban farms to the market, which allows producers to lower cost and therefore make the produce more accessible. Entrepreneurs will also benefit. Small-scale enterprises will be created (Equipment and tools manufacture, compost making, processing and marketing of agricultural products, restaurants etc), there by providing self employment. Self-employment in any urban agricultural activity, by and large, will tremendously improve the livelihoods of urban poor dwellers. When livelihoods are improved, then poverty is alleviated.

18. Dissemination

The survey report and proceedings of the workshop will serve as important information and management tools for municipal authorities and other front line stakeholders in the urban agricultural sector. These documents will be produced in a booklet and distributed to all participants at the workshop. Abstracts of these shall be published in local news papers. Full articles and case studies shall be sent for publication in the urban agriculture magazine and other journals interested in urban agriculture.

The Dissemination of results at grass root level will be assured through training and extension. IRAD and BUSOFARM will jointly conduct the formal training. On-farm training, demonstration, Extension, Supervision and follow-up, will be the responsibility of BUSOFARM. The Bamenda urban council and the ministry of urban Affaires – provincial delegation shall provide open spaces of land in town, suitable for gardening. They will also provide equipment where need be. The pilot farmers shall provide labor. As pilot farmers however, they shall receive genetic material and garden tools at subsidized rates, as incentives.

The community Development department of the provincial delegation of agriculture shall be responsible for animating and mobilizing the farmers and to-be farmers in the city of Bamenda. They will organize the farmers into urban groups so as to facilitate contact training and follow-up.

19 Budget for the first phase only

Activities	**Contributions from local partners ($US)**	**Contributions from donor institution ($US)**
Survey aspects		
Training of 20 monitors (Two days)	-	2,100.0
Per diem for resource persons (6)	-	1,000.0
Transport of monitors	1,000.0	1,000.0
Incentive to respondents	-	1,500.0
Field material	-	1,000.0
Didactic material (IRAD)	600.0	-
Labor (Typing of questionnaires) BUC	400.0	-
Pedagogic materials and communication (Donor and BUSOFARM)	500.0	1,000.0
Data analyses (IRAD)	600.0	400.0
Final compilation and writing of report (Donor and BUC)	600.0	1,000.0
Sub total survey	**3,700.0**	**9,000.0**
Workshop aspects		
Contact visits for consultations and sensitizations (Donor and BUSUFARM)	400.0	1,000.0
Typesetting handouts and photocopy (Donor and BUC)	500.0	1,500.0
Publicity (Donor and BUSUFARM)	200.0	1,000.0
Pedagogic materials	-	1,000.0
Honorarium for main facilitators	-	1,700.0
Per diem for facilitators/consultants	-	500.0
Transport for external consultant (Donor and BUC)	1,000.0	3,000.0
Hiring of hall (BUC)	1,000.0	-
Per diem to participants	-	2,000.0
Feeding of participants (Donor and BUSOFARM)	1,000.0	1,500.0
Public address system	-	500.0
Report of the workshop (Donor, IRAD)	200.0	1,000.0
Sub total workshop aspects	**4,300.0**	**14,700.0**
Grand total	**8,000.0**	**23,700.0**
Overall totals	**31,700.0**	

N.B. The budget for the second phase will be prepared after evaluation is made on the first phase.

20 Monitoring and evaluation

An internal evaluation will be carried out after each of the project phase. This will be to assess needed corrective measures for the way forward. Indicators for phase one will be: survey report, minutes of the restitution workshops, local radio station programmes on UPA, press release on the studied matters, land use map elaborated. Indicators for phase two will be as follows: pilot farmers trained, demonstrative plots set-up, other stakeholders sensitized, proposal for by-laws elaborated.

21 Reference

Mougeot, L.J.A., 2000. Urban agriculture: definition, presence, potentials and risks. In: Baker, N. et al. (eds). 2000. Growing cities, growing food: urban agriculture on the policy agenda. Deutsche Stiftung fuer internationale Entwicklung (DSE), feldafing, Germany.

Smit, Jac, Annu Ratta and Janis Bemstein, 1996. Urban agriculture: An opportunity for environmentally sustainable development in Sub-Saharan Africa. The World Bank. Paper no. 11 of the Building Blocks for Africa 2025, Post-UNCED Series.

22. Executive summary

The aim of this three years project is to improve the productivity and sustainability of UPA in the Bamenda municipality in order to contribute to urban food security, poverty alleviation and healthy environment.

The project will be implemented in the urban and peri-urban areas of Cameroon, which is situated in the highly populated western highlands of \Cameroon.

The first part of the project will include activities related to the characterization of prevailing farming systems and the impact of these on the livelihoods of Bamenda city dwellers and the national economy. This phase will start with a literature review of existing information on UPA within the area and beyond. Complement to these findings will be information acquired from key informants and various groups' leaders and |NGO's, Government and private institutions inasmuch as they could contribute to accrue knowledge in UPA in the studied area, pertaining to location, scale policies, health and environmental hazards, contribution to national economy, income and labor considerations, etc. A formal survey will be designed to consolidate available information in line with farming practices, farmers' objectives and technological levels, gender involvement, types of speculations, potentials and constraints, demand and supply mechanisms, etc. Results of these will be disseminated through a restitution/sensitization workshop involving all stakeholders. The benefit of this restitution will be to sensitize the various stakeholders while allowing them to prioritize keys areas for possible interventions.

The second part of the project will be the improvement on findings gathered during the first phase. A focus will be on practical aspects, pertaining to the training of selected pilot farmers' groups on efficient UPA farming methods and their involvement on viable and sociologically technologies likely to increase their productivity. The use of FFS will be privileged. Farmers will participate actively in the development and testing of the identified technologies. Training will lay emphasis on empower women roles in technology generation, dissemination and adoption.

The expected output would be to raise awareness and empower producers and key stakeholders on the pathway to urban food security, poverty alleviation and healthy environment.

TITLE	SOLID WASTE MANAGEMENT AND URBAN AGRICULTURE FOR IMPROVED LIVELIHOODS IN KAMPALA CITY.			
	Name	**Institution**	**Job Title**	**Email address**
Project Leader	Semwanga Margaret Azuba	Kampala City Council	District Urban Agricultural Officer	msazuba@yahoo.com
Second Member	Maria Kaweesa	Environmental Alert	Programme co-ordinator Urban Agric.	envalert@envalert.org
Third Member	Denis Yiga	National Agricultural Research Organisation	Researcher	dyiga@yahoo.com
Estimated Cost	USD $ 173,564			
Local Contribution	USD $ 17,356			
Funding gap	USD $ 156,203			
Duration	3 Years			
Location	Makindye Division - Kampala District, Uganda			
Key Words	Gender, Solid waste, leachate, sorting, biodegradable waste, non biodegradable waste, toxic substances, processing, waste recycling and reuse, Marketing			

Background

Overview of solid waste management and urban agriculture.

Kampala City has a population of 1.2 million people growing at rate of 4.13% per annum, of which 48.7% are males, while 51.3% are females[1]. The City is administratively divided into five divisions. According to KCC structural plan 1994, approximately 23% of the city is residential. Sixty percent (60%) of this is an unplanned settlement. The unplanned areas of the City have a bearing on quantities of waste generated. On the other hand, the heterogeneity nature of the city population with different feeding and livelihood habits generates enormous quantities of waste.

Traditionally local authorities have been charged with the responsibility of managing waste. Recent studies indicate that generation of solid waste in Kampala City, is estimated at approximately 2kg/capita/day, with the commercial areas being the biggest generators. Approximately 45% of the waste generated is effectively collected by KCC. There are currently some private solid waste collectors who provide a door-to-door waste collection service at a fee, and account for 5% of the total refuse transported to the landfill.

KCC operates one landfill site, where all solid waste collected from the city is disposed, and no recycling is done. While some of the uncollected waste is disposed of either on the road sides and open drains, some is either burnt, buried in pits, piles in the backyards, or used in farmers' gardens.

[1] 2002, Uganda Population and Housing Census.

Urban Farming is one of the potential land uses, which can be applied to recycle biodegradable waste. Kampala City is reckoned to obtain 40% of its food needs from urban farming[2], 70% of the eggs & poultry consumed are raised with in the city, Approx. 50% of the H/hds supplement their income through UPA, and approx. 20% of the H/h waste is recycled and utilised as compost and livestock feed. All these contribute to improved livelihoods of the urban dwellers, in terms of food security, nutrition, income and employment. Therefore, solid waste can be used as a resource to boost Urban and Peri-urban Agriculture and livestock production activities

In spite of this contribution however, the production and waste recycling technologies in place are not well developed, to suit the interests of the urban farmer.

This project therefore, will study "How can a good management system of solid waste improve urban agriculture and urban dwellers' livelihoods?"

Scope

The project will operate in three parishes of Makindye division. The division was selected on the basis of;-

1. Having high volumes of uncollected waste in the communities due to limited resource (financial and material)
2. Having other ongoing research projects running in the division namely;-
    a. An investigation of livelihoods and production systems.
    b. An assessment of market opportunities of urban agricultural products.
    c. Disseminating technical interventions to support UPA through schools (USAIP)
    d. Health and livestock / zoonosis project.

    The above four Research projects are technically guided and supported by Urban Harvest in collaboration with Kampala urban Food Security, Agriculture and Livestock Co-ordination
    e. The Food security and nutrition project supported by Environmental Alert
    f. Ecological sanitation supported by Sida
3. Presence of community based initiatives for garbage collection, recycling and disposal such as;-
    - Urban Community Development Association (UCODEA)
    - Home Klin
    - Bin It
    - Save the Environment
    - Kabalagala Garbage Management Collectors

4. KUFSALCC

The project intends to use a holistic approach to solid waste management and reuse in Urban agriculture for improved livelihoods, and this will be enhanced by linking and networking with the ongoing projects and community based initiatives.

[2] Urban food security (Muwanga,2001)

Problem statement

Kampala City currently operates a total of 15 refuse trucks and 504 skips(collection containers). The trucks and most of the skips were purchased in 1993 and undergo a lot of mechanical breakdowns, which are very costly to maintain[3]. The skips that are placed at selected locations within the city. They have small capacities for the targeted population especially in the densely populated communities, and are in most cases spilling over.

Due to the inadequate repair and replacement of worn out skips, refuse is littered indiscriminately and often accumulates at different locations in the city.[4] The unplanned settlements are inaccessible by the trucks. This is also attributed to the "I don't care attitude towards waste disposal" exhibited by many urban dwellers. Over 80% of the waste generated is organic and therefore, if uncollected as is the norm in many cases, it attracts vermin, flies and other vectors, which transmit sanitation related diseases. The situation is further aggravated by seeping leachates (fluids from waste), contaminating underground waters and nearby rivers.

There is limited use of solid waste in urban agriculture due to limited technical know how by the urban farmers, hence poor soils and low food production.

The action research therefore, intends to investigate peoples attitudes towards solid waste management, possible interventions to reduce solid waste, low cost technologies for transforming solid waste into a resource and come up with strategies to minimise health hazards related to poor solid waste management.

Goal

Exploring options for transforming solid waste into a valuable resource for improved livelihoods of urban dwellers.

Specific Objectives

By the end of three years, the project will achieve the following objectives;-

1. Develop a profile of domestic solid waste for baseline information.
2. Design and investigate alternative ways of managing domestic solid waste.
3. Analyse and document best options that can improve livelihoods.

Methodology

1. Cross cutting issues
   - Gender issues to be considered through all the objectives
   - Participatory approaches in all project activities
   - Dissemination workshops

2. Selection of the target area
   Sampling:
   i. Purposive: 1 Division ⟶ 3 parishes (Urban new, Transition, Peri-urban)
   ii. Random: Target group ⟶ 240hhd (to include women, youths, PWD, in farming & non-farming hhds)

[3] Kampala District Development Plan (2003/04 – 2005/06)
[4] Kampala District Development Plan (2003/04 – 2005/06)

3. Community entry:
   - Consultative meeting at the division, parish and village levels.

4. Other methods according to the specific objectives.

Objective	Research questions	Activities	Time frame	Human Resource	Budget (Ug.shs)
To develop a profile of domestic solid waste for baseline information.	1. What is the existing situation on domestic solid waste in the project area? 2. What are the possible market opportunities of the reusable waste? 3. Who are the stake-holders and what are their interests and incentives towards solid waste management?	1. Mapping of the project area (by gender)	3 weeks	Project team Extension staff Local council leaders Target group	4,500,000/=
		2. Collect information on;- - Household disposal methods - Collection mechanisms - Different types of sold waste, their quantities and quality. - Occurrence of vectors in the target areas - Knowledge on reuse of solid waste - Existing potential market opportunities for recycled waste products - Existing community based initiatives involved in solid waste management - Community's attitudes towards domestic Solid waste Management.	2 months	Project team Extension staff Local council leaders at Div level Target group	15,700,000/=
		3. Carry out a stakeholder analysis on solid waste management	2 weeks	Project team Extension staff Local council leaders at Div. and District level	2,800,000/=
		4. Platform building between key stakeholders			
2. Design and investigate alternative ways of	1. To what extents is the KCC garbage Ordinance operationalised?	- Sensitise target communities about the KCC garbage ordinance (responsible for own garbage, source sorting)	1½ months		18,850,00/=

managing domestic solid waste.	2. What can be done to bring about an attitudinal change towards SWM in the target area? 3. What factors influence adoption of technologies	- Training the target group on solid waste management aspects and related health hazards.	Ongoing 10 months spread across the project period		25,000,000/=
		- Develop and advocate for appropriate technologies that would transform waste into a valuable resource	Ongoing	Research personnel, Project Team Farming and non farming hhds	23,500,000/=
		- Carry out an adoption analysis	2 months	Project team Liaison partners	11,700,000/=
3. Analyse and document best options that can improve livelihoods.	1. How can solid waste be utilised in urban agriculture ? 2. What are the possible trade offs and synergies associated with proper solid waste management ? 3. What information do policy makers require to advocate and support future interventions in solid waste management ?	- Sensitise target communities about the KCC Urban Agricultural ordinance	1½ months		18,850,000/=
		- Participatory training of the target group on low cost production technologies and alternative uses of biodegradable waste.	Ongoing 10 months spread across the project period		40,000,000/=
		- Establish on-farm demonstrations and trial sites on reuse of the biodegradable solid waste. - Exposure Visits			10,000,000/=
		- Carry out a cost benefit analysis on the reuse of biodegradable waste.	2 weeks	Consultancy	5,000,000/=
		- Documentation of the ongoing project activities - Dissemination of best practices using different channels (Audio and print media, workshops, meetings, documentaries and leaflets, Drama, exhibitions …...)	Ongoing		20,000,000/= 27,000,000/=

Action research tools

- Individual interviews

Focus group discussions (to include men, women, youths and children)

- Field Observations

Project Beneficiaries

These are categorised as follows;-

- Farming and non-farming households
- Vulnerable groups e.g. women, youths and the disabled
- Private sector
- Institutions (research, schools, local markets etc)
- Kampala City Council
- Civil Society Organisations

Partnerships and linkages

The city teams composition exhibits a partnership of institutions between Kampala City Council, Civil Society Organisations and research Institutions.

- Kampala City Council is mandated to provide and facilitate the delivery of quality, sustainable and customer oriented services efficiently and effectively.

- Environmental Alert aims at bringing about improvement in livelihoods of vulnerable groups in society through policy and practise changes in agriculture and natural resource management. Advocacy and capacity building components are the mainstream of the organisation's work. The organisation works with Intermediary organisations, Local Government authorities, Development NGOs, Private Sector, Networks and Central Government to implement its programmes.

- N.A.R.O, Mukono Agricultural Research Development Centre. This is a research institution created by the National Agricultural Research Organisation to increase client's participation in efforts geared at improving their livelihoods . Currently the station is working on a research programme in partnerships seeking a better understanding of the agro-ecosystem in the Central Uganda region including Kampala particularly to enhancing livelihoods in smallholder farming households.

The city team intends to work with other partners to ably achieve its objectives. The partners roles and contribution to proper solid waste management technology transfer are summarised in the matrix below;-

Partner	**Role**
Kampala City Council (KCC)	▪ Will co-ordinated the project ▪ Provide professional guidance on community planning, innovative participatory learning and information dissemination process ▪ Political support ▪ Popularise policy issues and set standards of how to go about recycling and waste management ▪ Collection and disposal of waste (not for immediate use)

	▪ Participatory monitoring and evaluation ▪ Establish networks and linkages with partners
Env.Alert / CSOs	▪ Community mobilsation ▪ Community institutional building ▪ Advocacy and capacity building on issues related to SWM ▪ Contribute to the training materials development ▪ Assist with participatory monitoring and evaluation ▪ Integrating extension, research and gender issues in the training materials
National Agricultural Research Organisation (NARO)	▪ Set up on-farm demonstrations and trials ▪ Spearhead research activities (Preliminary and in-depth surveys) ▪ Liase with extension providers on dissemination of appropriate technologies transforming SW into a valuable resource. ▪ Carrying out laboratory analysis of the composition of manure and soils
Private sector	▪ Establish profitable and sustainable collection mechanisms of waste ▪ Avail basic inputs for solid waste collection ▪ Pay KCC dues ▪ Marketing of waste products
Institutions (Schools, Universities, Local markets)	▪ Technical networks
Farming and non-farming hhds	▪ Participate in planning and monitoring of project activities ▪ Sort all their domestic waste ▪ Deliver or dispose waste at recommended collection points. ▪ Provide the training, demonstration and trial sites on possible innovations of transforming waste into a resource. ▪ Keep their home environments clean

Expected results

Objective	**Expected Output**
1. To develop a profile of domestic solid waste for baseline information.	- A profile on domestic solid waste available. - An evaluation of the existing solid waste management system.
2. Design and investigate alternative ways of managing domestic solid waste.	- Alternatives ways of managing domestic solid waste designed (sorting, recycling and reuse techniques) - Reduced volumes of uncollected solid waste in the community and improved home environment / sanitation
3. Analyse and document best options that can improve livelihoods.	- Adoption and multiplication of the innovations that transforming garbage into a valuable resource for agriculture and income. - Trade offs and synergies associated with proper solid waste management as an incentive for sustainability realised

Other outputs arising from the project.

- Strengthened networking and collaboration among key stakeholders
- Employment opportunities created for the vulnerable groups (most especially for the urban youths, women and the disabled

Communities empowered with knowledge and skills to sustainable utilise their waste for improved livelihoods.
Opportunity for replicability of the best practices in other communities in the District.

Monitoring and Evaluation

Participatory monitoring and evaluation will be conducted, to assess the performance of the project's activities and recommend strategies for improvements. This will involve;-
Development of monitoring and evaluation tools,

- Interviewing participating communities,
- Focus group discussions
- Technical and Political field visits,
- Review meetings and reports.

While undertaking monitoring, the team will consider the following questions;-

- Are we doing what we intended to do?
- Are we finding out what we wanted to know ?
- If not, why not and what should we do about it ?

Monitoring will be undertaken at two levels;-

1. Internal Monitoring

i. Monthly basis
Monitoring will be carried out by the Divisional Agricultural Extension worker in the company of a liaison partners, development partners, Parish Development Committees, Local Environment Committees and the Extension Link Farmers, to assess the performance and progress of project activities

ii. Quarterly Monitoring
Quarterly monitoring will be carried out by the Divisional Agricultural Extension worker, with representatives from the Civil Society Organisation, Team of project leaders, District and Divisional authorities (technical and political), to assess the performance and progress of the project activities.

2. External Monitoring

This will be specifically done by the funding institutions in the company of the implementing institutions on a yearly basis.

Evaluation

An impact assessment of the project performance will be carried out after one and a half years and a summative evaluation at the end of the project period.

Sustainability arrangements

i. Financial sustainability

The potential for income generated from the sale of resources from solid waste (manure, farm produce, brickkets, livestock feed etc) has a possibility of building financial capacity, enabling the beneficiaries attract and demand services at their own costs (ATP and WTP)

ii. Social sustainability

With community capacities built in group formation and dynamics, it is envisaged that, further recycling of solid waste and marketing of manure within themselves and other community members, will be enhanced.
On completion of the project, trained households, private garbage collectors,
CSOs and other stakeholders, will have adopted the necessary solid waste management technologies. Likewise the District and other Divisional authorities are expected to have gained interest in the innovations and hence support the project's replicability.

iii. Environmental sustainability

Effecting appropriate solid waste management practices at community level, will promote public hygiene, reduce quantities and emissions from waste, increase soil organic matter for UPA.

iv. Institutional sustainability

The project will ensure strong partnerships between the stakeholders in terms of working contracts, objectives, leadership, planning, implementation, teamwork and joint monitoring and evaluation. This capacity is vital and can result into an increased number of partnerships that can continue working together, and attract needed services.

Budget Summary

ITEM	QUANTITY
1. Community Entry	13,000,000/=
2. Objectives:	
To develop a profile of domestic solid waste for baseline information.	23,000,000/=
Design and investigate alternative ways of managing domestic solid waste.	79,050,000/=
Analyse and document best options that can improve livelihoods.	120,850,000/=
3. Monitoring and Evaluation	27,000,000/=
4. Administrative Costs (20%)	52,580,000/=
5. Local Contribution (10%)	31,548,000/=
TOTAL	**347,128,000/=**

Exchange rate 1USD : Ug.Shs 2,000/= = USD 173,564

REFERENCES

KCC Hand book (2001)

Kampala City (Garbage Ordinance) 2001

Local Government Act (1995)

Kampala District Poverty Eradication Plan (KDPEAP, 2001)

Constitution of Uganda (1997)

Department of Public Health and Environment (KCC)

Eberlee J (1997) The Neglected Industry of Kenyan Cities, Cities Feeding
Reople Report, International Development Research Centre (IDRC) Report Vol 21,No 3

Smith O.B. and Olaloku E.A. (1998) Peri-Urban livestock production system: Cities feeding people. CFP Report Series, Report 24.

Ibaren Konsultants, (2002) Urban and Peri-Urban livestock keeping in Kampala City: A scoping study.

Smith J., Ralta A. and Nasr J. (1996) Urban Agriculture, Food Jobs and sustainable cities Pg 120

Schonhuth M. (1993) Participatory Learning Approaches, An Introductory Guide: Rapid Rural Appraisal. Participatory Appraisal. (GTZ).

LAKE VICTORIA REGION
CITY DEVELOPMENT STRATEGIES
FOR IMPROVED URBAN ENVIRONMENT
AND POVERTY REDUCTION

KISUMU CITY: A STRATEGIC FRAMEWORK

June 2003

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FORWARD

The Kisumu City Strategic Development Framework constitutes an integral part of the efforts of the City Council of Kisumu's response to its mandate to create and sustain viable housing and livelihood initiatives within its area of jurisdiction. Sustainable livelihood improvements, especially affordable housing and water and sanitation services, are crucial elements in the transformation of a city and its development away from the traditional and rapidly emerging uncoordinated sprawling urban structure. The delivery of this strategy will be an important aspect of the development process of the City of Kisumu in its endeavour to re-structure the urban environment into a more viable, efficient and equitable spatial configuration.

The Kisumu City Strategic Development Framework is located within the established socio-economic challenges impacting on the people of Kisumu. The challenge is to impact positively on the felt socio-economic shortcomings affecting the people of Kisumu, so that their livelihood aspirations and related opportunities are available to a much more wider section of the populace.

To all intents and purposes, responsibility for the facilitation of housing, livelihood and associated infrastructure delivery is increasingly devolving to local authorities. For Kisumu, the key challenge is to increase existing delivery capacity in addition to developing other forms of capacity to shoulder this responsibility, while at the same time remaining fiscally viable. Furthermore, efforts must be made to improve the quality of housing and the environment in the face of diminishing resources and low affordability levels. The Kisumu City Development Strategy has as its overarching objective, the development of sustainable living environments. Its three key strategic pillars of Delivery, Facilitation and Co-ordination look towards solutions to ensure the delivery of a arrange of affordable livelihood opportunities, to facilitate and provide and enabling environment for housing delivery, including economic empowerment of communities, and to increase the co-ordination of activities and policies amongst all role players.

This document provides the framework for the development of a set of strategic programmes which together will constitutes the delivery, facilitation and co-ordination programmes of the City Council of Kisumu in meeting the felt livelihood needs in Kisumu.

INTRODUCTION

The Structure of The Document

The *Kisumu City Strategic Development Framework* is, substantively, the result of rigorous stakeholder consultations that were carried out with the citizens of the City of Kisumu. It captures their perspective on the determinants of their socio-economic circumstance. Intrinsic to the strategy, is an overarching embrace of the principles of sustainability, equity and empowerment, in an attempt to respond to their stated desire for sustainable improvements thereto.

Section One considers the City Development Strategic framework within the broader planning process of the Local Government, and as an integral part of the vision and mission of the City Council of Kisumu. This section also outlines the process of compiling the Kisumu City Strategic Development Framework, further relating the framework to the National and Regional contexts, thereby highlighting local contribution to sustainable development goals.

Section Two summarises basic information on socio-economic context, governance processes and structures of Kisumu City. Profiled herein too, in *the annex section* to this strategic document, is a summary of the citywide stakeholder consultations in which is captured the estimated development needs, and the indicated response-side issues for overcoming them.

Section Three outlines the Policy context within which the strategy is expected to operate. However, extensive analysis of the institutional arrangements or dynamics, such as the interactions between the strengths and weaknesses of key players, has not been done and shall require further exploration.

While, Section Four provides the Programmatic Response to the context of the development circumstance and comprises an overview of the essential elements of the Development Strategic Framework – its strategies, objectives and programmes. It also briefly outlines the institutional framework within which the strategy will be implemented.

The strategy provides a framework for the development of a set of strategic responses, which together will constitute the delivery, facilitation and co-ordination of development initiatives of the City of Kisumu.

At this stage of its development, this strategy is primarily organic and is to be enriched within the continuing inclusive citywide consultation process.

SECTION ONE: The City Development Strategic Planning Process

1.1. The City Development Strategic Framework in Context

To understand the CDS process, it is important to realise that strategic planning is not, essentially, about the production of a one-off end product. It involves a continuing, participatory process, which is both proactive and reactive, in a continuously changing environment. The CDS process, albeit flexible and sensitive to specific city conditions, is guided by the themes of Urban Governance, Improved Urban Environment, Economic Growth, Poverty Reduction and Gender Mainstreaming. Critical to the successful implementation of the CDS, is the continued interaction of the role players and other stakeholders, and their strategic engagement with the challenges within an identified thematic frame. Given the dynamic environment in which the CDS operates, and the need to be constantly apprised of the impact of its interventions and processes, the CDS necessarily requires, to build in, monitoring, evaluation, and feedback mechanisms to ensure its adaptability to the changing circumstances.

1.2. Compilation of the Kisumu City Strategic Development Framework

Kisumu CDS has been placed within the wider national and regional quest for sustainable development. Its compilation, has gone through the following steps:

Commitment of City Government – January 2002

- Intermediate Technology Development Group with support from UN-HABITAT, entered into a regional Cities/Municipalities Development Strategies partnership with the City Council of Kisumu.

Stakeholder Mobilisations – January to March 2002

- With support from UN-HABITAT and ITDG, a Sensitisation Workshop for City leaders (civic and executive) and stakeholders' representatives from the NGO sector, Environmental groups, Kisumu Hawkers Association and Private sector, was held at Kericho in February 2002. This was preceded and guided by preliminary data (mainly from literature review) and its synthesis by a team comprising staff from the city council and West Kenya NGO network.

- With support from UN-HABITAT, UMP, SIDA and ITDG, a Lake Victoria Region Cities/Municipalities Development Strategies Workshop for the Cities of Kisumu, Kampala and Musoma, was held in the period 11th – 13th March 2002, at the Sunset Hotel in Kisumu. Participants were drawn from NGOs, the respective local authorities, Associations of local governments, government departments.

  The workshop intended to (i) assess existing development situation in each city and extract derivative issues/problems therefrom, (ii) introduce to the three cities, the UMP City Consultation methodology and the City Development Strategy process, and (iii) develop a window of commonality through which the three cities would be guided in their efforts to establish their respective Cities Development Strategies.

The major outcomes from the workshop included City sensitive action plans, with Kisumu proposing to immediately continue citywide participatory consultations in order to elicit more information to enable identification of priority needs areas. This information would guide the determination of parameters for the proposed city-scan, which city-scan findings would inform development of action and investment plans.

Rapid Participatory Assessment (City Scan) – June to August 2002

(*Refer to annex 1 for report*)

- Rapid assessment of the prevailing characteristics that influence urban and economic environment of Kisumu, conducted by stakeholders' representatives in June 2002.

- Discussions of the draft city scan report, done with stakeholders' representatives for two weeks in July 2002

City-wide Consultation

- Consultations not conducted with stakeholders because it was felt that the interactive discussions on the draft city scan report, together with the then just concluded Local Authorities Service Delivery Action Plan (LASDAP), sufficed to inform the strategy development phase. The LASDAP is a three years development strategy. Its assemblage includes an intensive participatory process that is co-operatively done by the community, stakeholders and the Council.

Strategy development – 12th to 30th October 2002, May/June 2003

- Draft strategy paper assembled and then discussed with stakeholders, with technical support from ITDG.

- Stakeholder review of the draft strategy within the context of changed governance circumstance from January 2003.

Strategic Framework and Process

1.3. The Goals of the City Development Strategy

City Development Strategies aim to achieve a shared city vision and strategy, improved urban governance and management, increased investment and systematic and sustained reductions in urban poverty.

The goal of the Kisumu City Development Strategy is defined by:

Vision: By the year 2012, Kisumu City will be a thriving industrial and commercial regional centre, an attractive tourist destination and gateway to Lake Victoria, with a healthy populace enjoying equitable access to a high level of sustained service and development orientation and civic pride, within an improved, sound and well-endowed environment.

Mission: The creation of sustainable livelihood improvements in the City of Kisumu with a view to ensuring that by the year 2012, over 90% of the people of Kisumu will have equitable access to socio-economic opportunities which include secure tenure, employment, acceptable housing, essential services and support, in achieving incremental improvements in their living environment, with requisite social, economic, and physical infrastructure.

Key Strategies: City Development Strategy for Kisumu aims to:

- Implement the mission within the context of a sustainable and integrated development planning framework
- Establish Housing and Water and Sanitation services as lead sectors in the economic and social development of the City of Kisumu.
- Ensure that the provision of housing opportunities and development of balanced neighbourhoods will become part of a broader strategy to re-structure and transform the present sprawling and inequitable urban form in a more compact, integrated and accessible environment.
- Achieve an annual delivery of at least 2,000 housing opportunities in the City of Kisumu over the next 10 years.
- Provide households of different interests and means with a range of tenure options and a variety of delivery systems, which will enable access to housing opportunities in an affordable and sustainable manner.
- Foster public-private-community and sub-regional city partnerships
- Contribute to sustainable regional efforts to harness and exploit Lake Victoria resources.

SECTION TWO - Kisumu City Context

2.1. Introduction

This section intends to provide an overview of the socio-economic profile within the context of City of Kisumu, in order to understand the current challenges and to inform the proposed strategic interventions.

2.2. Basic City Information

City/Country:	Kisumu City Council, Kenya (being upgraded to City) Covers an area of approximately 417 Km², of which 297 Km² is dry land and approximately 120 Km² under water.
City population country pop.:	Approximately 345,312. Approximately 28.7 million (1999 census)
City Population density:	828 per Sq. Km
City growth rate:	Estimated at 2.8% p.a.
City's main function:	Principally, the leading commercial/trading, fishing, industrial, communication and administrative centre in the Lake Victoria basin. The City Council's main functions: - • Mobilise internal and external resources and, within existing regulatory framework, direct the resources towards addressing the following basic social needs of the populace in the City; o Provide social services esp. water supply and sewerage services; o Infrastructure development (roads, parking spaces, houses etc.); o Environmental sanitation, garbage collection and disposal; o Housing, Health, Education, Welfare - Markets, and Sports • Nurturing an enabling environment for the enhanced participation of the citizens in urban development
Economic / Poverty profile:	• 48% of the urban population live within the absolute poverty bracket (Nat. Avg. 29%) • Approx. 150 rooming/housing units per hectare in informal settlements • 75% of rural inhabitants own and stay in their homes. (Mostly semi-permanent structures) • Highest incidence of food poverty with 53.4% of the population below the food poverty line in comparison to Nairobi (8.4%), Mombasa (38.6%) and Nakuru (30%) • 30% unemployment rate • 52% of the working population engaged in the informal sector • Average monthly gross incomes in the range of KShs.3, 000-KShs.4, 000 • 60% of the urban population are resident in the peri-urban and informal low-income settlements • Adult Literacy Rate is 99% with male at 75% and female at 25% of the 99% • 24.6% of the urban poor have attained secondary school education

Administrative structure:	Kisumu City is composed of 17 civic wards with a total of 22 councillors: 17 who are elected by universal adult suffrage and 5 who are nominated from the majority party to represent special interests. Elections are held under a mixed presidential and parliamentary system after every five years. Co-ordination of activities of the city is legally bestowed on the City Council of Kisumu. The Council comprises a Civic arm and Executive arm. The Mayor is the first citizen in the local authority and the ceremonial head of the civic body. He/she is a councillor and is elected by councillors from amongst themselves to serve for a period of two years, renewable by election. The role of the Civic arm is to formulate, regulate and evaluate by-Laws and policies through relevant standing committees of the council. The City Council of Kisumu has Ten (11) standing committees namely; Finance, Staff and General Purposes Committee, Water Supply and Sewerage Services Committee, Works Committee, City Planning Committee, Social Services and Housing Committee, Housing Development Committee, Education Committee, Public Health Committee, Environment Committee, and Audit Committee. The standing committees are each headed by a chairperson who is elected by his/her colleagues from amongst themselves. The Mayor and his/her deputy are ex-officio members of all standing committees. Council decisions (Resolutions) are forwarded from the technical standing committees, through approval action at the Finance, Staff and General Purposes Committee, to the Main (Full) Council, which is chaired by the Mayor, for adoption and consequent execution. The role of the Executive arm of the council is to execute and implement council resolutions. The Local Government Act Cap 265 bestows this executive responsibility on the Town Clerk. The Town Clerk is the Chief Executive and Administrative Officer of the Council, and has the overall responsibility of co-ordinating the whole of the work of the council. He/she is assisted by chief (implementing) officers, who each head a department established under the policy guidance of a committee.

2.3. City of Kisumu within the National Context

Kisumu, the third largest town in Kenya, has the triple role of being the headquarters of the City of Kisumu, Kisumu District, as well as Nyanza Province respectively. It has developed progressively from a railway terminus and internal port in 1901, to become the leading commercial/trading, industrial, communication and administrative centre in the Lake Victoria basin, an area that traverses three provinces of Nyanza, Western and western Rift Valley. In addition, Kisumu serves as the communication and trading confluence for the Great Lakes region - Tanzania, Uganda, Rwanda and Burundi.

Kisumu has a very well developed road transport connection with adjacent towns such as Kericho, Kakamega, Homa-Bay, Kisii, Siaya, Busia, and the sugar belt satellite townships of Muhoroni, Awasi, Chemelil, Miwani and Nandi Hiils. Being on the convergence point of the great African North Road, Kisumu is well connected with Uganda and Tanzania and by extension Rwanda, Burundi and Congo DRC in the west, Zambia to the south and Sudan to the north. It's geographic position and its cosmopolitan profile, places the city strategically as a competitive growth centre in the emergent age of technological and economic development.

Political, Legal and Policy Framework

The political climate in Kenya has since the early 90's progressed from an exclusive one-party democracy to an inclusive multiparty system. Some developments of significance in this period include the review of the Constitution of Kenya, the preparation of the Poverty Reduction Strategy Paper (PRSP) and the review of various parliamentary acts (esp. the Local Government Act, The Electoral Act etc.) in response to social challenges and needs. A notable development in this regard is the on-going Kenya Local Government Reform Programme which encompasses the Kenya Urban Transport Improvement Programme (KUTIP), the introduction of Local Authorities Service Delivery Action Plan (LASDAP), a local level participatory planning and action tool and process, and replacement of the Service Charge (Local Revenue) with disbursement of the Local Authorities Transfer Fund (LATF) by the Ministry of Local Government. The latter is aimed at strengthening budget performance of local authorities.

Local authorities in Kenya are governed by several pieces of legislation as embodied in:

- The Local Authority Charges Act. Cap. 265
- The Rating and Valuation for Rating Act
- The Water Act (Cap 372) revised latest in the 2002.
- The Public Health Act Cap (242).
- The Penal code.
- The Environmental Management and Co-ordination Act 1999
- The Physical-planning Act of 1996, and
- The Land Acts (Cap 288 – 303), which regulate land use planning.
- By-laws, which are from time to time amended to facilitate effective service delivery in Councils.

Governance Situation of the City

The citizens of Kisumu have become increasingly active in their scrutiny of public managers for integrity, competence and ability to deliver as opposed to the populist practice in previous years. In addition, they now demand delivery of services and insist on getting quality service from the Local Authority.

Councillors together with civil society agents have frequently mobilised and sensitised members of their respective wards in order to obtain their participation and involvement in development activities. Cases in point have been mobilisation activities during the process of development of Local Authorities Service Delivery Action Plan (LASDAP), Local Authority Development Plan, and Poverty Reduction Strategy Paper. Citizens are forming community action groups/associations for the purpose of advocating and articulating their interests within their respective residential areas/communities. The civil society has made invaluable contributions in this regard.

The council has made a deliberate effort to promote private sector participation in the City's urban planning and development. Key result areas in this respect include *Swedish International Development Agency (SIDA)* supported rehabilitation of the Jomo Kenyatta Sports Grounds into a modern world class recreational facility, *Kenya Breweries* and *Telcom Kenya* Ltd support in the rehabilitation of the Kisumu Social Centre and part of the Moi Stadium, while the *Rotary Club* has made invaluable contributions to the development of the Rotary Youth Training Centre. *The Lions Club* continues to contribute material support to Mama Ngina Children's Home as well as support numerous environmental initiatives.

Civil society/ participation in local governance

- In 2001, the Mayor of Kisumu was instrumental in the establishment of a monitoring and co-ordinating focal point (Kisumu Round Table) composed of private sector, NGO's and council representatives.
- In 2000-2002, Kisumu City Council in a 20 years development partnership with SIDA, and with participation of stakeholders co-ordinated the renovation of Jomo Kenyatta Sports Ground into a modern recreational facility. Among its main development objectives, the Kisumu –SIDA partnership envisages that the facility, which is being managed through a stakeholder Trust Fund, will contribute to enhancing the Lake Victoria cities development partnerships.
- In its endeavour to improve provision of water supply and sewerage services, and to minimise on illegal water vending, the Council has set up a Water and Sewerage Company, called KIWASCO. KIWASCO has initiated the formation of Kenya-RE residential Estate Stakeholder forum with the aim of improving water and sewerage services surveillance efforts and enabling stakeholder participation in water services management, leakage detection and control in their estate.

The Economy

Over the past decade, the Kenyan economy has been affected by inhibiting external and internal factors that have had adverse effects on rural and urban livelihoods. The result has been soaring unemployment and heightened retrenchment of workers both in the public and private sector leading to increased poverty levels. In 1997, 49% of the Kenyan population was estimated to be poor[1]. Kenya then was ranked as the 17th poorest country in the world.

Kisumu, currently experiences the highest average urban poverty levels at 48% against a national average of 29%. Available statistics indicate that Kisumu, which is a net food importer, registers one of the highest incidences of food poverty with 53.4% of its population living below the *food poverty line* as compared to Nairobi (8.4%), Mombasa (38.6%) and Nakuru (30%)[2].

In comparison, many of its peer urban centres around the lake, the growing urban poverty indicators have been aggravated by the reduction of shipping and other transport services between Kenya and Uganda and Tanzania, the decline of the railway services, adverse weather conditions, influx of cheap subsidized imports, the infestation of the lake by the water hyacinth as well as the recent EU ban on Lake Victoria fish exports. Urban poverty in Kisumu, manifested itself in reduced living standards, the increasing number of street children, increased informal trade activities of hawking and peddling, increase in commercial sex activities and crime, especially in the low-income settlements.

Major industries in Kisumu such as Kisumu Cotton Mills, Kenya Matches, the Fish processing and Agro-based industries to name a few, have closed down, while some like Kenya Breweries, Miwani and Muhoroni Sugar Companies have scaled down their operations. Rather than growth and expansion, several plants dealing in manufacturing and processing are either performing dismally or have closed down, altogether. The parastatal fraternity has not been spared either from this effect as demonstrated by the Kenya Railway Corporation, which was once a major source of transport and jobs, and is currently tottering on the brink of collapse.

The majority of the populace relies entirely on wage employment. Despite the positive strides that have been achieved in promoting the participation of women in education and public sphere, the vulnerability of women is still high as noted in their employment which generally alternates between working as house helps under very difficult conditions, and engaging in subsistence trades such as selling vegetables, cooked foodstuffs, fish, second hand clothes, trinkets etc. The average monthly formal sector gross incomes are in the range of Ksh. 3000 – Ksh. 4000.

The Government, the City Council and the private sector have taken action at the national level to attract investors to Kisumu. This is through the improvement of infrastructure services and aggressively marketing Kisumu as an investment and tourism destination. This strategy promises to reverse the downward trends cited above.

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1 This was based on the absolute poverty indicator of KSh. 2,648,

2 The prevalence of hardcore poverty in Kenya dropped from 10% in 1994 to 7.5% in 1997. Kisumu City recorded close to 17%.

Kenya has endeavoured to improve its economic stranding by increasing its budgetary allocation towards poverty reduction. In 1997/98 this stood at 90,000/= (7% of all ministerial allocation) and has been increasing with successive annual budgets.

SECTION THREE: Policy and Institutional Context

Overview

This section looks at, and provides a summary of, and comments on the relevant national and local government policies, legislation and institutions that will influence the CDS delivery.

3.1. Introduction

Local Authorities policies and programmes need to be situated within National policies and programmes. They also need to be sensitive to the existing institutional frameworks and regulatory mechanisms. As such, the Kisumu CDS must locate itself within existing policy parameters and institutional/organisational frameworks.

At the national level, the government has formalised policies in policy documents and various Acts of Parliament. These policies and laws together provide direction for more localised strategy formulation, and an attempt is made here to isolate the key policies and laws affecting the urban management process in Kenya, and in Kisumu in particular.

The following subsections breakdown relevant policy and legislation into five broad categories, which describe the emergence and roles of a range of institutions that comprise part of the development forum in Kisumu.

3.2. Housing Policy

Due to a multiplicity of governance related issues, housing policy in Kenya has not received requisite attention and has therefore stagnated over the past few years, to the extent of being overwhelmed by the rapid urbanisation and resultant rampant breakdown in the due process of law with respect to housing and construction.

Housing affairs are coordinated by both the central and local governments the latter through local authorities. In principle, local authorities are constitutionally empowered to set parameters for local housing policy formulation to the extent that the observance of such parameters can be shown to be in the national interest. Outside the observance of such parameters, local authorities are empowered either to adopt policy developed by central government or to formulate new policy. In practice few local authorities if any have attempted to formulate local policy. However some have proposed (and in some cases implemented) modifications to central government policy, which can be described as major departures. Where this has happened substantial conflict between central and local government has been the result. In part, such conflict has occurred because of a failure to distinguish clearly; those parameters which are in the national interest from those which are open to local authority interpretation. More typically though, conflicts have occurred over matters of fundamental principle (such as minimum site/house size and so forth).

Building Code

The Building Code may be cited as the Local Government (Adoptive By-laws) (Building) Order 1968 conferred under regulation 210 of the Local Government Regulations 1963.

In terms of the building code, all spheres of government must ensure that building development is economically, fiscally, socially and financially affordable, equitable and sustainable.

The Building Code provides for the promotion of available public resources in a manner that stimulates private investment in, and contributions of individuals to building/construction development.

Development Principles

The Building Code substantively clarifies the respective roles of the different spheres of government with regard to building. It sets the direction on building, in that it specifies a set of development principles, which must be observed by all actors (both private and public) in their pursuit of building goals. In this regard, the code stipulates the following:

- Sets building/construction delivery standards
- Identifies and designates specifications for building development
- Facilitates and promotes an enabling environment for building development
- Promotes effective natural resource -e.g. land- use development.

Responsibilities of Local Government

The Building Code provides for a substantial role for local government in the facilitation of building delivery. Every local authority is required, as part of its facilitation of the process of development, to take all necessary steps to ensure that the inhabitants of its area of jurisdiction have access to adequate housing opportunities on a progressive basis, that conditions not conducive to the health and safety of inhabitants in its area of jurisdiction are prevented or removed, and that services in respect to water, sanitation, roads, storm-water drainage and transport are provided in a manner which is economically efficient. Furthermore local government is responsible for creating and maintaining a public environment conducive to financially and socially viable building/construction development, and resolution of conflicts arising in the building development process. Local government is also responsible for providing engineering services, and revenue generation services in so far as such services are within its legal mandate.

Rent Tribunal Act

The Act aims to promote equitable access to adequate housing through the proper functioning of the housing rental market; to promote the provision of housing rental property; to limit deficiencies in the housing rental market; and to make provisions for regulated areas.

In general terms, the Act provides for the protection of both the landlords and tenants. It provides for arbitration between landlords and tenants should the relationship between them have effectively deteriorated. In this regard, it allows for the establishment of a tribunal.

The Rent Tribunal Act is relevant to the delivery of rental housing through mechanisms, which are subject to provisions of the Act.

3.3. Local Government Policy

The underlying assumption of the Local Government policy is that local government is the sphere of government closest to the people, and is best placed to respond to their service delivery and development needs. Fundamentally local government is tasked with promoting an enabling environment for the harmonious integration and development of local communities.

The ongoing public sector reforms in the country have included due attention of the local government policy. In that context, some key challenges facing local government that include: backlogs in service delivery and infrastructure, the need to recognise rural/urban economic links, need to transform administration in local authorities, need for local authorities to enhance relationship of reciprocity with communities have been recognised. As such the reform process is looking at the local government as developmental and shall incorporate ways to address these challenges.

From the beginning of this year 2003, delivery and development are central issues for the national government system. Performance measurement, transparency and accountability of both central and local government are now changing from abstractions to hard-nosed requirements that apply to the daily business of the public sector. Notably, local authorities as with other government sectors, are now required to take lead role in promoting and ensuring that services are provided, facilitation for economic development and local investment are enabled. As such local authorities are now being required to establish performance management systems, the key elements of which are performance indicators, measurements of performance, reporting and monitoring and evaluation.

In terms of Local Authorities Transfer Fund (LATF) and Local Authorities Services Delivery Action Planning (LASDAP), minimum output requirements include the establishment of goals, strategies, the preparation of financial, institutional and communication plans. Minimum process requirements are that local authorities must provide appropriate mechanisms for community and partnership participation and that local authority planning must integrate intra-department activities

Local Government Act (Cap 265) LGA

The purpose of the LGA is to give effect to the vision of the local government as envisioned in the local government policy by identifying and facilitating core planning, performance management, delivery and reporting of the following core functions: economic development, urban form and land use, infrastructure provision, community services provision, safety and security, health, water and sanitation, housing, environment.

The basic and consistent tenet of the Act is that residents of a local authority are the foundation, content and focus of local authority. As envisioned in the ongoing reform process, the local authority shall no longer be the exclusive possessor and focus of political authority, but rather an instrument for the realisation of citizens' interests and priorities, and for communication between the municipality and residents.

Kisumu City by-Laws

An understanding of the object and functions of local authorities' By-laws can be discerned in the following summary:

"*Facilitation of access to public services, which means that subject to any other applicable legislation, and subject to which public service functions are allocated to the Local Authorities by any means, the Local Government shall be responsible in equal part with respective Local Authorities for devising and co-ordinating By-laws within the framework of the Local Government Act, and for the implementation of such By-laws within respective Local Authorities' areas as a whole: provided where such By-laws envisage implementation by a local authority, such implementation shall be undertaken by the relevant Local Authority, and provided further that if the Local Authority fails to undertake such implementation, the Local Government shall be responsible for such implementation as far as is reasonably provided for in the Local Government Act as read in conjunction with other relevant pieces of legislation .*"

In other words, service delivery within the confines of a Council's area is a Council function and policy formulation a concurrent responsibility of both central and local government authorities. More over in instances of non-delivery, the Central Government agency can re-assign the delivery responsibility from the respective council.

3.4. Physical Planning Policy

Guidelines for the fulfilment of local government's development role in Cities Development Strategies incorporate the terms of the Physical Planning Act. This identifies the need to:

- Create housing opportunities closer to work opportunities, economic activities and public facilities
- Generate a more efficient spatial-economic structure that is conducive to holistic community development
- Identify and develop well-located land for a mix of income groups and uses to achieve these ends.

Physical Planning Act 1996

Development Facilitation

The Physical Planning Act (6 of 1996) (PPA) is to be read in conjunction with the Local Government Act Cap. 256, the Government Lands Act Cap. 280, The Trust Land Act Cap 288, the Registered Land Act Cap 300 and the Land Control Act Cap. 302 in terms of structure and institutional direction. The PPA aims to facilitate planning and development at all levels of government and rationalises and consolidates the laws relating to planning and development within the nation. Specifically, it sets out to rationalise and streamline procedures for categorisation of land and generally to put in place systems and structures which will ensure effective, participative, and sustainable development. As such it provides a framework for the facilitation of development in the country in an orderly way, so as to ensure the rational and sustainable development of the nation and the utilisation of its natural resources.

Constitution of the PPA

Incorporated in the PPA is a hierarchy of physical planning liaison committees (PPLCs) namely the National, Provincial, District, and relevant local authorities' physical planning liaison committees. The composition of membership of the respective level PPLCs is clarified in the PPA and includes such persons as whose role directly impacts on the use and security of land.

Apart from the national physical planning liaison committee (NPPLC) whose principle functions include *inter alia:*

i. Advising the Minister on broad physical planning policies and standards, and economic viability of urban and agricultural land use proposals;
ii. Arbitration on complaints arising from decisions of the other PPLCs;
iii. Determination and resolution of land matters referred from other PPLCs; and
iv. Co-ordination and integration of physical planning nationally,

The provincial, district and local authorities' PPLCs are broadly tasked with:

i. The inquiry and determination of complaints against the Director of Physical Planning arising with respect to his/her exercise of his/her functions under the PPA;
ii. The inquiry and determination of conflicts with respect to proposals, and/or use of land within their respective tiers;
iii. Regulation of physical planning and land use proposals and actions within their respective tiers, as provide for in the PPA.

3.5. Environmental Policy

The environment policy is a key policy which impacts on land use and planning for Kisumu Cities Development Strategies. Some activities of the CDS shall have direct impact on the natural environment, and the CDS recognises the importance of minimising negative environmental impact in the city area.

Environmental Management and Co-ordination Act (1999)

The EMCA (1999), among other objectives, principally aims to promote participation of citizens in providing a clean and healthy environment. Of particular note, is the provision for legal redress by citizens in respect to activities and/or actions deemed to be injurious to their living environment. The EMCA (1999), further, addresses the following environment protection and conservation issues: Impact Assessments, Audits and Monitoring, setting of quality standards and conditions for restoration, conservation and easement. Being cognisant of international conventions and agreements on protection of the environment, the EMCA (1999) provides for the participation of Kenya on such controversial issues as the Nile Treaty debate.

3.6. Water Policy

Water Act Cap 2002 (8 of 2002)

Before the advent of The Water Act 2002(8 of 2002), co-ordination of the discharge of such duties, responsibilities and functions as, abstraction, production, use and management of water resources was variously regulated under different Acts.

The Water Act 2002, broadly seeks to co-ordinate (i) management, conservation, use and control of water resources; (ii) acquisition and regulation of rights to use water; and (iii) regulation and management of water supply and sewerage services. It is an integral part of the broader continuing reform process and is therefore linked to the development aspirations of Kenyans.

Broadly speaking, for completeness and institutional direction, application of The Water Act 2002 will most often require reference to The Land Acquisition Act Cap. 295, Criminal Procedure Code Cap. 75, The Exchequer and Audit Act Cap. 412.

Constitution of the Water Act 2002

The Water Act provides for a the following tiered structure for its implementation:

i. Water Resources Management Authority, at which level overall regulatory and co-ordination responsibility is bestowed,
ii. Water Services Regulatory Board, at which level responsibility for national standards and quality assurance is bestowed,
iii. Water Services Boards, at which level provincial, district and municipal water supply co-ordination is delegated, and
iv. Water Service Providers, at which level consumer water services delivery, is appointed.

3.7. Institutional Arrangements

The relative roles and responsibilities of the various policies and legislative instruments with regard to development have just been examined. In addition to government, however, a number of other institutions are increasingly emerging and playing an integral role in development. These have been set-up, funded or sponsored by the government, private sector and Non Government Organizations, or are the result of interaction and negotiation between the government, private sector and communities. The fundamental object of these institutions is the promotion and achievement of equitable and sustainable development of communities. The underlying concern, in the pursuit of this noble agenda, is holistically, how to minimise and manage risk effectively.

Clearly, the challenge to development programming today, is to obtain and avail the enormous requisite resources for its successful implementation. This consideration is sustained by the prevailing performance of the Kenyan economy.

The Kisumu CDS has attempted to address this largely by trying to pursue a co-operative partnership between the Council, government, private sector businesses and NGOs. As the CDS moves from the concept/planning stage to implementation stage, it shall require to augment this partnership arrangements through much more formal means.

Financing

In addition to the risk factors cited above, the Kisumu CDS shall *inter alia* need to:

- Aggressively mobilise wholesale financing for its major interventions such as housing, water and sewerage sectors etc.
- Facilitate co-operative financing schemes among informal traders' groups
- Consider the establishing end-user financing mechanisms for the low-income people at scale. This could involve the acquisition and provision of start-up loans (at zero real interest).

3.8. Concluding remarks

This section has attempted to provide an overview of the policy context within which the Cities Development Strategy shall intervene. The focus has been on relevant past policy and new or emerging policy. A perusal of existing legislation and policy indicates that there are tensions between certain policies and laws, for example the requirement for EIAs and land claims on one hand, and the objective of delivering services as soon as possible, on the other. Notwithstanding these anomalies, the policy provides that framework within which the CDS is to occur.

The government is currently engaged in the process of policies' reforms and while this is continuing, indications are that it will:

- Assess housing needs and determine the housing backlog.
- Address policy deficiencies and the need for greater differentiation, integration and transformation in the land, local government, water, environment, housing and financial sectors
- Establishing norms and standards in the above sectors.

In the light of the above, the Kisumu CDS shall build relevant capacity to exploit the salient opportunities intrinsic to its envisaged interventions without compromising the viability of its strategy. The perception, either of an opportunity or a serious threat to the viability of the Kisumu CDS, will depend on the relative magnitude of its interventions, available finances, existing capacity and resources, which it can muster.

SECTION FOUR: The Strategic Response

4.1. Introduction

In the period dating from 1997, especially in the last 3 years, Kisumu has registered incremental Social and Infrastructure achievements and improvements. This development has been enlivened by the open and consultative approach to leadership and management that has been adopted by the council, together with a new but previously dormant interest and participation, by various stakeholders, in the conduct and affairs of the City Council.

Challenges

Over 60% of the population in Kisumu inhabit the peri-urban and low-income settlements that are situated on the eastern and southern parts of the town and the rural parts of the City. Notwithstanding its record of achievements, the revelation of the inquiry processes of the City Scan and LASDAP have helped to confirm the significant challenges that the City of Kisumu is still grappling with, which include *inter alia*:

- Maintaining current capacity and broadening delivery in the light of increasing fiscal constraints.

- Improving the quality of housing, water and sewerage and the whole urban environment within the constraints of low affordability levels and a limited and diminishing (in real terms) subsidy base.

- The inability of the economy of Kenya, as previously discussed herein, to provide sufficient jobs for its rapidly growing workforce has resulted in depleted ability to afford security of tenure - either in terms of capital outlay or in terms of maintenance and payment of rates, tariffs, rents, or mortgage payments. Differentiation from income is hereby made in considering issues around access to credit.

- Most powers pertaining to land ownership, land use, control, land acquisition, land allocation and provisions for major land development schemes are with the Central Government. Issues such as settlement expansion, slum upgrading and landfill relocation and development that may touch on land and space take much time to implement

- One major challenge in governance pertains to lack of awareness of citizen responsibility at the grass-roots level. The majority of the residents tend to more concerned with elections; they presume that development is the responsibility of government and the council.

- The high incidence of infectious diseases has directly influenced the poor health status of the people of Kisumu. HIV/AIDS prevention and control still remains a serious social challenge in Kisumu. Added to this is the circumstance of inadequate and disproportionately distributed health professionals and facilities, especially in the peri-urban and rural parts of the City, that have compounded the problem of access and affordability of health services by the population.

- The Water hyacinth, albeit providing economic opportunities to small-scale entrepreneurs like basket weavers, furniture makers, and paper producers etc., continues to impact negatively on

livelihoods and the provision of water. The challenge of eradicating it is high on the local, national and regional agenda.

- Kisumu's rapid population growth at 2.8% per annum and consequent solid waste generation has overwhelmed the City Council's traditional solid waste management methods and capacity. The council can no longer cope with collection and disposal of solid waste, hence, resulting in generated waste staying uncollected for very long periods in time in backyards, paths and compounds[3] of peri-urban areas where the majority of people reside.

- Despite the good coverage of electricity in Kisumu, kerosene, charcoal and firewood still remain the major sources of energy in informal business premises e.g. food kiosks, and most of the peri-urban residential areas. The electricity distribution network is well developed in the town centre, while most of the peri-urban areas where it was intended for street lighting are under served. Connection of domestic power is only assessed on demand. Generally, accessibility to power by potential consumers is hampered by the expensive consumer tariffs.

- The city has very limited capacity for risk preparedness, disaster response and mitigation. The inadequate and poorly managed storm drainage conduits, exposes the lower east southern parts of the town to the problem of floods, a situation that is evident in Nyamasaria, Pandpieri, Nyalenda and the lower parts of Manyatta, in the peri-urban low-income settlements.

Outline of the Strategic Framework

The responsibility of City Council of Kisumu with respect to addressing the above non-exhaustive challenges can be summarised into two broad areas.

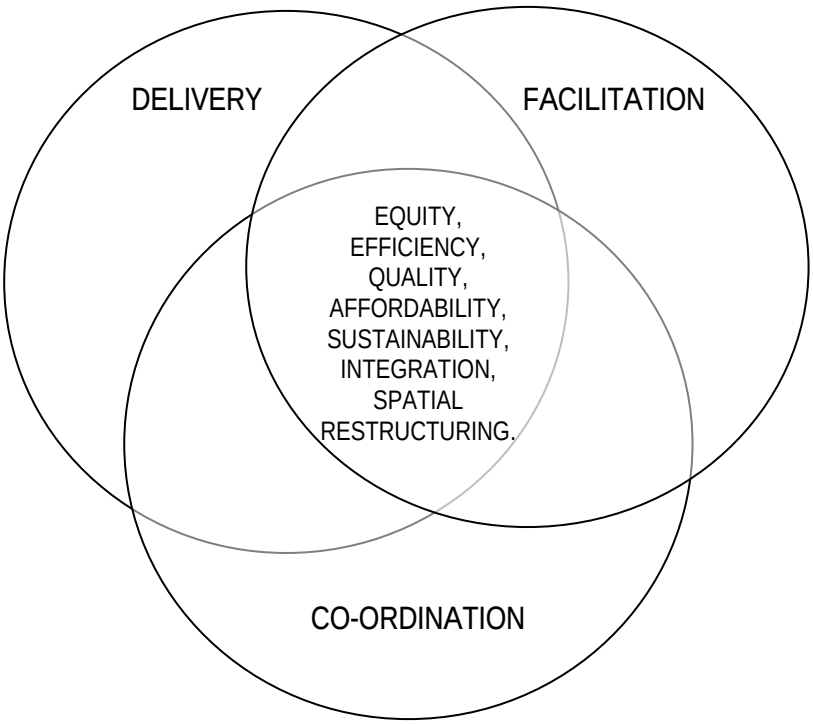
i. Facilitating housing, water and sewerage and economic sectors performance. This shall require facilitation processes on both:
   - The demand side (e.g. in relation to the beneficiary, e.g. access to subsidies, end-user finance etc.)
   - The supply side (e.g. in relation to developers and contractors, e.g. streamlining planning approvals, providing working capital loans, etc.)

ii. Facilitating and contributing to the management of Improved Urban Environment through:
   - Improving of the quality of life in informal settlements and in new developments.
   - Influencing of the location of new developments.
   - Improvements in the basic services e.g. health, education and security.
   - Influencing of sustainable exploitation of resources of Lake Victoria

Delivery, Facilitation and Co-ordination are the three strategic pillars within which the broad areas above and upon which the Kisumu Cities Development Strategies has been built. Clearly, the pillars are inextricably linked, mutually dependant and reinforcing. The first two pillars (delivery and facilitation) basically provide the conceptual framework within which the strategic interventions are divided. In turn, coordination is considered essential to achieve the effective implementation of the first two strategic pillars:

[3] Kisumu Town has one dumping site situated 3 Km from the city centre near the Moi Kisumu City Stadium. The facility has been overfilled and hence requires to be relocated.

The Three Pillars of Programme Delivery



Each of the strategic interventions identified in the rest of this section has a set of associated programmes. While a great deal of work has gone into identifying actions which need to be undertaken to achieve desired outcomes, it must be acknowledged that in many aspects there is still much scope for improvement.

4.2. Strategy One – Delivery

Fundamentally, the delivery strategy is concerned with concrete realisation of housing and livelihood opportunities and associated infrastructure to meet a variety of development needs. This implies that land will be identified and acquired; that the requisite bulk services will be made available; that projects will be implemented in terms of the available financing limitations; and that programmes will be put in place which result in longer term consolidation of the livelihood deliverables. Whereas local authorities have been key players in delivery in the past, the role of City Council of Kisumu is expected to focus increasingly on delivery facilitation in the future.

This shift from direct delivery to wards active facilitation presupposes that key strategic programmes that have been identified will be implemented through a range of interventions on both the supply and the demand sides as below summarised:

- A clearer definition amongst the role players and the formation of innovative partnership arrangements in the form of public-private–community partnerships and joint venture arrangements that clearly specify responsibilities, effectively manage risk, and identify targets.

- Providing Bridging Finance:

  - To allow for more capital subsidy approvals, and
  - To provide bulk infrastructure

- Identification of land for housing, and delivery of land and tenure in a range of ways, including:
  - Land release initiatives, and
  - Exploration and implementation of alternative tenure options
- Promoting Infrastructure Consolidation via:
  - The provision of housing and associated infrastructure support
  - Promotion of local economic development and affirmative acquisition policies
  - Enhancement of investment and business opportunities
  - Promotion of vocational and skills training

4.3. Strategy Two - Facilitation

Facilitation will entail the creation of an enabling environment for consolidating delivery of housing and livelihood opportunities, and hence will comprise the bulk of the activities of the City Council of Kisumu. The object will include facilitation of the project process, facilitation of development finance, development of housing, water and sewerage institutions, community empowerment programmes, and facilitating access to end-user finance. In other words, facilitation shall involve assisting in both the demand side in relation to the beneficiary, and on the supply side in relation to the service provision.

Given the multi-faceted nature of housing and livelihoods initiatives, it is unavoidable and desirable that some overlapping and interaction of programmes/interventions will occur, especially between community empowerment and consolidation. Inherent to this strategy, through programmes described below, is a package of support services, which will be provided in order to meet developmental and strategic goals.

- Project Cycle Facilitation, including:
  - Resources mobilisation and packaging for development
  - Promotion of resources utilisation objectives via project implementation
  - Progress monitoring of projects involving cash flow management, removal of blockages, and active assistance.
  - Assisting with plans approval
  - Political support

- Development Financial Facilitation shall involve the provision of a range of loans or grants in order to meet development objectives including:
  - Facilitating working capital loans
  - Bridging housing, water and sewerage etc. subsidies
  - Equity contributions to housing institutions
  - Topping-up funding
  - Bulk infrastructure loans
  - Funding for support programmes
  - Enabling access to end-user finance

- Community Empowerment via:
  - Promotion of community governance institutions
  - Promotion of Savings and Co-operative Societies
  - Development of community development plans
  - Pursuit of skills and training initiatives
  - Security and protection of consumers and residents

- Institutional establishment which will comprise active involvement in the establishment and support of NGOs and private sector institutions, including:
  - Setting up pilot projects
  - Contributions to the setting-up costs of institutions
  - Contributions to end-user loans

4.4. Strategy Three - Co-ordination

Housing and Water and Sewerage sectors, are key sectors in the development and management of integrated and sustainable human settlements. They involve different public and private role players, and cut through all sectors that make up the urban environment. Given their strategic place, especially of housing, within the urban make-up, it is critical that they coordinate themselves internally and externally with other sectors and actors. This requires that information pertaining to anticipated changes in policy, new developments, sector performance, programme evaluation, project monitoring, finances, changes in demand, etc. is continuously assessed and the implications of these communicated across sector. It also requires that policy formulation be seen to be an inclusive process that considers inputs from all sectoral players.

Co-ordination therefore, shall aim to improve the quality of life in the informal settlements and new housing, water and sewerage infrastructure developments for example through influencing the location of new developments. This shall involve inter-sectoral and intra-sectoral co-ordination and strategic integrated planning. To support these activities will be research and policy functions as well as information systems (e.g. GIS) and communications. Fiscal sustainability is considered a cornerstone of the Kisumu City Development Strategic Plan, and is dependant on co-ordinated activity. Four key elements of co-ordination will include:

- Co-ordination and Strategic Planning: the delivery of programmes will be achieved appropriately only if they are integral to the CDS process:
  - The role players and actors (stakeholders) will need to come on board, partner and be party of the transformation and development of City of Kisumu
  - Concerted urban planning will be a means of coping efficiently with the cost of well-located land and bulk infrastructure for low-income housing.
  - Working groups and creative partnerships will be essential to the delivery of programmes

- Research and Policy: In order to establish long term programmes:
  - An in-depth baseline study to establish the CDS monitoring database will be imperative.

- Research (continuous) into needs and supply mechanisms, as well as policy formulation will be essential.
- Advocacy and lobbying as well as information dissemination will be essential.

- Communication and Outreach: To achieve maximum results in suitable programme delivery will require:
  - Establishing and sharing of information systems and databases, particularly a GIS
  - Community empowerment through partnership approaches, IEC approaches etc.
  - Reaching out to beneficiaries and the wider city community.

- Fiscal Sustainability: Fiscal sustainability will involve ensuring that interventions are affordable in the long term. A number of different levels shall apply and will focus on:
  - Securing adequate funds
  - Sustainable and prudent utilisation of available resources
  - The trade-off between capital and maintenance costs
  - Payment of rates and services.

4.5. Strategic Programmes

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: **DELIVERY**	STRATEGY 2: **FALICITATION**	STRATEGY 3: **CO-ORDINATION**	VERIFIABLE OUTCOMES	RESPONSIBILITY
1. IMPROVED URBAN ENVIRONMENT	To incrementally improve health coverage to >80% of the population within the next 5 years	Furnish health facilities with basic essential drugs and dressings	▪ Tendering and procurement ▪ Pro-poor policies ▪ Implement client friendly user fees and charges regime ▪ Transparency and accountability	▪ Co-ordination and planning ▪ Inter-sectoral collaboration	▪ Health facilities routinely equipped with essential drugs and dressings ▪ Improved access by clients to health services.	Council, NGOs, Government

			▪ Strengthen provision of appropriate primary health care ▪ Institutional development ▪ Process delivery	▪ Co-ordination and planning ▪ Inter-sectoral collaboration	▪ Active Health Promotion Teams in all the Civic Wards ▪ Increased coverage of WATSAN facilities in Manyatta, Bandani, Nyalunya and Nyalenda Wards ▪ Improved health and sanitary standards in communities	Council, NGOs, Community by Wards, MoH, SANA, World Vision	

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: **DELIVERY**	STRATEGY 2: **FALICITATION**	STRATEGY 3: **CO-ORDINATION**	VERIFIABLE OUTCOMES	RESPONSIBILITY
1. IMPROVED URBAN ENVIRONMENT CONTD.	Ensure >90% of population have access to potable water within the next 5 years	Incorporate Kisumu Water and Sanitation Company (KIWASCO) by 2003	Formulate regulations and embrace practices that stimulate positive water solutions ▪ Pro-poor water pricing and tariff regime ▪ Adopt marginal cost pricing principle for consumers linked to sewerage system ▪ Explore pre-financing installation of water meters on a cost recovery basis	Incorporate community participation ▪ Planning and implementation ▪ Operation & Maintenance ▪ Collection of charges for small systems in informal settlements	▪ Enhanced efficiency in services delivery ▪ Increased consumer access ▪ Increased revenue performance	Council, Government, Private, NGOs, Community
		Install appropriate and affordable Water and Sanitation systems ▪ Rehabilitate existing water and sewerage infrastructure ▪ Expand water and sewerage network to lacking areas. ▪ Explore extension and installation of community water points to informal settlements	Manage demand ▪ Curb wastage from leakage and spillage ▪ Curtail billing inefficiencies ▪ Improve customer relations ▪ Curb vandalism of water reticulation network	▪ Establish community watsan committees ▪ Planning and co-ordination	▪ Coverage and access of potable water expanded to consumers in outlying and underserved areas ▪ Increased security of watsan facilities ▪ Improved performance of distribution system.	KIWASCO, Community

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: **DELIVERY**	STRATEGY 2: **FALICITATION**	STRATEGY 3: **CO-ORDINATION**	VERIFIABLE OUTCOMES	RESPONSIBILITY
1. IMPROVED URBAN ENVIRONMENT CONTD.	To promote and provide improved housing opportunities and associated infrastructure to meet >60% of the felt demand within the next 10 years	Implementation ▪ Delivery of satellite housing opportunities ▪ Private–public-community partnerships ▪ Capital subsidy facilitation programme	Process facilitation ▪ Land identification and packaging ▪ Linking capital subsidy project approvals with CDS ▪ Monitoring and facilitation of capital subsidy projects ▪ Building standards and plans approval ▪ Trouble shooting	Co-ordination and planning ▪ Inter-sectoral co-ordination ▪ Intra-sectoral co-ordination ▪ Integrated spatial and development plans ▪ Fiscal sustainability	▪ 2000> housing opportunities delivered in 5 satellite areas of Otonglo, Nyamasaria, Kanyakwar, Mamboleo and Chiga (400> per satellite area per annum) ▪ Subsidy facilitation programmes	Council, UN-HABITAT, MoPW&H, MoL, Private developers
		Delivery of land and tenure ▪ Land identification and assessment ▪ Land acquisition and assembly ▪ Land release programme ▪ Tenure reform	Financing ▪ Working capital loans ▪ Bridging subsidies ▪ Establishment and equity contributions ▪ Top-up funding ▪ Strategic grants ▪ Housing support ▪ End-user finance	Research and policy ▪ Research ▪ M&E of delivery ▪ M&E of policy ▪ Lobbying	▪ Requisite land delivered for development ▪ Financing	Council, Government, Community, UN-HABITAT

		Bulk infrastructure delivery ▪ Access finance ▪ Planning and co-ordination	Community empowerment ▪ Community governance ▪ Community development plans ▪ Organisational development and training	Communications and outreach ▪ Information networks and databases		Council, Community, UN-HABITAT

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: **DELIVERY**	STRATEGY 2: **FALICITATION**	STRATEGY 3: **CO-ORDINATION**	VERIFIABLE OUTCOMES	RESPONSIBILITY
1. IMPROVED URBAN ENVIRONMENT CONTD.		Housing consolidation ▪ Providing housing support services ▪ Promoting local economic development ▪ Business, vocational and skills training	Institutional establishment ▪ Facilitate set-up ▪ Financial support			Council, Community, UN-HABITAT, Chamber of Commerce and Industry

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: **DELIVERY**	STRATEGY 2: **FALICITATION**	STRATEGY 3: **CO-ORDINATION**	VERIFIABLE OUTCOMES	RESPONSIBILITY
1. IMPROVED URBAN ENVIRONMENT CONTD.	To improve the quality of life of >80% of the population by promoting a healthy environment within the next 10 years	Translate and avail Environment Management Policy	Formulate regulations ▪ Stimulate community based solid waste solutions ▪ Increase community awareness on environmental issues ▪ Encourage appropriate solid waste disposal methods e.g. waste recycling, composting etc.	Co-ordination and planning ▪ Inter-sectoral co-ordination ▪ Intra-sectoral co-ordination ▪ Co-ordinating framework for waste collection and recycling	▪ Improved Environmental conditions	Council, MoE, NGOs, Community, Kisumu Core Group

		Develop environmental advocacy, control and action groups	Establish community best practices ▪ Establish neighbourhood level environmental actions	Co-ordination and planning ▪ Neighbourhood committee co-ordination	Improved neighbourhood environmental conditions	Council, MoE, NGOs, Community, Kisumu Core Group
		Institutionalise environmental impact assessment and audits	Formulate community-sensitive council guidelines in line with national guidelines.	Inter-sectoral collaboration		Council, MoE, NGOs, Community, Chamber of Commerce and industry
	To contribute to the protection and conservation of Lake Victoria and its resources	Institutionalise protection and restoration orders ▪ Participate in and contribute to regional harmonisation process ▪ Develop an integrated environmental management scheme	Enforce Environment Management Committee Act guidelines ▪ Formulate and /or update environmental city by-laws	Co-ordination and planning ▪ Exploit the District Environment Management resources ▪ Inter-sectoral co-ordination	Environment sensitive LV communities (protection and conservation)	Council, LVLARC, LVEMP, LVFO, MoE, NGOs, Community

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: **DELIVERY**	STRATEGY 2: **FALICITATION**	STRATEGY 3: **CO-ORDINATION**	VERIFIABLE OUTCOMES	RESPONSIBILITY

2. POVERTY REDUCTION	Create productive employment	Harness, organise and support informal sector activities i.e. small scale traders, Jua-Kali artisans, hawkers associations etc.	Review council by-laws and regulations vis-à-vis informal economic activities ▪ Encourage informal-formal consultative round tables ▪ Explore opportunities of the Council providing guarantees for progressive informal traders	Co-ordination and planning ▪ Inter-sectoral co-ordination ▪ Public-private partnerships ▪ Legislative and fiscal support	▪ Organised and active economic groups ▪ Infrastructure at Kibuye, Kosawo, Kowino and Migosi markets rehabilitated and in use ▪ Reduction of hawking in CBD ▪ Improved infrastructure at Jua-Kali site.	Council, Chamber of Commerce and Industry, NGOs, UN-HABITAT
		Generate employment through municipal contracts and works	Promote pro-poor and gender sensitive policies ▪ Incorporate provision of employment of locals as a mandatory condition in council by-laws on tenders and contracts ▪ Enhance revenues mobilisation and utilisation efficiency	Co-ordination and planning ▪ Inter-sectoral co-ordination Public-community partnerships	▪ Increased levels of participation and involvement of locals, especially women, in public employment sphere ▪ Enhanced ability of the council to fund public rehabilitation works. ▪ Perceived improvement in urban environment	Council, Chamber of Commerce, UN-HABITAT

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: DELIVERY	STRATEGY 2: FACILITATION	STARTEGY 3: CO-ORDINATION	VERIFIABLE OUTCOMES	RESPONSIBILITY

2. POVERTY REDUCTION CONTD.	Improve incomes of the vulnerable urban households.	▪ Land tenure and release ▪ Providing Technical support service	▪ Information and technology exchange and Networking ▪ Review council by-laws with regard to Urban Agriculture ▪ Extension services ▪ Encourage Processing of Solid waste for inputs of Urban Agricutlure	▪ Urban CBO food security consortium ▪ Skills improvement ▪ Farmer to farmer exchanges.	▪ Reduced household food expenditure ▪ Increased household nutritional status.	Council, CBOs, Maseno University and Lagrotech consultants
	Encourage public-private investment initiatives	Commercialise management of selected public services e.g. solid waste disposal, markets, public latrines, water and sewerage, car parking, bus stop etc.	Secure relevant council approval and support ▪ Review council regulations on infrastructure provision to support and facilitate informal sector employment generation, manufacturing and marketing activities	Co-ordination and planning ▪ Inter-sectoral co-ordination ▪ Investment round tables ▪ Financing ▪ Training and capacity building ▪ Marketing advice and information	▪ Business information and advisory centres installed at e.g. Kenyatta Sports Ground, Kisumu Social Centre etc. ▪ Increased number of active small scale industrial enterprises	Council, Government, Chamber of Commerce and Industry, UN-HABITAT, Community

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: DELIVERY	STRATEGY 2: FACILITATION	STARTEGY 3: CO-ORDINATION	VERIFIABLE OUTCOMES	RESPONSIBILITY

3. GOOD GOVERNANCE	To promote security in the Municipality of Kisumu	Incorporate safety measures in CBD and residential areas ▪ Provide adequate street lighting ▪ Security lighting in homes ▪ Discourage and penalise overdue & incomplete construction projects in residential areas ▪ Advocate for appointment of a Municipal Magistrate ▪ Evaluate and formalise habitual informal practices e.g. hawking	Improve enforcement facility ▪ Review and enforce council by-laws on homes security lighting, hawking, construction etc. ▪ Skills update for enforcement personnel ▪ Sensitise residents on council by-laws ▪ Provide for penalties, in by-laws, for construction projects that stay uncompleted for too long in residential neighbourhoods	Co-ordination and planning ▪ Public-private-community partnerships ▪ "Zero tolerance" and community policing methods e.g. police booths installation	▪ Functioning street and residential neighbourhood lighting systems ▪ Expedient penalty of by-laws offences ▪ "Zero tolerance" and active community policing ▪ Strong liaison between law enforcement and community	Council, Government (OP), Chamber of Commerce and Industry, UN-HABITAT, Community

STRATEGIC THEME	OBJECTIVE	STRATEGY 1: DELIVERY	STRATEGY 2: FACILITATION	STARTEGY 3: CO-ORDINATION	VERIFIABLE OUTCOMES	RESPONSIBILITY

3. GOOD GOVERNANCE CONTD.	Improve City Council governance	Streamline Council administration e.g. in Governance, Administration and Legal affairs, Finance *(revenue, tendering and procurement),* Personnel *(recruitment and retention*), Social and Health services, Town planning and project identification ▪ Regular independent audits	Promote Standards ▪ Appropriately review and update regulations, procedures and standards ▪ Review and update best practices benchmarks for the council ▪ Invest in functional human resources development ▪ Enforce code of conduct and ethics ▪ Review roles and responsibilities ▪ Encourage community participation and involvement in needs and solution appraisals (LASDAP) ▪ Stakeholder scrutiny of resolutions, budgets and reports as provided in the Local Government Act Cap 265 ▪ Having periodic round table forum with stakeholders	Co-ordination and planning ▪ Inter-sectoral collaboration ▪ Fiscal sustainability ▪ Capacity building and training ▪ Integrity measures ▪ Cost effectiveness ▪ Liaison with KCBDA, Estate associations etc	▪ Pro-active Institutional character and framework adopted ▪ Efficient service delivery ▪ Computerised financial and procurement system ▪ Improved and efficient services response among council staff	Council, Government, UN-HABITAT, Media, Community, Chamber of Commerce and Industry, Stakeholder groups

4.6. Financial Plan

STRATEGIC THEME	OBJECTIVE	VERIFIABLE OUTCOMES	BUDGET IN KENYA SHILLINGS AND BY SOURCE				
			Council	Government	Local/NGOs	Private	Foreign
1. IMPROVED URBAN ENVIRONMENT	To incrementally improve health in communities in Kisumu City	▪ Health facilities routinely equipped with essential drugs and dressings ▪ Improved access by clients to health services.					
▪ Active Health Promotion teams in all the EMC Wards ▪ Improved health and sanitary standards in communities ▪ Toilets built and improved ▪ Chiga Health Centre rehabilitated ▪ Health centre to be expanded ▪ Toilets at Kibuye market rehabilitated	To incrementally improve health in communities in Kisumu City ▪ Sanitation and Health Disp. ▪ Child Health Coverage to be raised to 80% of the population within the next 5 years						
▪ Water and Sewerage services privatised ▪ Enhanced service delivery efficiency ▪ Increased consumer access ▪ Increased revenue performance							
▪ Coverage and access of potable water expanded to outlying and underserved areas ▪ Increased security of Watsan facilities ▪ Improved performance of distribution system.							

STRATEGIC THEME	OBJECTIVE	VERIFIABLE OUTCOMES	BUDGET IN KENYA SHILLINGS AND BY SOURCE				
			Council	Government	Local/NGOs	Private	Foreign

1. IMPROVED URBAN ENVIRONMENT CONTD.	To promote and provide improved housing opportunities and associated infrastructure to meet >60% of the felt demand within the next 10 years	▪ 400-500 housing opportunities per satellite area delivered in 5 satellite areas of Mamboleo, Chiga, Nyamasaria, Kanyakwar and Otonglo ▪ Vibrant public-private partnerships ▪ Requisite land delivered for development ▪ Bulk infrastructure delivered ▪ Financing support ▪ Planning and co-ordination framework ▪ Housing consolidation ▪ Support services provided ▪ Vibrant growth of local economy ▪ Business, vocational and skills training provided					
	To improve the quality of life of >80% of the population by promoting a healthy environment within the next 10 years	▪ Environment management policy translated and availed ▪ Practice of appropriate solid waste disposal methods established ▪ Neighbourhood environmental advocacy, control and action groups established ▪ Regular environment impact assessment and audit reports ▪ Council guidelines on environment management					
	To contribute to the protection and conservation of Lake Victoria and its resources	▪ Integrated (regional) environmental management scheme					

STRATEGIC THEME	OBJECTIVE	VERIFIABLE OUTCOMES	BUDGET IN KENYA SHILLINGS AND BY SOURCE				
			Council	Government	Local/NGOs	Private	Foreign
2. POVERTY REDUCTION	Create productive employment	▪ Organised and active informal economic groups ▪ Kibuye, Kosawo, Kowino and Migosi markets and associated infrastructure rehabilitated and in use ▪ Home-based cooperative industries set-up ▪ Improved Legislative environment ▪ Increased levels of participation and involvement of locals, especially women, in public employment sphere ▪ Enhanced ability of the council to fund public rehabilitation works. ▪ Evident improvement in urban environment					
	Encourage public-private investment initiatives	▪ Business information and advisory centres installed e.g. at Kenyatta Sports Ground, Kisumu Social Centre etc. ▪ Management of selected public services e.g. water and sanitation, solid waste disposal etc. commercialisation ▪ Improved pro-poor legislative environment					

STRATEGIC THEME	OBJECTIVE	VERIFIABLE OUTCOMES	BUDGET IN KENYA SHILLINGS AND BY SOURCE				
			Council	Government	Local/NGOs	Private	Foreign

3. GOOD GOVERNANCE	To promote security in the Municipality of Kisumu	▪ Functioning street and residential lighting systems ▪ Expeditious judicial action on by-laws offences ▪ Improved city by-law enforcement facility ▪ "Zero tolerance" for insecurity and active community policing ▪ Strong liaison between law enforcement and community					
	Improve local Council governance	▪ Pro-active Institutional character and management framework adopted ▪ Roles and responsibilities clarified in line with service delivery needs ▪ Regulations, procedures, standards and best practices benchmarks reviewed and observed ▪ Improved budget management ▪ Improved service delivery					
	Promote transparency in management of council affairs	▪ Clear depiction of city council's limitations vis-à-vis its service obligations ▪ Participation of city's stakeholders in scrutiny and execution of council decisions					

Annex 1: Kisumu City Scan

Objectives of the Study

The study was intended to inform the proposed stakeholders consultations on urban environment and poverty reduction by:

- Revealing the salient characteristics of urban poverty in Kisumu.
- Revealing the salient characteristics and inimical determinants of urban environment in Kisumu.
- Providing a basis for stakeholders'-public sector, communities etc –participation in improving the environment and reducing poverty levels in Kisumu.

Methodology

The 5-10 minute per respondent quantitative scan, relied on the use of a simple data capture questionnaire. The questionnaire was implemented by, an interviewer stopping at random, a previously unknown respondent and interviewing him/her.

Basically, the city scan sought to elicit the respondents' impressions on housing, urban planning, existing employment opportunities, perceived social problems, development and investment potentials, development agents and their roles, their roles, their (respondents') role in development, role of council in development, and possible solutions/interventions.

Responsible were interviewed in all the seventeen wards of the City of Kisumu, namely; market, Milimani, Kibuye, Stadium, Kaloleni, Nyalenda, Manyatta, Railways, Aerodrome, North, South West Kisumu, Central Kisumu, Kajulu West, Kajulu East, East Kisumu, East Kolwa and Central Kolwa.

In addition, respondents from agencies of Government Department Support, Non-Government Organizations and Community Based Organization and private companies were interviewed.

The Sample Size

The sample selection was randomly done such that the data would provide representative information from a cross-section of the communities in Kisumu. For this reason, the research design adopted cluster-sampling methods. The wards were first clustered and a sample of people from each ward was interviewed. The ultimate sampling unit in each case was the members of thee communities drawn randomly from each of the clusters. The number of the respondents interviewed from each cluster was determined in proportion to the estimated size of the population within that category.

A total of 3,742 questionnaires were administered with a complete response rate of 98.7 percent, which is high for rapid assessment of such design. The response rate, as noted from the p-value return of 0.046, supports the claim of representatives of the views and thus provides an informed position of the circumstance of those communities not to mention the base required for the proposed desired consultations.

Out of the 3,742, 265 comprised Public (Government Officers) and Private Sector (Big Business Premises and Senior Company Staff,) and NGOs respondents, of whom 212 were males and 53 were females. Albeit, constituting a statistically insignificant size (7%) of the survey population, this category of respondents provided an institutional, and thus a more informed perspective to the survey.

The table below depicts respondents by gender and age.

Figure 1. Respondents by age and Gender

AGE CLASS		FEMALE	MALE	TOTAL
UP TO 5 YEARS	Number Percentage	15 (45.5)	18 (54.5)	33 (100)
6 TO 14 YEARS	Number Percentage	259 (46.8)	295 (53.2)	554 (100)
15 TO 24 YEARS	Number Percentage	416 (41.7)	581 (58.3)	997 (100)
25 TO 34 YEARS	Number Percentage	479 (41.9)	665 (58.1)	1,144 (100)
35 TO 44 YEARS	Number Percentage	238 (41.1)	341 (58.9)	579 (100)
45 TO 54 YEARS	Number Percentage	116 (41.7)	162 (58.3)	278 (100)
55 YEARS AND ABOVE	Number Percentage	52 (33.1)	105 (66.9)	157 (100)
TOTAL	Number Percentage	1,575 (42.1)	2,167 (57.9)	3,742 (100)

The table reveals that more males were interviewed i.e. 57.9% as compared to female's 42.1%. This ratio is reflective of the fact that the respondents interviewed accosted on the randomly, and men tend to walk looking for employment or other activities, while most women would be found at home. As compared to the 1999 census result, Kisumu City Council had a population of 322,724 persons with 162,354 males as compared to 160,380 females with sex ratio of 101.

The distribution of respondents in the table shows that a most of the respondents were between age brackets of 15 and 34, thus comprising 57.2% of the whole of the sample children below 5 years recorded less than 1% while those above 55 years were 4.2%. The mean age for the whole population was 27.8 for females and 29 for males with an overall mean of 28.5 years.

Findings

The following findings summarize observations from the scan.

Occupation

An appraisal of main occupation in the surveyed population revealed that 53.7% are involved in informal employment, which includes Jua-Kali, hawking & petty trades (second hand wares and apparel, foodstuff and fruits), boda boda (bicycle taxi) etc. Women constitute the majority of informal traders and are often engaged in tailoring, sale of foodstuffs, vegetables, used clothing and household wares and petty trades, while men shall be found in the metal and wood fabrication, hardware sale, shoe making and repair, construction (Artisan and Masonry) among other informal activities.

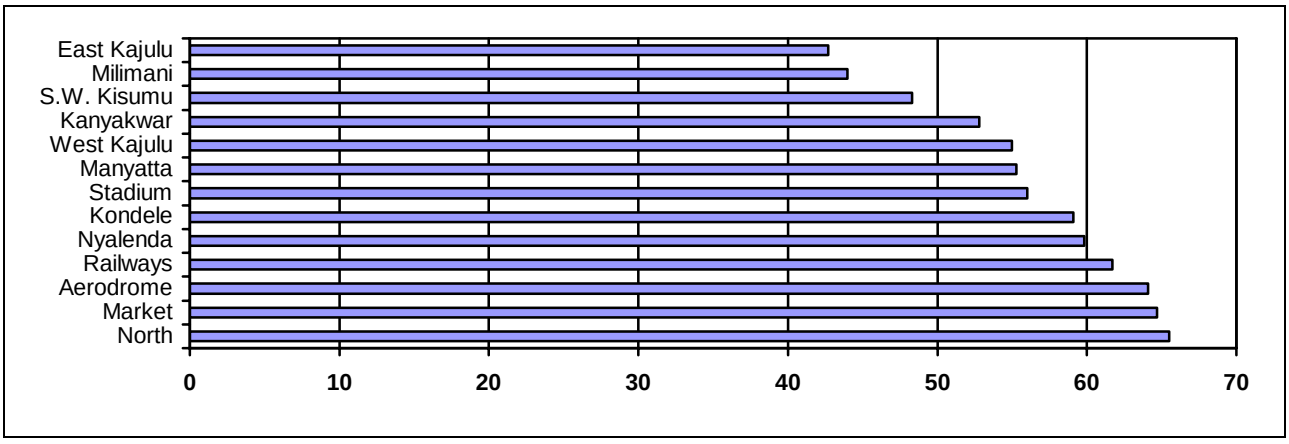
Figure 2: Main Occupation

OCCUPATION	NUMBER	PERCENT
INFORMAL EMPLOYMENT	1050	28.1
BUSINESS/TRADE	959	25.6
STILL IN SCHOOL	579	15.5
FORMAL EMPLOYMENT	354	9.5
UNEMPLOYED	332	8.9
FARMER	190	5.1
HOUSEWIFE	144	3.8
OUT OF SCHOOL	22	2.2
RETIRED	19	0.6
NOT STATED	12	0.5
PROFESSIONALS	2	0.3
TOTAL	3742	100

The proportion in school comprised 15.5%, while formal employment accounted for only 9.5% of the respondents. 14.9%, which includes the 3.8% of housewives and 2.2% of out of school comprised the unemployed category. Note that unemployed status herein, refers to those not engaged in any gainful means of income activity. Farmers accounted for 5.1%. National indices depict a 30% unemployment status and 52% engaged in informal sector. This corresponds quite well with the study findings.

A breakdown of informal employment response by ward revealed that in market 64.7% were engaged in informal employment, followed by Nyalenda with 59.8%, Kondele with 59.1% an Milimani with 44%. 47.4% of the respondents in Kibuye ward are engaged in informal employment, followed by Kaloleni with 52.4%, North with 65.5%, and Aerodrome with 64.1%, and East Kajulu with 45%, and West Kajulu with 55%, and Stadium with 56%, and Kolwa with 42.7%, and Manyatta with 53.3%, and Kanyakwar with 52.8%, and Railways with 61.7% and South West Kisumu with 48.3%. The City of Kisumu has recently recorded the highest prevalence of absolute poverty of 63% in comparison to Nairobi at 50%[4].

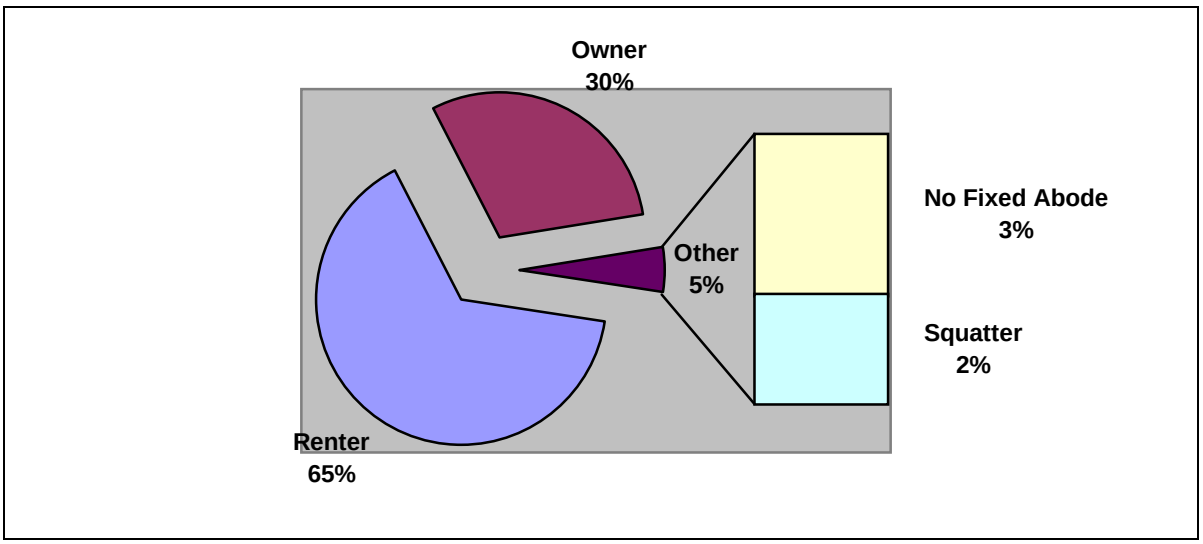
Figure 3: Respondents engaged in informal employment by Ward



[4] (PRSP 2001 - 2004). National absolute poverty is 53%.

In Kenya, owning a house or having decent shelter contributes to psychological well-being, a sense of dignity and security. The study revealed that 2,443 that is 65.3% of the respondents, stay in rental houses, 1,128 constituting 30.1% owned their residences, while 108 being 2.9% have no fixed aboard, and 63 representing 1.9% are squatters. The majority of the proportion of 30% who own their residents, are in the extended boundary wards of Kajulu and Kolwa.

Figure 4: Distribution of Respondents by Housing



An appraisal of the renter category by respective ward informed that 85.8% of respondents in Kondele are renters, followed by 84.5% in Stadium, 83% in North and 82.9% in Manyatta. The least number of renters were revealed to be in East Kajulu and Kolwa in the proportion of 16.1% and 14.2% respectively.

The wards with high rental response rates are generally densely populated and are mainly inhabited by informal and low-income workers. Houses in the formal settlements are mostly single to double-roomed semi-permanent structures that often lack basic water and sanitation facilities. Rents are usually in the range of KES300-500 per month. Tenants in these settlements are mainly involved in informal employment activities. The low-income settlements contain one, two and three bed-roomed, low-income council houses. These settlements have basic facilities and their rents are in the range of KES700-1, 000. Tenants are low-income civil servants and employees of companies.

The high response rate for renters is attributable to among other factors, the fact that most renters are low-income earners, the land tenure policy, and inhibitive cost of constructing or purchasing a house in urban centres.

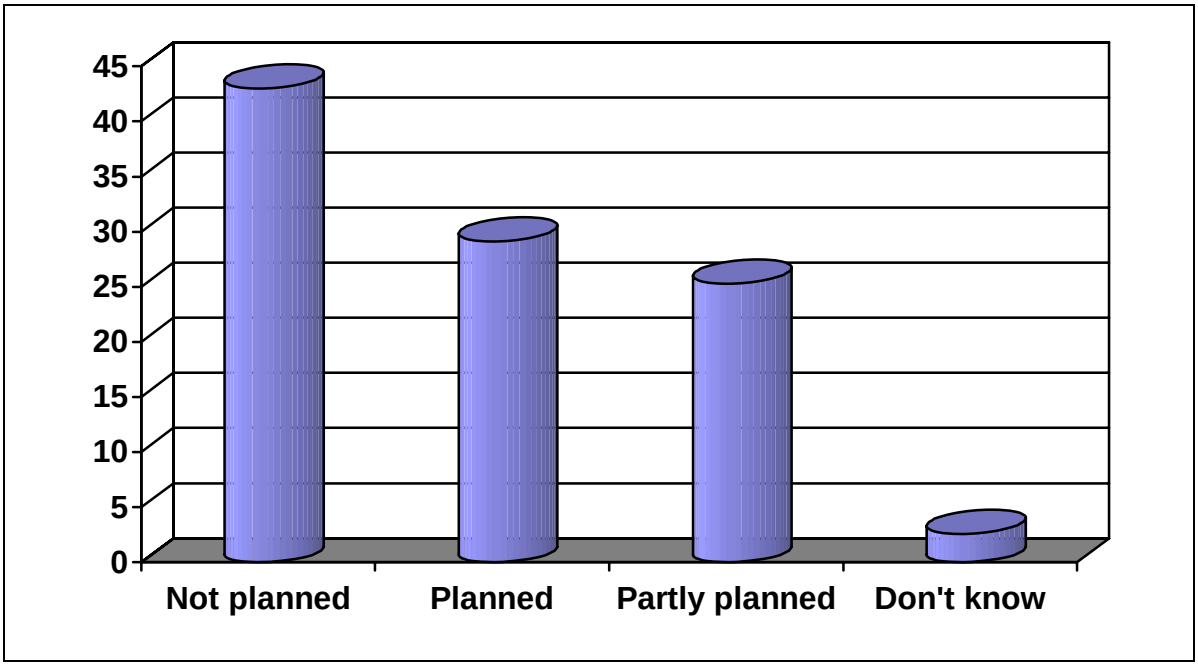
Apart from Milimani Ward, which is situated in the town and is a high class area, the other wards with low rental and which cover about 60% of the are of City of Kisumu are S. W. Kisumu, Kolwa, Kajulu, East Kisumu and Central Kisumu. They are situated in the extended boundaries of the city where land tenure is predominantly ancestral, still under freehold and lack basic facilities as water and sewerage systems etc. Because of urbanization and it attendant influence in these areas, albeit gradually, permanent rental houses are now being

constructed.

Urban Planning

Out of the 3,472 respondents who were interviewed, 44.5% indicated that their neighbourhood was not planned, while 38.8% felt there neighbourhood was planned, 12.3% felt it was partly planned and 4.3% did not know whether their neighbourhood was planned.

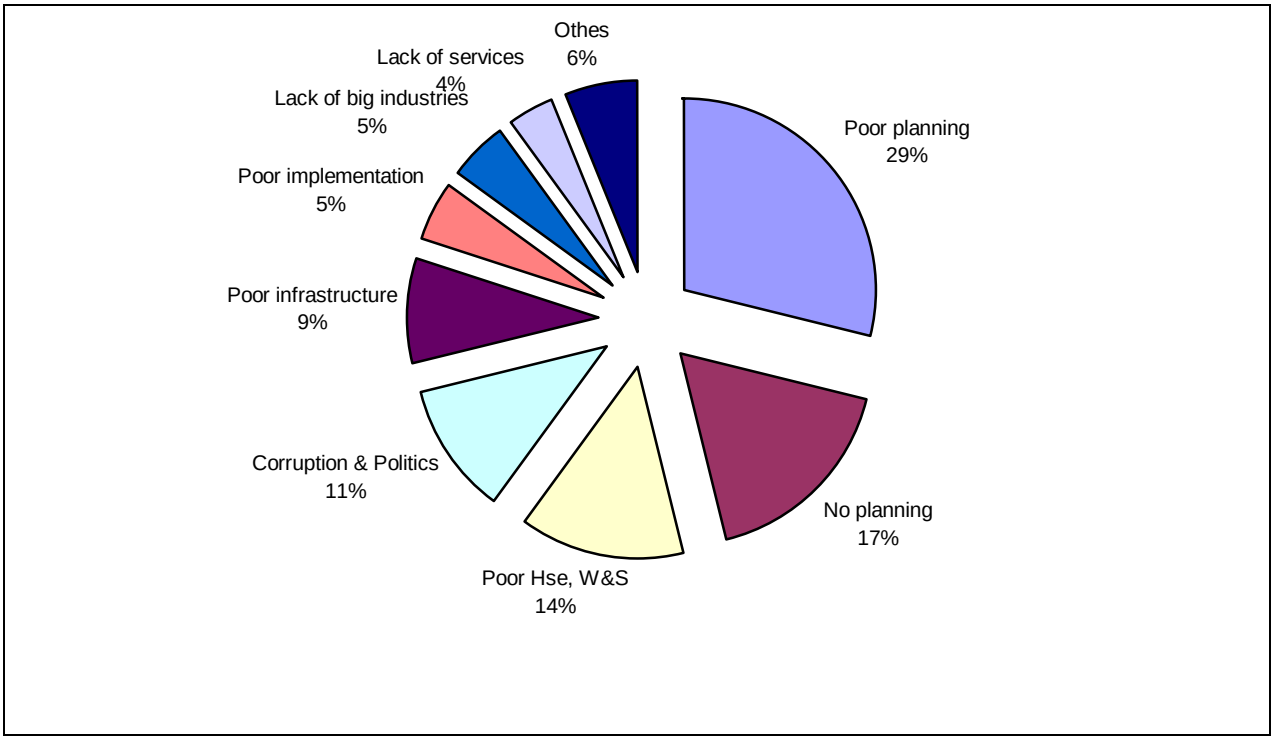
Figure 5: Impression of Respondents on Neighbourhood Planning



The impression of the public and private sector respondents on whether the Town is planned drew 43% positive, 29.1% partly planned, 25.3% negative and 26% don't know responses

Figure 6 below depicts the distribution of responses to further inquiry on the major problems that have contributed to lack and/or failed Town planning.

Figure 6: Problems Attributed by Respondents to Failed Town Planning



The respondents felt that in order to discourage the above shown cases, the capacity of the council for urban planning should be improved ad utilized

Major development desired in the next 3 years

As illustrated in figure 7 below, 267% of the respondents stated that one major development they desired to see in next three years was the city to be properly planned. 15.9% wanted jobs created because of high unemployment, while 9.1% wanted improvement in education standards, 8.5% wanted good shelter, 8.3% wanted adequate water supply and 5.7% desired proper sanitation and drainage in their neighbourhood a notable 63% indicated not knowing one major development they desired to see in the next three years.

The ward specific response to desired development in the next 3 years accurately reflected the circumstance of the people as it affects them. 227% and 169% of respondents in Kaloleni and Nyalenda respectively indicated that they needed better shelter within the next three years while 12.8% in Aerodrome, followed by 8% in Market, 79% in Nyalenda and 78% in Kondele desired good sanitation. With regard to good planning, 38.9% in East Kajulu required it, followed by Kolwa with 38.3% and stadium with 31.4%.

Figure 7: Major development desired by all Respondents in the next 3 years

ITEM	NUMBER	PERCENT
GOOD CITY PLANNING	999	26.7
CREATION OF EMPLOYMENT	596	15.9
IMPROVED EDUCATION STANDARDS	342	9.1
GOOD SHELTER	319	8.5
ADEQUATE WATER SUPPLY	312	8.3
INCREASED BUSINESS OPPORTUNITIES	280	7.5
DOES NOT KNOW	237	6.3
GOOD DRAINAGE AND SANITATION	213	5.7
GOOD HEALTH FACILTIES	154	4.1
CLEAN ENVIRONMENT	108	2.9
GOOD SECURITY	80	2.1
OTHER IMPROVEMENTS	48	1.3
REHABILITATION OF STREET CHILDREN	44	1.2
SECURITY OF LAND TENURE	10	0.3
TOTAL	3742	100

In response to the question on the desired development in the next 3 years, 43% of Public and Private Sector respondents returned a need for more industries, hence expressing the underlying desire for generation of income and by extension creation of employment. 14% indicated the need for piped water, while 8.7% returned a negative response and 6.8% wished for infrastructure development. Their response is detailed in figure 8 below.

Figure 8: Major Development Desired in the Next 3 Years as returned by Public and Private Sector Respondents

ITEM	NUMBER	PERCENT
MORE INDUSTRIES	114	43.0
PIPED WATER	37	14.0
NONE	23	8.7
INFRASTRUCTURE	18	6.8
OTHERS	18	6.8
SERVICE DELIVERY	12	6.8
PROPER SHELTER	10	4.5
SECURITY	8	3.8
PROPER DRAINAGE	6	2.3
NEW TECHNOLOGY	6	2.3
GARBAGE COLLECTION	5	1.9
SCHOOLS	4	1.5
HEALTH SERVICESS	4	1.5
TOTAL	265	100

Major Problem faced by people in the Area

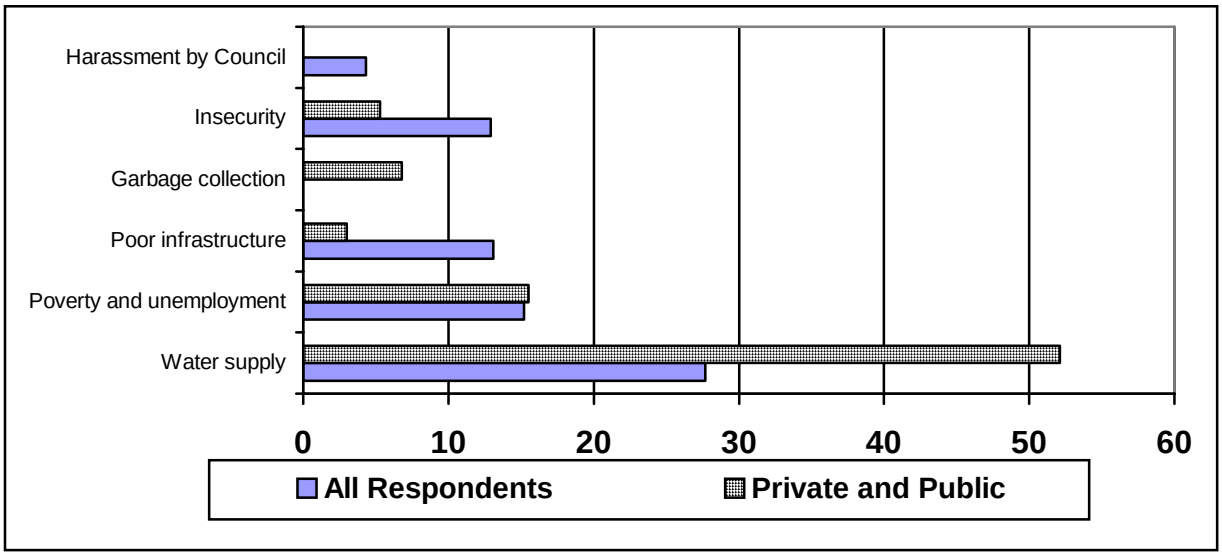
Although Kisumu is situated on the shores of the largest fresh Water Lake in Africa, 27.7% of the 3,724 respondents returned lack of water as the main problem. Poverty and lack of employment opportunities featured as the second main problem. Poverty and lack of employment opportunities featured as the second main problem as felt by 15.2% of respondents felt that poor infrastructure was the main problem while 12.9% felt that insecurity was. Harassment by council, access to health facilities, lack of educational facilities, poor business performance, lack of good shelter etc recorded les than 5% each as seen in Figure 9 below. Interestingly, only 0.6% felt that corruption is a problem, while only 1.4% felt that lack of good shelter is a main problem.

Figure 9: Major Problems faced by People in the Area.

ITEM	NUMBER	PERCENT
LACK OF WATER SUPPLY	1037	27.7
POVERTY AND UNEMPLOYMENT	570	15.2
POOR INFRASTRUCTRE	492	13.1
INSECURITY	482	12.9
HARASSMENT BY COUNCIL	160	4.3
NOTHING	132	3.5
ACCESS TO HELTH CARE	114	3.0
POOR EDUCATION FACILITIES	104	2.8
POOR BUSINESS PERFORMANCE	69	1.8
LACK OF SKILLS	55	1.5
LACK OF GOOD SHELTER	54	1.4
POOR COMMUNITY PARTICIPATION	22	0.6
CORRUPTION	21	0.6
DROPOUT OF ORPHANS	19	0.5
LANDLESSNESS	16	0.4
LACK OF SOCIAL AMENITIES	14	0.4
TOTAL	3742	100

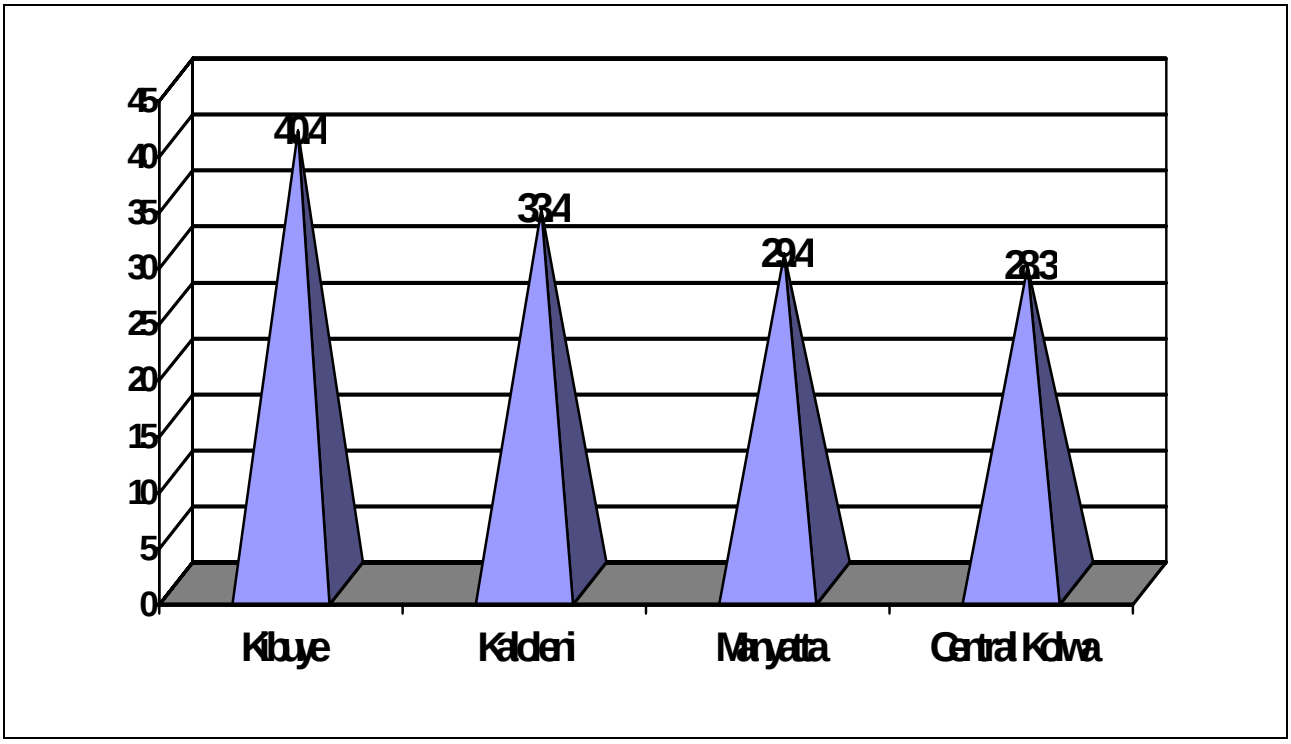
Figure 10 depicts views of Public & Private sector and all respondents on 6 major problems.

Figure 10: Comparative views of Public and Private sector and All Respondents on 6 Major Problems.



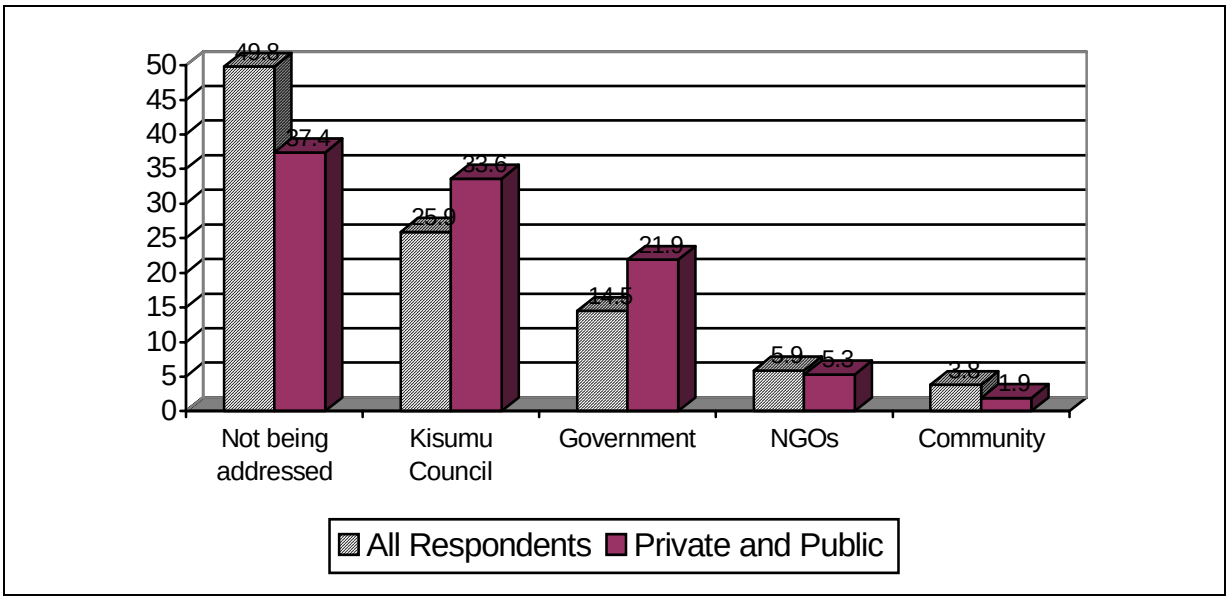
A ward specific response to the water problems of 40.4% in Kibuye, followed by 33.4% in Kaloleni, 29.4% in Kondele and 28.3% in Central Kolwa, is consistent with the actual situation on the ground where severe lack of water is experienced because the city water system is either decrepit or non-existent. The wards in the extended boundaries are not covered by the council or any other agency water systems and still rely on streams for their water needs, and therefore do not think water is a problem.

Figure 11: Wards with Severe Water Problems



Institution Addressing the Problem

Figure 12: Institution addressing the Problem



49.8% of the 3,742 respondents and 37.4% of the subset Public and Private sector respondents stated that no agency was addressing their felt problem. The proportion that stated that the problem was being addressed was in the order of 25.9% and 33.6% respectively for City Council of Kisumu, 14.5% and 21.9% respectively for Government, 5.3% and 5.9% respectively for NGO's and 3.8% and 1.9% respectively for community.

80.5% of the 3,742 respondents and 78.1% of the subset Public sector respondents returned No Agency for second intervening institution.

A cross-examination of the results in figure 9 and figure 12 indicates an awareness of the specific problems by all respondents and suggests a disappointment and loss of confidence with institutions entrusted to manage these public issues/problems, especially amongst the non-Public and Private Sector populace. Further it suggests retention of hope. The disparity between Public and Private Sector respondents and the rest of respondents is attributed to the formal nature of activities of the Public and Private Sector respondents, which has traditionally been catered for in existing pieces of legislation and the lack of clear legislation to guide informal sector activities.

One Key Investment in the Area

The local perception of investment constantly interchanges with development, hence the nature of responses as reflected in Figure 13 below.

37.7% of the respondents stated that small-scale business (including petty trades) was the key development/investment in the Kisumu, while 23.9% of the respondents felt that there was no key development in their area. Generally, this picture obtained in the ward specific analysis.

Figure 13: Key Investment in the Area

ITEM	NUMBER	PERCENT
SMALL SCALE BUSINESS	1410	37.7
NONE	896	23.9
SCHOOLS & CHURCHES	353	9.4
UILDING OF COMMERCIAL HOUSES	352	9.4
FARMING	216	5.8
ROAD REPAIRS	173	4.6
SOCIAL HALL	142	3.8
HEALTH FACILITES	106	2.8
OTHERS	45	1.2
HOME FOR ORPHANS	26	0.7
CLEANLINESS OF ENVIRONMENT	13	0.3
ELECTRIFICATION	10	0.3
TOTAL	3742	100

The Public and Private sector subset returned 30.2% for the on-going rehabilitation of the Jomo Kenyatta Sports Grounds and the just concluded rehabilitation of the Kisumu Bubs Stage as key investments. Other key

investments included Fish processing – 12.8% Small Scale business – 10.2%, Learning Institutions – 7.5%. They returned a No Investment response by 15.1%. Figure 14 below illustrates their response clearly.

Figure 14: Public and Private Sector view on Key Investment in the City.

ITEM	NUMBER	PERCENT
SPORTS GROUND/US PARK	80	30.2
NONE	40	15.1
OTHERS	35	13.2
FISH INDUSTRIES	34	12.8
SMALE SCALE BUSINESSES	27	10.2
LEARNING INSTITUTIONS	20	7.5
NATURAL RESOURCES	12	4.5
COMMUNICATION NETWORK	11	4.2
BANK	3	1.1
AIRPORT	2	0.8
TOURISM IMPROVED	1	0.4
TOTAL	265	100

Preference for Participating in Developing the Neighbourhood

Figure 15: How the Respondents would like to participate in developing their neighbourhood

ITEM	NUMBER	PERCENT
CREATE SELF EMPLOYMENT	873	23.3
NOTHING	818	21.9
PUBLIC DIALOGUE/COMMUNIICATION	747	20.0
PARTICIPATE IN COMMUNITY SERVICE	390	10.4
FINANCIAL SUPPORT/PAY TAX	368	9.8
GARBAGE COLLECTION/CLEANLINESS	226	6.0
PROMOTION OF INCOME GENERATION ACTIVITIES	95	2.5
PARTICIPATE IN SHELTER DEVELOPMENT	74	2.0
PARTICIPATE IN GARBAGE COLLECTION	51	1.4
PROMOTION OF SOCIAL RESPONSIBILITY	49	1.3
OTHERS	39	1.0
PROVIDING SANITARY FACILITIES	9	0.2
VOTING CAPABLE LEADERS	2	0.1

TOTAL	3742	100

On preference for participating in developing their neighbourhood, creation of employment was returned y 23.3% of the respondents. 21.9% indicated returned a nothing response, 20% was wanted to participate in public dialogue and communication, 10.4% to participate in community participation, while the rest recorded less than 10% in participation as can be observed in figure 15.

At award level, 40.2% in Central wanted to help in the creation of jobs, followed by East Kajulu with 39.4%, while northward was 30.5% and Aerodrome 29.5%.

A comprehensive appraisal of the results in figure 15 elicits the strong underlying fear of poverty and the inverse desire for Employment/Income Generation amongst the populace. The impression is one of widespread poverty. Promotion and participation Good Governance also features as a strong desire.

Specific Suggestions for Improving Information Sharing with Council

Most of the respondents comprising 49.9% of the total preferred sharing information with the council, 28.2% preferred use of print and electronic media, while those who did not want to share information were 13.5%. Those who wanted to share information through councillors, suggestion box and resource centres, respectively reported less than 5% (Figure 16). The results of 49.9% for "dialogue with council", and 4.8% for "through councillors" demonstrates that belief and hope is retained for the council among the respondents. It suggests the need for confidence building in the relationship between the council and the residents, for attainment of meaningful interaction.

Figure 16: Specific Suggestion for Improving Information Sharing between Respondent and Council

ITEM	NUMBER	PERCENT
DIALOGUE WITH COUNCIL	1869	49.9
USE OF PRINT & ELECTRONIC MEDIA	1054	28.2
NONE	506	13.5
THROUGH COUNCILLORS	181	4.8
USE OF SUGGESTION BOX	109	2.9
OTHERS	18	0.5
USE OF RESOURCE CENTRE	5	0.1
TOTAL	3742	100

Partnership for Improving Development of the City

Figure 17: Ways Partner Agencies can Work together to Improve Development of the City

WAYS OF IMPROVING DEVELOPMENT	NUMBER	PERCENT
JOINT IMPELEMNTATION	912	24.4
FINANCIAL CONTRIBUTION	764	20.4
DOES NOT KNOW	760	20.3
PUBLIC EDUCATION AND DIALOGUE	507	13.5
INFORMATION SHARING	359	9.6
WELFARE SUPPORT	Q94	5.2
COMMUNITY SERVICE	92	2.5
CAPACITY BUILDING OF CITIZENS	46	1.2
STRENGTHENING ROLES	42	1.1
OTHERS	4Q	1.1
BUILD FACTORIES	25	0.7
TOTAL	3742	100

Figure 19: Public and Private Sector View on Ways Partner Agencies can Work together to improve Development of the City

ITEM	NUMBER	PERCENT
JOINT IMPLEMENTATION	173	65.5
FINANCIAL SUPPORT	44	16.6
CREATION OF EMPLOYMENT	19	7.2
NONE	16	6.0
OTHER	13	4.9
TOTAL	265	100

As depicted in Figures 17 and 18 above, “Mutual collaboration” is the one word in the minds of the people that underlines the way partners (Private and Public agencies, the Community) can work together to develop the City of Kisumu. Of note, is the strong response for financial support involving the community, through sensation and dialogue, to participate in development of the city, emerged as a felt need? A breakdown of this analysis by ward revealed a similar representation.

Project Title: PROMOTING THE INTEGRATION AGROFORESTRY TECHNOLOGIES INTO URBAN AND PERI URBAN KISUMU.

City Team

Name: George Wasonga
Institution: Kisumu Municipality
Job title: Ag. Director of Environment

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Physical Planner
Institution: Ministry of Lands and Physical Planning
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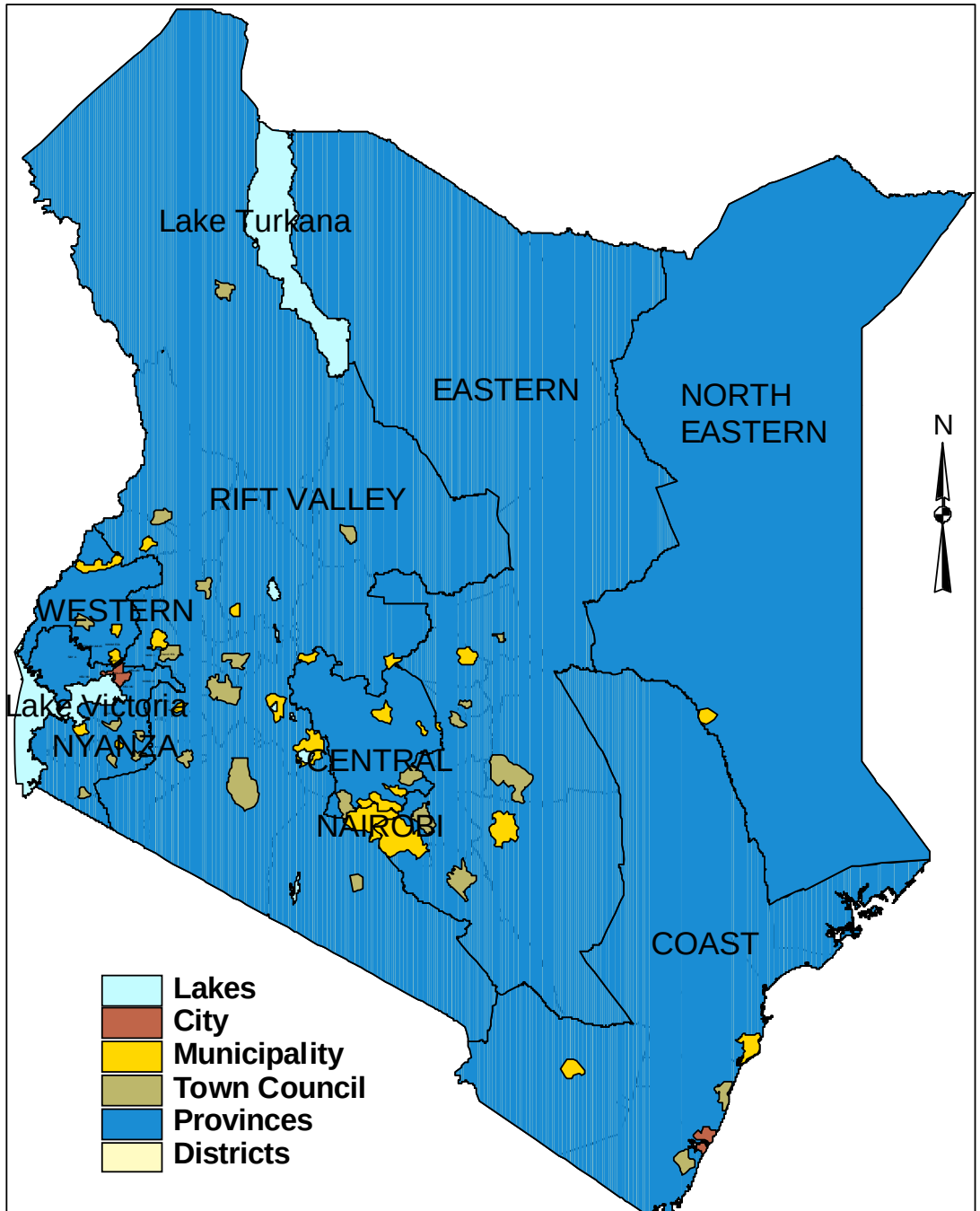
Name: Sammy Carsan
On farm specialist
Institution: World Agroforestry Centre(ICRAF)
Email: s.carsan@cgiar.org

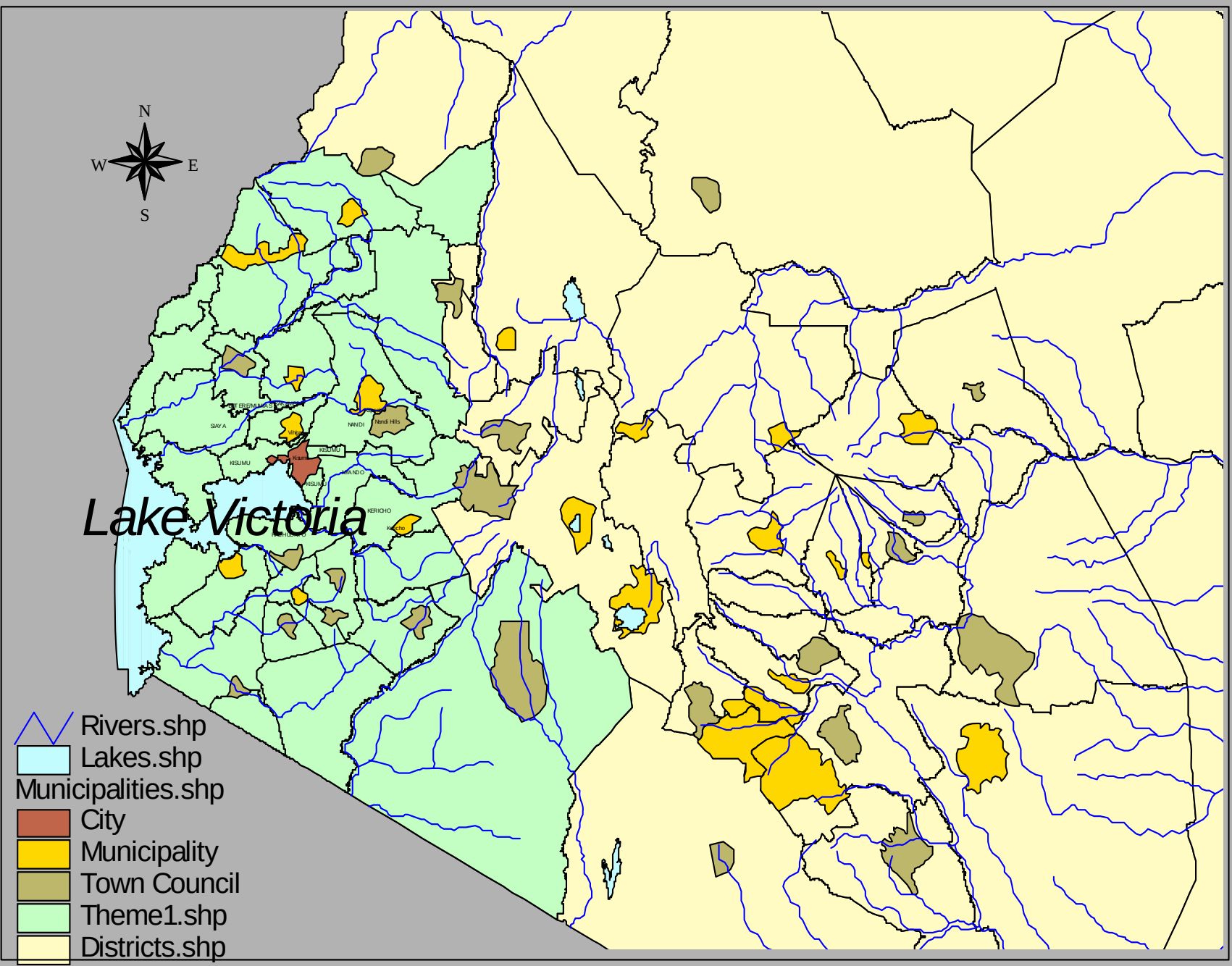
Introduction and Background:

- **Kenyan cities rapid growth & transformation-rural to urban**
- **Population needs food fuel and shelter and improved quality of life**
- **City design strategies need to play a role in UA**
- **Project city has the highest incidence of food insecurity: 53.4% of the pop suffer food insecurity compared to Nairobi (8.%), Mombasa (38.6%) and Nakuru (30%)**
- **People bring their farming cultural practices to town!**
- **Trees provide food for urban poor e.g in the Sahel Baobab leaves, Tamarind, processed parkia seeds**
- **UPA in Kisumu involves small scale rained mixed farming, small scale river irrigation, wetland farming, free range livestock keeping**
- **Predominant areas: along the lake shore, flood plains of Nyalenda and Dunga**
- **UA characteristic of over cropping, poor farm management system, low yields, irregular incomes, perceptions, policy and environmental degradation.**
- **Larger peri urban farming areas at the foot hills**
- **Progressive elimination of tree and shrub cover**
- **Soils are exposed leading to natural forces of degradation**

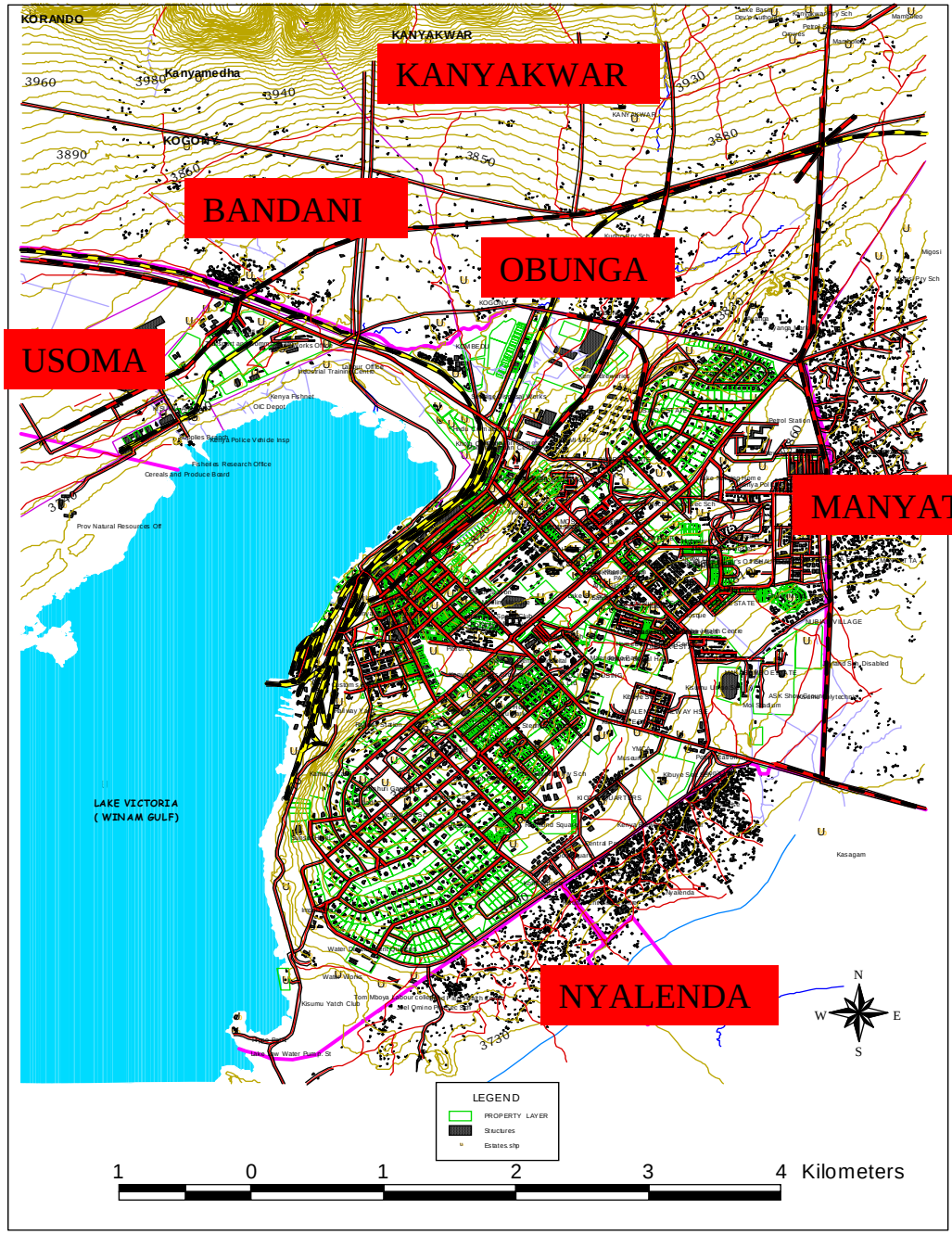
KISUMU IN THE NATIONAL CONTEXT



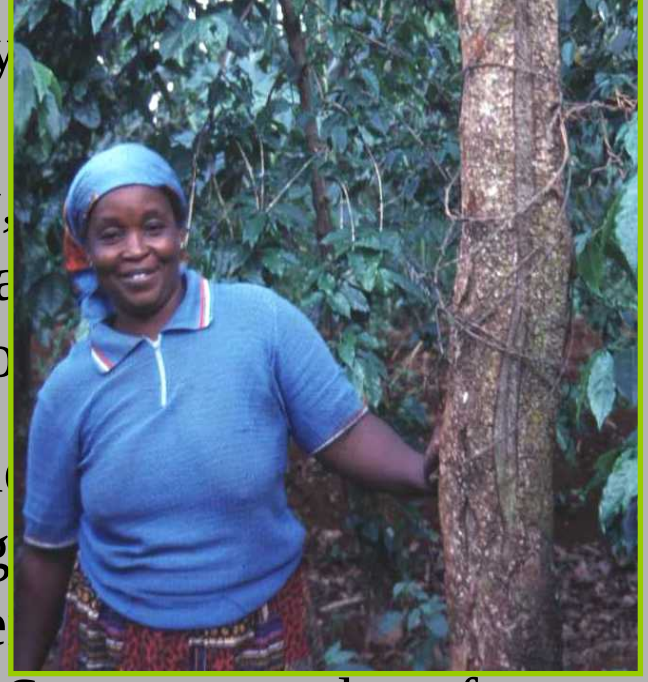
KISUMU IN THE REGIONAL CONTEXT



KISUMU STRUCTURES

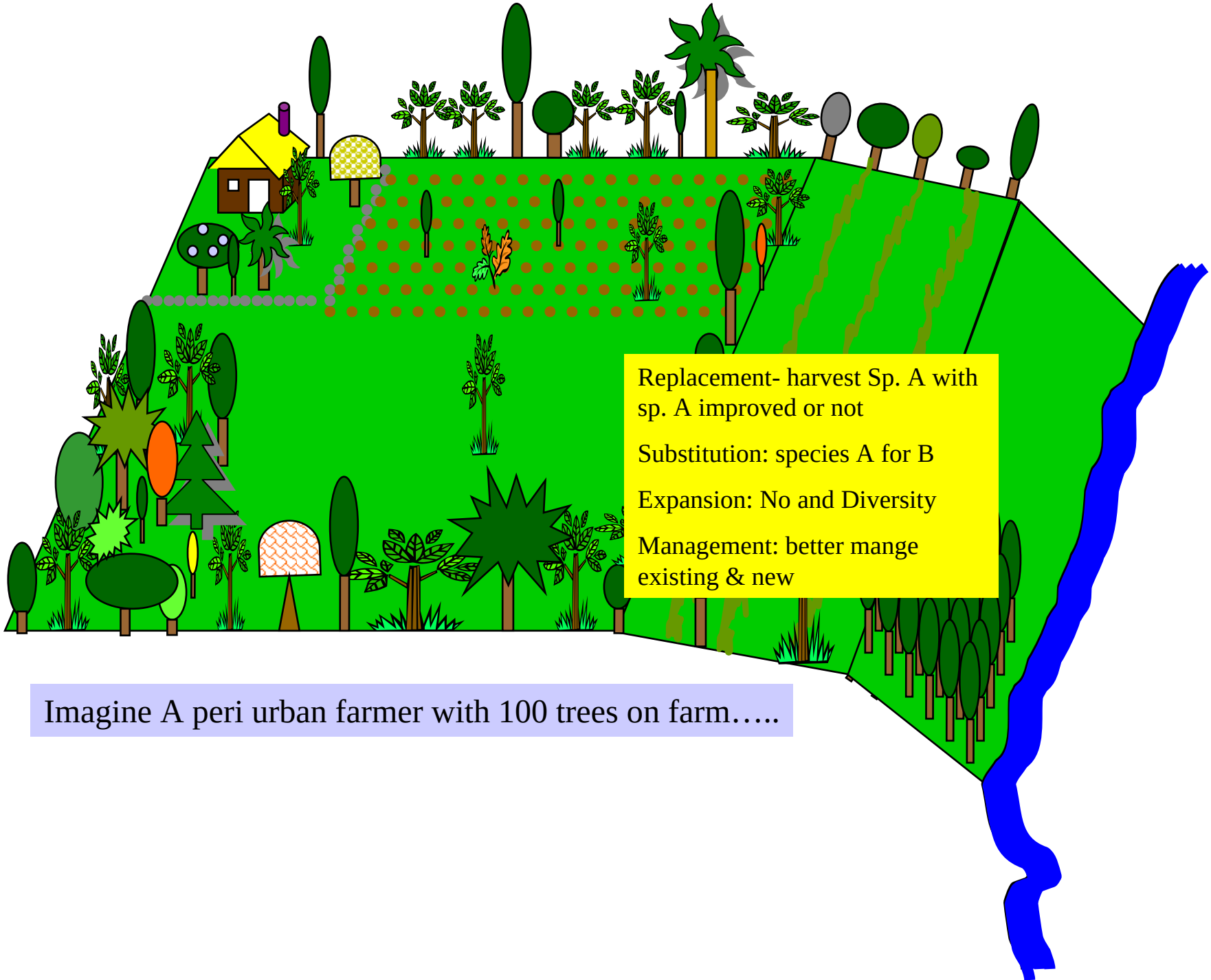


•**Fertilizer species**: In this technology
such as *Sesbania spp*. *Tephrosia spp.*
planted relay cropping. Alternatively,
coppicing such as *Gliricidia sepium*, a
with field crops commonly referred to



•**Medicinal trees and shrubs**: indivi
planted as boundaries, along field edg
are usually well protected looked-afte
husbandry practises being a priority. Some examples of tree species are *Warbugia ugandensis*, *Moringa spp*. and *Azadirachta indica*..

•**Fodder shrubs**: intensively managed tree shrubs continuously cut for feeding livestock. high nutritious species are preferred such as *Calliandra calothyrus*, *Leucaena spp.* and *Morus alba*. Indigenous fodder species are also conserved and managed by farmers. These include species such as *Trema orientalis and Sepium ellipticum.*



Imagine A peri urban farmer with 100 trees on farm…..

Current Initiatives

•Kisumu City Development strategy consider UA, involvements of grassroots communities, other development sectors

•Environmental Pedagogic centres (EPC) demo centre, best practice centre of lake Victoria Regional local Authority Cooperation (LvRLC)

•ICRAF-Kisumu city council High value trees initiatives, LVEMP/ICRAF GIS mapping.

•Use already developed AF tools, tree Database, Tree selector

•Ministry of Lands and Settlement/Kenya Green town Association Partnership

•Agroforestry consortium (CoSo FAP)

Project Objectives

To characterize the dynamics and the current trends in urban and peri urban agro forestry

Carry out background review

Identify target areas and key informants and groups

Conduct household survey to identify and analyze gender roles in agro forestry

Conduct a desk study to establish historical trends in the area vegetation cover in the past

Carry out a rapid market survey on tree based food products to assess local demand and supply patterns

Identify institutional gaps and options for incorporating AF technologies

Explore options for collaboration, networking and linkages with existing initiatives e.g CoSOFAP, EPC

Investigate and map the extent and typology of existing urban and peri-urban land tenure and agro forestry practices

Conduct spatial survey for selected settlements

Conduct rapid tree inventory of the existing tree species and functional use

Analyze existing GIS maps to cross check survey findings

Analogue survey findings on spatial maps

Methodologies

Rapid farmer household assessment, institutional analyse, focused group discussions and mapping of the existing spatial typology , semi structured interviews, meetings, literature review , participatory appraisal tools Transect walks, stakeholder analysis Organograms, SWOT analyis

Outputs

•Baseline data collected

•Agro forestry historical reports

•UPA agroforesrtry database of life forms (trees, shrubs, herbs and climbers) with potentials to support food and medicinal needs in urban setups.

•Gender and Agroforestry profile reports

•UPA GiS maps, spatial maps

•Literature bibliographies

•Practical guidelines for institutional capacity building

•Organization profiles

•State of the art that support urban agro forestry food production, including species with medicinal, fodder, fruit value among

•Policy and legislation recommendations

Beneficiaries

•KCC, GOVT Ministries

•Local community

•NGO’s, Urban Harveest

•Others Corporate, small& medium enterprises

•Nursery operators

•Research institutions, Universities

Work plan

Spread over one year

- Council meetings
- Start with background reviews
- Target area identification and mapping
- Rapid surveys
- Report synthesis and evaluations
- New initiatives proposals

Budget

KCC managed budget Subtotal

USD 11000

MLS managed budget: 6000

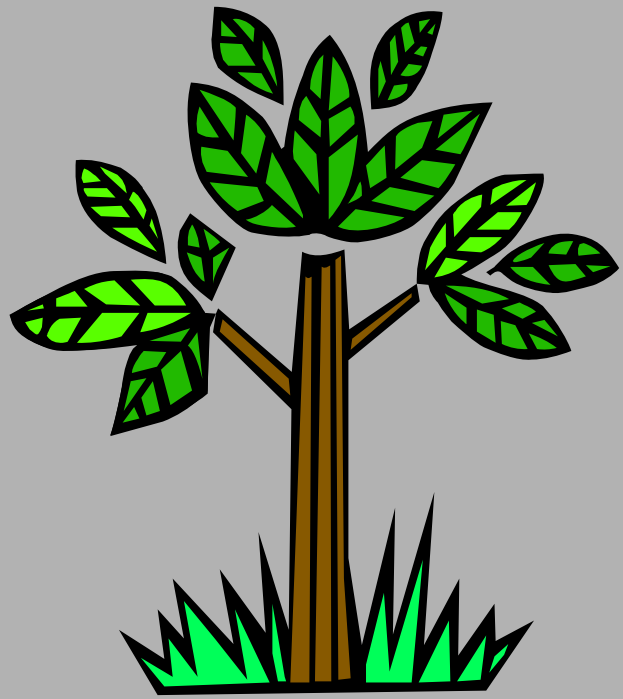
ICRAF managed budget: 9950

Total: 26,950

ICRAF contribution: 5000

Required: 21, 950

Thank you!



Anglophone Africa Training Course on Urban Agriculture

Concept Note for Kumasi, Ghana

1. Project title

Developing Community-Based Composting Guidelines: reducing poverty, food insecurity and environmental degradation

2. Project leader

Lois Amon (Female), Assistant Programme Officer, Community Development Initiatives, Centre for the Development of People (CEDEP), P.O. Box 5601, Kumasi, Ghana. E-mail: amaamon@yahoo.com

3. Second team member

Charles Woahene (Male), Manager Research, Planning and Development Section, Waste Management Department, Kumasi Metropolitan Assembly (KMA-WMD), P.O. Box 1916, Kumasi, Ghana. E-mail: ckmaximum@yahoo.com

4. Third team member

Andrew Mark Bradford (Male), Researcher, (Associate Researcher, International Water Management Institute (IWMI)), Centre of Developing Areas Research (CEDAR), Department of Geography, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, UK. E-mail: a.m.bradford@rhul.ac.uk

5. Total estimated cost of project

US$ 20,000.00 (Budget request: US$ 10,000)

6. Duration of project

12 months

7. Location of project

The peri-urban fringe of Kumasi Metropolitan Area

8. Keywords

Compost, environmental protection, food security, livelihoods, nutrient recycling

9. What is the project trying to achieve?

9.1 Introduction

The proposed project builds on the successful implementation of a participatory action research (PAR) pilot project that trialled low-cost (and no cost) composting techniques at the household and community levels in six peri-urban communities of Kumasi, Ghana (Bradford *et al.* 2003; Bradford, 2004; Bradford *et al.* 2004). This project is a continuation of that process and will now research and develop the necessary policy management tools and guidelines that would be required by local authorities to successfully implement appropriate community-based composting strategies. Research partners involved in this collaborative work will include the Kumasi Metropolitan Assembly (Waste Management Department), International Water Management Institute (IWMI), the Ghana Environmental Protection Agency (EPA) and the Centre for the Development of People (CEDEP) a leading Ghanaian non-governmental organization.

9.2 Project aim and objectives

The overall project aim is to research and develop management guidelines that will enable and support local authorities in the implementation of community-based compost strategies in peri-urban areas of Ghana. The objectives will include:

- Identify appropriate tools to enable local authorities to effectively and efficiently implement community-based compost strategies.
- Identify and develop local models that can be used to manage and monitor community-based compost programmes in the peri-urban context.
- Formulate management guidelines that logically address the above two points.

9.3 Background and local context

Rapid urbanization in Kumasi is resulting in major challenges to urban and peri-urban agriculture (UPA), food security, environmental protection and compost (Drechsel and Kunze, 2001). The pollution and waste disposal problem is most acute in peri-urban areas, where waste management services are seldom provided despite rapidly

increasing settlement densities (Adam, 2001). Open refuse dumps encourage fly breeding, which may result in an increase in faecal-oral infections (e.g. diarrhoeas, dysenteries, hepatitis A, cholera, typhoid). Disease associated with rats (salmonellosis, plague, endemic typhus rat-bite fever, leptospirosis) may also be promoted. Parasitic worms (e.g. hookworm) can be transmitted through the soils, particularly at sites where chamber pot waste is dumped and open defecation occurs. In Ghana, household activities are clearly differentiated on a gender basis. The Urban Waste Expertise Programme (UWEP) identify that women are far more likely than men to be involved in waste handling, cleaning up, or being associated with faecal waste, especially from children and older family members.

Although this poses problems, there are substantial opportunities to implement community-based compost strategies that are based on low-cost (and no-cost) nutrient recycling. In peri-urban areas of Kumasi, daily domestic waste consists mainly of food scraps (peels from cassava, yam and coco yam and plantain skins) and wood ash, with only small quantities of sand and plastic bags. In the light of these high proportions of organic matter in domestic waste, the high engagement (88%) in local ($\geq$4km) agricultural activities and the need for soil ameliorates in these same areas (Nsiah-Gyabaah and Adam, 2001), composting domestic waste is one strategy which can be adopted at the household and community level to reduce waste outputs and to provide much needed soil inputs for peri-urban agriculture, particularly in peri-urban areas where female-headed households are still dependent on agricultural based livelihoods. Such approaches have the potential for creating a classical win-win situation by increasing urban and peri-urban agricultural production through appropriate soil fertility management; protecting the environment through the recycling of organic waste; and income and livelihood generation, which all combined enhances urban and peri-urban food security (Drechsel and Kunze, 2001).

9.4 Research approach

Separating and composting domestic waste at the household and community level can lead to substantial decreases in waste outputs and thus contribute to a cleaner environment, particularly in peri-urban areas that are plagued by open waste dumps. Furthermore, composting and reusing domestic organic waste is a means of recycling nutrients and restoring soil fertility, contributing to soil structure and humus,

increasing organic matter and improving the water holding capacity of soils. However, the successful implementation of backyard and community composting programmes requires substantial educational and training inputs across a range of topics including establishment of compost sites, constructing compost containers, appropriate compost handling and compost use. Successful implementation can be enhanced through the provision of demonstrations and information leaflets and the running of composting workshops. Financial assistance may also be required to purchase any required materials to build compost containers. However, the success of backyard and community composting is not dependent on the composting techniques or the containers used, but on 'intensive care and know-how of the individual' (GFA-Umwelt, 1999), which can only be fostered through well planned educational and training programmes with the beneficiaries participating in all stages of the planning and implementation process.

10. What activities are proposed?

The project will be conducted over a 12-month period and will be implemented as listed in the project timetable illustrated below.

Table 1.0 Project timetable

	Month (12 month project)											
Activity	1	2	3	4	5	6	7	8	9	10	11	12
Project formulation												
Stakeholder workshop												
Baseline surveys												
Community workshops												
Monitoring and evaluation			1/4			2/4			3/4			4/4
Micro-project implementation												
Guideline formulation												
Compost sampling/testing												
Guidelines publication												
Dissemination workshop												
Project dispersal												

10.1 Project formulation

Establish terms of reference; selection of six peri-urban communities; identification of relevant project stakeholders; multidisciplinary situation and stakeholder analysis.

10.2 Stakeholder workshop

Used throughout project to develop action plans and micro-project interventions and to formulate the guidelines with key stakeholders and community representatives.

10.3 Baseline surveys

Identify appropriate nutrient recycling strategies for specific peri-urban localities.

10.4 Community workshops

Identify environmental sanitation constraints; mobilize, educate and train communities in household and community-based compost strategies.

10.5 Monitoring and evaluation

Monitoring and evaluation will be conducted during the 3rd, 6th, 9th and final month of the project and will consist of the activities listed in Table 2.0.

10.6 Micro-project implementation

Establish household, community and school composting demonstrations within local management frameworks.

10.7 Guideline formulation

Development and compilation of 'Local Authority Community-based Compost Strategy Guidelines' with key stakeholders.

10.8 Compost sampling/testing

Testing of compost samples to identify best use practices for inclusion in guidelines.

10.9 Guidelines publication

Publication of 'Community-based Compost Strategy Guidelines'.

10.10 Dissemination workshop

Dissemination of project findings to all project stakeholders and communities.

10.11 Project dispersal

Finalisation of project related activities; closure of financial accounts; production of final project technical report.

Table 2.0 Monitoring and evaluation schedule

Month	Monitoring and evaluation questions
3rd	Completion of baseline survey and evaluation outcomes; participation levels and evaluation outcomes of community workshops; multidisciplinary situation and stakeholder analysis outcomes
6th	Completion of micro-project implementation and evaluation outcomes
9th	Monitoring & evaluation of micro-projects; completion of second stakeholder and community workshops and respective evaluation outcomes; review of guideline formulation process
12th	Publication of guidelines; completion of dissemination workshop and evaluation outcomes; final project evaluation and completion of project technical report

11. What will be the result of the project?

The project will result in the development of implementation and management guidelines for community-based compost strategies that are based on integrated nutrient recycling approaches that close the rural-urban nutrient cycle, primarily by using organic waste as an agricultural fertilizer in UPA. Due to the development of such guidelines together with the municipal key players and non-governmental organisations that are already active in peri-urban areas, it is anticipated that uptake of the results and multiplier effects are most likely to occur. These effects include improved soil fertility management which will then contribute to income and livelihood generation particularly in the poorer peri-urban areas where female-headed households are still dependent on agriculture, despite the high cost of agricultural inputs and the loss of agricultural land for construction activities, which has already resulted in agricultural intensification on the smaller remaining farming plots. At the institutional level clear policy guidelines for the implementation of community-based compost strategies in peri-urban areas will be proposed and published.

12. How will this be achieved (methodology)?

The proposed project builds on the successful implementation of a pilot participatory action-research (PAR) project that trialled low-cost (and no cost) composting techniques at the household and community levels in six peri-urban communities. This project will also be implemented in six peri-urban communities with the selection criteria being based on environmental, geographical, social, economical and political factors, thereby, ensuring that villages with a range of different peri-urban characteristics will be represented. Likewise, this project will also be implemented using a PAR approach, which in essence, is a problem-solving, iterative and systematic approach to research where a range of intellectual resources are drawn upon to find a solution to a problem or to improve current practices. The proposed research tools that will be used during the fieldwork – transect walks, semi-structured interviews, focus group discussions, micro-projects and workshops – are predominantly qualitative research methods, and hence bestow several important advantages, which are crucial if a PAR approach is to be successful and truly participatory. These advantages include:

- Flexibility of research design and methods

- Increased holistic understanding of the issues.
- More natural settings.
- Inclusion of local perceptions and viewpoints (Curry, 1996).

Implemented micro-projects will be strategically distributed at prominent points throughout each participating peri-urban village and will be used to provide simple demonstrations that could be easily replicated by other community members after observing the direct benefits of the composting process. By increasing the number and distribution of such micro-projects in each village, and conducting composting workshops using the demonstration sites, the dissemination capacity will be increased and a wider community audience will be reached. However, due to the time required to produce compost there may be a prolonged period before outputs are available, hence the intervention must be well planned and sustainable, with local people actively participating in all stages of the planning and implementation process. Therefore, the project will not only build capacities at institutional level (Waste Management Department/local NGOs) but also at the grassroots by empowering urban and peri-urban farmers to produce and analyze knowledge, particularly in soil fertility management and local environmental sanitation issues.

13. Who will benefit?

The development of community-based compost guidelines will provide decision support tools for the benefit of both municipal authorities and urban and peri-urban farmers. In an agricultural context, composting and reusing domestic organic waste is a means of recycling nutrients and restoring soil fertility, contributing to soil structure and humus, increasing organic matter and improving the water holding capacity of soils. For urban and peri-urban farmers this bestows several benefits: reduction in expensive chemical fertilizer and pesticide inputs; more sustainable cropping practices on intensely used plots; conservation of water sources, particularly during the dry season and when rainfall is erratic in the wet season. Also, in addition to producing natural fertilizer for UPA, composting substantially reduces the amount of domestic organic waste destined for open refuse dumps, thus also contributing to a cleaner environment and a reduction in the domestic chores of women and children that are related to waste disposal. On a wider context, increased urban and peri-urban

agricultural production provides greater food security, increases incomes and enhances the livelihoods of urban and peri-urban farmers.

14. How will the results be disseminated and followed up?

First the projects results will be disseminated through the publication of guidelines for community-based compost strategies in peri-urban areas. In addition, results will be disseminated in journals, reports, articles, local media (national newspaper local radio broadcasts), and at a final project dissemination workshop that will be targeted at both institutional (local government, NGO, research institutions) and community audiences (peri-urban communities and urban and peri-urban farmers). For example, recent activities on the initial pilot PAR project received national media coverage in March 2003, when an article about the programme was printed in the national Ghanaian daily newspaper the *Daily Graphic* (2003).

The collaborative partnership is crucial for the uptake of the results and any follow-up, also with respect to other Ghanaian municipal city authorities. Project results will also be disseminated in reports, articles, journals, radio broadcasts and workshops and will be targeted at government, NGO, research institutions and the urban and peri-urban farming groups. Additional outputs from the recent pilot study in Kumasi include: publication of compost leaflets in both English and the local Twi language; poster and short paper presented at the International Symposium 'Eco-sanitation' in Germany (Bradford *et al.* 2004); article in Urban Agriculture Magazine (Bradford *et al.* 2003); and a section in a IDRC final technical report (Bradford, 2004) . A similar dissemination strategy will be used to communicate the final research results, which will address the wider social and political aspects of community-based compost strategies in peri-urban areas. In particular, community participation and interaction mechanisms among the different stakeholders will be addressed, as will the necessary policies to promote appropriate community strategies.

Collaboration with the local and national references will further disseminate project findings. For instance, in the Environmental Protection Agency's (EPA) publication 'Manual for the Preparation of District Waste Management Plans in Ghana', decentralised composting strategies have been identified as "[o]ne of the most significant potential areas for recycling" (EPA, 2002: 29). EPA also highlight that

"household composting is potentially the most useful, although it must obviously be carried out in such a way as to avoid a nuisance in the residential neighbourhood" (EPA, 2002: 29). The results from this project will be used in the development of safe and hygienic household composting strategies that will be applicable at the national level and thus contribute to publications such as the EPA's district waste management manual, in which household composting is promoted, but the social, cultural and technical aspects are not yet addressed.

15. Budget breakdown (one year)

Description	Budget request	KMA input	IWMI input	CEDAR input
Staff input				
CEDEP	1500.00			
KMA-WMD		1500.00		
CEDAR				2500.00
Capacity building				
Stakeholder workshops & community meetings	2000.00	1500.00	2000.00	
Materials for compost projects (drums, stakes etc.).	4000.00	1600.00		
Information dissemination (leaflets, publications etc.)	1500.00		500.00	
Logistics & local transport	1000.00			
Compost testing		400.00		
Total US$	**10,000.00**	**5000.00**	**2500.00**	**2500.00**

16. Local references

- Environmental Protection Agency (EPA), Ashanti Regional Office, Kumasi, Ghana
- International Water Management Institute (IWMI), Ghana Office, KN-UST, Kumasi, Ghana
- Ministry of Agriculture (Kumasi Metro Office), PO Box 3820, Kumasi, Ghana
- Department of Crop Science, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana
- Department of Civil Engineering, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

References

Adam, M. (2001) 'Definition and Boundaries of the Peri-urban Interface: Patterns in the Patchwork'. In Drechsel, P. and Kunze, D. (eds.) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa*. IWMI, Food and Agriculture Organisation and CABI Publishing, Wallingford, UK, pp. 193-208.

Bradford, A.M. (2004) 'Options for Waste Composting in Peri-Urban Settlements'. In Drechsel, P. (Ed.) *Closing the rural-urban nutrient cycle. Options for municipal waste composting in Ghana. Final Report on IDRC project 100376.* International Water Management Institute (IWMI), West Africa Office, in preparation.

Bradford, A. Ashong, K. McGregor, D. and Simon, D. (2004) 'Waste separation and composting at the household level: peri-urban interface, Kumasi, Ghana' (poster and short paper). In Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH and International Water Association (IWA) *ecosan – closing the loop. Proceedings of the 2nd international symposium on ecological sanitation 7th – 11th April 2003, Lübeck, Germany*. GTZ, Eschborn, Germany, pp. 349-352.

Bradford, A. McGregor, D. and Simon, D. (2003) Container Composting in Peri-Urban Kumasi, Ghana. *Urban Agriculture Magazine*, 10: 30-31.

Curry, J. (1996) *An Introduction to Qualitative Research.* University of Wales, Bangor, UK.

Daily Graphic (2003) EPA initiates moves. 31st March, p. 23.

Drechsel, P. and Kunze, D. (eds.) (2001) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa*. IWMI, Food and Agriculture Organisation and CABI Publishing, Wallingford, UK.

EPA (2002) *Manual for the Preparation of District Waste Management Plans in Ghana*. Environmental Protection Agency, Ministry of Environment & Science and the Ministry of Local Government & Rural Development, Ghana.

GFA-Umwelt. (1999) *Utilisation of Organic Waste in (Peri-) Urban Centres.* GFA Infrastruktur und Umweltschutz GmbH, Bonn (GFA Umwelt), Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), Eschborn and Ingenieurgemeinschaft Witzenhausen Fricke & Turk GmbH (IGW), Witzenhausen, Germany.

Nsiah-Gyabaah, K. and Adam, M. (2001) 'Kumasi: Farming Systems and Farming Inputs in and around Kumasi'. In Drechsel, P. and Kunze, D. (eds.) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa*. IWMI, Food and Agriculture Organisation and CABI Publishing, Wallingford, UK, pp. 96- 111.

African Roots

Improving the nutritional status of people with HIV/AIDS through urban agriculture in Msunduzi

Background and context

- KwaZulu-Natal highest rate HIV/AIDS
- 55%-65% of medical in-patients HIV +
- 1 in 4 children is orphaned by AIDS
- 300 people per month die of AIDS

Problem Statement

The increase and prevalence of HIV/AIDS epidemic and the suffering of People Living with HIV/AIDS due to lack of access to nutritious food and medicinal plants, has resulted in the formation of the project called African Roots.

Project Objectives

- Improve access by People Living with HIV/AIDS (PLWHA) to nutritious foods through food gardens
- Improve access to exotic and indigenous medicinal plants in urban and peri-urban gardens

Project Partners

- Msunduzi Municipality
- Children In DIstress (CINDI)
- Institute of Natural Resources (INR)

Kick off Activities

- 3 partners will meet
- Formulate agenda for stakeholders meeting
- Meeting with stakeholders
- Introduce project to council
- Meeting with beneficiaries and stakeholders
- Develop plan of action

Tentative Plan of action

- Identification of beneficiaries
- Development of database of medicinal plants and nutritional crops
- Identify suitable areas for food gardens
- Establish a nursery
- Awareness and training activities

Expected Outputs

- Urban Agriculture Policies formulated
- Integration of UPA into HIV/AIDS interventions
- Upscale UPA to neighbouring cities
- Urban agricultural extension services provided for by Msunduzi Municipality

Expected Outcomes / Impacts

- Improved nutritional status of People Living with HIV/AIDS
- Access by PLWHA to medicinal plants and nutritional crops
- Prolonged life expectancy of PLWHA

Time frame

5 years (2003-2008)

Sustainability

- Donor dependant
- Msunduzi municipality provide services
- INR management and coordination
- CINDI information sharing, resources mobilization and lobby for children

Monitoring and Evaluation

- INR reports to the partners
- Evaluation done by partners and / or external evaluators

Risks and mitigations

- Non-cooperation of role players
- Inability of role players to contribute to the physical implementation of activities on the ground

Engage partners in contractual agreements

Make a partnership with the private sector

Project Beneficiaries

- Primary beneficiaries: PLWHA infected
- Secondary beneficiaries: PLWHA affected

Budget estimate

- R 2.05 Million (U$D 300.000)

Budget summary

Year	1	2	3	4	5
Total	**420 260**	**326 900**	**359 590**	**394 891**	**548 430**

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MSUNDUZI CITY
SUMMARY OF PROJECT PROPOSAL
OR PROJECT CONCEPT

Project Title **African Roots**

Project Summary

The Municipality of Msunduzi and local partners intends to implement a project called African Roots to assist people living with HIV and AIDS to gain access to nutritious foods and medicinal plants. The project is part of the Strategic Framework for Addressing HIV and AIDS at the Municipal Level that the Municipality developed and adopted in 2002. Broadly the project is estimated to commence from November 2003 to December 2008. This is a summary of the project proposal, which is available for partners with interest.

Principal Aim of the project – To improve the nutritional status of People Living with HIV/AIDS from poor communities in Msunduzi municipality.

Background and Context

Area- Pietermaritzburg, KwaZulu-Natal

The Aids pandemic in KwaZulu Natal is overwhelming in public hospital capacities, with medical patients spilling into surgical, gynaecological And orthopaedic wards, often forcing doctors to choose who lives and who dies.

KwaZulu-Natal has the highest rate of HIV/AIDS infections. It is reported that 55% - 65% of medical in- patients are HIV positive. One in four children (2002) in Pietermaritzburg has been orphaned by AIDS and the number is set to rocket in the next 10 years.
N.B. The accepted definition of an orphan in the academic and development literature is a child under the age of 16 whose mother has died. In 1996 6% of children in Pietermaritzburg were aids orphans. Six years later the number has risen to 25%.

Problem Statement

The increase and prevalence of HIV/AIDS epidemic and the suffering of People Living with HIV/AIDS due to lack of access to nutritious food and medicinal plants, has resulted in the formation of the project called African Roots.

Project Objectives

The project objectives are:

1. To improve access by People Living with HIV/AIDS to nutritious foods through food gardens.
2. To improve access to exotic and indigenous medicinal plants in urban and peri-urban gardens.

Project Partners

The current project implementation partners include:

- Msunduzi municipality – provides municipal services e.g. providing land for the crop and plant production except for livestock.
- CINDI – support, share information, mobilize resources and lobby on behalf of children affected by HIV/AIDS.
- INR – management and / or coordination of the activities.

Main activities will include

As part of the project, the following activities will be undertaken

- Identification of beneficiaries and accessing level of demand.
- Development of database of medicinal plants and crops.
- Identify suitable areas and establish food gardens and growing medicinal plants.
- Establish a centre for propagating medicinal plants.
- Awareness and training activities for participants in the project.

Expected Outputs

The expected project outputs are:

1. The formulation of Urban and Peri-Urban Agricultural Policies by the local government.
2. The integration of Urban and Peri-Urban Agriculture into HIV/AIDS interventions including western and traditional remedies (e.g. nutritional and medicinal plants).
3. The extension of Urban and Peri-Urban Agricultural practices to other neighbouring cities.
4. The provision of agricultural extension services by Msunduzi municipality.

Expected Outcomes/ impacts

1. Improved nutritional status of People Living with HIV/AIDS.
2. The access by PLWHA to medicinal plants and nutritional crops.

Time frame for implementation

The duration of the project is 5 years from 2003-2008.

Sustainability

The nature of the project does not lend itself to income generation and therefore will always be dependent on the support of the municipality and other development partners. The Msunduzi municipality will provide the services (e.g. provision of land for crop production).
The Institute of Natural Resources will manage and coordinate the project activities.
Children in Distress (CINDI) will support, share information and mobilize resources, lobby on behalf of the children affected by HIV/AIDS.

Monitoring and Evaluation

Monitoring will be done by INR which will provide management and direction through reports and the evaluation will be conducted annually by the project partners and /or by the external evaluators.

Main risks and how to address them

Risk: Non-cooperation of role players and the government departments.
Mitigation: Engage partners in written contractual agreements.

Risk: Inability of role players to contribute to the physical implementation of activities on the ground.
Mitigation: Engage partners in written contractual agreements.

Risk: Lack of the financial support.
Mitigation: Continuous fundraising for the project by writing project proposals

Project Beneficiaries

Primary beneficiaries are People Living with HIV/Aids who are infected.
Secondary beneficiaries are People Living with HIV/Aids who are affected.

Budget estimate

The total budget for the project over the period of five years is:
R 2. 05 million

Budget Summary

Year	1	2	3	4	5
Total	**420 260**	**326 900**	**359 590**	**394 891**	**548 430**

Articles and publication

- *Aids takes its toll in infant mortality.* Ronnie Govender. Sunday Times: Sunday 6 October 2002
- *City faces Aids orphans' crisis.* Brett Horner. Sunday Times: Sunday 6 October 2001
- *Can KwaZulu-Natal hospitals cope with the HIV/AIDS human tide?* Chris Bateman. South African Medical Journal: Aids bulletin – July 2001 vol. 10, no.2
- *It is Destroying the Children – Living and Dying with AIDS.* Tessa Marcus. The School of Human and Social Sciences (Sociology). University of Natal. Pietermaritzburg. July 1999
- *The CINDI/Natal Witness High School Essay Competition*, held to commemorate Youth Day – 16 June 2001: "How AIDS Affects Me." (extracts and winners from 53 essays submitted for the competition.)

For more information, please contact

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NAIROBI RESEARCH AND INFORMATION SERVICES FOR URBAN-AGRICULTURE:
Empowering Through Knowledge Sharing

PROJECT PROPOSAL PRESENTED TO THE "ANGLOPHONE REGIONAL TRAINING COURSE ON URBAN AGRICULTURE"
Nairobi, Kenya
8 – 26 September 2004

PRINCIPAL INVESTIGATORS
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Total Estimated Cost of the Project: US Dollars 54, 395.00

Total Cost (US Dollars)	NCC	KARI	DRD	DONOR
54,395.00	**9,020.00**	**12,100.00**	**9,735.00**	**23,540.00**

Duration of the Project: 12 months, (April 2004 – March 2005)

BACKGROUND

Rapid urbanization in Kenya has been accompanied by inequitable economic growth resulting in increased urban poverty with many low-income households suffering from extremely limited alternative livelihood options and food insecurity. Nairobi City has an estimated population of 2.5 million people and is projected to reach 3.2 million by the year 2010 (GoK, 2001). With a population growth rate of 4.6%, the city will continue to experience an increasing demand for food.

To meet their food demands and some surplus for sale, the urban poor grow crops along roadsides, in the middle of roundabouts, along railway line, under power lines and keep domestic animals including cows, pigs, chicken and goats that can be seen roaming about or scavenging on solid waste dumps in residential areas. Thus, it is a multi-purpose economically viable activity that creates opportunities including jobs; waste recycle, access to food; use of vacant land; micro-enterprise development and improved urban environment (Lee-Smith et. al., 1987; Dannery, 1996; LPP, 2002; Ishani et. al., 2002). The urban poor populations in the informal settlements are the major actors in this sub-sector. (Dannery, 1996). Vulnerable groups, such as female-headed households, children, retired people, widows and people with limited formal education are particularly involved in urban agriculture (Ishani *et. al.* 2002).

PROBLEM DEFINITION

Although a lot of UA activities have been done in Nairobi there is limited collaboration, co-ordination and networking for dissemination of information among researchers, practitioners and farmers at the grassroots level. Currently there is no agency providing information services, wider sharing and networking among stakeholders. Due to limited access to information on urban agriculture there are negative attitudes towards it, social-cultural biases against it, constraints to access of resources, inputs and services for its development, health risks, production and postproduction constraints and a general lack of organization. These constraints and biases about urban agriculture are further reinforced by the mainstream news media, which more often than not reports about the environmental and health risks from inappropriate practices. Currently, policies, legislations and institutional arrangements are absent, inadequate and inconsistent. Thus, there is no shared vision; there are many conflicting views. This project proposes to provide a forum to build a shared vision for urban agriculture in Nairobi.

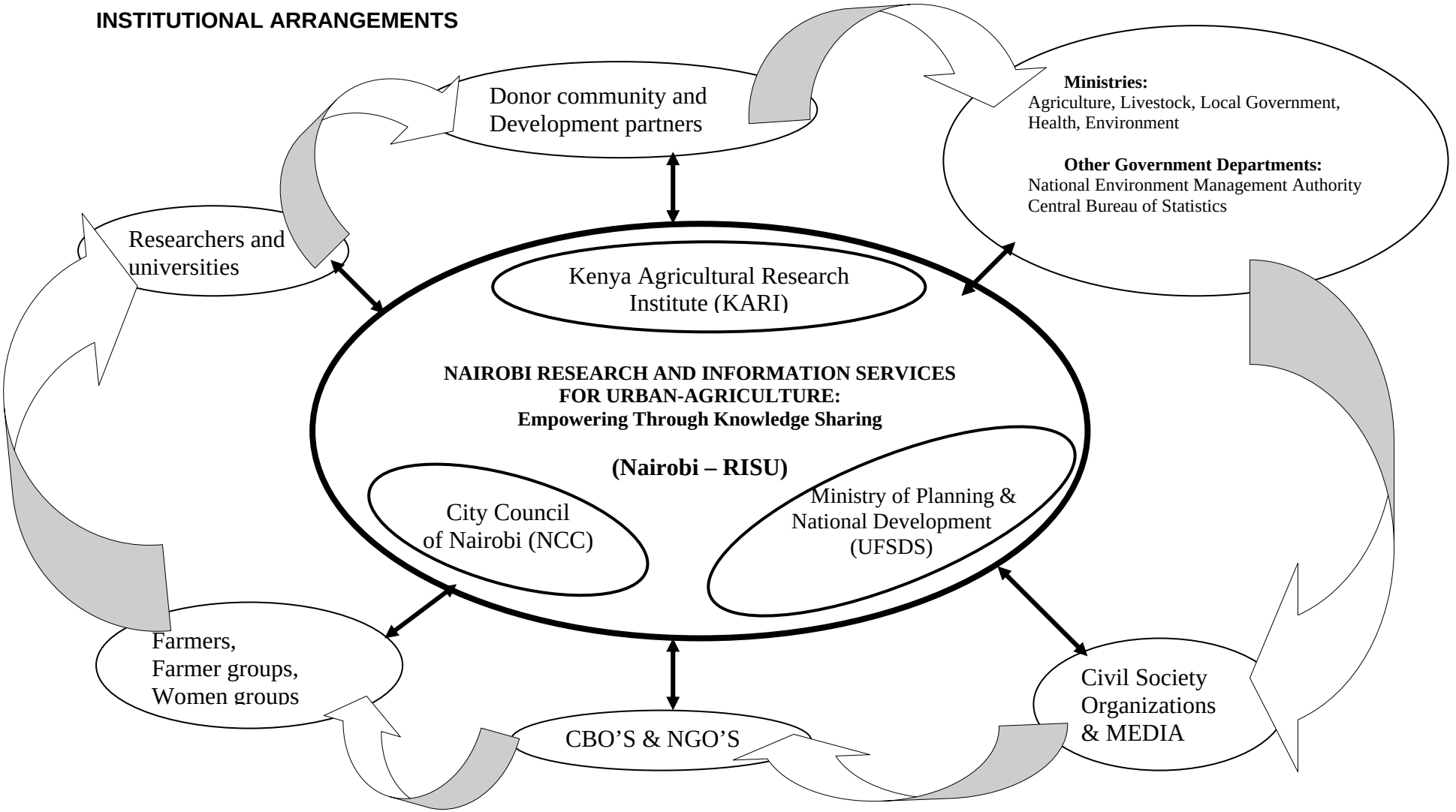
JUSTIFICATION

This project recognizes information services as one sector that drives development and economic growth throughout the economy. Current thinking is such that for any community to function efficiently and productively and to ensure its survival, a basic minimum stock of usable information needs to be acquired, stored, and exchanged (Mchombu, 1993). Appropriate knowledge and information on urban agriculture will provide the key to increasing awareness of the important role that urban agriculture can play in sustainable urban development in Nairobi. Information will be the necessary prerequisite to knowledge for enhanced capacity development and

empowerment of the urban agricultural stakeholders. The urban poor increasingly require overcoming the constraints of poverty, malnutrition and hunger. The poor urban agricultural producers are marginalized in terms of access to existing knowledge and improved technologies. Since local governments have a major role to play in urban poverty reduction, relevant information is needed to advise policy makers and city authorities in order to provide guidance for the formulation of pro-poor urban action plans and legislation. Thus, there is a clear opportunity to improve the current policy and regulations, production and management systems through information sharing. This project will build up on on-going initiatives by KARI, NCC, and DRD and other actors (See Annex 1).

The proposed operational arrangements are as shown in Fig. 1 below. The linkage network will by no means perform the roles and mandates of the actors but rather provide a linkage framework for their networking.

INSTITUTIONAL ARRANGEMENTS



GOAL

To provide research and information services on urban agriculture as a strategy for promoting environmentally, socially, and economically sustainable urban development in Nairobi.

OVERALL OBJECTIVE

To establish an inter-agency and multi-stakeholder research and information service on UA in Nairobi.

SPECIFIC OBJECTIVES

1. To identify the main information needs, communication pathways and their relevance to each of the categories of stakeholders in UA in Nairobi.
2. To respond to these needs through the facilitation and strengthening of linkages between stakeholders of UA in Nairobi including individuals, user groups, the wider community, and policy makers.
3. To build consensus among UA actors for the way forward.

ACTIVITIES/OUTPUTS

Activities under objectives 1: To identify the main information needs, communication pathways and their relevance to each of the categories of stakeholders in UA in Nairobi.

a) A detailed literature search
   - Inventory of past projects/programs
   - Thematic reports

b) Stakeholder analysis: Identify individuals, institutions and experts involved in UA

c) A field study to;
   - Inventory present and planned projects/programs;
   - Identify main constraints and potentials of UA in Nairobi

d) Identify problems and constraints in delivering, exchanging and sharing information among institutions and individuals (differentiation of youth, men and women's information needs

Activities under objectives 2: To respond to these needs through the facilitation and strengthening of linkages between stakeholders

a) Establishing an urban agriculture resource center to facilitate information exchange among institutions and individuals involved in UA.

b) Establish Nairobi urban agriculture information network

c) Identify the most appropriate information pathways and means of dissemination for each group of stakeholders.
d) Dissemination of UA information.

Activities under objective 3: To build consensus among UA actors for the way forward

a) Stakeholder workshop to sensitize actors and build consensus for the way forward.
   - Facilitate establishment of new and strengthen linkages with existing sectoral networks (livestock, solid waste management, wastewater use, indigenous vegetable crops, agroforestry etc).

b) Develop an action plan for promotion of UA in Nairobi.
c) Together with stakeholders, present interim UA action plan to City Council of Nairobi.

METHODOLOGY

Highly participatory methodologies are preferred in this project. We will facilitate participatory approaches, gender analysis tools, and consensus building in all the activities. Feedback and dissemination meetings and consultative stakeholders workshops will follow these to facilitate and strengthen linkages between stakeholders of UA in Nairobi. Together, the project team and stakeholders will undertake monitoring and evaluation of the process and develop indicators that will be used to determine the benefits of the products and services on individuals, user groups, the wider community, and policy makers. The Project design incorporates the utilization of the Project logical framework indicators as a monitoring and learning tool to link activities, schedules, to address challenges, and to ascertain the attainment of objectives.

EXPECTED OUTPUTS

1. Status reports for different thematic areas of UA in Nairobi.
2. Inventory of stakeholders, roles and responsibilities, and relevance to the project.
3. Information gaps in UA.
4. Existing communication pathways and their efficiency.
5. Established information exchange systems.
6. Common vision and action plan for UA in Nairobi.

EXPECTED BENEFICIARIES

1. Urban farmers and their associations,
2. Service Providers,
3. Civil Society Organizations,
4. Development Partners,
5. Policy-makers,
6. Extension workers,
7. Business Community,
8. Researchers,
9. Local Authorities,
10. General Public,
11. The Academia,
12. Relevant Government Agencies,
13. The Media,
14. Opinion Leaders.

MONITORING AND EVALUATION

The Project Document will be subject to a revision with respect to impact bench marking, and regular consultations will be held to review the progress of Project activities and make suggestions for modifications and re-orientation of activities as may be necessary. Monitoring of the project will involve impact monitoring by use of benchmarks. The performance indictors for the Project are the benchmarks set out in the log-frame. The achievement of these benchmarks is to be monitored very closely by the Project team and other actors with quarterly Project Performance Evaluation Reports (PPER) being prepared regularly to review progress on the outputs and make recommendations for any appropriate modifications necessary to link activities, keep schedules, address challenges, and attain objectives.

PHASE II – YEAR TWO

A: INTEGRATING UA INTO NAIROBI CITY URBAN PLAN

a) Participate in the Nairobi City Strategy Plan formulation.
b) Participate in the process of policy formulation for UA in Nairobi.
c) Propose the review of by-laws fro UA in Nairobi.

C: DISSEMINATION, FOLLOWED UP AND SUSTAINABILITY

The project will continue in phase two to;

d) Package relevant information on urban agriculture for stakeholders.
e) Disseminate information to stakeholders.
f) Continuously use indicators in participatory monitoring.
g) Assess benefits (using sex-disaggregated data) of delivery of information on different user groups, and the wider community, through the application of indicators to measure benefits by gender.

While the project will be aimed at Nairobi, the methodology that will be applied and networks established will be important lessons for other towns in Kenya and the region. Such lessons will be disseminated to other towns through publications, audio-visual media, conferences and workshops, technical reports, the website media presentations, exhibitions and outdoor media. The best bet practices and identified needs in communication and information delivery will facilitate follow up pilot projects. Since women are the majority stakeholders in urban agriculture their needs will receive special attention in this project and in future phases.

WORK PLAN FOR YEAR 1

Activity No.	Summary narrative	Lead	Contribute	Time in Months April 2004 – March 2005)											
				A	M	J	J	A	S	O	N	D	J	F	M
	To identify the main information needs, communication pathways and their relevance to each of the categories of stakeholders in UA in Nairobi.														
1.1.	Undertake a detailed literature search	KARI, NCC, DRD	All												
1.2.	Stakeholder analysis: Identify individuals, institutions and experts involved in UA	KARI, NCC, DRD	All												
1.3.	A field study to; Inventory present and planned projects/programs; Identify main constraints and potentials of UA in Nairobi	KARI, NCC, DRD	All												
1.4.	Identify problems and constraints in delivering, exchanging and sharing information among institutions and individuals (differentiation of youth, men and women's information needs).	KARI, NCC, DRD	All												
	To respond to these needs through the facilitation and strengthening of linkages between stakeholders														
2.1.	To establish an urban agriculture resource center	KARI	All												
2.2.	Establish Nairobi urban agriculture information network	KARI, NCC, DRD	All												
2.3.	Identify the most appropriate information pathways and means of dissemination for each group of stakeholders	KARI, NCC, DRD	All												
2.4.	Dissemination of UA information	KARI	All												

	To build consensus among UA actors for the way forward														
3.1.	Stakeholder workshop to sensitize actors and build consensus for the way forward	KARI, NCC, DRD	All												
3.2.	Develop an action plan for promotion of UA in Nairobi	KARI, NCC, DRD	All												
3.3.	Together with stakeholders, present interim UA action plan to City Council of Nairobi	KARI, NCC, DRD	All												
	PHASE II (From April 2005)														
	Participate in the Nairobi City Strategy Plan formulation		All												
	Continue to package relevant information on urban agriculture for stakeholders		All												
	Wider dissemination of information to stakeholders		All												
	Continuously use indicators in participatory monitoring		All												
	Continue to evaluation to assess benefits (using sex-disaggregated data) of delivery of information on different user groups, and the wider community, through the application of indicators to measure benefits by gender.		All												

BUDGET FOR ONE YEAR

Activity No.	Narrative summary	Total Cost (US Dollars)	NCC	KARI	DRD	IDRC
a)	Personnel salaries (3 Technical staff for 1 years and 1 Administrative/support staff 1 years)	18000	6000	6000	6000	-
b)	Subsistence	2000	-	-	-	2000
c)	Office space/Accommodation/set up	4000		2500		1500
d)	Consumables (e.g. Stationery, photocopy, printing).	3000	500	500	500	1500
e)	Other services (e.g. Tel./Fax, postage, e-mail).	3000	-	-	-	3000
f)	Transport costs (Fuel)	3500	-	-	-	3500
g)	Cost for library searches	2500	500	500	500	1000
h)	Consultant services including policy review	2500	-	-	-	2500
i)	Contracted services (e.g. printing pamphlets, brochures, posters, designing web page)	3000	-	-	-	3000
j)	Stakeholders consultation meetings	2500	500	500	500	1000
k)	Media publicity	1200	200	200	200	600
m)	Monitoring and evaluation	2000	-	500	500	1000
n)	Study tour to Kampala City Council	2250	500	300	650	800
Total		**49450**	**8200**	**11000**	**8850**	**21400**
Miscellaneous 10 % of Total		4945	820	1100	885	2140
GRAND TOTAL		**54395**	**9020**	**12100**	**9735**	**23540**

REFERENCES

1. **Bellows, Anne C., Robinson, V., Guthrie, J., Meyer, T., Peric, T. and Hamm, Michael W. (2000).** Urban Livestock Agriculture in State of New Jersey. In: Urban Agriculture Magazine, no 2, Urban Livestock, October 2000, RUAF, Leusden The Netherlands.
2. **Burke, A. (1999).** Communications and development: a practical guide. DFID. London.
3. **City Farmer, Canada's Office of Urban Agriculture (1999).** New York: bees bring taste of honey to inner city. Urban Agriculture Notes. http://www.cityfarmer.org/beesNY.html
4. **Dennery P. (1996).** Urban Food Producers' Decision-Making: A Case Study of Kibera, City of Nairobi, Kenya, African Urban Quarterly, 11(2,3), Nairobi.
5. **Ghirotti, M. (1999).** Making better use of animal resources in a rapidly urbanizing world: a professional challenge. World Animal Review 92, p 2-14
6. **GoK (2001).** Poverty Reduction Strategy Paper for the Period 2001-2004. Ministry of Finance and Planning, Nairobi.
7. **GoK (2002)**. National Development Plan for the period 2002-2008. Ministry of Finance and Planning, Nairobi.
8. **GoK (2003).** Economic survey 2003. Central Bureau of Statistics, Ministry of Finance and Planning, Nairobi.
9. **Ishani, Z., Gathuru, P.K. and Lamba, D. (2002).** Scoping study of Urban and Peri-urban poor livestock keepers in Nairobi. Mazingira Institute, Nairobi, Kenya.
10. **Lee-Smith, D., M. Manundu, D. Lamba and P.K. Kuria, (1987).** Urban Food Production and the Cooking Fuel Situation in Urban Kenya: Results of a 1985 National Survey. Mazingira Institute, Nairobi, Kenya.
11. **Livestock Production Programme (2002).** Peri-urban and urban livestock keeping in East Africa - A coping strategy for the poor? http://www.lpp.uk.com/filedir/Summary_Report.pdf
12. **Mchombu K (1995).** Impact of information on rural development: Background and methodology. **In:** McConnell P., 1995: Making a difference: Measuring the impact of information. IDRC, Canada
13. **Sawio C. J. and Spies L. (1999).** Towards the establishment of a Development and Research/Training Network on urban agriculture for East and Southern Africa. Paper presented at the ISBRAM – FAO Workshop on Urban and Peri-urban Agriculture, Accra, Ghana, 2-6 August, 1999.
14. **Schilderman T. (2002).** Strengthening the knowledge and information systems of the urban poor. DFID and ITDG.

Submission to the Anglophone Africa Training Course on UA

Title: Efficient and safe irrigation of urban vegetables through the use of groundwater

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Confirmed partners:

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Dr. Pay Drechsel, Head of Office, IWMI, PMB CT 112, Accra, Ghana p.drechsel@cgiar.org

Location of the project: Accra and Kumasi

Total time period: 24 months

Total Budget: USD 12,000

Project partners: *CSIR, Ministry of Food and Agriculture (MoFA), Water Research Institute (WRI), Enterprise Works (EP Works), IWMI, Students from Kwame Nkrumah University of Science and Technology (KNUST), Farmer Associations, Metropolitan Health Departments.*

Key words: wastewater, groundwater, vegetables, stakeholders, health risks, productivity, livelihoods,

Background:

In 1996 UNDP estimated that about 800 million people are engaged in urban and peri-urban agriculture (UPA) worldwide and contribute about 30% to the world's food supply. This is increasingly becoming a common expression of most urban areas in developing countries and is seen as an important means of attaining balanced diets and urban food security.
In several African cities, between 50 and 90% of the vegetable consumed are produced within or close to the city (Cofie et al. 2003; Moustier, 2001, Nugent, 2000, Maxwell, 1994 ;). The proximity

of UPA to consumers ensures freshness of the vegetables and likeliness to have higher nutrient contents than those stored and transported for long periods. This is especially important in Sub-Saharan Africa where refrigerated transport and cool storage are scarce. UPA also offers jobs for the poor, often especially women, and is an effective way to overcome poverty (Cofie et al. 2003). Pilot studies of KNUST and IWMI have also showed that especially dry-season irrigation of vegetables could allow farmers to go over the poverty line (Danso et al., 2003).

Sixty five percent (65%) of the people involved as UPA farmers or traders are women in many African countries (WFS 1996). UPA is a common phenomenon in Ghana and is mainly characterized by backyards and commercial small-scale irrigated vegetable farming. It is mainly carried out by men while marketing of the produce is predominantly a women domain. UPA has significant contributions to livelihoods and food security; for example, around Kumasi, Ghana, more than 12,000 farmers are involved in vegetable farming during the dry seasons (Cornish *et al.* 2001) and urban farmers grow 90% of the main vegetables eaten in the city (Danso et al., 2003). Vegetable farming is done on virtually every open space more close to water sources of almost all major cities and urban centers in the country. Most of the vegetables produced are contaminated with pathogens through the use of polluted water for irrigation and also from poultry manure and pesticides application. Analysis of sampled vegetables carried out by different researchers (e.g., Keraita *et al*., 2002, Mensah *et al.*, 2001, IWMI, unpubl. and Armar-Klemesu *et al.*, 2000) show levels of faecal bacteria contamination in lettuce and cabbage leaves varying from 1000 to over 30,000 in number. Although post-harvest contamination occurs, the majority takes place on farm, in part through poultry manure application but more significantly through the use of polluted water (Cornish *et al.*, 1999). However, the use of wastewater in UPA will not only lessen the pressure on water resources but will also increase water productivity through reuse of water and nutrients, which may be otherwise a nuisance to the environment. On the other hand, there have been some outbreaks of diseases like typhoid in Santiago, Chile and helminth infections in Egypt and Jerusalem that have been associated with crop contamination from wastewater irrigation (Blumenthal *et al.* 2000). The use of wastewater can also affect the farm workers since significant ascaris and hookworm infections have been reported in sewage farmers in India (Blumenthal *et al*. 2000). Health concerns are mostly related to water and crop contamination with pathogens from faecal matter while heavy metal levels are in tolerable limits due to the low industrialization of Ghana's cities.

Consequently, municipal authorities and government ministries often raise concern regarding the potential health risks to consumers, sellers and farmers without considering the added benefits such as income generation, employment creation and secured livelihoods. To safeguard both, public health and farmers' livelihoods' there is the need to explore all possibilities for risk reduction. Such a project is currently underway by IWMI and partners. The here proposed project will contribute to this broader one by exploring the provising of safer groundwater as alternative to drain water . It was initiated by the Centre for Scientific and Industrial Research (CSIR), Ghana, who allocated for this project seed funds of USD 50,000. Supplementary support has been promised by Enterprise Works, IWMI and MoFA.

Main Objective:
Reduce health risks and enhancing livelihoods of farmers and consumers of vegetables irrigated with polluted (or waste) water through provision of safer groundwater (GW) in urban farming areas of Accra and Kumasi.

Sub-objectives:

- To explore the availability of safer groundwater and to provide it to the farmers
- To monitor farmers' reaction and acceptability
- To analyse and improve (irrigation) water use efficiency
- To evaluate costs, availability risks and benefits of groundwater use in comparison with other water sources for irrigation

Outputs as defined in

- Study sites identified,
- GW resources evaluated
- Farmers exposed to alternative water sources, lifting and distribution devices
- Water lifting and application devices installed
- System monitoring (farmers' perception, maintenance, financial gains etc.)
- Decision support for optimised soil water use
- Salinity monitored in soils and water
- Workshop and Policy briefs

Methodology and Approach

.The study will be carried out in the cities of Kumasi and Accra. Various activities and methodologies will be employed.

1. To explore the availability of safer groundwater and to provide it to the farmers

Selection of farm sites will be based on farm size, number of farmers (male/female ratio), sources of water, type of crops and farmer willingness to co-operate. Primary data on farmers from IWMI-Ghana library will also provide additional information on the different sites in the cities. Further data on groundwater (GW) will be provided by Water Research Institute (WRI). For final site selection, farmers, municipalities and MoFA will be involved. Group and focus group discussions will be carried out with farmers in each selected farming sites to understand the main farming practices during both dry and wet seasons. Participatory assessment will be adapted to' expose farmers to water lifting devices, irrigation water and health implications. After this, a study tour with farmers to UPA areas in Lome and Ada/Keta area will be organised with Enterprise works (EW), IWMI and MoFA to expose our farmers to other UA farmers actually using wells and pumps. Participatory training for MoFA extension staff and farmers will help in the dissemination of low-cost water lifting technologies.

2. To monitor farmers' reaction and acceptability

Two Ph.D students (partly funded) and the MOFA will be in charge of scientific and social monitoring of devices, water application rates and assessment of farmers' perception and adoption constraints as well as economics, agronomic and water use**.** Specific activities are:

Part 1a). Water sampling and analysis using standard methods (APHA, 1989). This will be done in close intervals during rainy and dry seasons over one year. Water samples will be taken from irrigation water sources. Analysis will be done for the following physicochemical and microbiological characteristics:

- Total Suspended Solids (TSS), Total Dissolved Solids (TDS),
- Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), pH, Electrical Conductivity, selected heavy metals and plant nutrients.
- Population sizes and composition of Helminth eggs, total and faecal coliforms, faecal streptococci and other pathogenic bacteria.

1b. Crop quality sampling and analysis using standard methods and procedures. Samples will be collected in two-week intervals in both dry and rainy seasons over one year at farm gate on representative major farming sites. Analysis will be done for the following parameters

- Population sizes and composition of Helminth eggs, total and faecal coliforms, faecal streptococci and other pathogenic bacteria, and heavy metals.
- In collaboration with the pesticide laboratory of WRI, also pesticide residues will be analysed periodically.

1c. Low-cost on-farm wastewater treatment methods (together with the farmers): Trials using sedimentation ponds, sand filters, filters connected to pumps and other methods. Risk reduction will be attested through irrigation water quality changes. Again, any innovation will

only be tested after participatory pre-assessments and agreement with the concerned farmer collaborators.

3. To analyse and improve (irrigation) water use efficiency
Well drilling and water quality analysis will be carried out by WRI, and Enterprise Works will assist with tube wells down to 7m. In addition, EW will provide treadle pumps and basic water application devices. Different institutions such as IWMI and KNUST will help to analyse and recommend appropriate water application systems and rates in corresponding field trials. Other analysis will be on electrical conductivity (EC) analysis to check for groundwater salinity (only Accra). Technical feasibility and observatory studies (using terrameters, piezometers etc); will be applied to find out the areas that can yield shallow water and getting appropriate locations to avoid on-farm pollution.

4. To evaluate costs, availability risks and benefits of groundwater use in comparison with other water sources for irrigation.
In concrete examples per city, financial and economic feasibility studies will be carried out in view of safer irrigation water sources like (shallow) wells and pipe water, drain, stream, groundwater and related water lifting devices. NGOs, like Enterprise Works with an already related approved USAID project on treadle pumps will join in. Gender-specific focus group discussions will be used to record and analyse farmers' perception and acceptability. The overall results will be evaluated with different economic, social, agronomic indicators in multi-stakeholder workshop which will be organized prior to the end of the project. It will be done with wastewater management agencies, local authorities, health departments, MoFA and associations representing farmers, sellers, and consumers to (i) introduce the project, (ii) learn about awareness levels and perceptions on water pollution, vegetable contamination and options for health risk reduction, and (iii) analyse their expectations from the project. Opportunities and constraints for health risk reduction will be identified and ranked using semi-quantitative methods and SWOT analysis.

Table 1. Summary of the Tentative Work plantain

Activities	**Time Period (Months)**											
	2	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**
Study sites identification												
GW resources evaluation												
Farmers exposed to alternative water sources, lifting and distribution devices												
Study tour to Lome/Ada												
Water lifting and application devices installation												
System monitoring (farmers' perception, maintenance, economic and agronomic, etc.)												
Decision support for optimised soil water use												
Salinity monitoring in soils and water												
Training of farmers & extension staff in water lifting devises and efficient irrigation												
Final multi-stakeholder workshop and analysis												
Final Technical report write-up												

Beneficiaries and impact

The main target groups of the project are farmers and consumers but also those authorities in charge of food safety and public health.

The project will lead to improved awareness on vegetable related health issues in Ghana and actively contribute options for the reduction of diseases related to wastewater irrigation. Some of the impacts on stakeholders are:

- As most vegetables found in urban markets are produced with wastewater, the consumer will benefit from safer produce.
- Policy makers will benefit from alternatives to banning Urban Agriculture, which can be considered in policy revision and formulation.

- Urban Agriculture and its stakeholders (farmers, traders, market sellers) will benefit from a better reputation and can continue (now with public support) to maintain their contribution to urban food security, creation of employment opportunities and (own) poverty alleviation. This will be of special benefit to all vegetable sellers who are mostly women.
- The awareness material and guidelines for training will be made available to other projects addressing similar situations.
- The participating research institutions will benefit from their collaboration in a project of applied research of immediate benefit to the public in a developing country.

Follow Up Dissemination Strategy:

- Stakeholders involved in the research process will be having first-hand information from the activities and workshops. Through the developed guidelines on improving productivity, innovative farmers (who were participants in the research process) from the two cities will be trained further together with extension agents to relay and practically demonstrate the information to their fellow farmers. The developed guidelines will be written in farmer-friendly booklets and in local languages, which will be made available free to the farmers and a demonstration plot will be acquired in each selected farming site. The extension service and NGOs working with UPA vegetable farmers will be involved.
- The overall project will incorporate the Groundwater Alternative in its portfolio of risk reducing strategies and use different training and awareness program with individual modules (with stakeholder specific demonstration workshops, joint farm/market visits, awareness material, poster, videos etc. in local languages) will target farmer groups, consumer groups, market women, and authorities for result dissemination.stakeholder. Leaflets, awareness material, poster, videos etc. in local languages and other.
- KNUST is running a training program for MoFA extension staff and will incorporate information from this subproject on water lifting devises and smallholder irrigation efficiency.
- Through the press, local NGOs and collaborating (consumer, women) associations for the general public
- Other ways will be IWMI's website and the Urban Agriculture Magazine as well as the RUAF network.

Implementation and Management (Strategies envisaged to ensure transdisciplinarity)

Lead institution: Accra Metropolitan Assembly Food and Agriculture Department (AMA-MoFA) jointly with IWMI.

Accra Metropolitan Assembly Food and Agriculture Department (AMA-MoFA) of Accra: is an institution directly under the Ministry of Food and Agriculture with the responsibility to provide an enabling environment for sustainable agricultural development that would ensure food security, higher employment and incomes of the people within the Metropolis through policy formulation and their enforcement. **Mrs. Esther Panou** is of the key urban agriculture extension officer in the Accra

metropolis she will facilitate most of the meetings and will supervise all the issues of the proposed project related to farmer organisations and regular monitoring of the project.

IWMI, West Africa has offices in Accra and Kumasi and agreed to jointly coordinate the project with the Ministry. **George Danso,** an agricultural economist with a strong foundation in urban agriculture and an agropolis awardee (2001) will inspire and provide the necessary technical assistance in support of the project. Apart from working for IWMI on urban agriculture he also served as consultant for GTZ and FAO on the subject as well. Mr. Danso has his own farmer association in Kumasi and this will facilitate the participation of farmers in Kumasi. The local IWMI team has worked on urban agriculture since 1995 (then under IBSRAM) and has a recognized expertise in this field as RUAF focal point and through Dr. Drechsel who is in the steering committee of the System-wide Initiative on Urban and Peri-urban Agriculture (SIUPA).
Mr. Opare has good working experience in urban agriculture. He is a core member of the **La farmer association** in Accra. Mr. Opare has a long history in marketing and production of exotic vegetables in urban Accra. He will coordinate and arrange most of the meetings with the farmers and follow up activities and dissemination strategies since he is working with the farmers as well as the market women.
The involvement of team members and institutions with complementary expertise is a pillar of the project. Regular meetings involving all the team members from the participating institutions/association and other key stakeholders will be held for planning and reviewing of on-going activities. There will be quarterly review and feedback meetings from stakeholders. The project leading institute will coordinate this.

Monitoring and evaluation plan

i. **Research activities monitoring:** Various research activities will be monitored by different members of the team and institutions according to profession as explained under implementation and management. For logistic purposes, the three team members will oversee activities in the project areas. Professor Quansah together with MOFA extension division will be in charge of Kumasi. Mr. Alan Brewis of Enterprise Works and Dr. Sackey for Accra. The necessary technical assistance will be provided by Dr. Pay Drechsel.

ii. **Institutional and human resource development:** The project leader will monitor institutional capacity strengthening run a gender sensitive analysis. Supervisors from participating learning institutions will monitor actors involved. There will be regular meetings and field reporting involving relevant actors, supervisors etc. to monitor and evaluate their progress.

iii. **Research and output quality:** Some activities are dependent on outputs of others and team leader will ensure that they check the quality of what they give out or receive. Advances in scientific and methodological activities and added value to multi-disciplinary approach will be regularly assessed. There will research report, workshop proceeding and policy briefs.

iv. **Outcome Mapping:** This will be used to monitor and report on the soft outputs from the project. The final progress makers will be developed with the help of IDRC evaluation unit. Initial contact has been made with the head of the evaluation department and he is willing to provide the needed support.

Budget Breakdown

Output	Co-funded by	IDRC input
Farmers meetings and preliminary site selection	MoFA, Farmer Associations, IWMI	
Well drilling tests* (final site selection), water quality analysis, installation of water lifting devices **	EP Works, IWMI, CSIR/WRI	Ca. 5000 USD
Study tour for farmers and extension staff	CSIR, IWMI	Ca. 3000 USD
Monitoring of farmers' feedback, devices, and water application rates	IWMI, MoFA	
Recommendation on appropriate water application rates	IWMI	
Training of farmers & extension staff in water lifting devises and efficient irrigation	MoFA, IWMI	Ca: 3,000 USD/two cities
Operational costs (both research partners and non-research partners)***	CSIR, IWMI, MoFA	Ca: 3,000 USD/two cities
STAFF TIME (national)	IWMI	Ca. 2000 USD
Total	50,000 USD	Ca. 16,000 USD

* Costs depend on drilling, GW exploration.
** EP Works (Enterprise Works) would supply treadle pumps (USAID grant).

Reference:

APHA (1989). Standard Methods for the Examination of Water and Wastewater. 17th Edition, American Public Health Association, Washington DC. 1,268 pp.

Armar-Klemesu, M., 2000. Urban agriculture and food security, nutrition and health. In: Baker, N. *et al*. (eds.) Growing cities, growing food. DSE, Feldafing, p: 99-113

Blumenthal, U.J., A. Peasey, G. Ruiz-Palacio and D.D. Mara (2000). Guidelines for wastewater reuse in agriculture and aquaculture: recommended revisions based on new research evidence. WELL study No. 68 part 1, June 2000. London.

Cofie, O.O, Rene van Veenhuizen and Pay Drechsel, 2003. Contribution of Urban and Peri-urban Agriculture to Food Security in Sub-Saharan Africa. Paper presented at the Africa session of 3rd WWF, Kyoto, 17th March 2003

Cornish G.A, J.B. Aidoo and I. Ayamba (2001). Informal irrigation in the peri-urban zone of Kumasi, an analysis of farmer's activity and productivity. *Report OD/TN 103*, Feb. 1999. UK: HR Wallingford.

Cornish, G. A, Mensah, E, and Ghesquire, P, 1999. Water quality and peri-urban irrigation. An assessment of surface water quality for irrigation and its implications for human health in the peri-urban zone of Kumasi, Ghana. Report OD/TN 95. HR Wallingford, UKCofie, O.O. and P. Drechsel. 2003. Water for Food in the Cities: The Growing Paradigm of Irrigated (Peri)-Urban Agriculture and its Struggle in Sub-Saharan Africa. African Water Journal Vol. 1 (1). Submitted.

Danso, G., P. Drechsel, T. Wiafe-Antwi and L. Gyiele. 2002. Income of farming systems around Kumasi, Ghana. Urban Agriculture Magazine 7: 5-6.

Danso, G.K., P. Drechsel, S.S. Akinbolu and L. A. Gyiele. 2003. Review of studies and literature on the profitability and sustainability of urban and peri-urban agriculture. FAO Final Report (PR 25314). Mimeo.

Keraita B., P. Drechsel, F. Huibers, L. Raschid-Sally (2002). Wastewater use in informal irrigation

in urban and peri-urban areas of Kumasi, Ghana. Urban Agriculture Magazine 8:11-13.

Maxwell, D.G. 1994. The household logic of urban farming in Kampala. Cities Feeding People. An examination of urban agriculture in East Africa. IDRC, Ottawa, Canada (pp. 47–66).

Mensah, E., P.Amoah, P.Drechsel, R.C. Abaidoo.2001.Environmental Concerns of Urban and Peri-urban Agriculture: Case Studies from Accra and Kumasi. In: Drechsel, P and Kunze, D (eds). Closing the nutrient cycle for urban food security and environmental protection.IWMI/FAO/CABI:Wallingford Oxon, UK, Pp.55-68

Moustier,P. 2001. Assessing the Socio-economic Impact of Urban and peri-urban Agricultural Development. Paper submitted to Workshop on Appropriate Methodology in Urban Agriculture Research, Planning, Implementation and Evaluation, Nairobi, Kenya. Organized by CIP-SUIPA and ETC-RUAF

Nugent, R.A. 2000. The Impact of Urban Agriculture on the Household and Local Economies. In: Bakker, N., M. Dubbeling, S.Guendel, U. Sabel Koschella, H. de Zeeuw (eds.). 2000. Growing Cities, Growing Food, and urban agriculture on the policy agenda. DSE Germany, 67-97.

Program, Publication Series for Habitat II, Volume One. UNDP, New York, USA.

UNDP (1996): Urban Agriculture: Food, Jobs and Sustainable Cities. United Nations Development

WFS (1996). World Food Summit, Rome, Italy. *http://www.fao.org/docrep/003/w2612e/2612e07c.htm*.

CONCEPT NOTE

1. Project Title: **Urban Agriculture: A strategy for poverty alleviation**

2. Project Leader

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4. 3rd Team member

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5. Total estimated cost of project: **79.370FCFA (158.74 US$)**
6. Duration of project: **3 years**
7. Location of project: **Bamenda Town**, North West Province, Cameroon
8. Key words: Urban Agriculture, survey, constraints, workshop, Dissemination, Improvement packages, sustainability, Extension and Training

1) What the project will achieve:

At a time when urbanization is increasing coupled with urban poverty and food insecurity, and subsequent deterionation of the urban environment, it has become urgent to consolidate the existing knowledge on urban agriculture. It is even more urgent to inform policy makers and other stakeholders in this sector (producers and to –be producers entrepreneur, traders on the potentials of urban agriculture as a strategy for poverty alleviation and urban development. For this reason, the project has the following goals and objectives:-

A) To make an intensive evaluation and document the existing knowledge on urban agricultural production practices in the city of Bamenda, to know what the farmers are producing: how are they producing and for whom they producing (production system).The evaluation of the state of knowledge on UA will enable the laying down of strategies to ameliorate productivity and increase incomes of urban poor farmers, as a means of alleviating poverty.

B) The survey will produce data, and start a process of consultations and awareness creation among the identified stakeholders (producers traders, entrepreneurs, municipal councilors, the provincial delegations of urban affairs, Agriculture, Environment etc). The consultative process will continue and extend to experts and also to on- going UA projects out of Bamenda eg (Ministry of Urban Affairs, Yaounde) and elsewhere. This process will culminate in a consultative workshop which will increase stakeholders participation in their own decision making process.

C) The third project goal is to established at least 10pilot farmers on intensive vegetable production sites and small livestock rearing. The aim here is to prepare farmers who will serve as demonstration of the type of production system that is intended for the market as an income

generating activity for poor urban farmers. High valued vegetables are very high in demand but limited in supply, in Bamenda town.

2) Proposed Project Activities

1) The activity plan is divided into 3 phases. The first phase will be to conduct a base line survey to evaluate the state of knowledge on urban Agriculture in Bamenda. The survey will involve the collection and analysis of Socio- economic data on the active population (employed and unemployed, as well as gender issues), involved in urban agricultural practices with emphasis on gardening and small animal species. Of particular importance will be the farmers resource availability (land, labour, capital, and how these limited resources are allocated. Information on land will include the available under utilize arable land in the urban open spaces, both public and private. The evaluation will collect data on production levels, and the contribution of farm produce and/ or income from farm produce in the over all household budget and management. The survey will also record production problems constraints and information gaps that hinder urban agriculture as well as the potential for improvement.

II) The second phase will be the participatory consultative workshop. Formal consultations will be carried out with all the identified stakeholders in the municipality and beyond (Senior officers of the municipality, NGOs, CIGs, researchers, the ministry of urban affairs where there is an on-going project on urban agriculture, Ministry of animal breeding and Fisheries, Ministry of the Environment and Forestry ,Ministry of Town Planning and Housing, Feed producers, Businessmen, Farmers Expert consultants). Two or more preparatory meeting will be held with representatives of the technical departments concerned, produces, traders entrepreneurs and the municipal authorities. During these meetings and at the workshop the major discussions will center on how to alleviate poverty by promoting UA. Proposed workshop themes will be presented and may be modified if need be. The workshop will be the highest point of consultation where participant will brainstorm and come out with important resolutions that will guide policy frameworks in the future.

III) The third phase will involve the training of farmers to be established. At least 10 farmers will be trained and established within 7months after the workshop, and followed up for two year after establishment. The training intends to introduce critical information that are lacking on best farming practices, and available support services. This will also strengthen their capacity to produce for the market so as to increase household incomes. As at now, there are no intensive gardening or market oriented gardening in Bamenda. This will be a pilot project that will produce leader farmers who will serve as demonstrators or leader farmers.

3) Expected Results Of The Project

- The results of the survey will improve the team's knowledge on the urban food system, including production constrains and provide indices for evaluation at the end of the project. The information obtained will enable the team to prepare improvement packages and training modules that will be disseminated to urban farmers.
- The survey result will provide sufficient data and information that will be presented to stakeholders during the consultative workshop to support the need to promote urban agriculture as a strategy for poverty alleviation.
- The survey report will serve as reference document for information on urban Agriculture in the city of Bamenda.
- It is hoped that the workshop will open up avenues for beginning the process of addressing the issues of policy development that will integrate urban agriculture so as to provide

security and incentives for urban farmers in the city of Bamenda. In this way municipal authorities will start to implement support activities for the promotion of U A such as best farm competition agro-pastoral shows etc for farmers in Bamenda city.

- It is also expected that the project will further open avenues for examining innovative and critical issues on urban challenges such as confined space farming technologies, environmental conservation, public health protection and urban policy on hand tenue.
- The project as whole will serve as an initiative for sensitization and the awakening of Bamenda urban dwellers to discover the potentials of U A. It is expected that the trained farmers will adopt better production and market practices and serve as farmer extensionist and demonstrators in the dissemination of project results.
- It is expected that the project will facilitate dialogue between the municipal administration, social workers and producers, and initiate support in the design and implementation of urban agriculture policies and project, at the municipal level.

4) Methodology

The collection of data and background information on the food production system in Bamenda city shall be done by using a structure questionnaire that will be designed to elicit information on general socio-economic characteristics (age, sex, education, household size, ethnic and religious background and), and production systems (land ownership, labour use, crop and animal husbandry practices, farm size and enterprise pattern. Several quarters will be covered using a stratified sample technique in order to construct intra and inter-quarter comparism of the production systems.

The target population shall be urban dwellers and interviews shall be held with representative farmers with the sample unit being the family, consisting of the farm household, their activities and their environment. This shall be done with the help of trained local monitors. The questionnaire will be designed to cover questions like:

- How does the removal of existing constraints affect the farm organization.
- How does the change in the farm organization affect productivity.
- How does the change in farm organization affect the income.
- What other form of income generating activity is the farmer engaged in.

Participants for the workshop will be selected from among the stakeholders who have been identified during the survey and consultations. The consultative workshop will be highly participatory that will take the form of a laboratory, to complement the processes of diagnosis, problem identification and resolutions on urban agriculture. The format will include a key note address that will introduce among other issues, an overview of the existing municipal and national policy on urban Agriculture and a scientific presentation of research findings on urban agriculture. More than half the time available for the workshop will be spent in working sessions/discussions. Participants will be divided into working groups during the problem/solution identification sessions, each group relating to a different subject area. Some of the subjects areas will include:

- The link between urban agriculture and other development challenges (poverty alleviation, food security, productive open space management in Bamenda city, environmental protection, women's development and their role in urban agriculture, community resource development, productive use of urban waste etc).
- Strategy for integrating UA in the development policy and land use planning of Bamenda city.
- How to stimulate and encourage public and private investment in UA.
- What support services can be put in place for the promotion of UA.

Field trips will be carried out to aquent participants with field realities. As part of technical assistance, an expert consultant shall be requested from one of the following international organizations to serve as moderator/facilitate at the workshop: Cities Feeding; People of IRDC, Canada; FAO Yaounde; and the Urban Harvest Programme of CIP/CGIAR in Nairobi. For the training method the farmers shall be selected based on their interest and commitment. The training shall be for pilot farmers, on intensive- year – round farming system involving gardening and small livestock. The training shall be holistic, including improved crop and animal husbandry (composting, agroforetry, rotation, green maturing, animal housing feeding, using urban organic waste, disease control, folder banks etc). Small scale enterprise, financial management and book –keeping. The aim is to:

- Enable farmers make use of available urban productive resources.
- Improve on productivity so as to make substantial saving on food expenditures and increase income thereby reducing poverty

Who Will Benefit

The direct beneficiaries will be urban farmers who are poor or middle class. They raise livestock and grow crops to feed their families in the city Bamenda. As at now, Bamenda town does not have many who grow vegetables intensively for economic purpose. The target population shall be women and youths who are active in urban agricultural food production systems. Project farmers will be trained on how to generate income from intensive gardening and small livestock rearing, on limited land, in open spaces and at the back yards of residences. Benefits are largely economic.

However, non- market benefit are also important functions of the project such as food security, better nutrition of the poor, recycling of urban organic wastes, urban greening and better urban micro climate, recreation, urban landscape management, etc. These are benefits that wills accrue indirectly to the community.

The urban poor will also benefit from the proximity of urban farms to the market, which allows producers to lower cost and therefore make the produce more accessible. Entrepreneurs will also benefit. Small-scale enterprises will be created (equipment and tools manufacture, compost making, processing and marketing of agricultural products, restaurants etc), there by providing self employment. Self-employment in any urban agricultural activity, by and large, will tremendously improve the livelihoods of urban poor dwellers. When livelihoods are improved, then poverty is alleviated.

Dissemination Of Results

The survey report and proceedings of the workshop will serve as important information and management tools for municipal authorities and other front line stakeholders in the urban agricultural sector. These documents will be produced in a booklet and distributed to all participants at the workshop. Abstracts of these shall by published in local news papers. Full articles and case studies shall be sent for publication in the urban agriculture magazine and other journals interested in urban agriculture.

The Dissemination of results at grass root level will be assured through training and extension. IRAD and BUSOFARM will jointly conduct the formal training. On-farm training, demonstration, Extension, Supervision and follow-up, will be the responsibility of BUSOFARM. IRAD will further more be responsible for the multiplication of genetic material for dissemination. The Bamenda urban council and the ministry of urban Affaires – provincial delegation shall provide open spaces of land in town, suitable for gardening. They will also provide equipment where need be. The pilot farmers shall provide labour. As pilot farmers however, they shall receive genetic material and garden tools at subsidized rates, as incentives.

The community Development department of the provincial delegation of agriculture shall be responsible for animating and mobilizing the farmers and to-be farmers in the city of Bamenda. They will organize the farmers into urban groups so as to facilitate contact training and follow-up.

Table 1: Summary of activities

No	Activity	YR1	YR2	YR3
1	Meeting consultation contact visits.	*		
2	Preparation and training of monitors	*		
3	Analysis and compilation of survey report	*		
4	Organization of consultative workshop	*		
5	Compilation and preparation of workshop proceedings	*		
6	Production of farmers booklets	*		
7	Selection of pilot farms	*		
8	Establishment of pilot farms	*		
9	Dissemination of technology packages	*	*	*
10	Multiplication of genetic Material	*	*	*
11	Follow-up activities		*	*
12	Production and sales of farm produce		*	*

Table 2: Project Budget (‘000cfa)

No	Item	Contributors to the Budget					Total
		BUC	IRAD	BUSOFARM	FARMERS	*FUNDING PARTNERS	
1	Land	10000	5000		5000	-	20000
2	Heavy Equipment and Lubricants	5000	-	-		-	5000
3	Salaries	1500	7200	6300	-	-	15000
4	Remunerations					3900	3900
5	Transport	-	-	-	-	1600	1600
6	Training and workshop	-	2000	-	-	2500	4500
7	General Preparation and co-ordination	-	-	110	-	1045	1155
8	Farmers input	-	-	-	5000	-	5000
9	Follow up activities	-	-	-	-	16000	16000
	Total	-	-	-	-	25045	71.255

Table 3: Expenditure

N0	Item of expenditure	YR1	YR2	YR3	Total
1	General preparation and co-ordination				
1.1	Meetings, contact visits consultation	355	-	-	355
1.2	Typesetting, photocopying questionnaires and handouts	200	-	-	200
1.3	Communication and publicity	300	-	-	300
1.4	General co-ordination	300	-	-	300
	Subtotal	1155			1155
2	Trainings and workshop				
2.1	Training of monitors and farmers	500	-	-	500
2.2	Hiring of hall for workshop	200	-	-	200
2.3	Pedagogic materials	700	-	-	700
2.4	Production of workshop proceedings and farmer booklets	500	-	-	500
2.5	Hiring of public address system and audio visual Hotels Bills	400	-	-	400
2.6		400	-	-	400
	Sub Total	2500			2.500
3	Transportation				
3.1	Monitors and local resource persons	600	-	-	600
3.2	External resources persons	1000	-	-	1000
	Sub Total	1600	-	-	1600
4	Remuneration				
4.1	Honorarium	750	-	-	750
4.2	Stipends to monitors	2000	-	-	2000
4.3	Perdiem to seminar participants	750	-	-	750
4.4	Payment to secretary/Typist	200	-	-	200
4.5	Payment to statistician	200	-	-	200
	Sub total	3900	-	-	3900
5	Local contributions				
5.1	Researches salary (IRAD)	2400	2400	2400	7200
5.2	Allowance to volunteers (BUSOFARM)	2100	2100	2100	6300
5.3	Salary to Staff (BUC)	500	500	500	1500
5.4	Land	20.000	-	-	20.000
5.5	Heavy Equipment	5000	-	-	5000
5.6	Farmer input (labour)	3000	2000	-	5000
5.7	Training infrastructure	2000	-	-	2000
	Sub Total	32.900	4900	7400	47.000
6	Follow-up activities				
6.1	Multiplication of Genetic material	-	4000	3000	7000
6.2	Extension and supervision	1000	2500	2500	6000
6.3	Animation	1000	-	-	1000
6.4	Garden Tools	-	2000	-	2000
	Sub total	2000	8500	5500	16000
	TOTAL	43.945	13.400	12.900	72.155
7	Overheads 10% of Total	7.2155			
	Grand-Total	**79.370**			

1US$ = 500FCFA

TITLE	SOLID WASTE MANAGEMENT FOR URBAN AGRICULTURE IN KAMPALA CITY.			
	Name	**Institution**	**Job Title**	**Email address**
Project Leader	Semwanga Margaret Azuba	Kampala City Council	District Urban Agricultural Officer	msazuba@yahoo.com
Second Member	Denis Yiga	National Agricultural Research Organisation	Researcher	dyiga@yahoo.com
Third Member	Maria Kaweesa	Environmental Alert	Programme co-ordinator Urban Agric.	envalert@envalert.org
Estimated Cost	USD $ 75,000			
Duration	2 Years			
Location	Makindye Division - Kampala District, Uganda			
Key Words	Gender, Solid waste, leachate, sorting, biodegradable waste, non biodegradable waste, toxic substances, processing, waste recycling and reuse, Marketing			

Background:

This study will be undertaken within an emerging institutional framework addressing urban and peri-urban agriculture research and development in Kampala City. A Coordinating Committee for Urban and Peri-urban Agriculture and Livestock (UPA&L) has recently been established, building on a previous committee co-ordinating urban/peri-urban agriculture and Health research activities. One of the institutions involved in the project (Environmental Alert), is already involved in an extensive programme of urban agricultural extension in collaboration with KCC, which has created awareness to a number of farmers in Makindye Division on waste re-use.

Kampala City has a population of 1.2 million people growing at rate of 4.13% per annum, of which 48.7% are males, while 51.3% are females[1]. The movement of people to the City continues unabated, reinforcing the urgency of the Central and Local Governments to deal with the emerging urban / peri-urban issues. According to the Kampala Structural Plan (1994), 40% of the settlement systems in Kampala City are planned. The un planned areas of the City have a bearing on quantities of waste generated. On the other hand, the heterogeneity nature of the city population with different feeding and livelihood habits, generates enormous quantities of waste.

Recent studies indicate that generation of solid waste in Kampala City, is estimated at approximately 2kg/capita/day, with the commercial areas being the biggest generators. The average daily waste generated is 960 tonnes, but about 45% of the waste generated is effectively collected by KCC. There are currently some private solid waste collectors who provide a door-to-door waste collection service at a fee, and account for 5% of the total refuse transported to the landfill.

Solid waste is collected in skips that are placed at selected locations within the city. The few available skips have small capacities for the target population especially in the densely populated communities, and are in most cases spilling over. Kampala City currently operates a total of 15 refuse trucks and 504 skips. The trucks and most of the skips were purchased in 1993 and are now costly to maintain[2]. Due to inadequate management of skips, repair and replacement coupled with the indiscipline of the city residents, refuse is often littered

[1] 2002, Uganda Population and Housing Census.
[2] Kampala District Development Plan (2003/04 – 2005/06)

indiscriminately and often accumulates at different locations in the city.[3] Over 80% of the waste is organic and therefore, if uncollected as is the norm in many cases, they attract vermin, flies and other transmitters of disease, while leachates seep into groundwater or nearby rivers. This whole environmental catastrophe ensues with enormous un-quantified knock-on effects on the health and environmental sectors, which relate to poverty and food insecurity due to unsustainable resource use.

Urban sanitation and waste management are priority areas for cities and municipal authorities[4]. However, their waste management capacities are still inadequate. Currently there is no waste recycling done by KCC, and as such, no site has been specifically allocated for recyclable waste.

KCC operates one landfill site, where all solid waste collected from the city is disposed. While some of the uncollected waste is disposed of either on the road sides, open drains, in farmers' gardens, some piles in the backyards and is either burnt or buried in pits.

The importance of UPA&L is now becoming increasingly recognised in the international arena and local scenes. UPA&L has tremendous potential to improve the livelihoods of the urban poor and to make an important contribution to food security in developing countries. Kampala City is reckoned to obtain 40% of its food needs from UPA&L[5]. In spite of this contribution however, the production technologies in place are not well developed, to suit the interests of the urban farmer. Waste management and reuse is one of the important elements / technologies in UPA&L. Some solid waste processing technologies into compost and livestock feed, have been developed and are being tried out. This project therefore, intends to improve on the existing processing technologies, by participatorily harnessing the biodegradable domestic waste generated, for livestock feed and food production purposes.

Kampala City has recently undergone a process of re-examining its draft Bills of Ordinances, 2001, related to UPA&L through participatory Divisional and District forums, during August 2003. Out of this process, various stakeholders contributed useful views and ideas that will be incorporated into the revised Ordinances. At the same time, awareness was created about UPA&L activities in the city.

Some elements of the above process, especially the consultative meetings, will be employed by this project, to publicise the 'Kampala City Garbage Ordinance, 2000', as well as, create public awareness on the risks and benefits of waste. This will influence the policy on planning and implementation approaches on domestic waste management. Policy and regulation, will therefore, be needed to enforce sorting, collection and disposal mechanisms in order to reduce the tendencies of garbage piling up.

This project will take the form of a multi-stakeholder action research with selected households, farmers and service providers in selected areas of the city. The purpose of the project is to reduce garbage in the target areas and the socio-economic problems related to it, by increasing the recycling of biodegradable solid waste and involving a bigger percentage of the garbage generators (households), putting into consideration the possible contribution of women and youths. This action research will be gender responsive and will endeavour to look at the physical, chemical and biological risks and effects of uncontrolled solid waste collection and disposal. The research process will create awareness and the findings will assist in developing appropriate strategies for sustainable domestic waste management and reuse, particularly in UPA&L.

[3] Kampala District Development Plan (2003/04 – 2005/06)
[4] Urban Agricultural Magazine. No.9, April 2003
[5] Urban food security ???(Muwanga,2001)

Expected Achievements

- Household incomes, Household food security, sanitation related diseases and sustainable resource management, will be addressed.

- Reduced health hazards related to inadequate refuse collection and disposal (and associated risks such as transmission of diarrhoroea and dysentery, mosquito breeding sites and other related diseases through scavenging animals).
- Improved inter-sectoral linkages between health, agriculture, community development and environment.
- Adoption of clear waste reuse policies for urban agriculture, which are, based on health criteria and impact assessment of waste reuse schemes in agriculture.
- Quality standards for the City solid waste management and reuse established.
- Waste separation at source and appropriate disposal mechanisms, coupled with a system of regular collection will be established.
- Involvement of special interest groups like the youths and women in the processing of solid waste.

Proposed Activities

i. Baseline survey

This will entail looking at a number of issues such as;-

- Household disposal methods
- The collection mechanisms
- Incidences of sanitation related diseases
- Farming households in the project area
- Knowledge on reuse of solid waste
- Existing community based initiatives involved in solid waste management

ii. Research

This will attempt to study the following;-

- Quantities of domestic waste
- Composition and content of the generated waste
- The effect of poor waste management on the environment.
- Existing recycling techniques
- Presence of pathogens before and after processing
- Possible reuses
- Marketing opportunities for the recycled waste products from both the biodegradable and non-biodegradable solid waste
- Laboratory analysis of the soil nutrients before and after compost application
- Alternatives to reduce on the solid waste brought along with food stuffs into the city
- Summarise and analyse research data.

In order to ably carry out the baseline survey and research activities, the project will;-

- Develop research instruments
- Identify key informants,
- Train appraisal team
- Identify study sites

iii. Preparatory activities /Community entry.

This will involve;-

- Holding of consultative meetings with the District and Division Authorities on issues of community solid waste management with a view to sensitise them about the intentions of the action research project, review the existing policies and legislation in place as regards to solid waste management, and solicit their views, resource support and acceptability levels of the project.
- Holding of meetings with parish leadership and development partners (Local councils, PDCs, LECs, CSOs ELF, Technical staff, Private garbage collectors, etc) on issues of community solid waste management to sensitise them about the intentions of the action research project and solicit their views, support and acceptability levels.
- Holding of community meetings at zonal level to sensitise the people about the intentions of the action research project and solicit their views, support and acceptability levels.
- Holding of meetings with liaison partners to establish ongoing activities and research programmes in the areas of health, sanitation and agriculture, and develop a strategy (work plans) of networking and collaboration.

iv. Actual Project Implementation

Project implementation will involve;-

- Pro-poor advocacy on waste management
- Establishment of a clientele system (waste generators, sorters, recyclers, collectors, users, advisors, etc)
- Gender mainstreaming in domestic waste management and reuse
- Sensitisation of the target communities about the 'KCC Garbage Ordinance, 2000' and the 'KCC Urban Agriculture Ordinance, 2001'.
- Training of waste handlers at all levels (on going throughout the project)
- Identification of on farm demonstration and trial sites.
- Set up on farm demonstrations and trials on reuse of the biodegradable solid waste
- Carry out a cost benefit analysis on the reuse of biodegradable waste UPA&L
- Establish a participatory data collection mechanisms at given intervals
- Multi-disciplinary monitoring and evaluation of project activities
- Documentation of baselines and controls
- Documentation of the ongoing project activities / project process (reports, photographs and video coverage)
- Development of IEC materials (Charts, booklets, brochures, Posters, Stickers etc)
- Disseminate best practices (workshops, open days, publications, media)
- Exposure study tours to other towns and cities in and out of the country, for Comparison.
- Pilot on alternative methods to reduce on solid waste that is brought along with food from the rural areas.
- Establishment of an Information Management Systems in the project area.
- Impact Assessment of the project performance at an interval of six months intervals.

Expected Project Results

The expected results of the action research are envisaged as follows;-

- Available solid waste reuses option at household level and in urban agriculture.
- Reduced volumes of uncollected solid waste in the community
- Reduced solid waste collection costs incurred by KCC and the private collectors.
- Improved environmental health standards in the urban communities.
- Enhanced skills in undertaking action research by all stakeholders.
- Adoption and multiplication of the innovations generated by the project.
- Strengthened networking and collaboration among key stakeholders in Health, Environment and Urban Agriculture.
- Strengthened Multi-sectoral approach in improving community solid waste management.
- Employment opportunities created for the vulnerable groups (most especially for the urban youths, women and the disabled)
- Improved soil fertility, productivity and household food security.
- Established standards and guidelines on safe solid waste recycling and reuse methods.
- Identified potential markets for the recycled solid waste.
- Positive attitudinal change on domestic solid waste management (having more households sustainably managing their domestic solid waste).
- Community initiatives in solid waste management appreciated by the division authorities.
- Attract investors in waste management and recycling.
- Up-to-date data on solid waste management and urban agriculture.

Methodology

The action research project will be conducted in Kampala City. However, due to lack of sufficient capacity in terms of financial resources and human capabilities, the project shall not cover the whole city. One of the five divisions, Makindye, has been targeted for the project on a pilot basis. This has been selected on the basis of having other ongoing projects in the same division, and the presence of private garbage collectors, who have collection and disposal structures.

There are three categories of projects going on concurrently in Makindye Division. These are;-

- The Food security and nutrition project implemented by Environment Alert.
- The project encourages households to reuse solid waste in the produce fruits, vegetables and small livestock, for consumption.
- Ecological sanitation by KCC. This is piloted to ensure proper disposal of
- human excreta in the poorly sanitised areas of Kampala City and the reuse of the recycled excreta for agricultural production.
- Research projects;-
- An investigation of livelihoods and production systems.
- An assessment of market opportunities of urban agricultural products.
- Disseminating technical interventions to support UPA through school(USAIP).
- Health and livestock / zoonosis project.

These research projects are carried out to generate information about the status of UPA&L, market opportunities for urban agricultural produce and the livelihoods of the farming households.

It is on the basis of the above project activities on waste management and possible reuses in UPA&L, that Makindye Division, has been targeted for this action research. It is also hoped that a holistic approach to solid waste management and reuse in UPA&L, will be enhanced by linking with the ongoing projects.

A participatory action oriented research will be carried out using the training and demonstration methods to generate information and data required for the sustainable community solid waste management programmes in the city. An exploration of methods, through participatory "method" and "result" demonstrations and trials will be done, reinforced with experiential learning techniques.

The project co-ordination team will work in close collaboration with elected representatives, to implement the proposed project activities. The existing institutional arrangements like the "Parish Development Committees" and the "Health and Environment Committees", and the technical staff, will be instrumental in mobilising and execution of plans in compliancy to the Kampala City Council Structural Development Plans and the Local Government Plans.

In order to effectively carry out action research in domestic solid waste management in Kampala City, the project will involve;-

- Establishment of a co-ordination desk in KCC
- Consultations with all stakeholders at all levels from the District down to the Zones in the project area. This will entail bringing together all stakeholders and sensitising them about their roles and nature of linkage in the project.
- Mapping out the project areas
- Administer semi-structured questionnaires to a sample population to generate baseline information.
- Acquisition and provision of relevant equipment and materials
- Mobilisation and sensitisation, which will be gender sensitive (caution will be taken to ensure that a substantial number of beneficiaries will be women they are responsible for waste handling and disposal)
- Training on thematic issues related to solid waste management (sorting, recycling, reuse [especially biodegradable materials], 'Garbage Ordinance, 2000', environmental health)
- Identification of demonstration farmers
- Establishment of on-farm demonstrations and trials.
- Testing soil samples before and after nutrient applications
- Follow-up on field activities and other routine supervision to offer technical backstopping and monitor the performance of the demos and trials
- Monitoring and Evaluation of project activities
- Participatory Rapid Appraisals at six monthly interval

Project Beneficiaries

These are categorised as follows;-

- Farming and non-farming households
- Academicians
- Vulnerable groups e.g. women and the youths
- Private sector
- Institutions (research, schools, etc)
- KCC leadership
- Civil Society Organisations

Dissemination of Information

Designed within the research learning strategy and backed up by the following,

- Radio and TV programmes,
- Newsprints,
- Displays on Public notice boards
- Community meetings,
- Stakeholders workshops / Public Dialogues
- Documentaries and leaflets.
- Music, Dance and Drama
- Project Reports.
- Exhibitions

Monitoring and Evaluation

Monitoring will be carried out quarterly, and evaluation every 6 and 12 months, to assess the performance of the project's activities and recommend strategies for improvements.
This will be handled at different levels and will involve;-

- Development of monitoring and evaluation tools,
- Interviewing participating communities,
- Technical and Political field visits,
- Review meetings and reports.

Internal Monitoring

This will be twofold, on a monthly and quarterly basis;-

i. Monthly basis
Monitoring will be carried out by the Divisional Agricultural Extension worker in the company of a liaison partners, development partners, Parish Development Committees, Local Environment Committees and the Extension Link Farmers, to assess the performance and progress of project activities

ii. Quarterly Monitoring
Quarterly monitoring will be carried out by the Divisional Agricultural Extension worker, with representatives from the Civil Society Organisation, Team of project leaders, District and Divisional authorities (technical and political), to assess the performance and progress of the project activities.

External Monitoring

This will be specifically done by the funding institutions in the company of the implementing institutions on a yearly basis.

Sustainability arrangements

- On completion of the project, trained households, private garbage collectors,
- CSOs and other stakeholders, will have adopted the necessary solid waste management technologies. Likewise the District and other Divisional authorities are expected to have gained interest in the innovations and hence support the project's replicability.
- With the training received in group formation and dynamics, it is envisaged
- that stakeholders will be empowered with knowledge, skills and the capacity to organise themselves in working groups, through which, further recycling of solid waste and marketing of manure within themselves and other community members, will be enhanced.
- It is anticipated that revenue generated from the sale of manure and the farm

produce thereafter, will empower stakeholders, to contribute to the resource envelop that will run the subsequent activities.

ITEM	QUANTITY	AMOUNT
Community Entry - Preparation activities - Consultative meetings at the District, Division, Parish and Village levels. - Radio programmes - Television programmes - Music Dance and Drama (MDD) - Liaison Partners (work plans) - Documentation of baselines and controls - Monitoring and Evaluation		12,835,000/=
Baseline Survey - Preparation Activities - Data collection - Data analysis - Report writing - Dissemination of findings		8,500,000/=
Research activities - Development of research instruments. - Identification of Respondents (FGD's & Interviews) - Lab test on samples. - Data analysis - Report writing - Dissemination of findings - Monitoring and Evaluation		11,115,000/=
Action programmes - Pro-poor Advocacy on waste management - Establish of clientele system - Gender mainstreaming in waste management and re-use - Publicizing the KCC "garbage ordinance 2001" and "Agriculture ordinance 2001" - Training - Identification of on farm Demos and Trial sites - Set up demos and Trail plots - Cost benefit analysis on the Re-use of biodegradable waste in UPA - Multi Disciplinary monitoring and Evaluation - Dissemination of best practices - Exposure study tours - Pilot on alternative methods to reduce on solid waste that is brought along with food from the rural areas. - Establishment of an information management system (IMS) in the project area - Establishment of Data collection mechanism (harder and soft wave requirements) - Routine supervision - Monitoring and Evaluation - Impact assessment of the project performance		43,300,000/=

Documentation of the on going project activities - Reports - Photos - Video coverage - Production and development of information, Education and Communication materials. - Site Exhibitions		14,700,000/=
Monitoring and Evaluation - Development of monitory and evaluation tools - Technical and political field visits - Review meetings		6,300,000/=
Administrative Costs - Stationery - Fuel - Allowances - Computer with accessories - Photo copier - Refreshments - Office furniture - Communication charges - Bank charges		38,250,000/=
Contingency (10%)		15,000,000/=
TOTAL		**150,000,000/=**

Exchange rate 1USD : Ug.Shs 2,000/= **USD 75,000**

REFERENCES

KCC Hand book (2001)

Kampala City (Garbage Ordinance) 2001

Local Government Act (1995)

Kampala District Poverty Eradication Plan (KDPEAP, 2001)

Constitution of Uganda (1997)

Department of Public Health and Environment (KCC)

Eberlee J (1997) The Neglected Industry of Kenyan Cities, Cities Feeding Reople Report, International Development Research Centre (IDRC) Report Vol 21,No 3

Smith O.B. and Olaloku E.A. (1998) Peri-Urban livestock production system: Cities feeding people. CFP Report Series, Report 24.

Ibaren Konsultants, (2002) Urban and Peri-Urban livestock keeping in Kampala City: A scoping study.

Smith J., Ralta A. and Nasr J. (1996) Urban Agriculture, Food Jobs and sustainable cities Pg 120

Schonhuth M. (1993) Participatory Learning Approaches, An Introductory Guide: Rapid Rural Appraisal. Participatory Appraisal. (GTZ).

1. **Project Title: INTEGRATING AGROFORESTRY TECHNOLOGIES INTO URBAN FOOD PRODUCTION SYSTEMS: A SPECIAL FOCUS ON KISUMU CITY.**

2. Project leader
Name: Sammy Carsan
Institution: World Agroforestry Centre

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E-mail: scarsan@cgiar.org

3. 2nd team member
Name: Miriam Wambugu
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Job title: Physical Planner
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4. 3rd team member
Name: Denis Osino
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Job title: Forest Researcher
E-mail: olosin@yahoo.com

4th team member
Name: George R. Wasonga
Institution: Kisumu Municipality
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E-mail: grwasonga@hotmail.com

5. Total estimated cost of project: US$ 354,484

6. Duration of project: 3 years.

7. Location of project: Kisumu city and its neighborhoods

8. Key words: Urban Agroforestry, Kisumu, Life forms, and Enterprises.

Introduction

The human habitat is rapidly undergoing a transformation from rural to urban. According to World Bank findings, by the year 2030, the urban population globally will be twice as large as the rural population. Half the world's population now lives in towns or cities. The poor make up the majority of the urban population. It is estimated that in the year 2020, 75% will live in Africa, Asia and Latin America and many will be facing severe problems of food and nutrition insecurity, a deteriorated urban environment and an impoverished quality of life. The growth of urban centres in many African countries, both in number and in population has increased rapidly. The absolute number of people living in these urban areas is growing much faster more than developed regions. The dramatic increase in urban population on developing countries with the corresponding need for food, fuel and shelter and for improving the quality of life in the cities calls for the design of strategies in which forestry can play an important role.

Urban and peri-urban agroforestry offers various potential benefits, including provision of the urban poor with some trees and shrubs products such as fuel wood, fodder, medicine, timber, construction poles, food (fruits, nuts, vegetables etc).

Trees are perhaps as important to urban people as they are to rural people, and the preservation, promotion, and improvement of urban agroforestry could be one of the most direct and economically, socially, ecologically and nutritionally appropriate means of bringing about sustainable development.

Urban agroforestry is here defined as the planting, protection or preservation of trees for their economic, social and ecological value as part of agricultural and horticultural systems in urban

areas, not only adjacent to houses and other buildings but also on undeveloped land within urban areas.

Trees can contribute significantly to the food requirements of the urban poor, both on a daily basis and in times of crisis. For example, foods like Baobab leaf, tamarind and processed Parkia seeds are very popular in large towns in the Sahel. Local tree species with medicinal uses are intensively exploited in and near towns (Sené 93). Trees are also an important source of animal fodder, particularly during dry seasons (Carter 93).

Low-care edible plants are increasingly being recognized as excellent candidates for multipurpose use as ornamental roadside plantings. It is important to note that trees not only provide food need s but also help in correcting the challenges ranging from impairment of human health, nutrient cycling to economic and other welfare losses, to damage to the ecosystem. Forests can help alleviate food requirements by incorporating trees into farming systems (agroforestry) and smallholder plantations (Cline-Cole 1990, Kuchelmeister and Braatz 1993).

Many urban residents in the developing world rely on biomass fuels for cooking and heating. Collection of fuelwood has caused extensive degradation around many urban settlements. To resolve this problem, "softer" methods incorporating agriculture, agroforestry and smallholder plantations could be adopted to help alleviate this problem (Anderson and Fishwick 84; Cline-Cole 90; Kuchelmeister and Braatz 93).

The contention of this proposal is that the quality of life, especially of the urban poor, can be significantly improved by better integrating diverse urban trees and shrubs in urban design and urban development initiatives. To develop and sustain such initiatives in developing countries, urban agroforestry must initially focus on meeting immediate needs for basic necessities. This can best be achieved by multipurpose resource use.

It is important to note that the proposed study city of Kisumu has the highest incidence of food insecurity with 53.4% of the population below the food poverty line as compared to towns of Nairobi at 8.4%, Mombasa at 38.6% and Nakuru at 30%. Some of the challenges that the proposed project will face include low and irregular incomes resulting to malnutrition and environmental degradation, poor urban planning that doesn’t incorporate urban tree planting as a means to livelihood, lack of policy framework and institutional support for urban farming and institutional perceptions which perceive "modern city" as constraints to urban farming among others.

In line with other initiatives already being undertaken in Kisumu, such as Lake Victoria Regional Local Authorities Cooperation (LVRLAC), Cities Development Strategy (CDS) supported by SIDA and UN-Habitat under the Urban Management Programme (UMP). The proposed activities aim at adding value by upgrading participation of stakeholders within a democratic environment to encourage ideals of good governance and sustainable management practices for comprehensive short and long-term urban development strategy for the city of Kisumu.

A programme is under initial discussion with ICRAF in Kisumu to involve the planting of high value trees in the urban landscape to provide both the aesthetic values and contribute to food security. A recently concluded Urban Livestock workshop in Nairobi (30th Sept. - 1st Oct. 2003) also highlighted the urban planning constraints and the council intends to include urban agriculture considerations in the strategic plan for the city. This will borrow from the Local Authority Service Delivery Action Plans (LASDAP), which is a three-year strategic plan for the council (2002 - 2005).

It is against this backdrop that three persons from a multidisciplinary team and multi-institutions having recognized the potentials offered by urban agroforestry; selected Kisumu City – a growing town in Western Kenya with a population of 322734 as at 1999 population census - in piloting an urban agroforestry programme with urban planning as a means of enhancing food production within the town and its peri-urban centers.

9. What the project will try to achieve (objectives)

i. To improve the capacity of urban and peri-urban communities in establishing tree based enterprises for food production, income generation, and poverty reduction.
ii. To determine the market structure and dynamics affecting urban agroforestry food products.
iii. To develop a database of life forms (trees, shrubs, herbs and climbers) with potentials to support food and medicinal needs in urban setups.
iv. To promote tree-planting campaigns in designated sites to enhance nutritional, nutrient cycling, physiological and aesthetic benefits.

10. Proposed activities.

Under objective (i):
Activities under the first objective are geared towards developing human and technological knowledge and skills for the societal stakeholders under the urban agroforestry systems. Trainings are proposed in aspects of enterprise development, market information and tree use among others. The target includes community-based institutions, which are already working within the Kisumu City and its peri-urban environs. Linkages among the institutions and individuals will be strengthened through exchange visits and thematic workshops. Since women are key players in urban agroforestry, especially in tree nursery development, they will receive special attention in the proposed training sessions. The activities proposed include:

- Availing technologies for establishment of private/commercial nurseries for fruit and medicinal trees, apiaries, herbal gardens and mushroom production.
- Organize training programmes in food tree care and enterprise development through workshops, seminars and exchange visits.
- Link urban agroforestry farmers to enhance networking and exchange of information.

Under objective (ii):
Activities under objective (ii) will strive to add value to the process of developing products from urban agroforestry. The activities will identify key actors in the process of marketing and promote synergies among the players. Of importance will be handling and storage needs as well as pricing of urban agroforestry products. Participatory workshops dominated by community institutions and grass root organizations will be organized to build linkages and enhance partnership. The activities will include:

- Appraise the supply chain, channels and market structure of urban agroforestry food products, and linkages among partners and key actors involved in the sale of urban agroforestry food products.
- Determine the potential of handling and storing of urban agroforestry food products identified in the chain

Under objective (iii):
Activities under this objective will basically address technology transfer and participatory adaptive research. Through field surveys, various urban agroforestry species will be ranked and

promoted for germplasm development. The activities have strategic interest to interest to both ICRAF and Museum which are building database on existing biodiversity in Lake Victoria region. Among the information to be collected are the nutritional values of the plant species identified. The following are the expected activities:

- Holding field surveys to identify high value life forms (trees, shrubs, and herbs) with potentials to support urban agroforestry systems.

Under objective (iv):

The initiative will pick or replicate best practices and best bets and institutionalize them through demonstrations in schools, green spaces, among other areas. Tree planting campaigns in collaboration with communities, NGOs, industrialists will be promoted under guidance of the municipal council. The following activities are proposed:

- Encourage food tree planting in schools, churches, business premises and hospitals.
- Promote establishment of agroforestry species along shelterbelts, windbreaks/greenbelts, gardens, residential streets, parks and roadside planting and incorporate the participation of other stakeholders e.g. industrialists.

11. Expected results (outputs)

a) The livelihood of a section of urban poor dwellers enhanced by income generating enterprises developed from urban agroforestry technologies in the targeted/clusters or zones proposed by the joint technical committee.
b) A detailed profile with baseline information on life forms that can support urban agroforestry food production. The profile will include species with medicinal, fodder, fruit value among others. A plant guidebook for Kisumu City is also targeted.
c) A comprehensive annotated bibliography detailing research findings, urban forest baseline status, laws and regulations, case studies and lessons from other cities in relation to food production and poverty reduction.
d) A detailed market analysis report of urban agroforestry food production with information on threats and opportunities for handling products and value addition.
e) Pockets or patches of urban environment with green spaces capable of supplementing and enhancing nutritional, physiological nutrient cycling and aesthetic benefits of trees.
f) A sound basis for recommendation to the policy community on how to intervene effectively to achieve critical development objectives including sustainable use of forest resources to stimulate food production and reduce poverty in urban environments at local, national and regional levels. By networking with other NGOs in the city who are involved in this area a strong lobbying power is expected for the integration of urban agroforestry practices to the mainstream urban planning process.
g) Better informed decisions and undertaking by stakeholders with respect to urban agroforestry and recognition of the value of green spaces in cultivating healthier communities.
h) At least 20 residents selected from community based institutions, small-enterprises, women groups among others trained on various aspects of enterprise development and marketing.
i) Enhanced collaborative partnership and increased information sharing on the emerging issues on urban agroforestry especially in regard to best practices and best bets.

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12. How the results will be achieved (methodology).

Phase I - Planning Phase

Management structure

To develop an agroforestry approach that works to the circumstances of Kisumu City, technical aspects will be combined with issues of economic, social, organizational legal and administrative importance. Workshops, partnership building and networking will be key at project initiation, implementation and dissemination. It is envisaged that working with existing networks, associations, and community-based organizations will be more appropriate than forming new ones. A joint technical committee drawing from municipal council, National Museums of Kenya and ICRAF will however be mandated on project oversight.

Literature review

This phase will review secondary sources containing information pertinent to the study. This will consist of an extensive literature review and consultations with the relevant persons to establish material available about the study area, laying strategies for fieldwork (e.g. mapping the study area), and establishing rapport with the local community members. Meetings will be organized with community members with a view to presenting the overall goals of the project and discussing the participatory methods to be used.

Mapping and field survey

Based on a participatory need assessment and poverty mapping, a criterion for Kisumu Urban greening will be developed in consultation with grassroots organizations, NGOs, and the technical committee. Important aspects to be considered in locating zones /pockets for urban greening for food production will include the following factors among others;

- Presence of stable and organized community based institutions
- Ongoing initiatives on urban recycling and waste management programmes
- Presence of tree based small and medium enterprises
- Dense population of urban dwellers and availability of green space
- Borrow earlier designs such as the one developed by KGPA (1999) and Mazingira Institute(2002)

Phase II - Implementation Phase

Training will be conducted to build the capacity of city officials, community producers and partners who are also targets; in tree products for food and market enterprise development. Target groups will be trained through workshops, exchange visits and public lectures on aspects such as development of nurseries, tree species selection/choices, apiaries, herbal gardens, agroforestry home gardens, marketing, and site improvement for trees, incentive schemes and other urban agroforestry technologies. Market training and forging linkages for tree based enterprises to ensure enterprise development will also be a priority. Supply chain analysis will also be carried out to develop simple market information systems and market returns for urban agroforestry products.

Linkages will be enhanced with groups to organizations involved in market intelligence e.g. Kenya Agricultural Commodity Exchange (KACE). Existing farmer field schools, demonstration plots established in schools, municipal sites, churches and public institution sites would be instruments of reaching local neighborhoods with agroforestry

programmes. Attempts will be made to mobilize grassroots organizations and their local resources to securing tree tenure and protection for low-income groups and transferring responsibility to local communities to encourage ownership.

Field surveys using participatory approaches will be used to conduct urban tree inventories and other live form that support urban environment. Collected information will build to a database of plants that support urban food, medicinal use, and fodder and aesthetic value. Multidisciplinary team participation and appraisal methods such as interative investigation, semi-structured interviews, rough mapping and administration of questionnaires will be used. Community participation will be paramount especially women involvement. Studies on urban agriculture have indicated that women are the main participants (Ninez, 1985; Streiffler, 1987). Their role in ranking the species for food production will be underlined. Participatory techniques such as snowballing and purposive sampling will also be applied in understanding linkages affecting urban agroforestry food production.

Contact nurseries initiated by ICRAF and municipal council of Kisumu will be instrumental in trying small quantities of improved tree germplasm for fruits, fodder, medicinal and timber uses. Training on tree propagation and groups involvement in ongoing tree planting along the roads and roundabouts. The groups will also provide a link to forecast germplasm demand and supply. Many partners already working with ICRAF around Kisumu have shown interest. These include: Kisumu Consortium, Food security, Urban Agriculture and Livestock Forum for Kisumu, Municipal Council of Kisumu, Ministry of Planning, Ministry of Agriculture (NALEP), Kenya Agricultural Research Institute (KARI), Kenya Forestry Research Institute (KEFRI), International Centre for Insect Physiology and Ecology (ICIPE) (neem medicinal tree products), Farm Africa, contact nursery operators, local NGOs and CBOs.

The project will build upon other initiatives ongoing between ICRAF and Municipal Council of Kisumu. Currently ICRAF undertakes nursery training on good nursery practices, propagation issues, participatory farming system analysis, soil fertility work, and is also involved in the environment programme by planting ornamental trees on the roundabouts, on the streets and waste management by providing litter bins. Tree planting campaigns will be conducted through radio programmes, brochures, posters, (in local languages) barazas, district environmental committees and National Environmental Management Authority (NEMA). Potential partners such as Green Town Project, Mazingira Institute will be approached for exchange of information and partnership building.

13. Beneficiaries

The primary beneficiaries of this project will be members of the local community who will take the initiative in incorporating agroforestry technology in their food production systems. Others include:

- Municipal officials (town planners, landscape architects, park and garden managers, legal advisers etc) who will be expected to incorporate aspects of urban agroforestry food production in Management Plans for improved quality of life of urban dwellers especially the poor.
- Small and medium scale enterprises who are selling urban forest food products within urban center e.g. owners of commercial nurseries. Through the participatory research component of this project, the owners of such enterprises will be empowered, as they will increase their knowledge on production and marketing of such products.

- Through the participatory research component of this project, the local groups (organized or loosely knit) such as Central Business District Associations, self-help groups, learning institutions will also be empowered, as they will increase their knowledge of urban agroforestry techniques for their own use.
- Corporate industrialists who may want to promote their status – Corporate Social Responsibility (CSR) e.g. Total Kenya Eco Project that is involved in tree planting programmes and other multi-national organizations, which may be involved in environmental conservation and with whom we hope to collaborate. While they may support the project activities in cash or kind, such occasions will be an opportunity to advertise their products.
- Research institutions and NGOs dealing with urban environments.
- Extension staff in the Ministry of Agriculture.

14. Dissemination and follow up

The majority of partners will be involved in the project planning, implementation and evaluation workshops to help build common understanding as well as highlight urban agroforestry possibilities. Workshops, seminars and networking will be used in information sharing and tasking partners with project activities.

Several types of partners twining as targets are recognized in applying outputs. They include:

- Municipal Council:
  Involvement in sorting out ownership and management rights. The kind of land and tree tenure depending on the specific situations. Support on tree planting on public land and negotiation with government to clear tree rights for certain urban dwellers. It's envisaged that residents will prefer private and group tree tenure because benefits can be enjoyed individually.

- Ministry of Planning:
  Working to give tree-planting priority at the design phase other than as fill up activity for buildings and other projects. Incorporate social dimensions in urban planning. Urban planning has to take into account the dynamics of land use and uncontrolled expansion in the cities. Trees have to fit after everything else is written on the design.

- Ministry of Agriculture:
  Extension services to encouraging a shift from the usual rural focus to include urban focus. Raise general awareness by teaching about importance of tree planting and general agriculture. There will be need to shift the more technical training to practical activities.

- Local NGOs and CBOs:
  Establishment of demonstration sites, facilitation of farmer exchange visits and responsibility for expansions.

- Contact Nursery Operators and community groups:
  Working on collective action as extension agents will work on small quantities of improved tree germplasm to help popularize them. Contact nurseries will be key in follow-ups.

- Green Towns Movement:
  Involvement in advocacy, policy lobbying and group dynamics.

- Contact urban farmers:
  Early adopters will provide feedback and help in technology diffusion.

Policy recommendations are likely to emerge with urban agroforestry being incorporated in urban planning by the local authorities and the city dwellers. National institutions will take lead in formulation of policy options.

Publications, posters and brochures in local languages will be used to reach communities outside target groups.

Mass media, print media and radio programmes aired in Swahili and local languages would be key in information sharing and sensitizing local groups on role of urban agriculture in general.

Tree planting campaigns through schools, churches, women groups and community neighborhoods mobilization will be vital avenues for information dissemination.

Results will also be disseminated through interactive sites e.g. websites so as to reach institutions and academia who would be interested in urban agroforestry information.

Established community based nurseries and demo plots will be used as focal points for dissemination of information. Organized groups will be able to learn the relevant technology by visiting such places and be provided with the published material.

15. Budget breakdown (Total budget in US $)

ITEM	**Year 1**	**Year 2**	**Year 3**	**Total**
Staff time	52400	53300	53000	158700
Operational expenses	18600	23500	22200	64300
Equipment	8000	7756	5600	21356
Consumables	19557	23400	2500	45457
Workshops & meetings	8000	9236	8000	25236
Training	7078	6500	5000	18578
Publications (in operations)	-	-	-	
Travel	5050	8080	7727	20857
Contingency	6337	7265	5646	
TOTAL	125022	139037	109673	354,484

16. References

Aipira, H. (1995) 'Urban farming: making Africa's cities sustainable'
Ecodecision 15 (Winter 1995):83-86

Basweti, C.; Lengkeek, A.; Prytz, L.; Jaenicke, H. (2001) Tree nursery trade in urban and peri-urban areas: a survey in Nairobi and Kiambu districts, Kenya RELMA,
Swedish International Development Cooperation Agency (SIDA), Nairobi (Kenya).

Brown, L.R. State of the world 1992: a World Watch Institute report on progress toward a sustainable society W.W. Norton & Company.

Carter, J. E. (1994), The Potential of Urban Forestry in Developing Countries: A Concept Paper. Forestry Department, Food and Agricultural Organization of the United Nations, Rome, Italy.

FAO (1989), Urban and peri-urban multipurpose forestry, an annotated bibliography. Forest Resource Division, Forestry Department, FAO, Rome.

Gordon, A.; Davis, J.; Long, A.; Meadows, K.2000 The role of natural resources in the livelihoods of the urban poor. Natural Resources Institute (NRI), Chatham Maritime (UK)

Government of Kenya: The 1999 Population and Housing Census, (2001), "Counting Our People for Development", Volume I. Central Bureau of Statistics, Ministry of Finance and Planning, Republic of Kenya, Nairobi.

Government of Kenya: Second Report on Poverty in Kenya, (Nov. 2000), "Poverty and Social Indicators", Volume II. Central Bureau of Statistics, Ministry of Finance and Planning, Republic of Kenya, Nairobi.

Government of Kenya: Poverty in Kenya, (Dec. 2000), "Popular Version of The Second Report on Poverty in Kenya". Human Resources and Social Services Department (HRSSD) and Central Bureau of Statistics (CBS) assisted by GTZ Social Policy Advisory Services, Ministry of Finance and Planning, Republic of Kenya, Nairobi.

Hamer, A.M.; Steer, A.D.; Williams, D.G. (1986) Indonesia: the challenge of urbanization. World Bank.

Haque, F. (1987) Thirteen city profiles. Urban forestry, FAO.

Kisumu District Development Plan, (2002 – 2003), "Effective Management for Sustainable Economic Growth and Poverty Reduction". Ministry of Finance and Planning. Nairobi.

Kuchelmeister, G., and S. Braatz, (1993), Urban forestry revisited. *Unasylva* 173(44).

Lee-Smith Diana and Davinder Lamba, (1987) the potential of urban farming in Arica. Eco decision. 37-40.

Lee-Smith, Diana, (1998)African urban agriculture policy: Issues and priorities. Background paper for the international conference on productive urban space management, Pretoria, south Africa, 3-5

Manundu, M. et al, (1987), "Urban Food Production and the Cooking Fuel Situation in Urban Kenya" National Report: Results of a 1985 National Survey. Mazingira Institute, Kenya.

Ninev, V. (1985), Working at Half Potential: Constructive Analysis of Home Gardens Programmes on the Lima Slums with suggestions for an Alternative Approach; Food and Nutrition Bulletin, 7(3)-6-14.

Onganga, O. (1990), "Urban Forestry Development in Kenya" in *Proceedings of the Fifth National Urban Forest Conference*, Los Angeles, California.

Mazwell, D.G. (1997) Alternative food security strategy: a household analysis of urban agriculture in Kampala.

Pereira, C.; Mansur, E.; Bila, A. (1986) Urban fuel wood development in Mozambique - country report.

Streiffeler, F (1987), Improving Urban Agriculture in Africa: A Social Perspective; Food and Nutrition Bulletin, 9(2);8-13.

Smit, J, (1992), "Urban Forestry in Latin America, Africa and Asia", Mimeo prepared for the UNDP Project # GLO-84-007 by RDC Consultants, 1711 Lamont Street, Washington DC 20010 (contact Smit, J, Senior Consultant).

Trefon, T. (1995) Forest conservation and central African cities: Kinshasa, Libreville and Yaounde. Boston MA: African Studies Center, Boston University,

Thaman, R.R, (1987), "Urban Agroforestry – The Pacific Islands and beyond" in *Unasylvia* 155 vol. 39, 1987/1.

Zarina, I. et al (2002), Scoping Study on Interactions Between Gender Relations and Livestock keeping in Kisumu. Natural Resource International Ltd., Mazingira Institute, Nairobi, Kenya

Anglophone Africa Training Course on Urban Agriculture
Concept Note for Kumasi, Ghana

1. Project title
Nutrient Recycling in Peri-Urban Agriculture

2. Project leader
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5. Total estimated cost of project
US$ 31,250.00 (Budget request: US$ 10,000)

6. Duration of project
12 months

7. Location of Project
The peri-urban fringe of Kumasi Metropolitan Area

8. Keywords
Compost, environmental protection, food security, livelihoods, nutrient recycling

9. What is the project trying to achieve?
The overall project goal is the development of options for an integrated nutrient strategy to close the rural-urban nutrient cycle in the Kumasi area. Rapid urbanization in Kumasi is resulting in major challenges to environmental protection, waste management, food security and urban and peri-urban agriculture (UPA) (Drechsel and Kunze, 2001). The pollution and waste disposal problem is most acute in peri-urban areas, where waste management services are seldom provided despite rapidly increasing settlement densities (Adam, 2001). Although this poses problems, there are substantial opportunities to raise awareness for waste management strategies that are based on nutrient recycling. Fundamentally, these training strategies consist of turning organic waste into compost at community and household level for use as an agricultural fertilizer in UPA. Specifically, the project has the following sub-objectives:

- Enhance urban and peri-urban food security by increasing urban and peri-urban agricultural production through appropriate soil fertility management.
- Income and livelihood generation particularly in the poorer peri-urban areas where female-headed households are still dependent on agricultural based livelihoods.
- Environmental protection through the recycling of organic wastes at community and household levels.

Separating and composting domestic waste at the household level can lead to substantial decreases in waste outputs and thus contribute to a cleaner environment, particularly in peri-urban areas that are plagued by open waste dumps. Furthermore, composting and reusing domestic organic waste is a means of recycling nutrients and restoring soil fertility, contributing to soil structure and humus, increasing organic matter and improving the water holding capacity of soils. However, the successful implementation of backyard composting programmes requires substantial educational and training inputs across a range of topics including establishment of compost sites, constructing compost containers, appropriate compost handling and compost use. Successful implementation can be enhanced through the provision of demonstrations and information leaflets and the running of composting workshops. Financial assistance may also be required to purchase any required materials to build compost containers. However, the success of backyard composting is not dependent on the composting method or container, but on 'intensive care and know-how of the individual' (GFA-Umwelt, 1999), which can only be fostered through well planned educational and training programmes with the beneficiaries participating in all stages of the planning and implementation process.

10. What activities are proposed?

The proposed project will be implemented using a participatory action-research (PAR) approach and will extend previous work by CEDAR and IWMI already undertaken in Kumasi. In peri-urban areas of Kumasi, daily domestic waste consists mainly of food scraps (peels from cassava, yam and coco yam and plantain skins) and wood ash, with only small quantities of sand and plastic bags. In the light of these high proportions of organic matter in domestic waste, the high engagement (88%) in local ($\geq$4km) agricultural activities and the need for soil ameliorates in these same areas (Nsiah-Gyabaah and Adam, 2001), composting domestic waste is one strategy which can be adopted at the household level both to reduce waste outputs and to provide much needed soil inputs for urban and peri-urban agriculture.

Baseline surveys will be used to identify appropriate nutrient recycling strategies for specific localities, which will then be implemented through the means of community, school and household demonstrations, workshops and field trials. In suitable localities backyard composting will be implemented as the preferred option, followed by community-based compost projects. Backyard composting urban and peri-urban areas requires suitable composting containers to stop disease vectors, such as flies, mosquitoes, cockroaches and vermin such as rats from being attracted to the compost pile, thereby ensuring that the composting process remains safe, hygienic and acceptable to local residents and conforms to district and municipal sanitation by-laws (where appropriative, methods such as pit composting and compost piles (i.e. Bangalore method) will be used). Compost containers can be made from recycled materials such as tyres, blocks, bricks, wood, plastic barrels or 250litre drums; thereby making the technology accessible for low income groups.

Community composting projects will consist of anaerobic composting using tarpaulin-covered windrows. This method is an adaptation of the anaerobic composting methods used by market gardeners and smallholders where anaerobic compost is produced in sealed plastic bags or in small piles covered with plastic sheeting (see Martin and Gershuny, 1992). Rather than using small piles, windrows measuring approximately 1.5 metres wide and 1 metre high will be formed, with organic waste added daily to the end of the windrow. The windrow is covered with (recycled) tarpaulins (waterproof canvas covers), which serve to protect the pile from waterlogging during heavy rains, prevent access to livestock, rodents, flies and mosquitoes, and also to prevent the pile from drying out under the sun.

School compost demonstrations will also be used within the localities as an additional capacity building measure. In Ghana, recent environmental initiatives implemented by the Environmental Protection Agency (EPA) have been targeted at school children through the

medium of 'School Environment Clubs' in an attempt to raise environmental awareness amongst younger community members. Implementing school compost projects enhances this process by enabling school pupils to gain practical hands-on experience of composting techniques, rather than just learning theoretical aspects about composting. The educational aspect will be enhanced through the provision of compost thermometers to enable students to monitor the compost temperature during the decomposition, conversion and synthesis phases, thereby increasing the scientific understanding of the compost process. An additional benefit of school compost projects is the production itself of compost for use on school agricultural projects, as all schools located in peri-urban areas have small school farms and hence a high potential for compost use.

In addition, information leaflets in both English and the local Twi language will be distributed. The leaflets will provide clear instructions in environmental sanitation, household waste separation and container composting and will include simple sketches. The demonstrations will then monitored over several weeks during which further training and technical assistance will be provided, particularly if any problems should arise. When these technologies are implemented appropriately, they can not only improve environmental sanitation but also enhance local livelihoods. These methods have already been tested in six peri-urban locations since 2001 and there is considerable scope in extending this work to other peri-urban areas of Kumasi, thus developing a wider nutrient recycling strategy. Furthermore, the Kumasi Waste Management Department will assist in the development of small-scale options for co-composting with backstopping of compost from their co-composting plant.

11. What will be the result of the project?

The result of the project will be the development of an integrated nutrient strategy for Kumasi's fringe communities, which will close the rural-urban nutrient cycle, primarily by using urban and peri-urban organic waste as an agricultural fertilizer in UPA. In the development of such options together with the municipal key players and non-governmental organisations that are already active in peri-urban areas, uptake of the results and multiplier effects are most likely to occur. Improved soil fertility management will then contribute to income and livelihood generation particularly in the poorer peri-urban areas where female-headed households are still dependent on agriculture, despite the high cost of agricultural inputs and the loss of agricultural land for construction activities, which has already resulted in agricultural intensification on the few remaining farming plots. Also, in addition to producing natural fertilizer for urban and peri-urban agriculture, composting reduces the amount of domestic organic waste destined for open refuse dumps or municipal landfill sites, thus contributing to a cleaner environment and, where waste collection services are provided, a reduction in collection and transport costs (GFA-Umwelt, 1999).

12. How will this be achieved (methodology)?

The proposed project follows is based of the successful implementation of a pilot participatory action research (PAR) project conducted in six peri-urban communities. In essence, PAR is a problem-solving, iterative and systematic approach to research where a range of intellectual resources are drawn upon to find a solution to a problem or to improve current practices. The proposed research tools that will be used during the fieldwork – participatory rural appraisal techniques, semi-structured interviews, micro-projects and workshops – are predominantly qualitative research methods, and hence bestow several important advantages, which are crucial if a PAR approach is to be successful and truly participatory.

These advantages include:

- Flexibility of research design and methods
- Increased holistic understanding of the issues.
- More natural settings.
- Inclusion of local perceptions and viewpoints (Curry, 1996).

Implemented micro-projects will be strategically distributed at prominent points throughout each participating peri-urban village and will be used to provide simple demonstrations that could be easily replicated by other community members after observing the direct benefits of the composting process. By increasing the number and distribution of such micro-projects in each village, and conducting composting workshops using the demonstration sites, the dissemination capacity will be increased and a wider community audience will be reached. However, due to the time required to produce compost there may be a prolonged period before outputs are available, hence the intervention must be well planned and sustainable, with local people actively participating in all stages of the planning and implementation process. Therefore, the project will not only build capacities at institutional level (Waste Management Department/local NGOs) but also at the grassroots by empowering urban and peri-urban farmers to produce and analyze knowledge, particularly in soil fertility management and local environmental sanitation.

13. Who will benefit?

The development of options for an integrated nutrient strategy for Kumasi will provide decision support tools for the benefit of both municipal authorities and urban and peri-urban farmers. Maximising the recycling of organic waste at the household, community and municipal level will reduce the quantities of waste normally handled by the municipal and district Waste Management Departments. In an agricultural context, composting and reusing domestic organic waste is a means of recycling nutrients and restoring soil fertility, contributing to soil structure and humus, increasing organic matter and improving the water holding capacity of soils. For urban and peri-urban farmers this bestows several benefits: reduction in expensive chemical fertilizer and pesticide inputs; more sustainable cropping practices on intensely used plots; conservation of water sources, particularly during the dry season and when rainfall is erratic in the wet season. On a wider context, increased urban and peri-urban agricultural production provides greater food security, increases incomes and enhances the livelihoods of urban and peri-urban farmers.

14. How will the results be disseminated and followed up?

The partnership with the municipality is crucial for the uptake of the results and any follow-up, also with respect to other Ghanaian municipal city authorities. Project results will also be disseminated in reports, articles, journals, radio broadcasts and workshops and will be targeted at government, NGO, research institutions and the urban and peri-urban farming groups. For example, recent activities on a pilot school environmental club and composting programme received national media coverage last March, when an article about the programme was printed in the national Ghanaian daily newspaper the *Daily Graphic* (2003). Additional recent outputs from the pilot study and other related compost projects in Kumasi include: publication of compost leaflets in both English and the local Twi language; refereed paper presented at the International Symposium ‘Eco-sanitation’ in Germany; poster presented at the International Symposium ‘Eco-sanitation’ in Germany; paper presented at the International Solid Waste Management Conference, Kumasi, Ghana; article in Urban Agriculture Magazine; and a paper presented at the UK Royal Geographical Society annual conference (thematic group: peri-urban management).

Collaboration with the local and national references will further disseminate project findings. For instance, in the Environmental Protection Agency's (EPA) publication 'Manual for the Preparation of District Waste Management Plans in Ghana', decentralised composting strategies have been identified as "[o]ne of the most significant potential areas for recycling" (EPA, 2002: 29). EPA also highlight that "household composting is potentially the most useful, although it must obviously be carried out in such a way as to avoid a nuisance in the residential neighbourhood" (EPA, 2002: 29). The results from this project will be used in the development of safe and hygienic household composting strategies that will be applicable at the national level and thus contribute to publications such as the EPA's district waste management manual, in which household composting is promoted, but the social, cultural and technical aspects are not addressed.

15. Budget breakdown (one year)

Description	**Budget request**	**CEDAR input**	**Other input (IWMI)**
Staff input			
CEDEP, KMA-WMD	600.00		
CEDAR		18,750.00	
Local transport	900.00		
Workshops, community meetings	3000.00		2000.00
Materials for compost drums, pits etc.	5000.00		
Capacity building (leaflets etc.)	500.00		500.00
Total	**10,000.00**	**18,750.00**	**2500.00**

16. Local references

Environmental Protection Agency (EPA), Ashanti Regional Office, Kumasi, Ghana
International Water Management Institute (IWMI), Ghana Office, KN-UST, Kumasi, Ghana
Ministry of Agriculture (Kumasi Metro Office), PO Box 3820, Kumasi, Ghana
Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana

References

Adam, M. (2001) 'Definition and Boundaries of the Peri-urban Interface: Patterns in the Patchwork'. In Drechsel, P. and Kunze, D. (eds.) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa.* IWMI, FAO, CABI Publishing, Wallingford, pp. 193-208.

Curry, J. (1996) *An Introduction to Qualitative Research.* University of Wales, Bangor, UK.

Daily Graphic (2003) EPA initiates moves. 31st March, p. 23.

Drechsel, P. and Kunze, D. (eds.) (2001) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa*. International Water Management Institute, Food and Agriculture Organisation and CABI Publishing, Wallingford, UK.

EPA (2002) *Manual for the Preparation of District Waste Management Plans in Ghana.* Environmental Protection Agency, Ministry of Environment & Science and the Ministry of Local Government & Rural Development, Ghana.

GFA-Umwelt. (1999) *Utilisation of Organic Waste in (Peri-) Urban Centres.* GFA Infrastruktur und Umweltschutz GmbH, Bonn (GFA Umwelt), Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ), Eschborn and Ingenieurgemeinschaft Witzenhausen Fricke & Turk GmbH (IGW), Witzenhausen, Germany.

Martin, D.L. and Gershuny, G. (eds.) (1992) The Rodale Book of Composting. Rodale Press, Emmaus, Pennsylvania, USA.

Nsiah-Gyabaah, K. and Adam, M. (2001) 'Kumasi: Farming Systems and Farming Inputs in and around Kumasi'. In Drechsel, P. and Kunze, D. (eds.) *Waste Composting for Urban and Peri-urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa.* International Water Management Institute, Food and Agriculture Organisation and CABI Publishing, Wallingford, UK, pp. 96- 111.

Children in Distress

CINDI

Networking for children affected by AIDS

Ref: 011-496 NPO

Institute of Natural Resource

PIETERMARITZBURG MSUNDUZI

AFRICAN ROOTS

Concept Note

for the

Anglophone Africa Training Course

Urban Agriculture

July 2003

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1 Project Summary

The "African Roots" initiative aims to address the nutritional needs o poor communities affected by HIV/AIDS through the co-ordination of food garden initiatives in the Msunduzi municipal area, and the propagation of traditional/indigenous plants. The "African Roots" initiative will be lead by the Institute of Natural Resources in partnership with the CINDI (Children in Distress) Network and the Msunduzi Municipality (see Appendix A).

1.1 Organisation Information

Type: Section 21 Company, Associate Institute of the University of Natal

Name: Institute of Natural Resources

Physical Address: 67 St Patrick's Street, Scottsville, 3201

Postal address: Private Bag X01, Scottsville, 3209

Telephone: (033) 346 0796

Facsimile: (033) 346 0895

E-mail: inr@nu.ac.za

Contact Person(s):

Ms Jennifer Mander
Chief Executive Officer
mander@nu.ac.za

Mrs René Ford
Project Manager
fordre@nu.ac.za

1.2 Project Information

Name: African Roots

Time Frame: 2003 – 2008

Size of target population: The Proposal seeks to co-ordinate *ad hoc* food garden initiatives (the number of these initiatives are not known at present) in the Msunduzi Municipal area (pop 570 000) where it is estimated that 8 – 10 000 children are orphans.

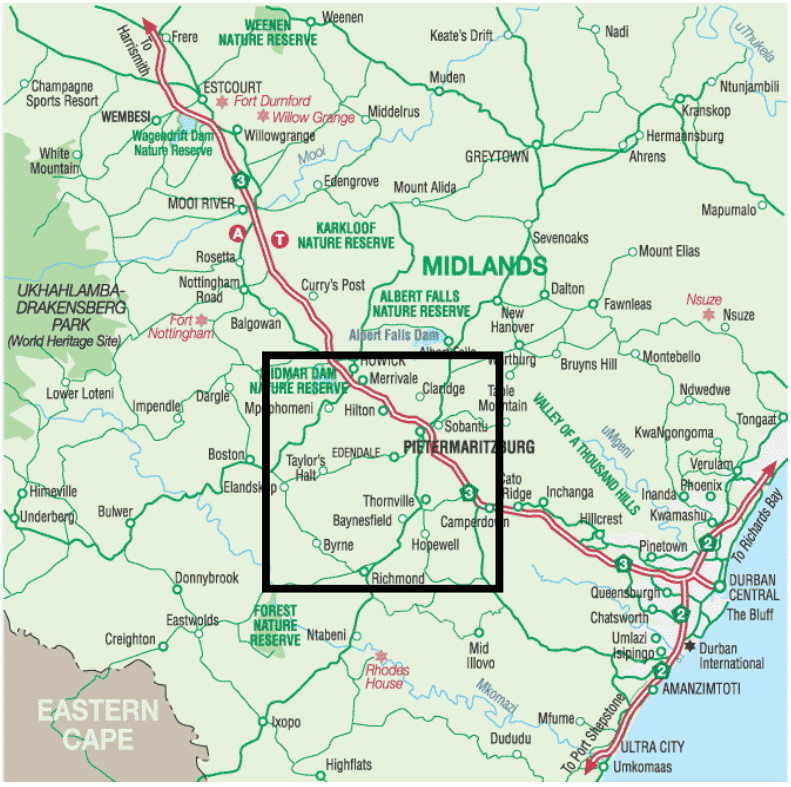
Total budget: R2.05 million

2 Background and Context

2.1 Pietermaritzburg, KwaZulu-Natal

The AIDS pandemic in KwaZulu/Natal is overwhelming public hospital capacities, with medical patients spilling into surgical, gynaecological and orthopaedic wards, often forcing doctors to choose who lives and who dies.

KwaZulu-Natal has the highest rate of HIV infection in SA, with 36% of the population infected and an estimated 4.6 million orphans countrywide (McKerrow, 2001). Chris Bateman of the Medical Research Council states that doctors in at least two major hospitals, Edendale in Pietermaritzburg and King Edward in Durban, report that 55%-65% of medical in-patients are HIV positive (see article Appendix B). Medical beds at Northdale and Edendale Hospitals in Pietermaritzburg are running at 120% over capacity as a result of HIV/AIDS. Dr Paul Kocheleff, HIV/AIDS clinic chief at the Greys and Edendale Hospitals reports that, based on the estimated six-year silent incubation period of HIV, the tide of sick people now presenting at KwaZulu-Natal hospitals represents the 1994/5 HIV-positive prevalence figure of just 15%-20%. An Edendale Hospital survey, undertaken in 2001 (clinical observation) found that 50% of patients were HIV positive. Dr Jim Muller (Edendale Hospital) believes this now matches the figures noted at King Edward Hospital.



Map 1: Msunduzi Municipality

One in four children (2002) in Pietermaritzburg, KwaZulu-Natal has been orphaned by Aids, and the number is set to rocket in the next 10 years (see article Appendix B). The accepted definition of an orphan in the academic and development literature is "a child under the age of 16 whose mother has died". In 1996, 6% of children in Pietermaritzburg were AIDS orphans. Six years later the number has risen to 25%.

Dr Rob Garner (former chairperson of CINDI) feels that without AIDS, the orphan population in SA would be 1-2% of the child (under 16) population. The effect of AIDS has increased this, to 10 or even 20% of the child population. Lovelife and USAID (Children on the Brink) suggest that in SA as a whole the orphan population is now 4%-5% of the child population. In KZN, where the epidemic is most advanced, the figure is much higher than this. In a small survey conducted in Edendale in 1999 by Dr Garner, 6.3% of the children under 16 were maternal orphans. Dr Garner estimates that the figure could now be as high as 8%.

2.2 Food Security and nutrition

The HIV/AIDS epidemic has long been recognized as posing a major threat to food and nutrition security in Sub-Saharan Africa (Ssemakula, 2002).

HIV/AIDS affects food security by reducing:

- Food availability through decreased production and loss of labour
- Food access through declining income for food purchases
- The decline in stability and quality of food supplies due to the shift to less labour intensive production of foods of lower nutritional content

Reduced food production and supply coupled with the shift to lower quality foods leads to food insecurity, increased levels of protein and energy malnutrition as well as other nutritional deficiencies, such as minerals and vitamins. This has serious consequences for people living with HIV/AIDS who have a 50% higher protein and a 15% higher energy requirement than an uninfected person.

Ssemakula (2002) predicts that one consequence of the food shortages is going to be an increased death rate in people with HIV/AIDS. It is also to be expected that there will be both increased rates of malnutrition in children and probably an increase in infant and child mortality. As nuclear, extended family and community networks are disrupted, the problem of children whose parents have died from AIDS will be compounded, resulting in a worsening of the circumstances of orphans and vulnerable children (OVC).

Professor Stokes (2002)of the Pennsylvania State University People, writes, in her paper on “Measuring impacts of HIV/AIDS on rural livelihoods and food security”, that people living with HIV/AIDS (PLWHA) have

special nutritional needs to assist them in remaining active and productive workers, warding off the opportunistic infections that accompany the disease and in prolonging their lives. Mitigation efforts can range from nutritional education programmes aimed at infants, children, adults and the elderly; nutritional support and education for afflicted individuals; orphan support and infant feeding programmes, to increased agricultural productivity through improved plant varieties and better crop management techniques. Nutritional gardens can provide needed nutrients and add variety to the staple foods consumed by households. Efforts to provide a balanced, nutritious diet help to strengthen the immune systems of healthy persons and assist them in warding off other infections that render them more vulnerable to HIV/AIDS.

Mitigation strategies designed to improve household nutrition are not independent of other efforts to improve households' livelihoods and food security. Topouzis (2001:33-34) lists a number of strategies that would improve food security and nutrition, including the following:

- Use of improved crop management and plant varieties with higher yields
- Emphasis on staple crops such as sweet potato and cassava
- Improved agricultural practices and technologies to save labour and capital
- Use of small ruminants for consumption, sale and manure
- Nutritional education
- Labour exchange arrangements
- Increased access to agricultural extension services that address needs of households affected by HIV/AIDS
- Changes in gender roles

Adoption and use of these practices by AIDS-affected households, as well as unaffected households, need to be monitored and evaluated. Traditional extension programmes aimed at male household heads are not likely to reach orphan- or female-headed households, or even the elderly – exactly those households that most need labour-saving practices and technologies. Thus, nutrition and agricultural extension programmes need to be gender- and age-sensitive in reaching those households most in need. This strategy requires that a range of role-players interact and coordinate their efforts. Role players include amongst others:

- Faith initiatives (feeding schemes),
- NGOs
- Private sector
- Local government
- Department of Health
- Department of Social Welfare
- Department of Agriculture and Environmental Affairs

2.3 Articles and Publication

Some articles illustrating the HIV/AIDS situation in KZN and in particular its effect on OVCs are listed below and attached in Appendix B

- *Aids takes its toll in infant mortality***.** Ronnie Govender. Sunday Times: Sunday 6 October 2002.
- *City faces Aids orphans' crisis***.** Brett Horner. Sunday Times: Sunday 18 November 2001
- *Can KwaZulu-Natal hospitals cope with the HIV/AIDS human tide?* Chris Bateman. South African Medical Journal: Aids bulletin - July 2001 vol. 10, no. 2
- *It is Destroying the Children- Living and Dying with AIDS***.** Tessa Marcus. The School of Human and Social Sciences (Sociology). University of Natal. Pietermaritzburg. July 1999
- *The CINDI/Natal Witness High School Essay Competition***,** held to commemorate Youth Day - 16 June 2001: "How AIDS Affects Me. " (extracts and winners from 53 essays submitted for the competition.)

3 The African Roots Project

3.1 Problem Statement

The need to address the nutritional status of PLWHA and OVCs has been recognised by the Children In Distress (CINDI)[1] Network and its strategic partner, the Msunduzi Municipality (formerly Pietermaritzburg).

CINDI in partnership with the Msunduzi Municipality formed the Nutrition Working Group, which recognised that it is difficult for HIV+ve people and other vulnerable groups to live healthy lives in the absence of adequate nutrition. Consequently the Working Group seeks to enhance people's access to organisations in Pietermaritzburg who are providing emergency food aid, share information about nutrition and the preparation of food, and offer training in order to encourage communities to become involved with food production.

During 2002, the Msunduzi Municipality, the Institute of Natural Resources (a co-opted member of the Nutrition Working Group) and CINDI held a series of nutrition/urban food-garden workshops. At these workshops participants identified the need for an AIDS nutrition/agriculture co-ordinator who can network with government departments such as the Department(s) of Agriculture and Environmental Affairs, Health and Social Welfare, Education, NGOs and private sector role-players to facilitate the development of food production initiatives which focus on providing the correct nutritional needs for PLWHA and OVCs - with a special emphasis on the role of easily accessible, traditional or indigenous plants with a high nutritional and/or medicinal value. The initiative was named "African Roots".

This function has up until now been provided on an *ad hoc* basis by various concerned role-players, however it has become important to provide more coordination and impetus, in order to achieve any impact. The nature of the work to be undertaken in order to provide the necessary coordination and impetus requires that a single person be appointed on a full-time basis with the necessary institutional support from the INR and CINDI to ensure effective and efficient delivery.

[1] CINDI was founded in July 1996 and consists of over 80 organisations that collaborate to mitigate the impact of HIV/AIDS on children in the KwaZulu-Natal Midlands.

3.2 Aims, Objectives and Activities of "African Roots"

3.2.1 Aim

The aim of the African roots project is to address the nutritional needs of poor communities affected by HIV/AIDS (with special attention given to female and child headed households) through the co-ordination of food garden initiatives in the Msunduzi municipal area, and the propagation of traditional/indigenous plants.

3.2.2 Objectives

The objectives of the African Roots project would therefore need to focus on:

1. The identification and formation of strategic partnerships.
2. The development of a strategy (in collaboration with strategic partners identified) which will ensure an:
    a. Increase in the variety of plants, with a nutritional and medicinal value, available to affected households.
    b. Increase in the number of affected household cultivating plants with a nutritional and medicinal value.
    c. Increase in the quantity and quality of plants produced by households.
3. The coordination of the activities of the different partners in order to achieve the objectives set in (point 2) above.

3.2.3 Project Activities

The project is divided into two phases:

- **Phases one** involves the formulation of a strategy in collaboration with partners. During this phase the aims of the African Roots initiative will be confirmed and the tasks and objectives to be undertaken/achieved finalised.
- **Phase Two** would see the strategy implemented by the agricultural co-ordinator.

3.2.3.1 Phase One: Strategy Formulation

Given the general *ad hoc* and uncoordinated nature of interventions currently being undertaken by various role-players, it will be important to achieve a common strategy and focus to ensure the most effective and efficient use of limited resources. The strategy needs to focus efforts on areas, which address the short-term crisis, but also put in place a long-term solution, which increases food security for vulnerable groups.

In order for the nutrition/agricultural co-ordinator to provide an effective and efficient service, the proposed intervention needs to be focussed on key deliverables. The key deliverables will emerge from the short and long-term intervention strategy. The development of this strategy and its operational plan will provide the

framework within which the co-ordinator will operate and allow for the monitoring and evaluation of progress against a set of objectives both in the short and long-term.

The strategy formulation process will be undertaken by a team consisting of representatives from various organisations and will be managed and coordinated by the Institute of Natural Resources on behalf of the CINDI network and the Msunduzi Municipality. The INR will report on the activities of the co-ordinator to a committee, established in phase one to ensure the objectives set are met.

3.2.3.2 Phase Two: Implementation of the African Roots Strategy

Nutrition/Agricultural Co-ordinator

The nutrition/agricultural co-ordinator will be based at the INR where s/he would have access to an office and administrative support required to perform the tasks required.

The responsibilities and activities of the co-ordinator will be clearly defined in the strategy formulation phase. However, the general functions envisaged for the co-ordinator are to:

- Identify projects within the Msunduzi Municipality, which relate specifically to providing the nutritional needs of people living with AIDS/HIV and OVC's.
- Promote indigenous plants, which are easily accessible and have nutritional and/or medicinal properties.
- Liase with government departments (and NGOs) to access extension/technical services required.
- Assist communities in compiling business plans to unlock available funds.
- Investigate and coordinate initiatives to include large-scale agriculture as a short-term solution to providing food.
- Investigate and coordinate initiatives, which include the private sector (eg food service companies) as a short-term solution to providing food (this function would primarily involve the facilitating of linkages with existing food distribution networks such as Gifts in Kind).
- Facilitate and direct access to services required by people living with AIDS/HIV and OVCs as identified.
- Monitor the effect of projects initiated.
- Network with and coordinate the efforts of various role-players identified in implementing the strategy formulated.
- Assimilate, compile and distribute information on best crops to plant for maximum impact on nutrition.
- Perform a public relations function.
- Document and write reports on work/studies undertaken (English writing skills essential).

The nutritional/agricultural coordinator will also focus on forming partnerships with academic institutions such as the University of Natal and other learned individuals who can assist in the production of information leaflets. Information published will focus on:

- The nutritional value of crops.
- Crop production techniques (eg labour saving techniques).
- The use of traditional and indigenous crops and remedies.

These articles will be published on the websites of CINDI as well as the INR. In addition the articles and information produced will be published in local newspapers such as the ECHO (a weekly community supplement circ 50 000) that is already running a series of articles on nutrition and the planting of high nutritional value crops, compiled by the CINDI network.

3.3 Risks

Given the interest already expressed by many role-players as well as current activities already taking place on the ground, it is unlikely that the main risks to the project would be realised. However areas of concern would be:

- Non-cooperation of role-players and government departments.
- Inability of role-players to contribute to the physical implementation of activities on the ground.
- Non-performance of the nutrition/agricultural co-ordinator appointed.

3.4 Project beneficiaries

The proposed project involves the appointment of a nutrition/agricultural co-ordinator to ensure an effective and efficient strategy within the Msunduzi municipal area to address the nutritional needs of people living with HIV/AIDS - in particular orphans and vulnerable children. The project therefore does not have direct beneficiaries. However, indirect beneficiaries would be people living with HIV/AIDS and in particular orphans and vulnerable children living within the Msunduzi Municipal area. These beneficiaries will in the true nature of collaboration be identified by different role-players as part of the coordination activities envisaged for the project.

3.5 Budget

	Year 1	Year 2	Year 3	Year 4	Year 5
STRATEGY FORMULATION AND REVIEW					
Alternative strategy statements	30000				
Meeting with key stakeholders	20480				
Stakeholder workshop	22720				
Finalise strategy	10880				
Identify highly nutritional food types	14240				
Identify projects	16160				
Monitoring and evaluation of strategy		20000	22000	24500	27000
Strategy review					100000
Disbursements					
Travel	5000				
Workshop	8000				12000
Consumables	2500				2000
Sub-total strategy formualtion	**129980**	**20000**	**22000**	**24500**	**141000**
AGRICULTURAL COORDINATOR					
Annual salary	150000	165000	181500	199650	219615
Travel	26400	29040	31944	35138	38652
Consumables	12000	13200	14520	15972	17569
Computer	12000				
Management and supervision	74880	82368	90605	99665	109632
Administration	15000	16500	18150	19965	21962
Sub-total Agrilcutural Coordinator	**290280**	**306900**	**337590**	**370391**	**407430**
PROJECT TOTAL	**420260**	**326900**	**359590**	**394891**	**548430**

3.6 Sustainability

The nature of the project (coordination) does not lend itself to income generation and will unfortunately always be dependant on donor funding. However the cost savings achieved through the coordination of currently independent activities and the delivery of nutrition to vulnerable households will make this the most economically efficient health care service the city can provide.

On the ground projects this proposal seeks to stimulate through the coordination of role-players and hence the effective use of funding available, will very definitely have an income generating component which is essential if they are to become sustainable and self-sufficient.

3.7 Monitoring and Evaluation

Implementation of the projects objectives as determined during phase one will be reviewed biannually; this is in addition to the management and direction to be provided by the INR. The project itself will be reviewed and evaluated annually by a team appointed during phase one.

As indicated by Professor Stokes the adoption and use of practices promoted by the coordination of activities within the Msunduzi municipal area by AIDS-affected households, as well as unaffected households, should be monitored and evaluated. Monitoring and evaluation of these strategies will obviously depend upon the mix of programmes and practices that are identified in phase one.

Indicators would likely include measures of nutritional knowledge, adoption of recommended practices and technologies and the mix of crops produced and consumed by households. Given the short-term need to monitor and evaluate the effectiveness of mitigation efforts, indicators such as these are more likely to be responsive to recommended practices and technologies than more traditional indicators of household nutrition and food consumption such as stunting or wasting in children that reflect longer-term processes. Quantitative targets will be set when formulating the strategy.

3.8 Activities of other Organisations

3.8.1 CINDI

CINDI (see appendix A) partners look to each other for support, share information, mobilise resources, lobby on behalf of children affected by HIV/AIDS and unite for action in Working Groups that seek to secure the rights of children – to health care, administrative justice, nutrition etc. The Nutrition Working Group under CINDI is a strategic partner in the African Roots initiative and will draw on the skills and resources of its more than 80 members as and when required.

3.8.2 Msunduzi Municipality

The Msunduzi Municipality (see appendix A), also known as the City of Pietermaritzburg, is a local authority catering for the needs of 570,000 people, of whom it is estimated that 100,000 are living with HIV/AIDS, and of whom approximately 300 per month are dying of AIDS/TB. It provides a wide range of municipal services, including water, sewerage, housing development and rental, municipal traffic control, fire and emergency services, libraries, clinics and environmental health services, roads, drainage, community halls and sports facilities, stimulating economic development and tourism, an airport, parks, gardens, cemeteries and electricity.

In addition to these traditional services it provides community development services to residents through its decentralised Ward Committee structures, which include capacity building in various aspects, strengthening of democracy through promotion of local decision making, development of income generating projects, stimulation of community food gardens, leadership skills for youth, and general life-skills education and training.

The Msunduzi Municipality forms the level of Government, which is closest to the people, and it is accountable to its residents through 73 elected Councillors and the 37 Ward Committees.

4 Institute of Natural Resources

Company Profile

Institute of Natural Resources

1. Introduction

The Institute of Natural Resources was formed twenty-two years ago with the aim of contributing to the effective management of natural resources. We are a public benefit, Section 21 Company (not for gain) and an Associate Institute of the University of Natal.

The service and work of the INR ultimately aims to make a substantial contribution to poverty alleviation, sustainable livelihoods, development initiatives and wise use of natural resources.

Our services are based on participative, multi-disciplinary and integrated approaches to projects. We aim to bridge the gap between science and application, with emphasis on practical management systems. Our solutions aim for innovation in integrating the needs of People, Environment and Development.

2. Business Details

Type of business: Section 21 Company, Associate Institute of the University of Natal

Postal address: Institute of Natural Resources, Private Bag X01, Scottsville, 3209
Physical address: 67 St Patricks Rd, Pietermaritzburg, 3201
Telephone no: 033-3460796
Facsimile: 033-3460895
E-mail: inr@nu.ac.za

Contact person: Jennifer Mander (Chief Executive Officer)

Business registration number: 1996/000355/08
P.A.Y.E: 740/07/2607/3
Unemployment Insurance Fund no: 385102/0
Workmen Compensation registration no: 4778302300

Banking Institution: Nedbank
Branch: Scottsville, Pietermaritzburg
Account number: 1341 0217 18
Name of account holder: Institute of Natural Resources

3. Categories of Competencies

The INR is in the business of natural resource management (in which we include agriculture).

Our fields of expertise are:

- Environmental management
- Small-scale agriculture and agribusiness
- Indigenous plant products
- Woodland and forest management
- Coastal, estuary and freshwater environments
- Land resettlement and tenure
- Eco-tourism

The services we provide are:

3.1 Local/rural economic development

Our services include:

- Project conceptualisation, management and implementation
- Project business planning
- Project evaluation and review
- Local economic development studies
- Feasibility studies (including agri-processing projects)
- Technical skills training (e.g. broiler production)
- Capacity building
- Facilitation

3.2 Environmental impact assessment

Our services include:

- Environmental compliance requirements including scoping and environmental impact assessment
- Environmental management systems and plans
- Environmental monitoring (including the development of monitoring principles and indicators)

3.3 Agricultural

Our services include:

- Agricultural development, including business appraisals, strategy development, production systems, marketing systems, training for emergent farmers in production and farming business

3.4 Trade economists

Our services include:

- commercialisation and informal marketing of natural products
- implications of trade policy on environmental factors

4. Human Resources

The gender and racial composition of the Institute's staff (tabulated below) indicates a firm commitment to transformation and corrective action.

MALE		FEMALE			
AFRICAN	WHITE	AFRICAN	COLOURED	INDIAN	WHITE
2	2	3	1	1	9

5. Small Emerging Sub-contractors

Our current working approach is that we sub-contract to as many small emerging firms as possible within our contracted projects. Further, as part of our Equity Plan, we undertake capacity building by working with emerging agricultural and environmental professionals. Examples of emerging firms with whom the INR has worked include:

- The Albert Luthuli Community Development and Education Trust
- Mbono Training
- Zakhe Training Institute
- Enzangakho Consulting
- Akhatech
- Isineke
- Greater Edendale Environmental Network and its associated groups
- Sipho Kapile Building and Block Making
- Aaron Mahlangu Farming

- Traditional healer's associations

6. Recent Clients

- Department of Agriculture and Environmental Affairs (provincial)
- Department of Land Affairs
- Department of Arts, Culture, Science and Technology
- Department of Water Affairs and Forestry
- eThekwini Municipality
- South African Sugar Association
- Portnet
- Sappi Saiccor
- Impala Irrigation Board
- Water Research Commission
- Department for International Development (DfID)
- European Union
- International Development Research Centre (Canadian Government)
- Ford Foundation

7. Resume of Recent Project Experience

	PROJECT	CLIENT	DATE
1.	Nansindlela Research, Demonstration and Training Farm	Various donors	Ongoing
2.	Southern African Vetiver Network	KwaZulu-Natal Dept of Agriculture and Environmental Affairs and donors	Ongoing
3.	Operational Extension Strategy for the KwaZulu-Natal Department of Agriculture	KwaZulu-Natal Dept of Agriculture and Environmental Affairs	2002
4.	Umkhanyakude Small grower Groundnut Pilot Project	KwaZulu-Natal Dept of Economic Development and Tourism	2002
5.	Development of a tourism strategy for western Tete province (Mozambique) with emphasis on Tchuma Tchato	Provincial Directorate of Tourism (Tete) / Ford Foundation	2002
6.	Rapid scan of agricultural potential for Umkhanyakude District Council	Department of Economic Development and Tourism	2002
7.	Identification of candidate wetlands in the Mearns Basin for rehabilitation and recommendation of appropriate rehabilitation measures.	DWAF	2002
8.	Maputaland Cashew Nut Farmers Association business plan	Maputaland Cashew Nut Farmers Association	2002
9.	Business plan for the development of a community production centre in Swaziland	Stewart Scott	2002
10.	Implementation of a monitoring and evaluation system for the KZN Department of Agriculture	KZNDAEA	2002

11.	Development of an operational extension strategy for the KZN Department of Agriculture	KZNDAEA	2002
12.	Medicinal plant industry strategy and business plan development for eThekwini Municipality	eThekwini Municipality	2002
13.	Review, amendments and registration of founding documents for the Zamakhupile Fruit and Vegetable Co-operative	Independent Development Trust	2002
14.	Medicinal plant industry strategy and business plan development for KwaZulu-Natal	KwaZulu-Natal Department of Economic Affairs and Tourism	2002
15.	Development of a SADC network for commercialisation of indigenous fruit, fibre, timber and medicinal plants and products	Kellogg Foundation	2002
16.	Assessing the economic impacts of different water management scenarios (environmental reserve) for the Thukela catchment	Department of Water Affairs & Forestry	2001 - current
17.	Assessment of the environmental impacts arising from the proposed development of an irrigated estate on the Makhathini Flats	Noordelike Sentrale Katoen	2001 - current
18.	An environmental scoping study for the proposed resettlement of the Hilton Valley Community	Hiltonian Society	2001 - 2002
19.	Preparation of socio-economic, health and landcare criteria and indicators to monitor the impacts on local households arising from the development of the Maguga Dam, Swaziland	SKPE	2001 - 2002
20.	Catchment Assessment Tool for guiding Strategic Planning in the eThekwini Municipal Area	eThekwini Municipality	2001 - 2002
21.	Identifying optimal strategies for promoting sustainable rural livelihoods in commercialising marula products	Centre for Ecology & Hydrology (Department for International Development)	2001 - 2002
22.	Environmental scoping for the development of an irrigation project on the Makhathini Flats for the Phapamani Farmers Association	Independent Development Trust	2001 - 2002
23.	Sustainability plan for the Makhathini community production centre	Independent Development Trust (Dept of Public Works)	2001 - 2002
24.	Implementation of a pilot community production centre project under the community based public works programme on the Makhathini Flats	Independent Development Trust (Dept of Public Works)	2001 - 2002
25.	Establishment of criteria for the evaluation of the extension service of the KZN Department of Agriculture	KwaZulu-Natal Dept of Agriculture and Environmental Affairs	2001
26.	Investigation of environmental guidelines for responsible tourism in South Africa	Natural Resources Institute (United Kingdom)	2001
27.	Assessment and evaluation of potential land use options in the Mbangweni Corridor, northern KwaZulu-Natal	Group for Environmental Monitoring	2001

28.	Assessment of natural resource assets and environmental opportunities in the Greater Edendale Area, Pietermaritzburg	Ridl Glavovic	2001
29.	Environmental Management Plan - Ndumu "A" Irrigation Scheme	KwaZulu-Natal Department of Agriculture and Environmental Affairs	2000 - current
30.	Establishment of peri-urban community gardens in Sobantu	KKS/COMPASS	2000 - current
31.	The commercialisation of a range of indigenous medicinal and fibre plant products in association with small scale traders and traditional healers in KwaZulu-Natal including: - propagation, cultivation, sustainable harvesting, processing, packaging, enterprise development, capacity building and marketing - establishment of several small business using technologies developed	Department of Arts, Science, Culture and Technology	2000 - current
32.	KZN Coastal Craft Work and Medicinal Plant Project	Department of Environment Affairs and Tourism	2000 - 2002
33.	Development of the Principles, Criteria, Indicators & Standards (PCI&S) for Sustainable Forest Management	Department of Water Affairs and Forestry	2000 - 2002
34.	Land Care Programme - Small Scale Agricultural Development (Edendale)	KwaZulu-Natal Department of Agriculture and Environmental Affairs	2000 - 2002
35.	Spring Grove Dam EIA – Investigation of impacts to wetlands and associated crane populations	Water Resource Planning/ Alletson Ecologicals	2000 - 2001
36.	KwaMashu-Effingham Link Road: A Comparison of the Environmental and Socio-economic impacts of alternative alignments through Kenville	eThekweni Municipality: Engineers department, Traffic and Transportation	2000 - 2001
37.	Needs-Driven, Farmer-Led Programme to strengthen farmer organizations to access service providers themselves and drive their own development in Vulindlela District and Sobantu Village	Independent Development Trust	2000 - 2001
38.	Assessment of the environmental impacts arising from the proposed scenarios reflecting the range of options for the airport and industrial development in the South Industrial Basin and the relocation of the airport to La Mercy	Durban North, South and Central Local Councils	2000
39.	Assessment of the environmental implications of the Land Reform Process in South Africa	Land and Agricultural Policy Centre	2000
40.	Mtentu Scoping: identification of potential impacts and mitigation measures for the extension of a community camp at the Mtentu Estuary, Eastern Cape	European Union	2000

41.	Assessment of resource use patterns and recommendations towards a management strategy for the Sihangwane Sand Forest, northern KwaZulu-Natal	Human Sciences Research Council / HNRE programme	2000
42.	Scoping exercise to identify issues and potential impacts associated with the construction of a barrage scheme on the Mkomazi River	Sappi Saicor	1999 - current
43.	Small-scale Cane Contractor Support Programme: forming and strengthening contractor/grower/miller committees	SA Sugar Association	1999 - 2002
44.	Utilisation and development plan for Ntendeka Wilderness Area	Department of Water Affairs and Forestry	1999 - 2002
45.	Assessment of environmental Impacts of proposed infrastructural and tourism ventures along the Transkalagadi highway in Botswana	Imani-Capricorn	1999 -2000
46.	Identification of tourism development opportunities in the Ongoye Forest Reserve, and the preparation of enterprise development and operating models for preferred enterprise opportunities	KZN Tourism Authority	1999
47.	Small-scale Cane Contractor Support Programme: training in cane husbandry, basic business, basic organizational procedures (with SASA Experiment Station)	SA Sugar Association	1999
48.	Eastern Cape Estuaries Management Programme	Department of Environment Affairs and Tourism, Water Research Commission	1998 - current
49.	Development of an approach for incorporating economic considerations into the quantification, allocation and management of the environmental reserve for rivers	Water Research Commission	1998 - 2002
50.	Land Care Natural Products Project	Department of Agriculture	1998 - 2001
51.	Preparation of an environmental management policy and plan for the South African sugar industry. Environmental management support programme for Cane Growers	Cane Growers	1998 - 2001
52.	Project management, design and feasibility assessment of a 800 000ha wildlife reserve and tourism development in Gaza and Maputo Provinces, Mozambique	Dinson & Associates and Government of Mozambique	1998 - 2000
53.	Etafuleni Ward (near Verulam) : Feasibility survey on Urban Agriculture	eThekwini Municipality	1998
54.	Incorporation of woodland use values by subsistence farmers into national accounting	Council for Scientific and Industrial Research	1998
55.	The economic valuation of biodiversity in Swaziland and recommended strategies for commercialization	United Nations Development Programme	1998
56.	Management of the environmental component of the development of the Bivane Dam	Impala Irrigation Board	1996 - current

57.	Incorporating economic valuation of estuaries for supporting decision making in estuarine management	Water Research Commission	1996 - 2002
58.	Marketing surveys of traditional medicine in KwaZulu-Natal, Eastern Cape and Mpumalanga	Department of Environment Affairs & Tourism, Human Science Research Council, FAO, Durban City, DANCED & Department of Water Affairs & Forestry	1996 - 2000
59.	An economic analysis of indigenous plant cultivation strategies for South Africa	Department of Environment Affairs and Tourism and Human Science Research Council	1995 - 1998
60.	Honey Production – introduce simplified beekeeping methods as an income generator.	Brot fuer die Welt	1994 - 1998

APPENDIX A

PARTNER ORGANISATION'S PROFILES

Children in Distress

CINDI

Networking for children affected by AIDS : Ref 011-496 NPO

CO-ORDINATING OFFICE

c/o The Anglican Cathedral, 169 Longmarket St, Pietermaritzburg 3201. P O Box 157, Pietermaritzburg 3200.

Tel. 033-3457994. Fax 033-3457272 E-mail : yspain@sai.co.za Website : www.cindi.org.za

CINDI INFORMATION SHEET : NOVEMBER 2002

1 BACKGROUND

CINDI was founded in July 1996 and currently consists of over eighty government and non-government agencies who collaborate around the issue of children affected or orphaned by AIDS in and around Pietermaritzburg (where it is estimated by practitioners in the field, that the numbers of orphans in the municipal area range from between 8 000 - 10 000).

2 OBJECTIVES

CINDI Partners look to each other for support, share information, mobilise resources, lobby on behalf of children affected by HIV/AIDS and unite for action.

3 ACTIVITIES

The activities of the Partners fall into three broad categories

- Prevention (mobilising and empowering communities to take care of vulnerable children);
- Early Intervention (when prevention fails, ensuring that rapid intervention strategies are in place to divert children from institutional care to community based models of care);
- Children In Care (ensuring optimum care in institutions, foster care or cluster foster care).

4 WORKING GROUPS

CINDI Partners coalesce around specific issues and have formed the following working groups **:**

4.1 **Child Intervention Panel (CHIP)** a monitoring and advocacy peer group panel that secures administrative justice for children caught up in bureaucracy. CHIP is currently chaired by the Director of Pietermaritzburg Child Welfare Society.

4.2 **CINDI Research Reference Group** - an ad hoc Working Group that guides research conducted on behalf of the Network eg "Wo! Zaphela Izingane/It Is Destroying The Children" by Prof Tessa Marcus 1999, and "CINDI : A

Critical Analysis and Guideline for Networking." UNP School of Psychology 2001. These documents are available on our website

4.3 **Home Based Care Consortium** (Msunduzi Hospice is the Lead Partner), which developed an isiZulu Home Based Care Tutor Training curriculum for community groups with limited literacy skills. The teaching material for this course was developed in conjunction with the Centre for Adult Education, University of Natal, Pietermaritzburg. The Consortium has recently secured training contracts for the local Departments of Health and Welfare, and funding permitting, aims to offer the Course to disadvantaged communities at no charge.

4.4 **The Thapelo Medicines Access Working Group** (Msunduzi Hospice is the Lead Partner) accesses non-script palliative medicines (eg worm remedies, vitamin syrups, Bactroban ointment etc) on behalf of home based carers, foster parents and institutions who are caring for dying children. (This project is named after an abandoned little girl who died of full blown AIDS at one of the facilities run by a CINDI Partner. The staff named the child Thapelo, which means prayer in Sotho.) The Thapelo Project has just been given a converted shipping container by Coca Cola which has been placed at Msunduzi Hospice's office in Edendale from where we began our Pilot Dispensing Project on 22 April 2002. We were able to purchase an initial stock of materials thanks to the generosity of a Dutch surgeon who worked at Edendale Hospital in the 1970's and who on his retirement asked patients and colleagues to make monetary contributions to CINDI in lieu of (unwanted) gifts - this amounted to R28 000. Thapelo receives limited stocks (gloves, baby powder, disinfectants etc) from the Msunduzi Municipal Health Department and receives advice from the Chief Provincial Pharmacist who will hopefully facilitate our access to State Tender prices for the purchase of our supplies.

In October 2002, the Working Group employed a part time BSc graduate (three mornings a week) to manage the stock control and to monitor the work of the caregivers.

4.5 **The Healing Plants Project** - together with the National Botanic Society (Lead Partner), CINDI and Life Line/Rape Crisis are propagating and promoting the use of the common indigenous plants bulbine and carpobrotus (sour fig) in the treatment of skin diseases and thrush associated with HIV/AIDS. These plants are available from Life Line at no charge and complement the work of the Home Based Care Consortium and the Thapelo Project.

In October 2002 the Working Group received funding from the Vodacom Foundation which enabled it to print 2 000 full colour information posters which have been distributed to schools, clinics, libraries and government departments.

4.6 **The Housing Access Working Group** (Built Environment Support Group /BESG is the Lead Partner) is lobbying the Municipality and Provincial Housing Department to ensure that their policies make allowance for the reality of child-headed households and orphans and vulnerable children.

4.7 **Children to Children Outreach** - a pilot programme involving approximately 5 local primary schools who be collect items for sick children (such as Super C's, lip ice, face cloths, toilet soaps, Dettol etc) which are then distributed to CINDI organisations who are caring for sick children via the Thapelo Project.

4.8 **Local Government Working Group** - CINDI works closely with local government (especially our Deputy Mayor, Clr Zanele Hlatshwayo) and has ensured that the needs of children in distress are included in the Integrated Development Plans of the Msunduzi and Umgungundlovu Municipal Councils.

4.9 **The Nutrition Working Group** (Life Line is the Lead Partner) recognises that it is difficult for HIV+ve people and other vulnerable groups to live healthy lives in the absence of adequate nutrition. Consequently the Working Group hopes to enhance people's access to groups in Pietermaritzburg who are providing emergency food aid, share information about good nutrition practices, and offer training in order to encourage communities to become involved with food production.

The Working Group has just purchased a quantity of E-pap (a fortified maize porridge that is enhanced with vitamins and mineral such as selenium and zinc for use in poor families and immune compromised people). This product is soluble in COLD water, so that people do not have to collect firewood to prepare it, and can feed an adult twice a day for 5 - 7 days at R7,50 which is our current selling price to CINDI Partners. In future, we intend to set up a network of PWLA who can sell the porridge as an income generating project.

4.10 **The CINDI Funding Panel** – The CINDI Network has recently been approached by several large donor agencies who have enquired about the possibility of giving money to CINDI Members through the Network. In addition, they have asked CINDI to take on the role of selecting and monitoring the final funding applications. Consequently in March 2002 CINDI drew up a Corporate Funding Protocol and agreed to become a conduit for funding proposals in excess of R500 000 in order to manage this process and in the interests of equity and transparency CINDI will create a five person Funding Panel consisting of neutral members of the Network and independent members of the community, who will be elected by the CINDI Members.

MSUNDUZI MUNICIPALITY

The Msunduzi Municipality, also known as the City of Pietermaritzburg, is a local authority catering for the needs of 570,000 people, of whom it is estimated that 100,000 are living with HIV/AIDS, and of whom approximately 300 per month are dying of AIDS/TB.

With approximately 3,500 employees it provides a wide range of municipal services, including water, sewerage, housing development and rental, municipal traffic control, fire and emergency services, libraries, clinics and environmental health services, roads, drainage, community halls and sports facilities, stimulating economic development and tourism, an airport, parks, gardens, cemeteries and electricity.

In addition to these traditional services it provides community development services to residents through its decentralised Ward Committee structures, which include capacity building in various aspects, strengthening of democracy through promotion of local decision making, development of income generating projects, stimulation of community food gardens, leadership skills for youth, and general life-skills education and training.

It forms the level of Government which is closest to the people, and it is accountable to its residents through 73 elected Councillors and the 37 Ward Committees.

Since November 2001 it has initiated the Msunduzi AIDS Strategy, which is a partnership approach to addressing the AIDS epidemic at local level. It is an initiative of the Msunduzi Municipality and Non-Governmental Organisations in the area, principally those belonging to the CINDI Network, together with many faith-based organizations, community-based organizations and some businesses. It aims mainly to fill the gaps in service provision left by other levels of Government, and to address all levels of intervention from prevention, through treatment and care, to impact mitigation. While there is an initial business plan, it is non-prescriptive regarding the possible activities by participating partners, and aims instead to rather see how each partner can support and augment the activities of other partners, thus leading to a response to the epidemic which is more rapid, extensive and creative.

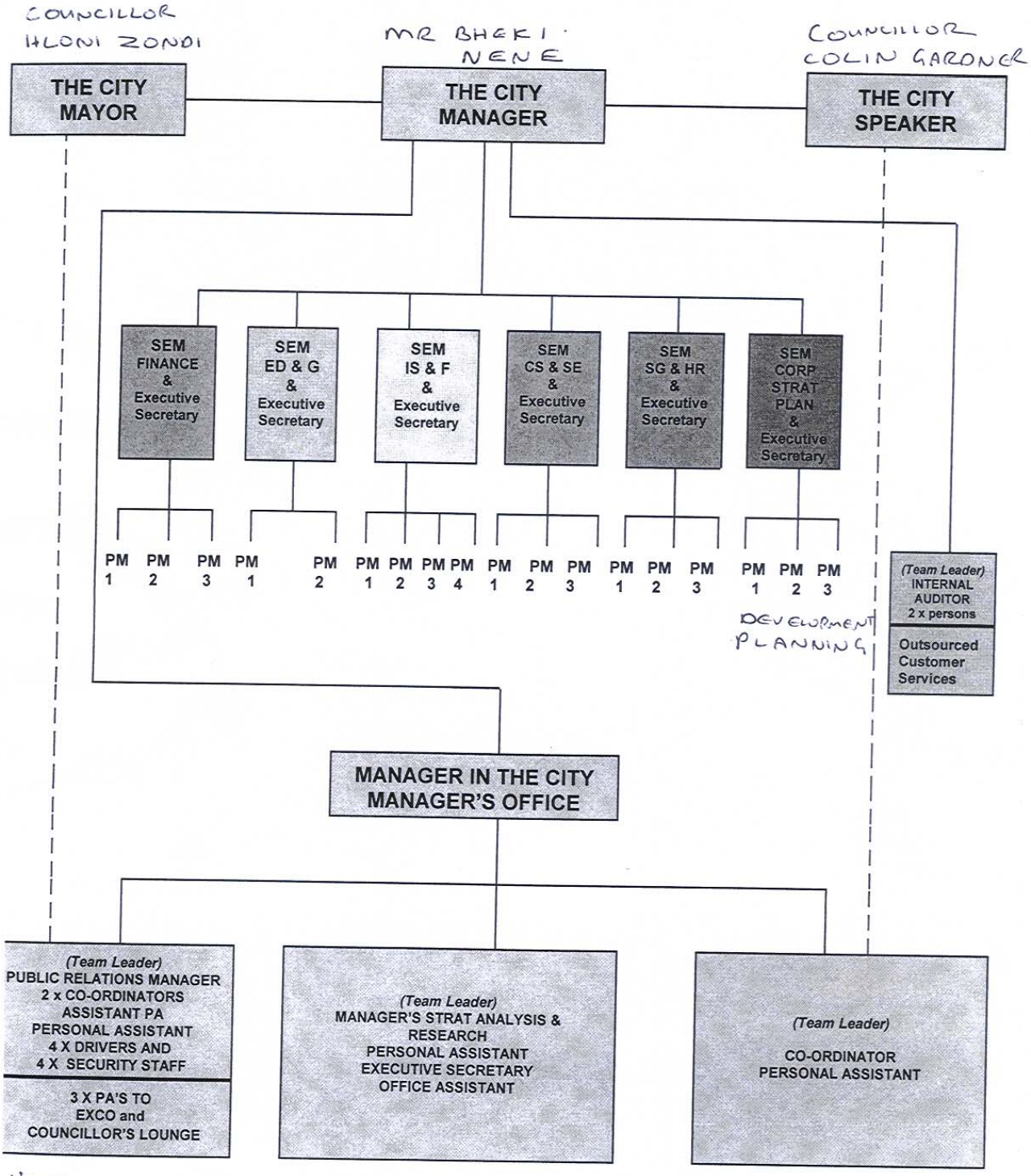
Further information on the Municipality and its AIDS Strategy can be obtained from:

Dr Julie Dyer
Medical Officer of Health
PO Box 89
Pietermaritzburg 3200
South Africa

Dyerj@pmbcc.gov.za
Tel (27) 33-3951350
Fax (27) 33-3951505

ANNEXURE A

ORGANISATIONAL STRUCTURE



NOTE:

SEM – STRATEGIC EXECUTIVE MANAGER

PM – PROCESS MANAGER.

NAIROBI FOOD NETWORK

PROJECT PROPOSAL PRESENTED TO THE "CITIES FEEDING PEOPLE" PROGRAMME IDRC – CFP AND THE URBAN HARVEST PROGRAMME OF CIP/CGIAR

OCTOBER 2003

PRINCIPAL INVESTIGATORS

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Total Estimated Cost of the Project: US Dollars **66,000.00**

Total Cost (US Dollars)	NCC	KARI	DRD	IDRC
66,000.00	**8470.00**	**11770.00**	**9020.00**	**42,240.00**

Duration of the Project: 36 months, (January 2004 – December 2006)

Location of project: Nairobi City and neighbourhoods (Thika District, Kiambu District, Ngong and Athi River).

Key Words: Adaptive research, information network, institutional linkages, Nairobi, policy-makers, poor urban farmers, public awareness-raising, research dissemination, service providers, technology transfer, urban agriculture policy, urban agriculture.

NAIROBI FOOD NETWORK

Background

Rapid urbanization in Kenya has been accompanied by inequitable economic growth resulting in increased urban poverty with many low-income households suffering from extremely limited alternative livelihood options and food insecurity. Nairobi City has an estimated population of 2.5 million people and is projected to reach 3.2 million by the year 2010 (GoK, 2001). The Economic Survey of 2003 (GoK, 2003) recorded 50% prevalence for absolute poverty in the city. With a population growth rate of 4.6%, the city will continue to experience an increasing demand for food. To meet their food demands and some surplus for sale, the urban poor grow crops along roadsides, in the middle of roundabouts, along railway line, under power lines and keep domestic animals including cows, pigs, chicken and goats that can be seen roaming about or scavenging on solid waste dumps in residential areas.

In Nairobi urban agriculture is a multi-purpose activity providing means of diversifying livelihoods, while contributing to households' food demand, incomes, insurance needs and welfare (LPP, 2002). It is an economically viable activity that creates opportunities including jobs; waste recycle, access to food; use of vacant land; micro-enterprise development and improved urban environment (Lee-Smith *et. al.,* 1987; Dannery, 1996; Ishani *et. al.,* 2002). The urban poor populations in the informal settlements are the major actors in this sub-sector. (Dannery, 1996). Furthermore it has been shown that vulnerable groups, such as female-headed households, children, retired people, widows and people with limited formal education are particularly involved in urban agriculture (Ishani *et. al.* 2002). The urban poor increasingly require appropriate knowledge and information on urban agriculture to improve their livelihoods as urban agriculture is increasingly being seen as an important component of urban development, and urban environmental management (Sawio and Spies, 1999).

Although a lot of research has been done all over the world and even in Nairobi there is no collaboration, co-ordination and networking for dissemination of research results among researchers, practitioners and farmers at the grassroots level in Nairobi. Development agencies and researchers who possess knowledge on urban development do not disseminate that knowledge to the urban poor effectively, resulting in only limited uptake and impact at the grassroots (Schilderman, 2002). Reasons given for this include lack of knowledge about the information needs and resources of the urban poor, dissemination through top-down approaches, inappropriate information resources and minimal use of participatory communication methods. Due to limited access to information on urban agriculture there are negative attitudes towards it, social-cultural biases against it, constraints to access of resources, inputs and services for its development, health risks, production and postproduction constraints and a general lack of organization. These constraints and biases about urban agriculture are further reinforced by the mainstream news media, which more often than not reports about the environmental and health risks from inappropriate practices.

Urban agriculture in Nairobi remains unrecognized by legislators, farmers, academia, service organizations, local support organizations, development agencies, the general public and governmental agencies resulting in lack of the political goodwill necessary for its progress. Currently, city planners do not take into account the demands of urban agriculture in their planning and urban agricultural producers in Nairobi face a variety of institutional constraints including restrictive legislation. Yet, cities around the world continue to exploit this opportunity (Bellows et. al. 2000; City farmer, 1999; Ghirotti, 1999).

The key to unlocking these constraints that work against urban agriculture is to increase awareness of the important role that urban agriculture can play in sustainable urban development. Information services is recognised as one sector that drives development and economic growth throughout the economy. Since local governments have a major role to play in urban poverty reduction, relevant information is needed to advise policy makers and city

authorities in order to provide guidance for the formulation of pro-poor urban action plans and legislation. Moreover, the poor urban agricultural producers are marginalized in terms of access to existing knowledge and improved technologies. Thus, there is a clear opportunity to improve the current production and management systems through information sharing. Information will be the necessary prerequisite to knowledge for enhanced capacity development and empowerment of the urban agricultural producers. This is envisaged to lead to enhanced food security and income generation with improvements to the environmental and human health as important by-products.

Therefore, the long-term goal of this project is to promote urban agriculture as a strategy for environmentally, socially, and economically sustainable urban development in Nairobi.

Overall objective
To improve accessibility and availability of balanced and analytical public information on best practices of urban agriculture and related subjects for policy development and action programs at the national, city and community levels.

Specific objectives
1. To improve public awareness and knowledge on urban agriculture for broader appreciation of its benefits and limitations.
2. To facilitate information exchange and sharing among institutions and individuals involved in urban agriculture.
3. To facilitate the integration of urban agriculture into policies, strategies, programs, action plans and projects.

Proposed activities/Methodology
1. To improve public awareness and knowledge on urban agriculture

Activity 1.1. To gather, analyze and interpret information on urban agriculture:
There is a need to perform an overview of urban agriculture from earlier surveys, evaluations and knowledge with a focus on the characteristics, trends, issues and constraints in urban and peri-urban areas. To this end, the desktop literature search of local and international literature on urban agriculture will generate reports that enable local actors to identify opportunities and potentials for improvements and which build upon local innovations. The information will be compiled into reports.

Activity 1.2. To analyze the current status of communicating information and knowledge on urban agriculture in Nairobi with a view to establishing the information needs of beneficiaries and stakeholders and the way in which inherent constraints can be overcome.
Access to information and communication are essential prerequisites to development of knowledge (Schilderman, 2002). Communication for social, economic and technological development encompasses many different media and approaches. There is a need to determine the current status of communicating information and knowledge and delivering services of UA in Nairobi. This project proposes to use a process of dialogue with the urban farmers and decision-makers in determining the different media and approaches used to communicate with them. The methodology to be used will be based on AKIS. This exercise is envisaged to generate information attitude towards urban agriculture, information needs and gaps identified and suggestions provided on the most appropriate communication channels and pathways for information dissemination to different actors.

Activity 1.3. Establishing an urban agriculture resource center.
To facilitate the use of information by potential users, a resource center located within KARI will serve as a reference of local, national and international information on urban agriculture.

Information will be collected and made available in a centralized location. For enhanced data management computer hardware and software will also be set up.

Activity 1.4. Packaging urban agriculture information.
Stakeholders of urban agriculture are varied. The differences among them imply differences in interests, needs, levels of education and resources. To provide information on the opportunities of urban agriculture and the solutions to the problems requires that information be packaged to cater for the different user needs and resources. For effective communication, to users of urban agriculture information, various methods will be used to package information on UA for individual, group and mass communication. These methods include newsletters, reports, radio broadcasts, T.V. documentaries, newspaper articles, Internet web pages, policy briefs, workshop materials and journal articles.

Activity 1.5. Dissemination of urban agriculture information to policy makers, urban farmers, support organizations (e.g. NGOs, CBOs, Academia, NARS, IARS, Development agencies and Service providers).
For the information to be useful it must reach the end user. In disseminating information on UA, this project will endeavor to have the widest reach possible. In this regard it will incorporate as many systems for information delivery as possible. At the individuals level the project will facilitate face-to-face interactions between individuals, word of mouth and e-mail. At a group level community meetings, academic, professional, and sector journal articles, experiential learning, training, demonstrations, and exchange visits will be instituted. For mass communication posters, broadcasts on national radio and T.V. and written articles on newspapers together with publicity through exhibitions (e.g. Nairobi trade fair) and outdoor media (e.g. bill boards, bus back panels and painting slogans on walls) will be used.

2. To facilitate information exchange and sharing among institutions and individuals involved in urban agriculture.

Activity 2.1. Facilitate the setting up of an urban agriculture information network.
Social networks including kinship, proximity, and friendship, that function on the basis of reciprocity are the foremost source of information of the urban poor (Schilderman, 2002). Poor networking and organisation among poor urban militates against their ability to express their demands in a concerted way. Facilitating the formation of a network of researchers, community based organisations, farmers at the grassroots level and other actors involved in urban agriculture will lead to the development of community social capital. This will in turn make it easier for individuals to access information and for the communities to develop a knowledge capital. Through the network this project will in addition deliver a model for building dialogues regarding urban agriculture, which emphasises organisational/institutional innovations and participatory technology development. Finally, to enhance sustainability, knowledge pathways for the dissemination of outputs will be identified and a forum for linking agents and actors involved in urban production established. The network will endeavour to remove constraints and problems constraining the promotion and management of urban agriculture among its members. Particular emphasis will be laid on access of information to women because of their inherent disadvantages and to other marginalized groups.

It is envisaged that a web page hosted within the KARI Website will enhance information exchange between policy makers and actors at institutional levels. Farmers' exchange field trips to production sites with well-managed UA will cater for persons at the grassroots level. In addition workshops, seminars, conferences and consultative meetings for all actors will work to facilitate the integration of urban agriculture into policies, strategies, programs, action plans and projects.

Activity 3. Collaborate with all stakeholders in generating and distributing relevant information and influencing change in policy.

A policy environment that is conducive for urban agriculture to thrive needs to be fostered through a consultative effort of all actors. To this end KARI, NCC and DRD will work with all other partners to influence policy change in favor of urban agriculture. Specifically, collaboration will be instituted with:
(a) The Nairobi Livestock Forum activities especially the information management study and dissemination, and urban livestock policy consultations.
(b) The Nairobi Urban Food Supply and Distribution Project activities especially in organizing workshops for information dissemination and urban food policy consultations.
(c) NEMA to **i**dentify and disseminate environmental standards (indicators) relevant to urban agriculture and participate in urban environmental policy consultations.

Outputs

1. Balanced and analytical public information on best practices of urban agriculture and related subjects for policy development and action programs at the national, city and community levels.
2. Improved public understanding on urban agriculture and strong collaborative partnerships among policy makers, researchers, practitioners and farmers at the grassroots level for information sharing, diffusion of best practices, identification of priority issues and elimination of wasteful duplication of activities.
3. Acceptance of urban agriculture as an important sector in urban development and its inclusion into policies, strategies, programs, action plans and projects.

Expected Beneficiaries

Urban farmers and their associations, Service Providers, Civil Society Organizations, Development Partners, Policy-makers, Extension workers, Business Community, Researchers, Local Authorities, General Public, The Academia, Relevant Government Agencies, The Media, Opinion Leaders.

Dissemination, followed up and sustainability

While the project will be aimed at Nairobi, the methodology that will be applied and networks established will be important lessons for other towns in Kenya and the region. Such lessons will be disseminated to other towns through publications, audio-visual media, conferences and workshops, technical reports, the website media presentations, exhibitions and outdoor media. The best practices and identified needs in communication and information delivery will facilitate follow up pilot projects. Since women are the majority stakeholders in urban agriculture their needs will receive special attention in this project.

Monitoring and Evaluation

Monitoring and evaluation activities are integral components of the project. Monitoring and evaluation will be bottom-up, interactive and participatory involving all key stakeholders and especially the local communities. Independent evaluations may be undertaken as integral part of the project. The need for an in-depth ex-post evaluation will be decided upon towards the end of the Project. At the same period impact evaluation will be undertaken to verify the achievements and lessons to be learnt for further implementation in other future projects

The Project design incorporates the utilization of the Project logical framework as a monitoring and learning tool. This will be developed further, during the training course and upon the inception of the Project, to provide a hierarchy of logical frameworks for each component, detailing required outputs and benchmarks by quantity, quality and time. The Department of Research Development, in collaboration with all the stakeholders and beneficiaries, will be responsible for overall monitoring of Project activities. The three- team

members will backstop Project activities through planned monitoring visits, review meetings and regular progress reporting.

The Project Document will be subject to a revision with respect to impact bench marking, and regular consultations will be held to review the progress of Project activities and make suggestions for modifications and re-orientation of activities as may be necessary. Monitoring of the project will involve impact monitoring by use of benchmarks. The performance indictors for the Project are the benchmarks set out in the log-frame. The achievement of these benchmarks is to be monitored very closely by the Project team and quarterly reports prepared. Project Performance Evaluation Reports (PPER) will be prepared regularly to review progress on the output benchmarks and make recommendations for any appropriate modifications necessary to enhance the implementation of the output benchmarks.

KEY STAKEHOLDERS AND THEIR ROLES

KENYA AGRICULTURAL RESEARCH INSTITUTE: Will be the lead institution through the Research Officer in the Socio-Economics Department. The officer will be responsible for project coordination and will lead these activities by dedicating 50% of their time to the project under KARI's guidance. KARI will also contribute expertise on dissemination of knowledge and technologies and catalyze the process of outreach and adoption of agricultural technologies; the development/change of agricultural policy environment and literature review, synthesis reports, organizing workshops; and provide space for setting up the Urban Agriculture Resource Centre.

NAIROBI CITY COUNCIL: Within the Department of Environment (DoE), the Environmental Officer, in collaboration with the Department of Public Health, Department of Urban planning and Department of Social Services, will supply expertise on ways of achieving a clean environment and environmentally sound agricultural productivity. They will also provide substantive support to the Research Officers from KARI and the DRD in producing all outputs and spearhead initiatives for forming linkages with on-going UA initiatives.

THE DEPARTMENT OF RESEARCH DEVELOPMENT (DRD), IN THE MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

The Department of Research Development's core functions are: facilitating the formulation and implementation of national R&D policy; mobilization of funds for R&D; research liaison, coordination, inventory and dissemination. The Department liaises with all research and development organizations in the private and public sectors at the national, regional and international levels to ensure that national socio-economic development is actively supported by research through converting R&D results into goods, services and new technologies. Currently the Department is coordinating a project on 'Enhancing urban food security by improving food supply and distribution systems, which is expected to generate base line information from detailed case study in Nairobi. The resulting information will be disseminated using the Nairobi Food Network. The Department will also has expertise in monitoring, evaluation and impact assessment of R&D projects which it will bring o board the project.

OTHER COLLABORATING GROUPS AND THEIR POTENTIAL ROLES

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

Co-ordinates the various environmental management activities being undertaken by different agencies. Other functions include: Carrying out surveys to assist in proper management of Environment; advice the Government on legislative and other measures for the management of the environment and implementation of relevant treaties and awareness creation. NEMA will be involved in development and dissemination of relevant standards and indicators for urban agriculture.

URBAN HARVEST: Will supply background expertise on urban farming and contribute to project coordination through the presence of the Regional Coordinator. Will provide substantive technical support to the project.

GREENTOWNS: Kenya Greentowns Partnership Association is working with grassroots communities in several areas of Nairobi. Working together with Mazingira Institute, they have participated in a scoping study on livestock in Kibera, Kangemi, Dandora, Embakasi and Kahawa (See Ishani et al., 2002).

CORE AND CITY PARK HAWKERS COMPOSTING GROUP
A network of waste recyclers, with chapters in Nairobi, Nakuru and Kisumu. The Nairobi centre is in Majengo. They are members of Waste-net. They mobilize waste pickers from among the unemployed youth and produce and sell compost as well as other items from recycled waste including charcoal briquettes, mattresses and pillows from reused plastic stuffing etc. They are negotiating with the City for a plot(s) for waste separation and sorting. Waste-Net is helping with this process. They are one obvious source of data and consumers of project information and collaborative testing of innovations.

MAZINGIRA INSTITUTE: Has undertaken a lot of studies in Nairobi in the past. Recently carried out a study on urban and peri-urban small livestock keepers in Nairobi together with Greentowns. Currently the institute is the focal points for Nairobi Livestock Forum Project that will soon under take a study on information management systems. The institute also has a library with a lot of information on urban agriculture which will serve as a valuable resource during the background review.

KENYA BROADCASTING CORPORATION is the semi-government with radio Television stations and broadcasting that has complete national coverage national**.** Cooperate sponsors will be identified so that a 15 minute monthly program can be presented in English and Kiswahili radio stations.

NATION MEDIA GROUP publishes the Daily Nation (in English) and Taifa Leo (in Kiswahili) that are the most popular daily newspapers in Kenya. A monthly column will be dedicated for urban agriculture issues during the project.

MINISTRY OF LIVESTOCK AND MINISTRY OF AGRICULTURE
They will provide the necessary extension services and have close contacts with the farmers. They will provide information and will be consumers of the information generated by this project to advice farmers in Nairobi. This project will benefit from expertise of 43 frontline extension workers, 30 divisional subject matter specialists and 17 provincial subject matter specialists.

UNIVERSITY OF NAIROBI
The network will provide some materials to be used by the university in training. Will undertake to develop relevant technologies for UA in collaboration with other stakeholders such as KARI.

URBAN AGRICULTURE INITIATIVES
Will in collaboration with KARI, DRD, NCC and other stakeholders mobilize the urban communities consciousness to enable them grow their own food and maintain a healthy, clean and green environment through sustainable consumption habits. This will be done through elaborate programs including awareness and training, civic and environmental education, and advocacy and networking programs.

WORK PLAN

Activity No.	Summary narrative	Lead	Contribute	Time in Quarters											
				J-M/04	A-J/04	J-S/04	O-D/04	J-M/05	A-J/05	J-S/05	O-D/05	J-M/06	A-J/06	J-S/06	O-D/06
1.1.	To gather, analyze and interpret information on urban agriculture:	KARI, NCC, DRD	All	X											
1.2.	To analyze the current status of communicating information and knowledge on urban agriculture in Nairobi.	KARI,NCC, DRD, NAIROBI LIVESTOCK FORUM	All	X	X										
1.3.	Establishing an urban agriculture resource center.	KARI, NCC, DRD	All			X	X								
1.4.	Packaging urban agriculture information.	KARI, NCC, DRD	All				X	X							
1.5.	Dissemination of urban agriculture information to policy makers, urban farmers, support organizations (e.g. NGOs, CBOs, Academia, NARS, IARS, Development agencies and Service providers).	KARI, NCC, DRD	All				X	X	X	X	X				
2.1.	Facilitate the setting up of an urban agriculture information network.								X	X	X	X	X		
3.1.	Collaborate with all stakeholders in generating and distributing relevant information and influencing change in policy.	KARI, NCC, DRD	All						X	X	X	X	X	X	X
	Monitoring and evaluation	KARI, NCC, DRD	All				X	X	X	X	X	X	X	X	x

BUDGET

Activity No.	Narrative summary	Total Cost (US Dollars)	NCC	KARI	DRD	IDRC
a)	Personnel salaries (3 Technical staff for 3 years. and 1 Administrative/support staff 3 years)	18000	6000	6000	6000	-
b)	Subsistence	8000	-	-	-	8000
c)	Office space/Accommodation			2500		2500
d)	Consumables (e.g. Stationery).	4000	500	500	500	2500
e)	Other services (e.g. Tel./Fax, postage).	4000	-	-	-	4000
f)	Computer/e-mail	1500	-	-	-	1500
g)	Transport costs (Fuel)	5000	-	-	-	5000
h)	Cost for library searches including photocopying.	3000	500	500	500	1500
i)	Consultant services (e.g. setting the computer database for UA, web design)	2500	-	-	-	2500
j)	Contracted services (e.g. printing pamplets, brochures, posters, maintaining web page)	5000	-	-	-	5000
k)	Stakeholders consultation meetings.	5000	500	500	500	3500
l)	Production and broadcasting of 10-15 minutes radio program	2000	200	200	200	1400
m)	Monitoring and evaluation	2000	-	500	500	1000
Total		**60000**	**7700**	**10700**	**8200**	**38400**
Miscellaneous 10 % of Total		6000	770	1070	820	3840
GRAND TOTAL		**66000**	**8470**	**11770**	**9020**	**42240**

THE LOGICAL FRAMEWORK MATRIX

	Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions	Actors
Goal	Promote urban agriculture as a strategy for environmentally, socially, and economically sustainable urban development in Nairobi.	• Reduced urban poverty. • Increased employment. • Improved organic waste management.	• Documentation • Observation	There will be community and political support for urban agriculture.	All.
Objective 1	**To improve public awareness and knowledge on urban agriculture for broader appreciation of its benefits and limitations.**	• Increased demand for information on urban agriculture.	• Number of Web page hits. • Number of requests for information.	There will be active participation and no breakdown in communication among stakeholders and beneficiaries.	All
Output 1.1.	Balanced and analytical public information on best practices of urban agriculture and related subjects for policy development and action programs at the national, city and community levels.	• Availability of information packaged for different users. • Knowledge of urban agriculture updated. • Add to available literature.	• Documentation (pamplets, reports, newsletters e.t.c.) • Monitoring and Evaluation reports (Ex – and post-ante) • Citation analysis.	Availability of sufficient funds.	All
Activity 1.1.1.	To gather, analyze and interpret information on urban agriculture.				KARI, NCC, DRD
Activity 1.1.2.	To analyze the current status of communicating information and knowledge on urban agriculture with a view to establishing the information needs of beneficiaries and stakeholders and the way in which inherent constraints can be overcome.	• Needs assessment	• Study report		Mazingira, KARI, DRD, NCC
Activity 1.1.3.	Establishing an urban agriculture resource center.	• Availability of information in a centralized location.	• Electronic database • Literature • Reports • Observation		DRD, KARI, NCC and partners
Activity 1.1.4.	Packaging urban agriculture information into newsletters, reports, radio broadcasts, T.V. documentaries, newspaper articles, internet web pages, policy briefs, workshop materials and journal	• Availability of information on urban agriculture.	• Observation • Documentation		KARI, NCC, DRD, Mazingira, KBC, Media

	articles.				houses and other partners
Activity 1.1.5.	Dissemination of urban agriculture information to policy makers, urban farmers, support organizations (e.g. NGOs, CBOs, Academia, NARS, IARS, Development agencies and Service providers).	• Help in decision-making. • Difference in time spent carrying out tasks before and after exposure to information. • Increased confidence as researchers and / or administrators	• Documentation. • Observation.		All
Objective 2.	**To facilitate information exchange and sharing among institutions and individuals involved in urban agriculture.**	• Improved interaction among stakeholders. • Increased use of formal and informal information. • Capacity for problem solving enhanced.	• Observation • Reports of consultative workshops, seminars, and meetings. • Documentation • Number of sectoral networks formed and memoranda of understanding signed • Discussions • Monitoring and Evaluation (M & E) reports. • E-mail exchanges.	All stakeholders and beneficiaries are users and providers of information.	All
Output 2.1.	Improved public understanding on urban agriculture and strong collaborative partnerships for information sharing, diffusion of best practices, identification of priority issues and elimination of wasteful duplication of activities.	• Needs assessment and priority setting. • Better utilization of limited Research and Development (R & D) resources.	• M & E Reports. • Documentation • Discussion	All stakeholders and beneficiaries are users and providers of information.	
Activity 2.1.1.	Facilitate the setting up of an urban agriculture information network.	• Existence of a network	• Documentation		All
Objective 3	**To facilitate the integration of urban agriculture into policies, strategies, programs, action plans and projects.**	• Increase confidence of researchers and administrators. • Change of policy on urban agriculture.	• Focus group discussions.	Political stability and political goodwill for urban agriculture.	All
Output 3.1.	Acceptance of urban agriculture as an important	• Change of attitude	• Documentation of		

	sector in urban development and its inclusion into policies, strategies, programs, action plans and projects.	towards urban agriculture. • Increased productivity.	target audience changes using M & E (structured questionnaires and structured interviews).		
Activity 3.1.1.	Collaborate with all stakeholders in generating and distributing relevant information and influencing change in policy.	• Increased interaction. • Changes in policy.	• Documentation. • Reports of workshops and meetings. • Questionnaires.		All
Activity 3.1.1. (a)	Participate in the Nairobi Livestock Forum activities especially the information management study and dissemination, and urban livestock policy consultations..				Mazingira institute, KARI, DRD, NCC and partners
Activity 3.1.1. (b)	Participate in the Nairobi Urban Food Supply and Distribution Project activities especially in organizing workshops for information dissemination and urban food policy consultations.				KARI, DRD, NCC and partners
Activity 3.1.1. (c)	Identify and disseminate environmental standards (indicators) relevant to urban agriculture and participate in urban environmental policy consultations.				KARI, DRD, NCC, NEMA and partners
Output 4.	Monitoring and evaluation strategy prepared and implemented to identify best practices and lessons from projects.	Best practices and lessons identified.	M & E reports		
Activity 4.1.	Prepare a monitoring and evaluation strategy (ex-ante and ex-post)				
Activity 4.2.	Identify indicators for efficiency, effectiveness, outcomes and impacts.				
Activity 4.3.	Undertake participatory M & E survey and write report				

REFERENCES

Bellows, Anne C., Robinson, V., Guthrie, J., Meyer, T., Peric, T. and Hamm, Michael W. (2000). Urban Livestock Agriculture in State of New Jersey. In: Urban Agriculture Magazine, no 2, Urban Livestock, October 2000, RUAF, Leusden The Netherlands.

City Farmer, Canada's Office of Urban Agriculture (1999). New York: bees bring taste of honey to inner city. Urban Agriculture Notes. http://www.cityfarmer.org/beesNY.html

Dennery P. (1996). Urban Food Producers' Decision-Making: A Case Study of Kibera, City of Nairobi, Kenya, African Urban Quarterly, 11(2,3), Nairobi.

Ghirotti, M. (1999). Making better use of animal resources in a rapidly urbanizing world: a professional challenge. World Animal Review 92, p 2-14

GoK (2001). Poverty Reduction Strategy Paper for the Period 2001-2004. Ministry of Finance and Planning, Nairobi.

GoK (2002). National Development Plan for the period 2002-2008. Ministry of Finance and Planning, Nairobi.

GoK (2003). Economic survey 2003. Central Bureau of Statistics, Ministry of Finance and Planning, Nairobi.

Ishani, Z., Gathuru, P.K. and Lamba, D. (2002). Scoping study of Urban and Peri-urban poor livestock keepers in Nairobi. Mazingira Institute, Nairobi, Kenya.

Lee-Smith, D., M. Manundu, D. Lamba and P.K. Kuria, (1987). Urban Food Production and the Cooking Fuel Situation in Urban Kenya: Results of a 1985 National Survey. Mazingira Institute, Nairobi, Kenya.

Livestock Production Programme (2002). Peri-urban and urban livestock keeping in East Africa - A coping strategy for the poor? http://www.lpp.uk.com/filedir/Summary_Report.pdf

Sawio C. J. and Spies L. (1999). Towards the establishment of a Development and Research/Training Network on urban agriculture for East and Southern Africa. Paper presented at the ISBRAM – FAO Workshop on Urban and Peri-urban Agriculture, Accra, Ghana, 2-6 August, 1999.

Schilderman T. (2002). Strengthening the knowledge and information systems of the urban poor. DFID and ITDG.

What happens to organic waste in Nairobi ?

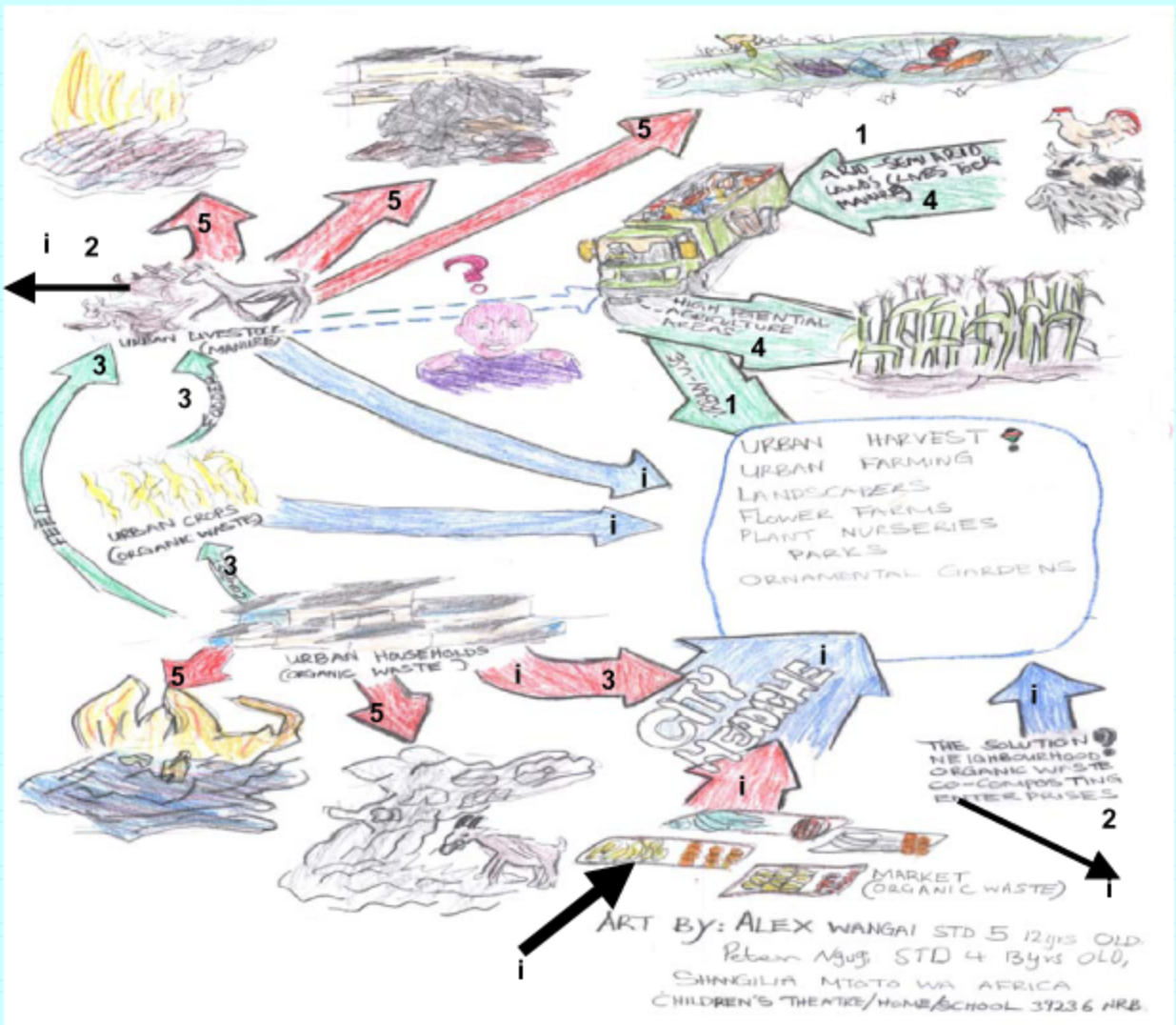
Problem

Solid organic waste is a poorly managed problem in Nairobi. Over 635,000 tonnes of solid waste is generated annually and only 40% of it is collected and disposed. Seventy percent of the solid waste is organic and only 1% of it is recovered through composting.

Partnership

Urban Harvest, is working with Kenya Green Towns Partnership Association (KGTPA), Kenya Agricultural Research Institute (KARI), ILRI and ICRAF to research and promote better waste management in Nairobi. Urban Harvest offers technical backstopping on Urban agriculture, Green Towns plays a significant role of linking the researchers with the community, KARI monitors the quality of compost, ILRI offers expertise on participatory methods and nutrient flows while ICRAF conducts market studies.

Project : Management of solid organic waste and livestock manure for improved agricultural productivity and income levels in the urban and peri urban Nairobi



Key (R-rural, U-Urban, NL-nutrient loss)

R-U=1, U-R=2,

U-U=3, R-R=4, NL=5,

i=intervene

Innovation

The innovation is a win-win situation as it:

- enhances community based urban environmental management
- promotes 'neighbourhood friendly' urban agriculture
- improves on income levels of the urban poor especially the youth
- enhances nutrient recovery and use
- enhances agricultural productivity

Green Towns has been working for quite along time with the urban poor and will help in knowledge delivery to these communities

Designed by: Mary Njenga of Urban Harvest (formally SIUPA) of International Potato Centre; Kuria Gathuru of Kenya Green Towns Partnership Association , Nairobi
Other contributors: Nancy Karanja University on Nairobi, Dannie Romney, ILRI and Diana Lee-Smith, Urban Harvest

Introduction[1]

In sub-Saharan Africa (SSA) the majority of the population will be living in and around urban areas by 2020. Rapid urbanization has provoked not only major challenges to rural–urban planning with regard to urban food security but also in relation to waste management and environmental protection. The development of appropriate policy tools to support this process by minimizing its negative externalities has become increasingly important as policy-makers have started to respond to these geographical shifts. Although the creation of coherent and relevant policy advice is still in its infancy, there is increasing awareness of the challenges ahead and recognition of phenomena, such as urban agriculture, which can contribute directly and indirectly to several policy goals.

Food security

The contribution to urban food security is certainly the most important goal. But urban and peri-urban agriculture can also increase employment and income, which, in turn, will permit people to purchase or otherwise acquire food to increase their food security. Although cities in many parts of the world were established in the most fertile regions, their location vis-à-vis agriculture is usually incidental nowadays. This is especially so in SSA where colonially founded capitals were often developed along the coast, as transport nodes and/or administrative centres. Soil and water supply conditions may not therefore be intrinsically ideal for crops, and bulk food production may well be at some distance from the cities. Thus, (peri-)urban agriculture may be more

[1]The text draws from a workshop keynote given by Chris Lewcock, formerly Natural Resources Institute.

significant for urban food security through a series of niche contributions that have a combined significance than through its contribution to aggregate urban food supply. These niche contributions include the production of highly perishable market products such as milk, green leafy vegetables, eggs, etc., as well as the production of subsistence crops in home gardens, but can also comprise the provisioning of food in emergencies, e.g. in economic depression or wartime. Therefore, agricultural development proposals for urban and near-urban areas should be focused on responding to carefully identified priority niche concerns.

Environmental protection

Urban and peri-urban agriculture offers the potential for a classic win–win situation in which one of the major urban management problems, i.e. waste disposal, can be tackled at the same time as increasing food security through exploitation of the nutrient potential of the 'wastes'. Unlike refuse in rural areas, urban household and market refuse is usually lost, contributes to urban pollution, or is used as landfill, meaning there is little or no return of biomass or nutrients to the production areas. The results are problems at both ends of the food chain: soil nutrient mining in rural and peri-urban production areas and pollution or waste problems where nutrients and other inputs accumulate (Fig. I.1).

However, it cannot be assumed that simply turning waste into compost and making it available to farmers is effective. As several contributions in this publication will point out, the raw wastes or composts may not be well located in relation to the farmers who require them, they may have high production/transport/labour costs, they may not have the correct characteristics for the crops chosen, the farmers may be unfamiliar with their use, and even if exploited to the maximum they may not prevent long-term fertility decline in intensively used soils. Moreover, there can be high environmental and health risks from farming with recycled wastes or wastewater, both from crop contamination and from the damage that intensive use of agricultural inputs might do to the environment. Therefore, it appears necessary to develop integrated nutrient strategies tailored to city specific situations. This certainly includes consideration of farm and soil types, water supply, manure and inorganic fertilizer availability, as well as a range of other biophysical and socioeconomic conditions.

Implementation in the urban–rural context

One of the key concerns should be that any solutions we devise can be effectively implemented. This is not just a matter of technical feasibility. It is governed essentially by the capacity and will of a bewildering variety of institutions and individuals who have to choose to support or take up the solutions. The task of developing and promoting relevant approaches to near-urban natural resource

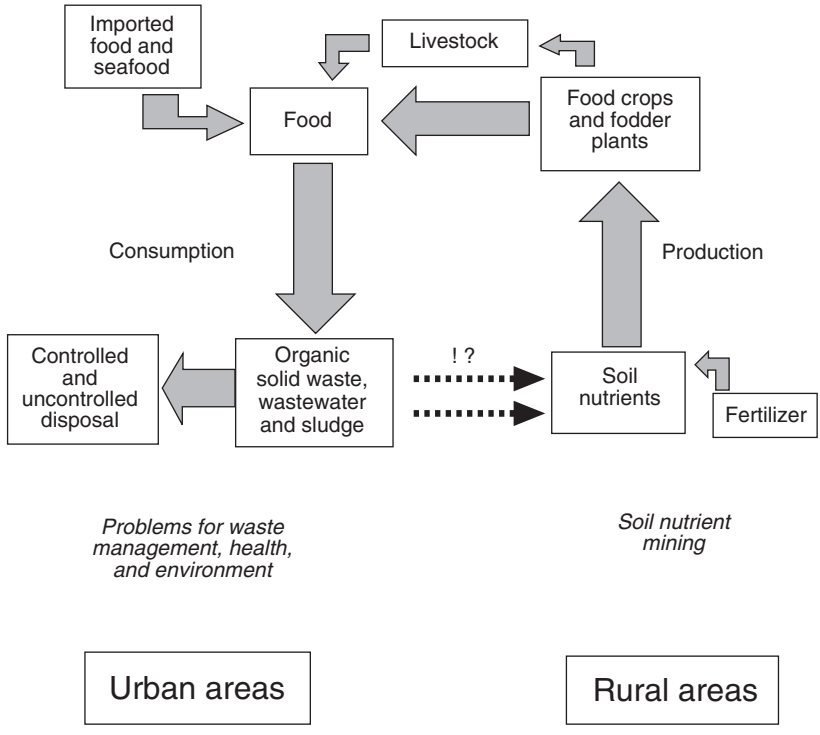


Fig. I.1. Urban centres are vast nutrient sinks. Agriculture, especially in the rural–urban interface (the peri-urban area), could benefit from nutrient recycling (Drechsel *et al.*, 1999, modified).

management is doubled in complexity because of the gulf which generally exists between urban and rural administrative, scientific and sociocultural perspectives. Therefore, it will be a challenge for urban and rural managers, scientists and policy makers to broaden their horizons, and to share and adapt their respective knowledge and policies.

This publication should contribute to this process. It contains state-of-the-art reports and case studies that focus on: (i) urban and peri-urban agriculture and farming systems; and (ii) environmentally safe nutrient recycling options from organic waste generated in cities for use by urban and peri-urban farmers. The reports address technical, biophysical, socio-economic and administrative circumstances. For the first time, different approaches to quantify urban nutrient balances and rural–urban nutrient flows are presented. Special reference is given to West and East Africa, with acknowledgement of experiences from other parts of the world.

Most of the chapters accepted for this publication are derived from an international workshop organized jointly by the International Board for Soil Research and Management (IBSRAM) and the Food and Agriculture Organization (FAO) of the United Nations in 1999. The workshop took place

in Accra, Ghana, with the Accra Metropolitan Assembly (AMA) as local co-host. Participants came from 15 countries, covering a broad range of disciplines as well as national and international institutions (Drechsel and Kunze, 1999).

This meeting followed two national events initiated by FAO and the Natural Resources Institute (NRI), respectively. While the FAO–AMA seminar had its focus on urban food supply and marketing (Sackey, 1998), the NRI workshop inaugurated the Department for International Development-funded Peri-urban Interface project located in Kumasi (NRI, 1995). This project produced a wealth of information and data on peri-urban agriculture and related issues, probably unique in the developing world. Several chapters in this book draw from this experience. However, the venue was not only chosen because of its proximity to Kumasi, but also due to Ghana's comparatively pioneering commitment to both urban agriculture and organic waste recycling. This was confirmed in the opening addresses of the Honourable Minister of Food and Agriculture, Mr J.H. Owusu-Acheampong and the Mayor of Accra, Mr Samuel V.A. Addo, who both acknowledged the role and importance of urban and peri-urban agriculture. The Minister furthermore urged the participants 'to explore possibilities of transforming the huge quantities of organic wastes, which accumulate in the cities into soil amendment inputs such as organic fertilizers for improvement of soil fertility and environmental sanitation'. This book summarizes related experience with consideration of its socio-economic, scientific and environmental dimensions. To suit the overall structure and emphasis, it became necessary to revise and shorten several of the chapters submitted; we are grateful to all authors for their cooperation.

Pay Drechsel
Dagmar Kunze

References

Drechsel, P., Quansah, C. and Penning de Vries, F. (1999) Stimulation of urban and peri-urban agriculture in West Africa – characteristics, challenges, and need for action. In: Smith, O.B. (ed.) *Urban Agriculture in West Africa.* IDRC, IDRC/CTA, Ottawa, pp. 19–40.

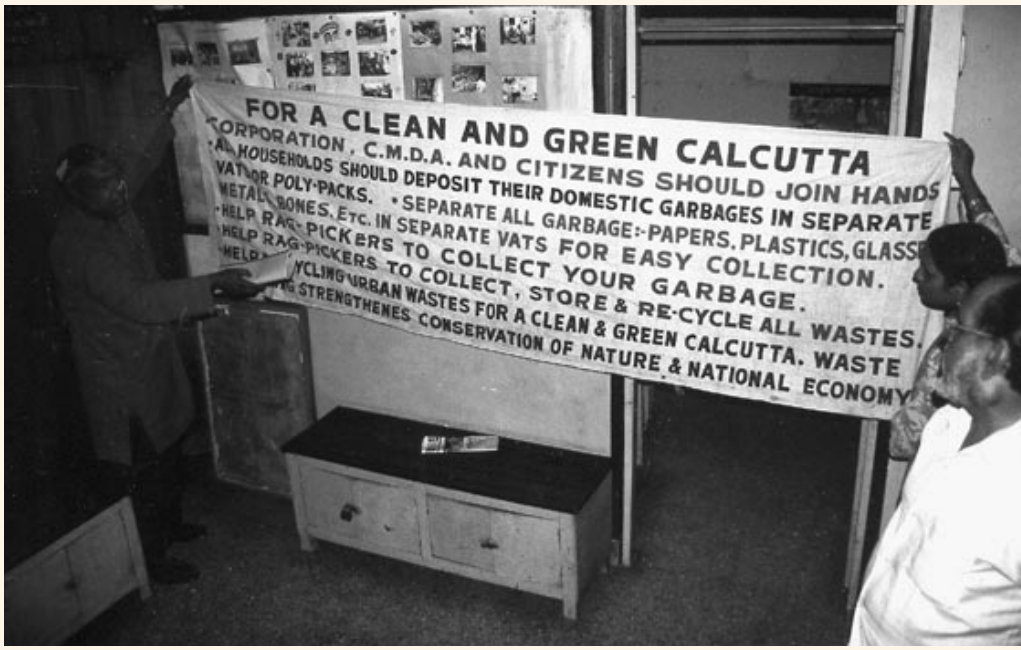
Drechsel, P. and Kunze, D. (1999) Synopsis of the International Workshop on Urban and Peri-urban Agriculture, organized by IBSRAM and FAO, 2–6 August 1999, Accra. http://www.cityfarmer.org/africaworkshop.html#africaworkshop

NRI (Natural Resources Institute) (1995) Peri-urban interface research – Workshop proceedings. 23–25 August 1995, Kumasi, Ghana. Natural Resources Institute, Chatham, UK.

Sackey, D. (1998) A report on the national FAO–AMA seminar on food supply and distribution systems held on the 15th to 17th April 1998 in Accra. Accra Metropolitan Assembly, Accra, Ghana.

Reducing Health Risks

of Urban Organic Solid Waste Use



C. Furedy

A CBO in Calcutta (United Bustee Development Association) promotes source separation of household waste

Whereas health concerns received little attention at the beginning of the thrust to promote urban and periurban agriculture in the past five years, progress has been made in articulating the health issues in developing countries. This paper comments further on one aspect related to the issue of health and urban agriculture: the risks of urban organic solid waste re-use.[1] The focus is the relation of health risk management to informal or community-based practices, which are seen as a major challenge for agriculture in the city. Because the capacity of governments to intervene is currently limited, gradual progress in self-regulation or self-limitation of risks is necessary. International projects and experts can assist in developing appropriate standards, research and practical measures.

Obtaining and processing urban organic solid waste for these different purposes involves many actors (see for details Furedy, Maclaren & Whitney 1999). Main uses of urban organic solid waste in cities of developing countries are: the application of untreated organic material from mixed municipal wastes directly to soils (e.g. Hyderabad); cultivation on old garbage dumps (e.g. Calcutta, see: Furedy & Chowdhury 1996); the feeding of animals with wastes and waste-derived feed (containing slaughterhouse wastes - an ubiquitous practice, e.g. in Hanoi, see Le 1995); and the composting of organic material in mechanised and small neighbourhood plants (e.g. in Accra, see Asomani-Boateng & Haight 1999).

The principal problems associated with these activities are:

- survival of pathogenic organisms in residues;
- zoonoses associated with animal wastes;
- increase of disease vectors;
- respiratory problems from dust and gases;
- injuries from sharp fragments; and
- contamination of crops from heavy metal take-up and agro-chemical residues via wastes and their leachates.

The concern is not exclusively with human health, as livestock are precious, and sometimes irreplaceable, resources for low-income farmers.

Most of the activities associated with the re-use of organic wastes are informal or semi-formal. The following chart indicates some of the main practices of urban organic waste re-use. The diversity of activities and actors, and their informal contexts, makes the management of health risks a seemingly overwhelming task.

REDUCTION IN HEALTH RISKS: INTERIM MEASURES

Current limits on regulation

A range of prevention and control measures could potentially ameliorate the diverse risks posed by using urban organic solid waste for food production (see Furedy & Chowdhury 1996). In the developing countries, however, most urban organic waste processing and re-use in urban agriculture is informal or semi-formal, whereas most of the proposed measures entail relatively sophisticated official interventions, new technologies, infrastructure development and re-design of waste management, cultivation and animal-rearing systems. Since there is little immediate prospect of effective intervention in the many informal

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activities, we must take what comfort we can from positive trends of 'self-help' in this field, and seek the easiest avenues for introducing information and low-cost technology at the urban and community level.

Self-regulation
There is evidence to suggest that when municipal solid wastes become seriously contaminated with non-decomposable materials and biomedical wastes, the practice of applying solid wastes to farms declines. Reports from periurban farmers who previously applied solid wastes to their fields around cities like Hyderabad, Delhi and Hubli-Dharwad in India indicate that many have discontinued the practice because they cannot attract sufficient agricultural labour, but also because their draft animals are too often injured by glass and syringes (Nunan 2000).

As levels of education rise in the urban population in general, there is also a better understanding of problems of waste management: concepts of waste reduction, separation at source of organics, and composting are no longer unfamiliar and there is more willingness to pay fees for solid waste management (Lardinois & Furedy 1999). It is rare to find a city now that does not have environmental NGOs with some interest in pollution and waste management, and such groups are well positioned to improve public awareness.

Sorting bone wastes in informal fertiliser plant, Kathmandu

C. Furedy

For instance, in the 1960s and 1970s, most of the pickers on Calcutta's municipal garbage dump worked barefooted, while now all, except perhaps young children, wear rubber or plastic sandals (even if picked from the garbage). More waste pickers are seen to cover their noses and mouths with scarves, and to try to protect their hands from cuts.
Nevertheless, many of the serious risks cannot be 'seen' by those handling wastes.

Further, people are slow to change their behaviours when their livelihood is at stake and public officials are also concerned about employment. Improving informal work is a slow process of education coupled with providing feasible alternatives.

Setting standards
Suitable standards for assessing health risks are required. International collaboration is required to reaching these standards. One area requiring attention is composting, in particular waste-derived compost. There is considerable interest in promoting composting of urban organics on a 'decentralised' or small scale at community sites. Many international and bilateral agencies have funded pilot projects in urban composting (see Hoornweg et al. 1999).

Farmers stop using contaminated solid wastes

A weakness is that few if any of the current projects pay attention to public health risks. The rationales of the projects assume that small-scale composting, and composting in general, will be beneficial to public health. Many questions remain unanswered, though. For instance, whether community-based composting increases rodent populations, and sites for vector breeding (although there are anecdotal reports that it may). In theory, well-managed composting should not have these effects, but small composting projects are rarely so orderly.

Most small-scale composting projects do not test their products (or the liquid wastes) for contamination, but if they did, the testing undertaken would likely be limited to tests of heavy metals such as arsenic, cadmium, lead, etc. This is because most tests of compost are derived from Northern standards (and even these vary remarkably, see Blaensdorf & Hoornweg 1997). The inputs for low-tech composting in urban neighbourhoods are more varied than the green wastes composted in most Northern cities, since source separation is not consistently practised. Furthermore, the temperature levels and maturation times necessary to destroy pathogens may not be consistently maintained in small NGO projects. It will be very difficult to monitor the products of scattered community composting undertakings.

Even in Northern countries, compost standards are being questioned. The Composting Association in the United Kingdom is working towards a voluntary standard for the UK that specifies minimum criteria for "potentially toxic elements, pathogenic micro-organisms and physical contaminants"[3]. Developing countries that are proposing to set compost standards at all, are for the most part adopting the older heavy-metals-based approach. Some scientists believe it is impractical to develop pathogen standards for compost in developing countries, and that the only feasible approach is to control the composting process (Hoornweg et al. 1999). Even if pathogenic standards cannot be applied, however, further work should be done to develop baseline indicators.

A big question mark hangs over "vermicomposting" because this compost is produced at lower temperatures than in the aerobic process. The recommendations in Europe, that the organic material be digested anaerobically before being put in worm beds, is not done in developing countries. In the municipal compost plant in Buenos Aires, however, worms are used to 'mature' compost, a process that adds two months to the production cycle but which should ensure the safety of the compost (Lardinois & Furedy 1999).

REFERENCES
- Asomani-Boateng R & Haight M. 1999. Assessing the performance of mechanised centralized composting plants in West Africa: the case of Teshi Nungua composting plant in Accra, Ghana. WARMER Bulletin 69 (Nov.): 4-6.
- Blaensdorf E & Hoornweg D. 1997. The Use of Compost in Indonesia: Proposed Compost Quality Standards. Washington: World Bank, Urban Development Sector Unit.
- Furedy C & Chowdhury T. 1996. Solid Waste Re-use and Urban Agriculture: Dilemmas in Developing Countries: The Bad News and the Good News. Paper presented at Joint Congress of the Association of Collegiate Schools of Planning, and Association of European Schools of Planning, Toronto, July. (Unpublished). Available at: www.cityfarmer.-org/Furedy.html.
- Furedy C, Maclaren V & Whitney J. 1999. Re-use of Waste for Food Production in Asian cities: Health and Economic Perspectives. In: Koc M, MacRae R, Mougeot L JA & Welsh J (eds), For Hunger-proof Cities (Ottawa: International Development Research Centre), pp 136-144.
- Hoornweg D, Thomas L & Otten L. 1999. Composting and its Applicability in Developing Countries. Urban Waste Management Working Paper Series 8. Washington, DC: World Bank.
-Lardinois I & Furedy C. 1999. Source Separation of Household Waste Materials. Analysis of Case Studies from Pakistan, the Philippines, India, Brazil, Argentina, and the Netherlands. Gouda: WASTE.
- Le TH. 1995. Urban-waste derived compost in Hanoi, Vietnam: factors affecting supply and demand. MSc thesis. Bangkok: Asian Institute of Technology. Unpublished.
- Nunan F. 2000. Urban organic waste markets: responding toe change in Hubli-Dharwad, India. Habitat International 24:. 347-360.
- Rosenberg L & Furedy C (eds). 1996. International Source Book on Environmentally Sound Technologies for Municipal Solid Waste Management. Osaka: International Environmental Technology Centre, United Nations Environment Program.

Some general guidelines for safety standards will only be the beginning: local standards must be devised, to take into account the nature of soils, cultivation methods, the crops grown and local culinary habits.[4]

Low-cost options

In the sectors of sanitation and housing, the great strides in service delivery came with more attention to low-cost options in the 1980s. The same approach can be applied in waste management related to urban and periurban agriculture. The subject of low-cost and small-scale amelioration of risk has not been much discussed and there are few examples of actual interventions. Some first steps are suggested here.

An important area for development is the very small-scale wastewater treatment systems able to achieve a standard suitable for irrigating urban plots. In amending agricultural practices, tried and tested procedures for control measures (for example, in crop selection) can be adapted from the work in small-scale wastewater irrigation projects.

Cities that have created sanitary facilities and health services to waste pickers, can extend the same protections to workers handling organic wastes. Community-based projects should ensure facilities and protective clothing, as well as health risk advice, for all staff. Many of the problems of composting units could be reduced if source separated organics could be obtained.

With regard to infrastructure, since the replacement of most garbage dumps with sanitary landfills is not possible, the creation of separate cells at dump sites to receive biomedical and industrial wastes should be a priority wherever 'mining' for organics and waste picking is present (see Nunan 2000). In community-based composting projects, more attention has to be given to the collection and disposal of leachates from decomposition.

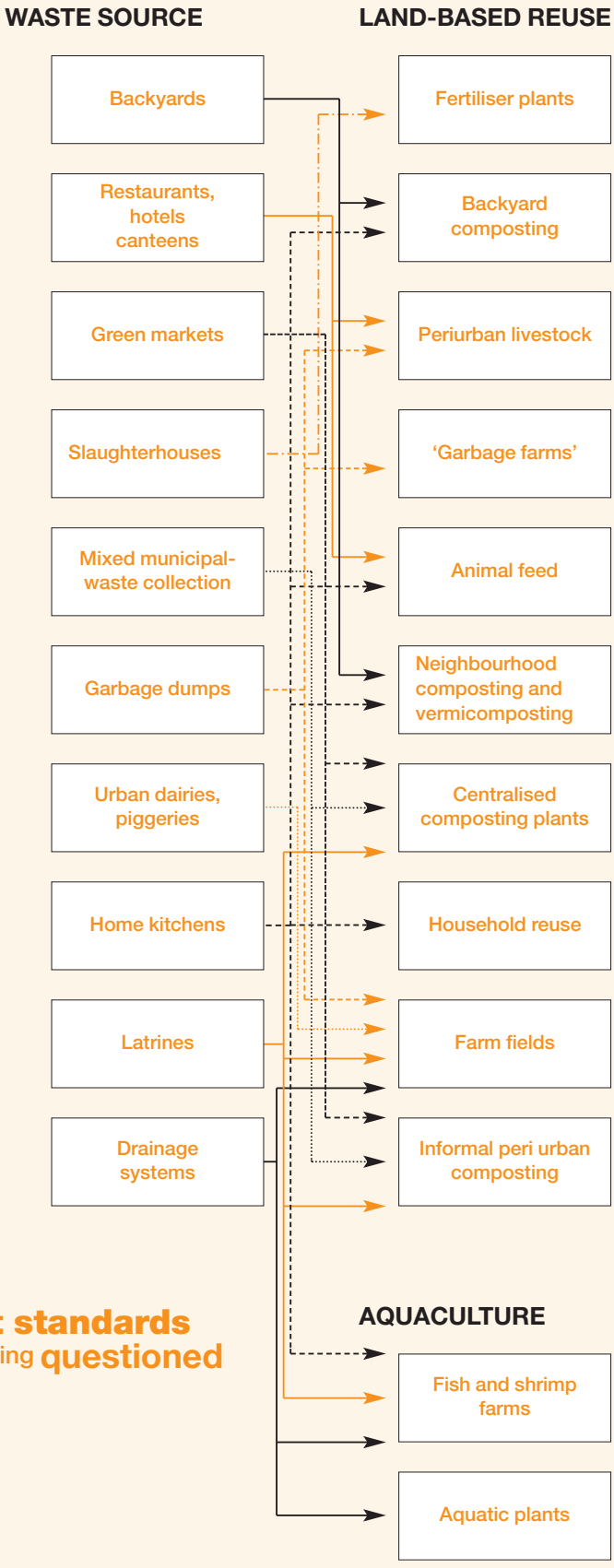
Control and monitoring of urban animals, their products and their slaughtering is a gargantuan task for many cities. Much better education of the public and the keepers of animals can pave the way for relocation, regulation and inspection.

CONCLUSION

Realistically, it cannot be expected that a great deal of research will be done on the specific health risks associated with many informal activities in urban food production. Nevertheless, the range of possible risks cannot be ignored, especially when international agencies are strongly promoting urban agriculture. What is needed is an approach that tries to balance risks and benefits. Development itself brings many improvements in public health and greater awareness among the public. In attempting to reduce risks while enhancing food production, cities will have to rely at first on available low-cost options for soil, water, and waste management. International and bilateral projects bear a special responsibility to foster awareness among the public and urban officials; such projects are the easiest way to convey practical understanding at the local level. At the international level, experts can contribute to progress through discussion of appropriate standards for soils, compost and waste management.

Compost standards are being questioned

Figure 1: Urban organic waste reuse in developing countries.



Source: Adapted from Furedy, Maclaren and Whitney 1999

Notes

1. Human excreta is not included in organic wastes for the purposes of this discussion.
2. It should be noted that far more urban organic solid waste reaches farms via direct delivery by waste collection crews, 'mining' of garbage dumps and the cultivation of old dump sites than from compost plants (Rosenberg & Furedy 1996 pp 72-73, Nunan 2000).
3. See http://www.recycle,mcmail.com/green.htm).
4. The point made by H. Shuval, with reference to WHO standards for wastewater re-use, that they are unnecessarily stringent for developing countries, may also apply to standards for soils and compost.

1

The Potential Use of Waste-stream Products for Soil Amelioration in Peri-urban Interface Agricultural Production Systems

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This chapter discusses the opportunities and constraints that influence the use of organic waste-stream products for soil amelioration. The information is given as a checklist to aid decision-making, illustrated where possible by examples from developing countries.

Key words: waste management, soil management, urban agriculture, farming systems

Introduction

In 1996, The Henry Doubleday Research Association was contracted to carry out a desk review for the UK Overseas Development Agency (now Department for International Development – DFID) on 'The use of urban waste in peri-urban interface production systems' (Allison *et al.*, 1998). This review had an international rather than a country-specific focus although most of the examples cited were from developing countries. The review formed part of a strategy 'to develop and promote cost-effective techniques for recycling/processing organic waste for use as a fertilizer' and contributed

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to the wider goal 'to increase productive potential by greater use of waste materials and recycling of resources'. The conclusions of the review were further developed in connection with an International Mycological Institute project on 'The Use of Composted Urban Wastes in Integrated Management Systems to Control Pests and Pathogens in Peri-urban Agriculture' which was funded by the Crop Protection Programme of DFID and studied the potential value of municipal compost for crop production in peri-urban Kumasi, Ghana (Harris and Smith, 1997; Anon., 1998). Finally, the concepts were refined as an input to a third study 'Kumasi Natural Resources Management Research Project' funded by DFID and coordinated by the Natural Resources Institute (Harris and Smith, 1998).

The objective of this chapter is to synthesize the information from these earlier studies in the form of a checklist to aid decision making.

Checklist for Analysing the Potential Use of Waste-stream Products in the Peri-urban Situation

Figure 1.1 shows a checklist for analysing the potential use of waste-stream products for soil amelioration in peri-urban interface agricultural production systems. Many of the questions posed will be common to all potential organic soil ameliorant materials considered for a particular location, clientele or purpose, but some questions will require answers for each potential material considered. The checklist is made up of the following categories, although in reality the analytical process is not a simple linear one:

- the nature, source and supply, and potential of the raw waste (Items 1–8);
- alternative uses of the waste (Items 9–12);
- quality and management of the waste (Items 13–24);
- processing of the waste (Items 25–32);
- demand for, and end use of, the waste or waste products (Items 33–42).

1. What wastes are available?

Within the urban and peri-urban situation, the concept of waste is often that of an otherwise 'useless or discarded material'. Such accumulated material may cause health, safety, environmental and aesthetic concerns, and may represent a problem requiring safe disposal. However, in one sense a material is only a 'waste' if it is useless; as soon as it is usable it becomes a 'resource'. Thus the same output of a process may be considered a waste if it has no further use, but a valuable by-product if it is used. While some of the materials considered for soil amelioration in this report are clearly wastes at present (in surplus, otherwise unused, and often presenting a disposal problem), others are by-products for which soil amelioration is but one of a range of potential uses. The supply of poultry manure is reported currently to be greater than

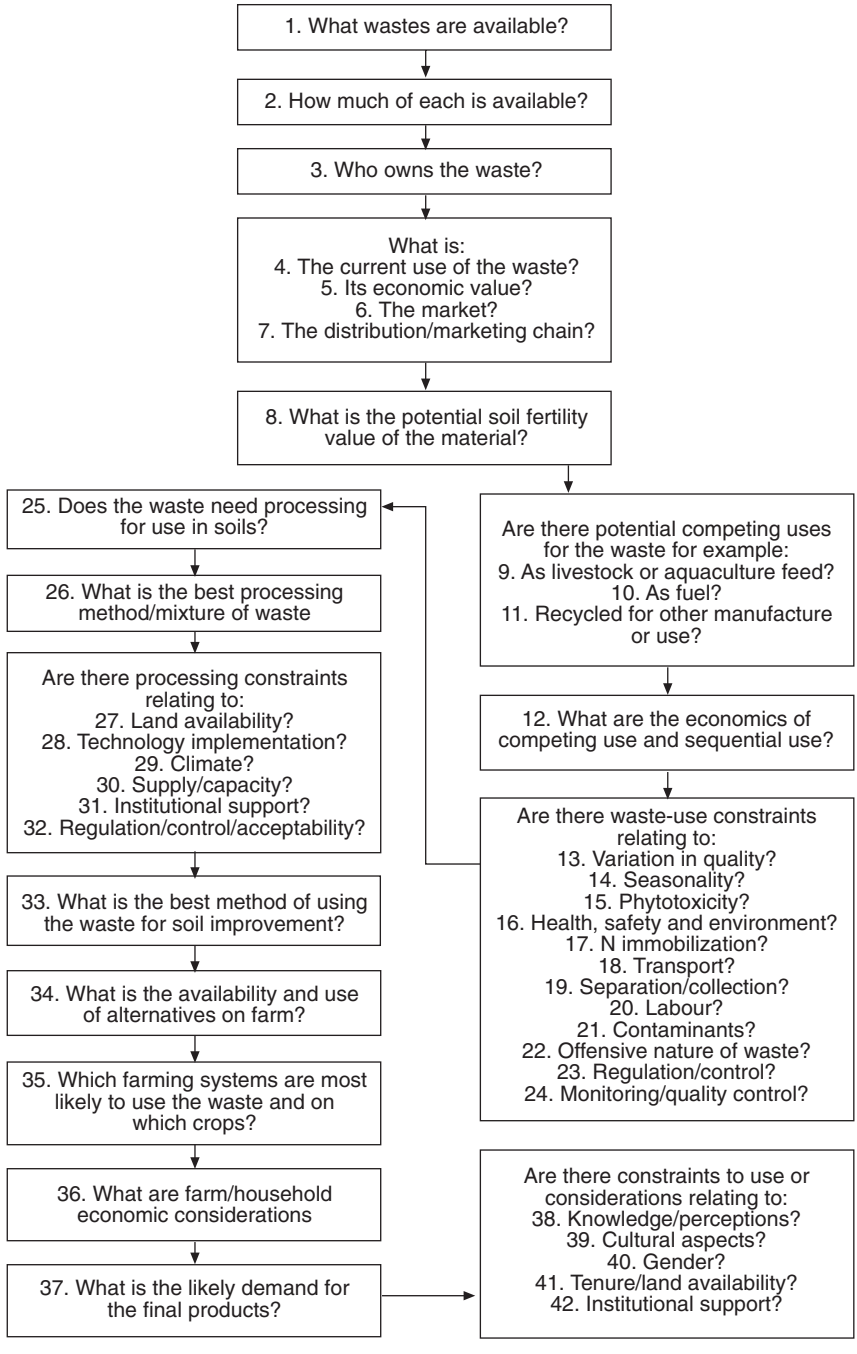

Fig. 1.1. Check list for analysing the potential use of waste-stream products in the peri-urban situation.

demand around Kumasi, Ghana. 'Poultry manure is dumped and sometimes burned by road sides in peri-urban Kumasi and its abundance creates a problem for poultry farmers' (Quansah *et al.*, 1997). Kindness (1999) reported that 84% of poultry manure is used in farming in peri-urban Kumasi and 15% is dumped and burnt.

Important organic materials include municipal waste, night-soil and sewage sludge, livestock manures, and agro-industrial wastes from crop processing and livestock. Municipal waste including domestic, industrial and commercial wastes in various proportions usually has a high organic content in developing countries. Salvage and recycling of metals and other materials of value is common in many developing countries and partly accounts for the high organic content of wastes, for example 87% in Accra and 75% in an Indian city, compared with 3–16% in a northern European city (Dalzell *et al.*, 1987; Deelstra, 1989).

In urban areas, large quantities of human excrement are generated. Night-soil is the term used for the mixture of human faeces and urine that accumulates in waterless sanitation systems. Seventy per cent of urban dwellers in developing countries are not on a sewerage system. Thus, in much of the world sewage is not water borne but exists as night-soil. Generally urban dwellers have access to pit latrines (80% in Dar es Salaam, Muller and Rijnsburger, 1994). Where treatment facilities exist, sewage sludge is produced.

Urban and peri-urban livestock enterprises, producing livestock outputs in great and increasing demand by urban populations, are producers of surplus animal manures because of intensification of the production systems, particularly for poultry and dairy production. There is thus less opportunity to dispose of manure on land held by the livestock producer. Livestock manure is also generated by the movement of animals from rural to urban areas for slaughter, sometimes with relatively brief 'finishing' of the animals in peri-urban areas.

In cities in developing countries, significant quantities of organic wastes are generated by agricultural processing enterprises. In practice, an audit of every processing operation in an area should be carried out to assess whether under-used by-products exist and whether soil amelioration is an option for use. For example, Kindness (1999) quantified the availability of municipal waste, night-soil and sewage sludge, black soil and livestock manures in Kumasi but also identified sawdust, slaughterhouse wastes, brewery waste, oil palm waste, cocoa waste and cassava peel as potential soil ameliorant resources in peri-urban Kumasi.

2. How much of each is available?

Estimates for total waste generation in cities vary, particularly in cities where much of the waste is not collected and the population of the city is growing rapidly. Estimates suggest that Metro Manila with 12 million people generates

4000 t of waste day^{-1} (Medina, 1993), Jakarta with a similar population produces 5000 t day^{-1} (Simpson, 1993), Dar es Salaam with about 3 million people generates 740 t of organic waste day^{-1} (Lopez-Real, 1995a), Calcutta with 10 million people produces 3000 t day^{-1} (Kundu, 1995), and Kano with 1.4 million people generates 450 t day^{-1} (Lewcock, 1994). Estimation of waste production from specific agro-industries or particular sectors, such as market waste, may be easier but few studies have attempted to provide anything other than wide-range estimates.

3. Who owns the waste?

In the first instance the producer owns the waste. However, since 'waste' varies from a valuable resource to a major disposal problem, ownership can be seen in positive and negative terms. Not surprisingly, the greater the value of the waste, the more interest there is in ownership, and conversely, the greater the supply or magnitude of disposal problems, the less desire there is for ownership, which has sometimes to be enforced by regulation under the same principle as 'polluter pays'.

There are many different models of ownership and transfer of ownership. The most relevant of these are given in Table 1.1. This list refers mainly to materials suitable solely for soil amelioration and more complicated arrangements exist when recycling of other materials such as glass, metal and wood is considered. Then, the 'ownership' models do not represent exclusive options.

4. What is the current use of the waste?

Although there are examples of very efficient waste recycling through collection, scavenging and processing with a high proportion of reuse of a wide range of waste types (Allison *et al.*, 1998), in many cases the lower value wastes such as municipal refuse remain underused. In developing countries where cities have grown rapidly and there is not enough money for environmentally sound waste disposal, a large proportion of the waste that is collected is dumped in abandoned quarries or wetlands near to the city. In Brazil it has been estimated that 76% of the 90,000 t of waste generated day^{-1} is disposed of in this way (Wells, 1995). Deelstra (1989) estimated that 90% of all waste from cities in developing countries is dumped when over 60% of it could be recycled.

5. What is its economic value?

It cannot be assumed that agriculture is the most economic or desirable use for all urban organic wastes. There may also be alternative uses of a waste material within agriculture, with economic factors dictating whether a particular

Table 1.1. Selected models of ownership for wastes as soil ameliorants.

Ownership model	Examples
• Producer uses the waste	• Home/community composting of domestic wastes • Use of manures and crop residues on peri-urban farms • Use of agro-industrial wastes on commercial farms and plantations
• Producer dumps the (relatively low value) waste which becomes common property	• Domestic waste where municipal refuse collections are absent, inadequate or offer incomplete coverage • Animal manures that are dumped and free to anyone who will collect • Industrial wastes such as sawdust which have little commercial value
• Producer sells the (relatively high value) waste to an end user; likely to be a farmer, but garden centres and private or public amenity horticultural projects are also purchasers	• High value by-products such as oil palm wastes, which often have alternative uses for animal feed, fuel, etc. • Animal manures
• Producer sells the (relatively high value) waste to an intermediate user interested in adding value to the waste by processing and/or re-sale	• Most commonly waste for re-sale as animal feed or fuel, but also for soil amelioration
• Producer gives the (relatively low value) waste to, or pays to have it removed by, a contractor or public body	• Usually municipal waste, but also agro-industrial wastes
◦ The waste becomes common property	◦ The collector permits scavenging of the waste, and may see this as a service in recycling and reducing disposal problems
◦ The waste is sold, or its exploitation licensed	◦ The collector retains ownership and sells the waste or a fraction of it, or controls access to scavenging and exploitation through licensing
◦ Unofficial 'owners' sell the waste to end users	◦ Low value waste that is dumped but unofficially sold by waste management officials accepting payments or by truck drivers diverting waste to end users

waste is used for fodder or fuel rather than fertilizer. Such decisions will affect various sectors of society differently. The purchase of livestock feed may allow more return of crop residues to the soil; the degree of access to a range of fuel sources may determine whether livestock manures are used as fuel or fertilizer.

Some by-products are less 'waste' than others, for instance cocoa bean shells and cotton seeds are exported to Europe from Ghana (Owusu-Bennoah and Visker, 1994) and this is reflected in their value. Wastes that occur in a 'pure' form rather than as an element in domestic refuse are likely to have a higher value since they are more likely to be used as, for example, livestock feed.

There is a need for detailed economic analyses of the value of wastes, especially studies that include the economic value, which could be given to the fertilizer value and longer term soil amelioration properties of waste products, and to disposal/environmental/health aspects in a cost–benefit analysis.

6. What is the market?

A limited amount of information exists on the influence of markets on the collection, processing and use of urban wastes for agriculture. In some cases there is evidence of trade in raw waste materials and this has been surveyed recently for Kumasi by Kindness (1999). The majority of documented cases, however, concern the successes and failures of institutionally organized large-scale schemes for processing urban organic waste. There are many reports of the cost of producing compost for soil amelioration exceeding its value. There are, however, also documented cases of successful viable markets for composts (Allison *et al.*, 1998). In Mali, Lardinois and van de Klundert (1994a,b) report that the reliable supply, low selling price, and proven quality as a soil conditioner have created a high demand from vegetable farmers for compost dug as black soil from municipal dump sites. There is a market for animal manures, often transported over considerable distances in Kenya (Lekasi *et al.*, 1998) and for poultry manure from intensive poultry farms in Nigeria and other countries (Opara and Asiegbu, 1996).

7. What is the distribution/marketing chain?

Clearly there are many different stakeholders involved in the waste stream in urban/peri-urban areas. Producers may be individual households, commercial or industrial producers, or public institutions such as hospitals and schools. Collectors/processors may be individuals, communities, cooperatives, non-governmental organizations (NGOs), commercial enterprises, or public waste management departments. Users may be individual farmers, communities, cooperatives or commercial plantations.

Waste collection tends to be the responsibility of municipal authorities. However, waste management can also involve a combination of public and private activity or be solely private. Furedy (1992) describes composting in Jakarta, supported by the municipality. The composting agents were private individuals involved in the waste trade, rather than government officials.

8. What is the potential soil fertility value of the material?

The nutrients contained in waste may be a major reason for applying it to crops, and nutrients will be mineralized gradually and become available. There is considerable variation in the nutrient content of municipal wastes. The values are probably most similar to the values for composted material cited in Cross and Strauss (1985), 0.4–3.6% N, 0.3–3.5% P_2O_5, and 0.5–1.8% K_2O, while Gaur and Verma (1991) state that Indian municipal wastes contain 0.5% N, 0.3% P, and 0.3% K.

The nutrient content may not, however, be the most valuable gain from addition to soil. Organic matter is necessary to maintain soil structure and provide an aerated yet moisture retentive environment for optimum root growth. Thus, the benefits of using organic materials for soil improvement result from increased water infiltration of the soil, its increased water-holding capacity, improved aeration and permeability, soil aggregation and rooting depth, and from decreased soil crusting, bulk density and runoff.

Organic waste material or compost is often applied to the growing crops as mulch where it has a beneficial effect in reducing weed growth. Compost and compost leachates also have an inhibitory effect on soil-borne pathogens (Hoitink *et al.*, 1997) either by enabling the plant to overcome sub-clinical root damage or more probably by allowing increased microbial activity to take place in the rhizosphere and soil zone around the plants, thereby encouraging microfloral antagonism to the growth of pathogens. Nematode populations may be decreased also (Gallardo-Lara and Nogales, 1987).

In Kenya, the value of manure is approximately five times that of its chemical fertilizer equivalent value (Lekasi *et al.*, 1998). This is presumably related to the effect of manure on the physical properties of soil as well as its role in plant nutrient supply. Elsewhere the long-term value of organic soil amendments may be less well understood.

9. Are there potential competing uses for the waste as livestock or aquaculture feed?

The fraction of the waste that is potentially valuable for soil amelioration may have alternative uses for animal feed, fuel or construction. Soil amelioration is often considered the least economic of the alternatives. In Senegal, crop residues are reported to be too valuable as animal feed to be used as fertilizer or for composting, while in Uganda, the poultry manure that is available is mixed with brewery waste and used as a cattle feed rather than as a fertilizer (Harris *et al.*, 1997). Municipal refuse is a significant source of food for urban livestock in many developing countries (Allison *et al.*, 1998).

Excreta added to aquaculture ponds stimulates growth of algae and thus the next link in the food chain such as rotifers and crustaceans that serve as fish food. McGarry (1976) points out that night-soil also acts as a direct fish

food. Yeung (1986) reports that 50–90% of the food fish in China come from waste-fed ponds.

10. Are there potential competing uses for the waste as fuel?

Fuel, like soil amelioration is often not considered a high value use of wastes but may be the chosen use where:

1. A shortage of alternative sources leaves little realistic choice other than the use of crop residues and/or animal manures for fuel. This situation is common in India and parts of Africa.
2. For reasons of convenience and fuel economy, the wastes may be used to produce biogas.
3. Use of agricultural residues such as bagasse, straws and husks as a fuel is often the most cost-effective management option for processing industries.

11. Are there potential competing uses for the waste recycled for other manufacture or use?

In most countries, waste paper has a higher value for production of paper than for livestock fodder or use as bedding, let alone as a soil ameliorant. Building blocks and boards can be made by incorporating agricultural fibre wastes such as straw. Cow manure is used as plaster for houses and straw is used for thatching, packing material or animal bedding. Paper can be produced from a wide variety of fibrous wastes. Craft items such as mats, hats and baskets can also be made from fibrous wastes. Maize stalks, rice husks and groundnut shells can be used for production of a wide range of products such as sugars, alcohols, furfural and cellulose derivatives, but this is seldom economic and seldom takes place in developing countries. With animal wastes, gelatine, glue and brush bristles can be obtained from animal body parts.

12. What are the economics of competing use and sequential use?

Sometimes it is not simply a question of single alternative uses for a waste, but a sequence of different uses, with soil amelioration at the end of the chain. For example, in West Bengal (Harris, 1996), rice straw is used as a thatch. When, at regular intervals, the thatched roof is replaced, the rotten straw is added to a compost heap but the better straw is fed to livestock. The manure from the livestock is added to the compost heap or applied directly in the field. Honghai and Veeman (undated) described a system in China whereby crop organic wastes are used as livestock fodder, the manure is used to produce biogas from which the effluent is used as a substrate for mushroom crops, with the spent mushroom compost used as a soil ameliorant.

There are few detailed economic studies of the alternative uses of wastes which are frequently not part of a cash economy. Some waste is recycled within a farm. Other waste is essentially 'free', as when livestock browse on domestic and market waste, but nevertheless very important to the household economy. The current pattern of use has evolved according to market forces and differs considerably from place to place. The use depends to a large extent on the local cost and availability of alternatives to each use.

13. Are there waste-use constraints relating to variation in quality?

Because of the variable nutrient content of urban refuse compared with compost that a farmer may have prepared from a single or small number of plant species plus manure, it may be difficult to estimate appropriate application rates. Farmers near Ho Chi Minh City, Vietnam were reported to err on the side of caution and over-apply additional inorganic nutrients (Jansen *et al.*, 1995).

14. Are there waste-use constraints relating to seasonality?

Composition of waste, particularly the organic components, varies from season to season (Samsunlu, 1982; Deelstra, 1989), again making it difficult to recommend exact application rates. Ishida (1989) found in Japan that whereas the demand for sewage sludge compost was seasonal, the supply was all year round and this led to problems of storage and maintenance of quality.

15. Are there waste-use constraints relating to phytotoxicity?

Garcia *et al.* (1992) showed that fresh sewage sludge and urban waste had severe inhibitory effects on seed germination. Phytotoxicity, in addition to that caused by ammonia 'burning' of crops, was due to excessive electrical conductivity, phenolics, and low molecular weight organic acids. Composts that are not thoroughly stabilized can also cause intensely reducing anaerobic conditions around the plant roots.

16. Are there waste-use constraints relating to health, safety and environment?

Wastes collected, processed or used close to streams may cause pollution; close to housing they may cause offence. Any waste made up of, or containing, human faecal material poses a health hazard from pathogens unless properly processed. It may be that the risk, or the cost of reducing the risk to

an acceptable level, of the use of some wastes outweighs their soil amelioration value. This might apply, for example, to biomedical wastes. A major problem in developing countries is frequently that source separation of high risk wastes does not take place and this can compromise the safety and value of mixed bulk wastes.

A further fear relating to urban waste and compost is that crops will accumulate high levels of heavy metals. However, Drescher (1994), studying vegetables growing on an urban landfill site in Lusaka, Zambia, found that vegetables did not accumulate heavy metals. Even in heavily contaminated soils, concentrations of metals in the vegetables remained considerably lower than soil concentrations. Possible contamination of urban wastes with genetically modified organisms has been expressed recently as a new concern in organic agriculture in the UK.

17. Are there waste-use constraints relating to N immobilization?

Inappropriate use of wastes with high C:N ratios as soil improvers can lead to reduced soil fertility. Inhibitions of crop growth and development can be caused by nitrogen immobilization that may occur when fresh organic material containing relatively low amounts of nitrogen such as rice straw or sawdust is applied to soils (Garcia *et al.*, 1992).

18. Are there waste-use constraints relating to transport?

The nature of some raw wastes such as citrus pulp, with a large water content, makes it too heavy to transport economically. The constraints of transport are cited as one of the advantages of centralized composting of municipal wastes to produce soil improvers. It is probably more practical than taking the waste from the city to farmers, expecting that they will separate the wastes, compost the organics and leave the non-compostables for re-collection by the municipality. Even after processing organic waste into compost, it is bulky and of low value and this can geographically limit the size of potential markets. Lardinois and Van de Klundert (1994a,b) reported that use of urban compost around Asian cities was limited to a range of 25 km.

On a local scale, even if suitable processed waste is available, farmers themselves may lack appropriate transport. Maxwell and Zziwa (1992) found, among other constraints, that farmers in Kampala had difficulty transporting the waste to their plots. Problems related to transport of poultry manure in Ghana include both the cost of transport of poultry manure to the farm and the general transport of manure around the farm. Often distances from the household to the farm are large and the use of any form of draught power or ownership of implements such as wheelbarrows is small or non-existent. Also, paths are easily overgrown making access difficult (Harris *et al.*, 1998).

Transport costs and difficulties may determine the most appropriate processing strategy. For example, a dry fertilizer can be produced by sewage de-watering, mixing with waste or straw, and leaving to ferment anaerobically for about 3 weeks before drying, granulating and packing (Bo Ling, 1994). This dry fertilizer is popular because it is easy to transport and handle.

19. Are there waste-use constraints relating to separation/collection?

While recycling of the waste starts as soon as it is generated, as door-to-door collectors may buy the more valuable items from householders, the actual collection and transport of the waste is usually municipal. Devising a collection system that minimizes contamination is of primary importance. Although poor neighbourhoods have an urgent need for waste services, in Asia, NGOs are finding it more effective to work in middle and upper class areas. Source separation and decentralized composting are more worthwhile and feasible in such areas because the wastes contain more recyclables, the householders better understand the purposes of waste separation, they can pay for collection services and there is space for composting (Furedy, 1992).

20. Are there waste-use constraints relating to labour?

One of the most frequently cited constraints to on-farm recycling of wastes is that of labour to make compost or, if purchased, to transport, spread and incorporate it (Harris *et al.*, 1998). Even simple re-use of crop and livestock residues is labour intensive and direct incorporation of residues into the soil is hard work.

Farmers in the highlands of Guatemala used compost but, the value of labour expended making and using compost was higher than the cash outlay for a smaller equivalent weight of chemical fertilizer (Vogler, 1991). However, it should be noted that compost will improve the soil structure more, in the long term, than chemical fertilizers and the value of a farmer's labour is only relevant if he has the opportunity of alternative work to earn income. If no cash is available he cannot buy chemicals and organic composting is one of the few options for improving the fertility of his land.

21. Are there waste-use constraints relating to contaminants?

Probably the greatest problem for producers of compost from urban waste all over the world is contamination with inorganic materials. Devising a collection system that minimizes contamination is of primary importance. Picking is becoming increasingly hazardous as waste now contains more broken glass, toxic materials and biomedical waste. The presence of glass in the resulting compost was cited as one of the reasons why the products of com-

posting plants established in Indian cities such as Calcutta, Madras, Delhi and Bombay were unpopular (Jalan *et al.*, 1995). Farmers found that compost prepared in Bangkok contained plastic and glass, and barefoot paddy farmers were, unsurprisingly, not prepared to use it (Anon., 1979).

22. Are there waste-use constraints relating to offensive nature of waste?

In a number of countries the production and use of composted wastes has been rejected by potential users. In Bangkok hauliers refused to loan vehicles for the transport of compost because of this (Anon., 1979). There are also cultural constraints on the use of night-soil in parts of Africa (Cline-Cole, University of Birmingham, UK, personal communication, 1996), but Owusu-Bennoah and Visker (1994) report that in Ghana farmers were hijacking septic tank emptying vehicles in order to release the raw night-soil over their fields.

23. Are there waste-use constraints relating to regulation/control?

Urban authorities may have restrictions enforced by planning, environment or public health departments that limit the areas that could be used for waste collection, storage and processing. According to the district planners in peri-urban Kumasi, the siting of waste dumps is supposed to be decided by the assembly man and the community, with advice from Town and Country Planning, but no guidelines exist. It is a different department, the Environmental Health Office, which is responsible for waste disposal (Blake *et al.*, 1997). Although assistance from all sectors in dealing with low value surplus wastes is usually appreciated, conflicts can arise when small enterprises, communities or NGOs attempt to assume responsibilities which local government authorities consider their own.

24. Are there waste-use constraints relating to monitoring/quality control?

In developed countries there are regulations controlling the quality, description, and advertising of most products including proprietary soil ameliorants. Some similar regulations may apply in developing countries. The ability to monitor and control quality, with important implications for recommended application rates, may well be limited by inadequate or expensive analytical facilities in poorer countries.

25. Does the waste need processing for use in soils?

In some cases urban waste, including household refuse, is used directly for agriculture (Anon., 1991; Mortimore, 1993; Lewcock, 1994). However, as

described above, the use of 'raw' urban wastes can lead to problems with inert contaminants, health risks and N-immobilization. In most cases, organic wastes for use as soil improvers are processed before use. This may consist of simple sorting or source separation, or of further processing. The most common means of processing is composting. Because the composting process results in significant nutrient losses, raw wastes are actually of higher nutrient value for use as fertilizers but composting organic wastes before using them: (i) sanitizes waste, the high temperatures achieved during composting are very important for sanitizing compost, weed seeds are also destroyed; (ii) reduces waste volume, weight and water content and provides a stabilized product particularly from the point of view of nitrogen delivery; and (iii) alters the composition of waste, making it more suitable for agricultural use, thereby overcoming problems of phytotoxicity.

26. What is the best processing method/mixture of waste?

Mixtures of materials

It is desirable to mix materials for composting in proportions that give rapid, effective and complete decomposition to a stable product. Thus the range and supply of different materials may need to be considered in a waste management strategy for soil amelioration. For example, night-soil can be processed by mixed composting with domestic wastes in windrows. Reporting on the potential for composting in Kumasi, Lopez-Real (1995b) pointed out that market waste is expected to be high in moisture content (> 60%) with a nitrogen content of around 2% and a C:N ratio of 20–40, making it highly acceptable for composting. However, if too high in moisture content this could become compacted and undergo anaerobic breakdown and become offensive. From a technical perspective, Lopez-Real (1995b) considered that the market wastes could be co-composted with sawdust waste.

Composting scale

The first stage in the determination of appropriate waste management strategies depends on determining the likely scale of operation, likely operators and potential waste collection possibilities. Once options have been refined at this level, the most appropriate technical methodology can be considered. As an example, the waste-use strategies considered by Harris and Smith (1997) in connection with the DFID Crop Protection project for peri-urban Kumasi (Anon., 1998) are summarized in Table 1.2.

Type of composting

Composting may be aerobic or anaerobic. Anaerobic systems tend to be associated with the production of methane, a contributor to the greenhouse effect.

Table 1.2. Strategies for the management of waste for soil amelioration and crop protection.

Strategy	Comments
1. Use of raw waste	• Does not include the required 'composting' aspect for crop protection • Limited opportunity to manipulate quality • Subject to many quality constraints (see above)
2. Urban home composting	• Often traditionally practised in an 'informal' way with back garden heaps or pits • Mainly household waste/livestock wastes, some crop residues • Limited capacity to deal with large amounts of urban waste • Many urban producers do not have gardens to use the compost • Resistance because of attraction of flies, rats and snakes • Relies on raising awareness
3. Peri-urban backyard composting	• As (2) above • Does not address the problem or potential of urban waste
4. On-farm composting	• Usually relevant to farm wastes from livestock and crop residues but may also include household waste • Labour a major constraint • Does not address the problem or potential of urban waste
5. On-farm composting with waste input from peri-urban community or urban areas	• Has worked in some areas where farmers receive wastes • Offers possibility of selecting higher value wastes for co-composting • Labour a major constraint, only possible with minimal labour requiring techniques • Likely cultural constraints to handling certain waste types • Transport a major problem
6. Peri-urban community composting	• Does not address the problem or potential of urban waste • Very few villages have their refuse collected by the district assembly; therefore, waste is available • Land is unlikely to be a constraint • Rubbish dumps are currently usually maintained by the women in the village; may need some additional/voluntary labour • Limited opportunity for commercial development
7. Peri-urban community composting with other urban peri-urban input	• As (6) above • Offers possibility of selecting higher value wastes for co-composting, such as surplus chicken manure • Possible to enhance composting process to enhance crop protection aspects • Possible cultural constraints to handling certain waste types • Transport a major problem

Continued

Table 1.2. *Continued*

Strategy	Comments
8. Urban community composting	• Requires effective community organization or NGO activity • Difficulty in sustaining voluntary labour • Limited commercial prospects • Likely mismatch between producers of waste and users of compost • Appropriate in areas that are inaccessible or where refuse collections are unreliable • Offers possibility of selecting higher value wastes for co-composting: livestock, market, organic household, agro-industrial wastes • Possible to enhance composting process to enhance crop protection aspects • Waste separation at source may be possible in higher income areas • May encounter resistance from municipal authorities who see waste management as their business • May encounter difficulties in access to adequate land and water resources • May experience difficulty in disposing of low value non-putrescibles in the waste
9. Private enterprise (small/medium scale)	• More likely to be on urban fringe than in outer peri-urban area • Poorly understood waste streams • Currently very poorly developed market for organic fertilizer • Offers possibility of selecting higher value wastes for co-composting • Possible to enhance composting process to enhance crop protection aspects • Waste separation at source may be possible in higher income areas • Requires significant investment even for low-tech options
10. Municipal large scale	• Land available and secure • Assumes municipal collection service • Close link, physically and administratively, between collection/delivery sites, composting and landfill • Possible subsidy, direct or hidden from municipal authorities • May generate revenue at least to offset costs • Likely to have (or train) staff to a reasonable technical level and better able to handle more difficult wastes such as night-soil + sawdust • Can achieve good sanitation of wastes • Possible separation of major categories only, such as market wastes, for composting • Large volume production • Depends on maintaining level of technology • Tends to become bureaucratic and inefficient

Production of biogas by microbial digestion is effectively anaerobic composting, albeit of a more or less liquid substrate. Generally, aerobic systems are favoured as they can be achieved using low technology, are easier to manage and reduce the waste to a stabilized form more quickly. Simple anaerobic decomposition methods can be employed by using pits or trenches that are covered with soil and left for long periods. This is sometimes more acceptable where night-soil and refuse are mixed.

Composting technology

It is beyond the scope of this chapter to review the technical options for composting but options for aerobic composting include open systems such as windrows and static aerated piles, in-vessel systems and even vermicomposting.

27. Are there processing constraints relating to land availability?

The availability of land sites for processing of waste can be a major constraint (Hardoy *et al.*, 1992). In Bangalore there were problems of finding an area of land with water for composting (Rosario, 1994). The high cost of land was also cited as one of the reasons why composting schemes in several Indian cities had closed (Jalan *et al.*, 1995).

28. Are there processing constraints relating to technology implementation?

The safe, acceptable and appropriate use of wastes in peri-urban agriculture is clearly enhanced when infrastructure and methodologies for required processing are in place. In general this represents a major constraint, since those countries and communities that perhaps have the greatest need of waste recycling for economic and agricultural reasons, often have the poorest provision of processing plants and equipment. The processing of organic wastes for soil amelioration is often attempted using medium- or large-scale technological approaches, although this is usually more to do with the economics and practicalities of handling large amounts of waste rather than a need for high technology processes per se. Organic waste can in fact be processed into a soil improver by very simple methods.

Plants in Morocco were built during 1962 to 1973 (Maung, 1982); by 1973 all the plants had broken down except one in Rabat which was processing 160 t of rubbish day^{-1}, a third of its intended capacity. Many of the reasons given for the failure of the projects were related to the technology employed and included incomplete facilities at the plant site, poor use of equipment, poor plant engineering, lack of skilled operating and maintenance personnel, and generally inadequate plant management.

29. Are there processing constraints relating to climate?

In dry climates where compost is prepared in windrows that are turned once they have passed the maximum temperature, turning can cause the compost to dry out and the compost has to be watered. Conversely in wet climates, as in Cameroon (Ngnikam *et al.*, 1993), composting may be the favoured option for waste disposal because burning the rubbish is not possible as it tends to be mainly organic with a high moisture content.

30. Are there processing constraints relating to supply/capacity?

Smaller plants may be attractive because they may be less susceptible to disruption caused by shortages of fuel or spare parts, or by strikes. However, there can be difficulties in choosing the sites if it is unclear how much waste can be collected from the district that each plant serves. A plant may subsequently turn out to be too small or too far away from the district it serves (Schweitzer, 1989).

31. Are there processing constraints relating to institutional support?

Many of the most successful waste management projects have relied heavily on support from local government or from NGOs or community groups. In many instances, as part of their responsibility for waste management, municipalities are prepared to subsidize the processing and use of organic wastes for agriculture. In Jakarta (Simpson, 1993), start-up grants, technical assistance, worker training and guaranteed purchase arrangements for the compost were made available and Jakarta city council provided collection and delivery of fresh rubbish and removal of non-compostable residues.

32. Are there processing constraints relating to regulation/control/acceptability?

There are likely to be planning restrictions on the siting and operation of waste processing plants. Home composting schemes often meet resistance because of attraction of flies, rats and snakes.

33. What is the best method of using the waste for soil improvement?

Generally, the material is applied either by incorporation into the soil during cultivation or to the growing crops as a mulch. The most appropriate application method should be considered on a case-by-case basis.

34. What is the availability and use of alternatives on farms?

There are suggestions that organic wastes are most readily used in agriculture where alternatives are not available or are too expensive (Owusu-Bennoah and Visker, 1994). Similar conclusions have been drawn by Lardinois and Van de Klundert (1994a,b). Farmers may be prepared to buy bulk compost in countries where the soils are desperately short of organic matter and where most alternatives are unavailable or impractical. Chemical fertilizers have a number of benefits. They are easy to transport, store and spread, have low costs per unit of fertilizer, crops react rapidly to them and they can guarantee high yields. However, they are also expensive and are often simply unavailable. In these circumstances organic waste materials may represent the only fertilizer option.

In contrast, there are many examples of positive preference for fertilizers derived from organic wastes. Farmers near Kano favour urban wastes as fertilizer since their effect once applied might last for 2 or 3 years, whereas two or three applications of artificial fertilizer might be required during the growing season. This is seen as a benefit because the reliability of all fertilizer supply is poor.

35. Which farming systems are most likely to use the waste and on which crops?

For reasons of availability and transport, urban organic wastes are used predominantly on the type of crops grown close to urban centres, especially vegetables (Siemonsma and Piluek, 1993) This does not preclude the use of wastes on agricultural field crops in peri-urban areas. For example, Anon. (1991) in Senegal reported the application of town refuse to farmland to increase the productivity of sorghum. Considering the Kumasi peri-urban area, Harris and Smith (1998) advanced the hypotheses in Table 1.3 for the potential for composted urban waste in different farming systems classified by Blake *et al.* (1997).

36. What are the farm/household economic considerations?

Where urban and peri-urban farming is a survival strategy, the levels of inputs are often very low. Few such farmers can purchase fertilizer, whether chemical or organic. However, the urban and peri-urban areas are also characterized by greater market opportunities and greater off-farm employment opportunities. Both of these stimulate entrepreneurial approaches and investment opportunities for crop and livestock production for urban markets.

Table 1.3. Hypotheses on the potential use of composted urban wastes in different farming systems.

System	Potential for use of composted urban wastes	Opportunities/constraints
Bush fallow mixed cropping	Very low	• Traditional bush fallow system for subsistence plus surplus • Limited current use of inputs
Sole crop cereals	Low	• Bush fallow system but often more for cash income • Limited fertilizer inputs, relatively large-scale farms • Likely to encounter major logistical constraints • Very impressive short-term soil fertility crop protection benefits would have to be demonstrated and very favourable cost–benefit relationships
Sole crop vegetables (rainy season)	Low/medium	• Sometimes opportunistic cultivation as part of bush fallow rotation • Opportunities and constraints as for sole cereal crops • Greater requirement for pest and disease control and higher value of crops may increase potential
Sole crop vegetables (irrigated)	Medium/high	• Especially where this forms an intensive use of land over several years
Specialized valley-bottom cropping	Medium/high	• Continuous cropping of cash crops close to urban markets and sources of compost • Considerable potential for increasing yields • Likely to be favourable cost–benefit relationship
Tree crops	Low/medium	• Perennial crops that can benefit from applications as mulch
Backyard farms	Medium	• Continuous cropping, mixture of perennial and annual crops • Opportunity for long-term building of soil fertility • Production may be mainly for home consumption with less concern for yield and less willingness to purchase/ transport compost • Natural place for using products of home compost and small-scale community compost products

37. What is the likely demand for the final products?

A report from a study tour of composting initiatives in the Far East (Anon., 1979) found the lack of a rural market. Farmers in both Thailand and Japan showed little interest in urban compost even when the price was reduced to 20% of the cost of production. Progressive farmers preferred to use inorganics, conservative farmers locally available manure. Elsewhere, a market can be created only where the price is subsidized effectively or when other economic, social or environmental factors play a part. Proyecto Biomasa, an Austrian government supported initiative in Nicaragua, produces about 700 kg day^{-1} of semi-dry compost. The compost is sold to growers of mangoes and melons and organic coffee producers. However, compost sales do not cover the costs of production (Foidl, Proyecto Biomasa, personal communication, 1996).

In Europe, where farmers are not prepared to pay a high price for compost but will use it, governments have a legal duty to dispose of wastes and may see compost making and use as a waste disposal strategy rather than an income generating one. However, private individuals and enterprises will not be interested in collecting, processing, and trading such low-value material, which will remain the responsibility of the city in which it is generated.

Despite the uneconomic production of composts from organic wastes in many places there are also documented cases of viable unsubsidized markets for composts. In Egypt, compost produced by the Zabaline (a group of Coptic Christians) is sold to farmers up to 150 km from Cairo (EQI, 1988). The situation in Egypt is unusual in that while soils lack humus, there is water available from the Nile and sophisticated urban markets are prepared to pay high prices for fruit and vegetables.

38. Are there constraints to use or considerations relating to knowledge/perceptions?

Among the reasons cited in a recent survey (Harris *et al.*, 1998) for not using organic fertilizers are lack of awareness that methods exist, lack of training, lack of detailed instructions, application methods and rates, and lack of proof of success. Maxwell and Zziwa (1992) also specifically asked farmers in Kampala if they made use of urban wastes but none did. Apart from an unwillingness to use the wastes, they believe that they had no value in agriculture.

Lack of technical advice was also one of the most significant constraints voiced by other farmers. Streiffeler (1987) reports that some cultivators in Kisangani, Zaire, observed that yields of cassava and banana were declining. The people realized that it was because they were not fertilizing their crops adequately but did not know that compost could substitute for expensive or unavailable chemical fertilizers.

Farmers may be unwilling to change to organic fertilizers because of the fear of failure or the risks involved. There are a variety of other reasons why

farmers choose not to use organic techniques, including composts, even when they are available. For example, because they are perceived as providing too long-term results, or are old-fashioned or ineffective. There is sometimes concern that composts introduce weed seeds, pests and diseases to the farm and the absence of these has to be guaranteed (Harris *et al.*, 1998).

39. Are there constraints to use or considerations relating to cultural aspects?

In many societies in sub-Saharan Africa contact with human faeces is considered defiling. Koranic edicts prohibiting contact with all human wastes are widely upheld in Islamic societies. The use of human excreta in agriculture and aquaculture is not condoned. While Islamic law is quite clear in regard to contact with human wastes, resource constraints, and religious, cultural and ideological variations lead to a variety of practices (Allison *et al.*, 1998).

Although there may be initial prejudices against the use of compost containing faeces, these may be overcome through education and practical demonstration. A recent study on the use of composting latrines in Tanzania showed that users' prior held beliefs had little bearing on the acceptability of the technology. There was no significant difference in willingness to use the compost between Muslims and Christians. It seemed the compost was sufficiently different from faeces not to be taboo. It has been suggested that cultural proscriptions on contact with excreta are more widely held among urban middle and upper classes than among the resource-poor, where attitudes are mixed.

40. Are there constraints to use or considerations relating to gender?

Gender balance in waste collection and processing varies with location and scale. Home and community composting may be almost exclusively a female role, whereas employment in the municipal waste processing chain may be exclusively male. Since the use of urban waste is predominantly in urban and peri-urban agriculture, the gender balance in urban waste use might be expected to reflect involvement in agriculture generally. Ratta (1993) reported that in Peru 80% of urban agriculturalists were female, with a figure of more than 50% for Kenya. In contrast, in Senegal, China and Brazil they were mainly male. It seems that the differences in the number of men and women involved in urban agriculture may depend on whether the agriculture is for subsistence, in which case women tend to be involved, or to generate cash when it becomes a more 'male' activity.

41. Are there constraints to use or considerations relating to tenure/land availability?

Farmers in urban and peri-urban areas often face the difficulty that they lack security of tenure. This means that they tend to grow annual crops (Maxwell

and Zziwa, 1992). The most significant constraints voiced by farmers are lack of access to land, capital, inputs, tools and technical advice. Farmers on the edge of expanding cities are less likely to invest in the use of long-term soil improvers such as urban waste if they are unsure how much longer they will be using the land, particularly when they do not have legal entitlement to the land they cultivate. Conversely, there is often an incentive, on rented land, to use high chemical inputs to guarantee immediate and economic return on land rents.

42. Are there constraints to use or considerations relating to institutional support?

The potential for use of composted urban wastes will be affected by the extent of their promotion through national or local government and NGOs. Use can be supported externally by international organizations, donor agencies and NGOs. In many instances, as part of their responsibility for waste management, municipalities are prepared to subsidize the processing and use of organic wastes for agriculture. In some instances governments contribute through supporting education campaigns. For example, McGarry (1976) reports increased use of night-soil in China in the 1950s because of government campaigns to encourage night-soil collection. The collection rate increased from 70% in 1952 to 90% in 1966 (Chao, 1970).

Generally, links between city governments and agriculturalists in and around cities are weak. There are a number of reasons for this. In the European model of city government adopted by many colonies at independence, agriculture has not traditionally been a concern of municipal authorities and urban agriculturalists tend to be neither a highly vocal nor an organized group, since they often exist as squatters, or agriculture may even be forbidden in urban areas (Maxwell and Zziwa, 1992).

Streiffeler (1987) mentions how the Nairobi government at one point ordered the destruction of spontaneous agriculture in the city. Cities with such attitudes to urban agriculture are unlikely to implement the appointment of agricultural extension officers and mechanisms for encouraging the use of urban waste by local farmers. One example of a city that actively encourages agriculture within its confines is Havana in Cuba. Because of the lack of agrochemicals the Cuban government is encouraging people to adopt organic cultivation methods. The government provides other forms of legislative support for urban agriculture; cooperatives have guaranteed use of the land for 10 years and are authorized to sell their produce at prices outside the controlled state sector.

Some policies may restrict the use of waste-derived soil ameliorants. Governments may have policies governing the sale and use of materials as fertilizers, sometimes developed to protect, promote, and subsidize appropriate chemical fertilizer use. In developed countries there are also environmental regulations, voluntary codes and designated sensitive areas for

regulating application rates, particularly with regard to nitrogen and heavy metal loading.

Conclusions

Most organic production occurs in rural areas, and consequently most organic wastes are found there including manure from livestock and residues from crops. Use of much of these wastes is integrated into the farming system. However, there is a vast traffic of organic materials into cities to feed and clothe the inhabitants and provide the raw materials for the industries that tend to be located there. Significant quantities of organic wastes are also produced by agricultural enterprises in and around the cities. As development occurs and urban populations increase, the type of waste generated is likely to change and the amount to increase. Productive use of these organic wastes is desirable to conserve resources and to protect the urban environment.

There have been many technology-based projects concerned with the use of municipal and/or agro-industrial wastes as soil ameliorants in agriculture. In many cases the technologies have been thoroughly studied and the main constraints associated with these technological projects seem to be a lack of resources rather than a lack of research information, and include lack of suitable land, finance, transport and maintenance of equipment. Such projects may generate a product for which there is an insufficient market or use, in some cases justifying this on the grounds of waste disposal alone. There are also a number of case studies of small-scale waste processing and use by individuals, cooperatives, communities, NGOs and private enterprises, where the end-products of processed waste are used in agriculture.

There have been far fewer studies starting from the basis of establishing the need for organic wastes in existing urban and peri-urban agricultural systems and investigating the potential to satisfy these needs within current resource constraints. There are a number of significant gaps in knowledge on the availability, value, processing, marketing, application rates, consistency of quality and efficacy of wastes at the farm level. The wide range of opportunities and constraints influencing the use of waste-stream products for soil amelioration should be thoroughly investigated before embarking on projects to develop this resource.

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and (iii) the use of composted wastes in integrated management systems to control pests and pathogens in peri-urban agriculture (R6941), funded through the Crop Protection Programme. The views expressed are not necessarily those of DFID.

References

Anon. (1979) The garbage war: need for defense! *The Urban Edge* 3(8), 1–3.

Anon. (1991) What a load of garbage can do for your crops. *Haramata* 12, 5.

Anon. (1998) *The Use of Composted Wastes in Integrated Management Systems to Control Pests and Pathogens in Peri-urban Agriculture.* Final Technical Report Phase I. Project ZA 0193. CABI Bioscience, Egham, UK, 64 pp.

Allison, M., Harris, P.J.C., Hofny-Collins, A.H. and Stephens, W. (1998) *A Review of the Use of Urban Waste in Peri-urban Interface Production Systems.* The Henry Doubleday Research Association, Coventry, UK, 34 pp.

Blake, B., Kasanga, K., Adam, M., Nsiah-gyabaah, K., Pender, J., Quashie-Sam, S.J., Warburton, H. and Williams, K. (1997) *Kumasi Natural Resource Management Research Project, Inception Report*, Vol. 1. Main Report. Natural Resources Institute, for Department for International Development, London, 60 pp.

Bo Ling (1994) Safe use of treated night-soil. *ILEIA Newsletter* October 1994, 10–11.

Chao, K. (1970). *Agricultural Production in Communist China (1949–1965).* University of Wisconsin Press, Madison.

Cross, P. and Strauss, M. (1985) *Health Aspects of Night-soil and Sludge Use in Agriculture and Aquaculture.* Report No. 04/85, International Resource Centre for Waste Disposal, Ueberlandstrasse 133, CH-8600, Duebendorf, Switzerland.

Dalzell, H.W., Biddlestone, A.J., Gray, K.R. and Thurairajan, K. (1987) Soil management: compost production and use in tropical and subtropical environments. *FAO Soils Bulletin* No. 56. Soil Resources, Management and Conservation Service, FAO, Rome, 177 pp.

Deelstra, T. (1989) Can cities survive: solid waste management in urban environments. *AT Source* 18(2), 21–27.

Drescher, A.W. (1994) Gardening on garbage: opportunity or threat? *ILEIA Newsletter* 10(4), 20–21.

EQI (Environmental Quality International) (1988) Moqattam composting plant evaluation report for the period from January 1987 to June 1988. *Environmental Quality International* 18. El Mansour Mohamed Street, Zamalek, Cairo, Egypt.

Furedy, C. (1992) Solid waste management: exploring non-conventional options in Asian cities. Paper presented at the *International Workshop, Planning for Sustainable Development – Cities and Natural Resource Systems in Developing Countries*, 13–17 July, 1992, University of Wales, University of Birmingham, University College London, International Institute for Environment and Development, Cardiff, UK.

Garcia, C., Hernandez, T., Costa, F. and Pascual, J.A. (1992) Phytotoxicity due to the agricultural use of urban wastes: germination experiments. *Journal of the Science of Food and Agriculture* 59, 313–319.

Gaur, A.C. and Verma, L.N. (1991) Integrated plant nutrition in prevailing crop mixes in India. *RAPA Report* No. 7, 60–79.

Gallardo-Lara, F. and Nogales, R. (1987) Effect of the application of town refuse compost on the soil–plant system: a review. *Biological Wastes* 19, 35–62.

Hardoy, J.E., Mitlin, D. and Satterthwaite, D. (1992) *Environmental Problems in Third World Cities.* Earthscan, London, 224 pp.

Harris, P.J.C. (1996) *An Assessment of the Potential Contribution of Organic Expertise and Techniques to the Development of Sustainable Farming Systems for the Eastern India Rainfed Farming Project.* (With special reference to Integrated Nutrient Management.) Report of a visit to the EIRFP, October 1996. The Henry Doubleday Research Association, Coventry, UK, 48 pp.

Harris, P.J.C. and Smith, G. (1997) *The Use of Composted Urban Wastes in Integrated Management Systems to Control Pests and Pathogens in Peri-urban Agriculture.* Project ZA 0193. Report of a visit to Kumasi, May, 1997. The Henry Doubleday Research Association, Coventry, UK, 57 pp.

Harris, P.J.C. and Smith, G. (1998) *Peri-urban Waste Stream Products for Soil Amelioration.* Consultancy report to the Kumasi Natural Resources Management Research Project, April, 1998. The Henry Doubleday Research Association, Coventry, UK, 56 pp.

Harris, P.J.C., Lloyd, H.D., Hofny-Collins, A.H., Barrett, H.R. and Browne, A.W. (1997) *Organic Agriculture in Sub-Saharan Africa: Farmer Demand and Potential for Development, a Study to Inform Policy.* Final Technical Report, Project R6362A, April 1997. The Henry Doubleday Research Association, Coventry, UK, 131 pp.

Harris, P.J.C., Lloyd, H.D., Hofny-Collins, A.H., Barrett, H.R. and Browne, A.W. (1998) *Organic Agriculture in sub-Saharan Africa: Farmer Demand and Potential for Development.* The Henry Doubleday Research Association, Coventry, UK, 14 pp.

Hoitink, H.A.J., Han, D.Y., Stone, A.G., Krause, M.S., Zhang, W. and Dick, W.A. (1997) Natural suppression. *American Nurseryman* 1 October 1997, 90–97.

Honghai, D. and Veeman, T. (undated) *Urban Agriculture as Urban Food Supply and Environmental Protection Subsystems.* Reference provided by Carole Rakodi, Urban Planning Unit, Cardiff University.

Ishida, T. (1989) Existing conditions for agricultural utilization of sewage sludge compost in Japan. In: Dirkzwager, A.H. and L'Hermite, P. (eds) *Sewage Sludge Treatment and Use*. Elsevier Applied Science, London, pp. 451–463.

Jalan, R.K., Sushil, D. and Srivastava, V.K. (1995) The emerging priority for disposal, use and recycling of MSW in India. *Wastes Management* April 1995, 17–18.

Jansen, H.G.P., Midmore, D.J., Binh, P.T., Valasayya, S. and Tru, L.C. (1995) Peri-urban vegetable production in Ho Chi Minh City, Vietnam. *Asian Vegetable Research and Development Center, Working Paper* No. 11, 65 pp.

Kindness, H. (1999) *Supply and Demand for Soil Ameliorants in Peri-urban Kumasi.* Report to the Kumasi Natural Resources Management Research Project (KNRMP). Project R6799. July, 1999. Natural Resources Institute, Chatham, UK, 40 pp.

Kundu, N. (1995) Urban solid waste recycling through vegetable cultivation and rag picking – a study in Calcutta. In: *Recovery, Recycling, Reintegration.* R95 Congress Proceedings; 1–3 February, 1995, Geneva. Vol. 4, 233–238.

Lardinois, I. and Van de Klundert, A. (1994a) Recovery of organic wastes in cities. *ILEIA Newsletter* October 1994, 6–8.

Lardinois, I. and Van de Klundert, A. (1994b) Recycling urban organics in Asia and Africa. *Biocycle* June 1994, 56–58.

Lekasi, J.K., Tanner, J.C., Kimani, S.K. and Harris, P.J.C. (1998) *Manure Management in the Kenya Highlands: Practices and Potential.* The Henry Doubleday Research Association, Coventry, UK, 35 pp.

Lewcock, C.P. (1994) *Case Study of the Use of Urban Waste by Near-urban Farmers of Kano, Nigeria.* 23 January – 7 March 1994. Visit Report, Project No. A0354 for Natural Resources Institute, Chatham, UK, 69 pp.

Lopez-Real, J.M. (1995a) *Visit to Dar es Salaam, Tanzania, December 1995*. Report to Natural Resources Institute, Chatham, UK.

Lopez-Real, J.M. (1995b) *Organic Wastes and Peri-urban Horticulture. Visit to Kumasi, Ghana, November 1995*. Report to Natural Resources Institute, Chatham, UK, 27 pp.

Maung, M. (1982) *Utilization of Rural and Urban Wastes to Improve Soil Fertility.* FAO/SIDA Workshop on the use of organic materials for improving soil productivity in the Near East, (Alexandria, Egypt, 9 October, 1978). FAO Rome, Land and Water Development Division, pp. 203–210. FAO Accession No. XF8226367 (available on microfiche).

Maxwell, D. and Zziwa, S. (1992) *Urban Farming in Africa: the Case of Kampala.* African Centre for Technology Studies, Nairobi, Kenya.

McGarry, M.G. (1976) The taboo resource – the use of human excreta in Chinese agriculture. *The Ecologist* 6(4), 150–154.

Medina, M. (1993) Collecting recyclables in Metro Manila. *Biocycle* June 1993, 51–53.

Mortimore, M. (1993) The intensification of peri-urban agriculture: the Kano close-settled zone, 1964–1986. In: Turner, B.L., Kates, R.W. and Hyden, G. (eds) *Population Growth and Agricultural Change in Africa*. University Press of Florida, Gainesville.

Muller, M.S. and Rijnsburger, J. (1994) Taking care of the urban environment; MAPET – a new service to empty latrines. *Gate* 4, 34–37.

Ngnikam, E., Vermande, P. and Rousseaux, P. (1993) Traitement des dechets urbains. Une unite de compostage des ordures menageres dans un quartier d'habitat spontane a Yaounde (Cameroun). *Cahiers Agricultures* 2, 264–269.

Opara, C.N. and Asiegbu, J.E. (1996) Nutrient content of poultry manures and the optimum rate for eggplant fruit yield in a weathered tropical Ultisol. *Biological Agriculture & Horticulture* 13, 341–350.

Owusu-Bennoah, E. and Visker, C. (1994) Organic wastes hijacked. *ILEIA Newsletter* October 1994, 12–13.

Quansah, C., Drechsel, P. and Lefroy, R.D.B. (1997) Agricultural production systems of the peri-urban interface: soil fertility issues. In: Gregory, P.J., Pilbeam, C.J. and Walker, S.H. (eds) *Integrated Nutrient Management on Farmers' Fields: Approaches that Work*. The Department of Soil Science, The University of Reading, Occasional Publication No. 1. The University of Reading, Reading, UK, pp. 199–209.

Ratta, A. (1993) City women farm for food and cash. *International Ag-Sieve* VI(2), 1–7.

Rosario, A. (1994) A decentralised approach to solid waste management. *Appropriate Technology* 21(3), 29.

Samsunlu, A. (1982) Composting in the city of Izmir. In: Thome-Kozmiensky, K.J. (ed.) *Recycling in Developing Countries*. pp. 177–181.

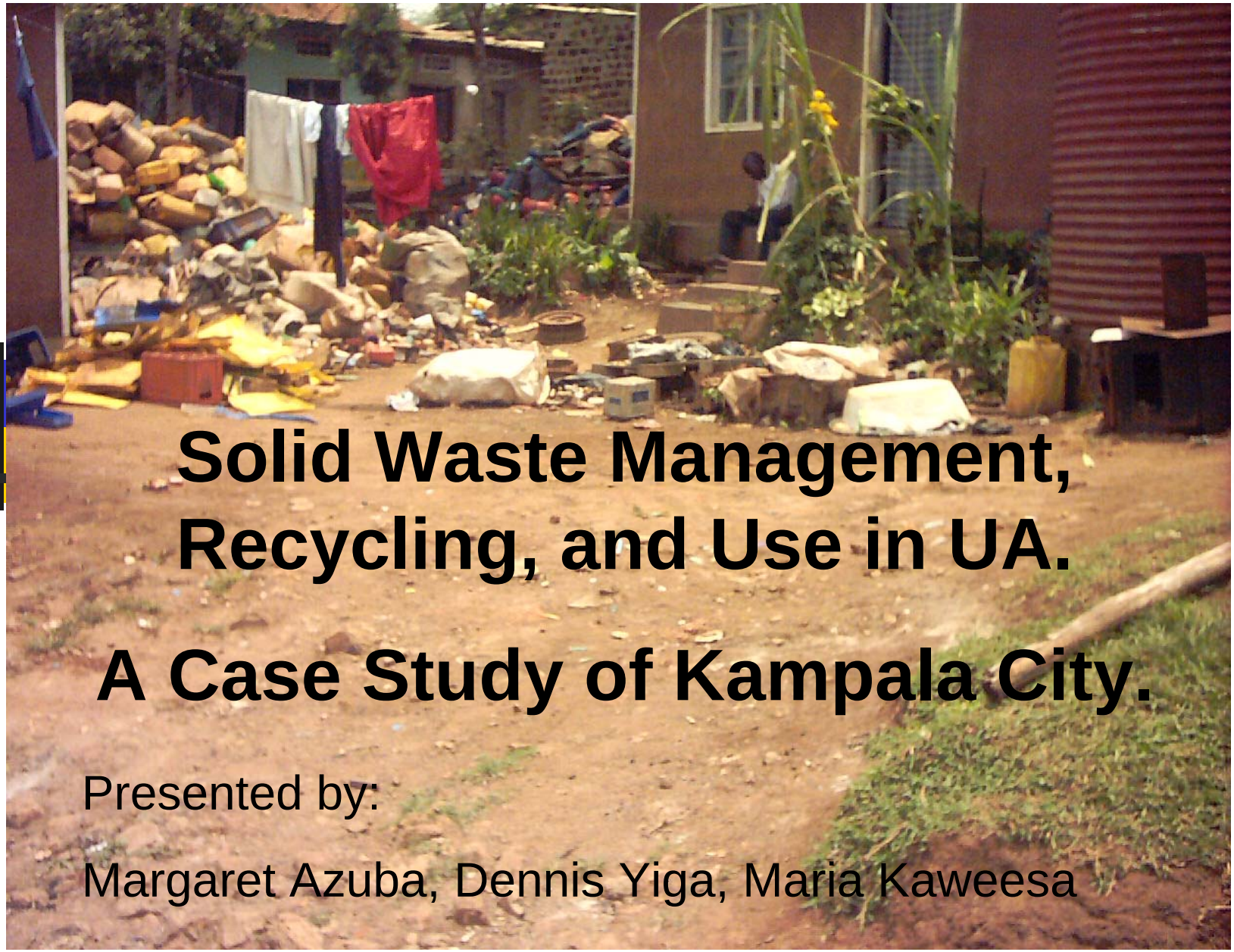
Schweitzer, F. (1989) Turning household waste into compost. *Gate* 3, 14–16.

Siemonsma, J.S. and Piluek, K. (1993) *Plant Resources of South East Asia: Vegetables*, Vol. 8. Backhuys Publishers, Wageningen.

Simpson, M. (1993) Lapaks and bandars convert MSW in Indonesia. *BioCycle* June, 78–80.

Streiffeler, F. (1987) Improving urban agriculture in Africa: a social perspective. *Food and Nutrition Bulletin* 9(2), 8–13.

Vogler, J. (1991) Recycling by voluntary organisations. *Gate* 4, 31–33, 37.
Wells, C. (1995) Managing solid waste in Brazil. *BioCycle* June, 53.
Yeung, Y.M. (1986) Examples of urban agriculture in Asia. *Food and Nutrition Bulletin* 9(2), 14–23.



Solid Waste Management, Recycling, and Use in UA.

A Case Study of Kampala City.

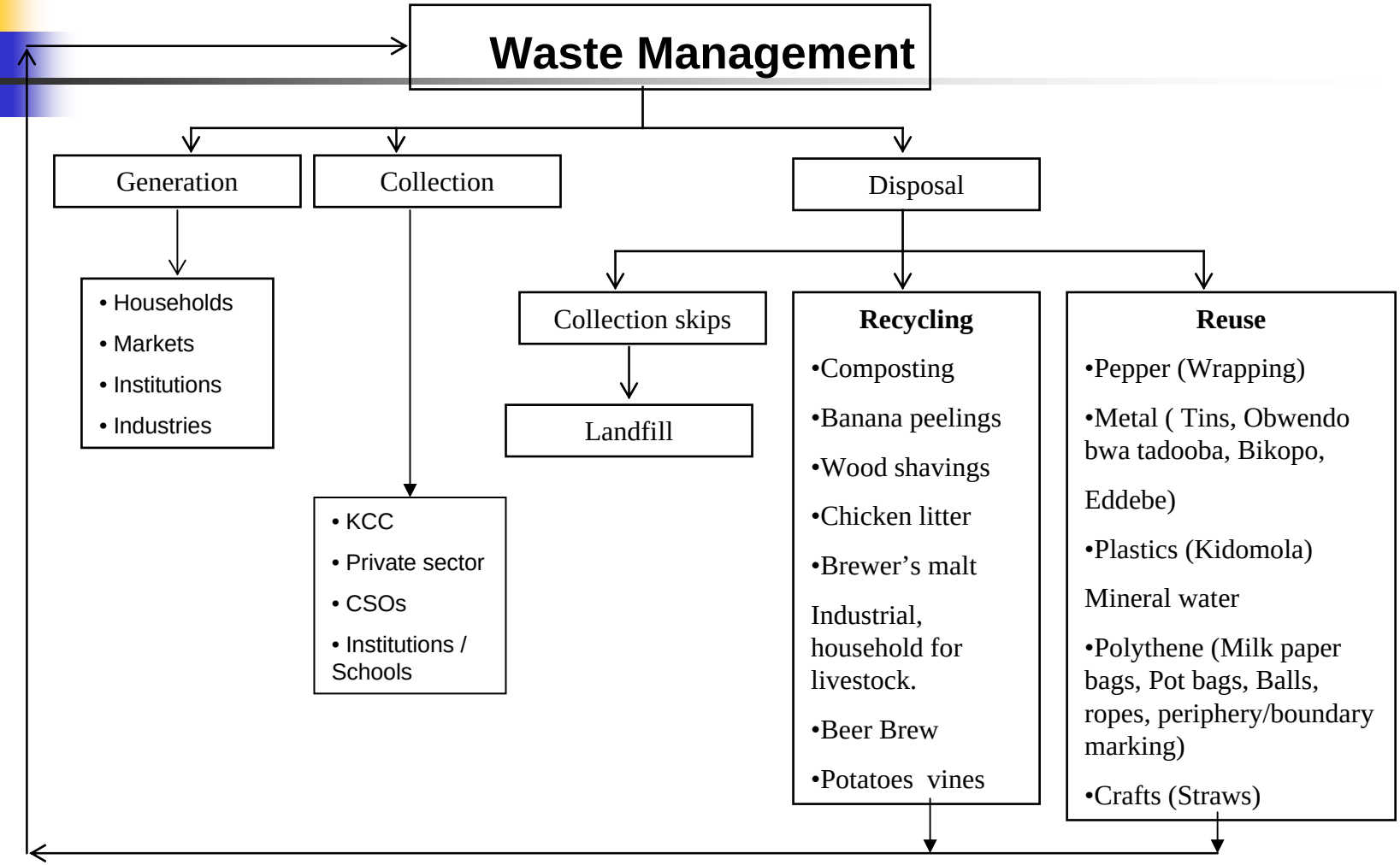
Presented by:

Margaret Azuba, Dennis Yiga, Maria Kaweesa

Objectives of management and recycling of waste in urban Agriculture in Uganda

- Reduce sanitation related problems.
- Improve soil fertility by recycling nutrients.
- Increase yield per unit area.
- Reduce costs of feeding (supplement livestock feed)/production.

Waste management & recycling flow diagram



Waste generation

- Approx. 2Kgs per capita per day of waste generated
- Average daily waste collection is 960 tones

Delayed waste collection by KCC

Solid Waste Collection

UCODEA Collection center

KCC Garbage truck

- 45% is collected by KCC and 5% by private collectors

Solid Waste Disposal

- 50% (uncollected) is disposed either on roadsides, open spaces, drains, gardens, pits, or burnt.

Sorting and Reuse of solid waste

Sorting

Community collection center

Recycled metallic waste on the local market

Shauri yako market collection center

Plastic bag reuse

Recycling

team

People Involved

Actors	Roles & responsibilities
KCC	▪Generally responsible for collection and disposal ▪Ensure that the city is clean of waste ▪Set standards of how to go about recycling and waste management
Private Sector (Charge 20,000/= per month)	▪Ensure timely collection in area of jurisdiction ▪Supply for bags per week, twice a week ▪Provide collection materials ▪Pay council dues
C.B.Os/NGOs. Community groups (Youth Groups & Women groups) Charge 100/= per heap	▪Involve community ▪Collect, sort, and recycle ▪Deliver or dispose at the skip BCODA
Institutions like schools	▪Manage their waste ▪Burn, pit, composting ▪Deposit in the KCC skip
Households	▪Generate waste ▪Properly dispose it off to recommended collection points ▪Keep homes clean

Constraints and Opportunities

Constraints

- Limited resources in KCC ably mange all the waste
- Poor solid waste management habits
- Bulky waste generated arising from feeding habits and livelihoods (need to reduce waste brought to the city).
- Limited knowledge on waste recycling and reuse technologies

Threats

•Rapidly growing city population vis-à-vis area.

Opportunities

•Availability of manpower Youth/Women

•Local Government structures; Admin, Parish Dev't committees, environment committees, and technical staff.

•Reuse of materials by the disabled.

•Close research institutions.

•Existing UA to consume raw compost

•Good Political will, city Minister/Mayor.

Way forward

- Develop appropriate technologies that can be utilised to convert refuse into a resource.
- Carry out a Participatory Action Research in solid waste management
- Popularise the laws and regulations related to Solid waste management.
- Strengthen public and private partnerships in Solid waste management.
- Source for funding to implement community based waste management interventions.

THANK YOU

Solid Waste Management in Urban Agriculture

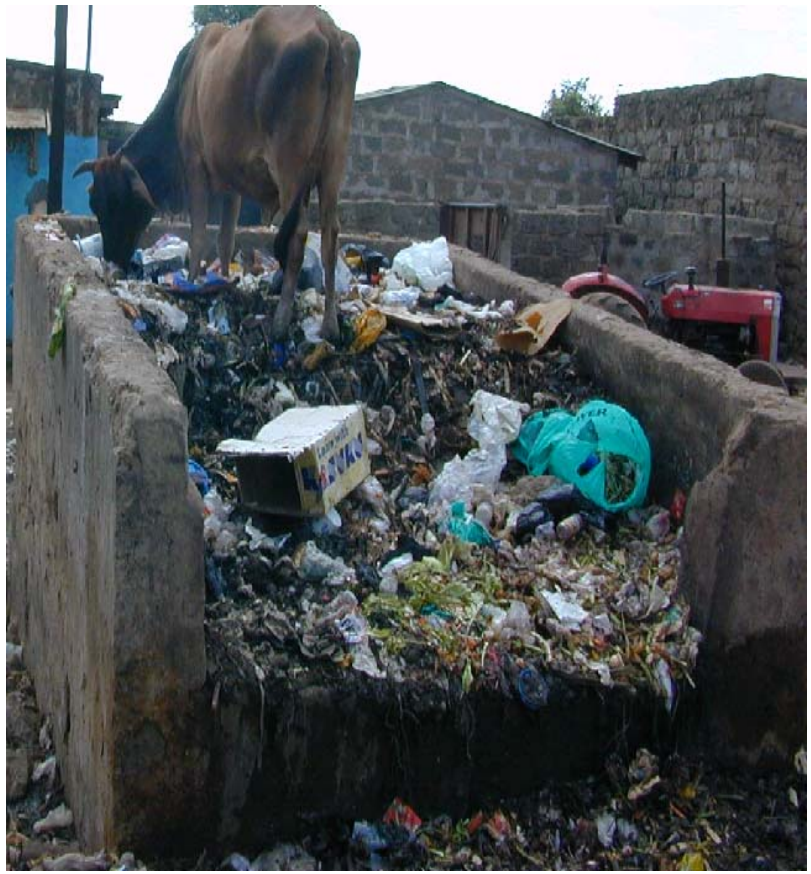
Promoting Organic Waste Recycling for UPA Through Demonstration Plots

Kisumu

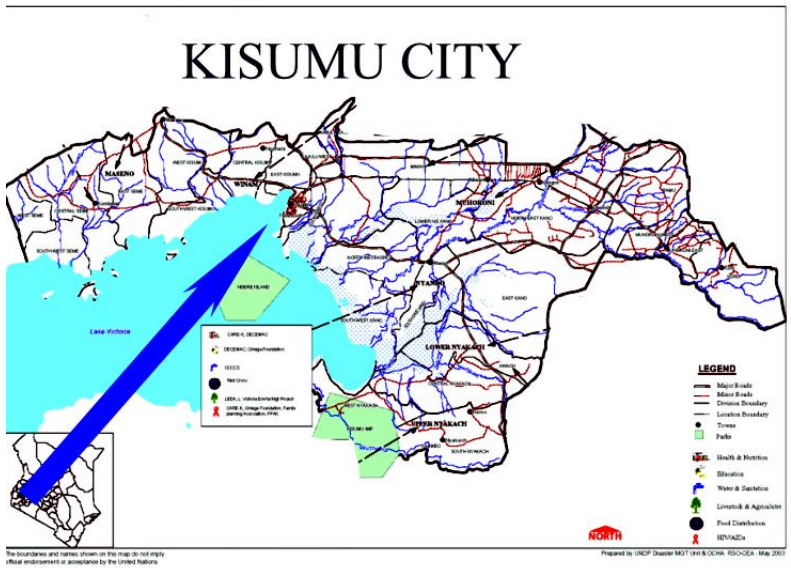
Robert Wesonga, Sammy Carsan and Miriam Wambugu

Common Scenes

- Mixed pile of garbage, largely organic by mass
- Free grazing livestock on waste
- Low evacuation frequency by city authority
- Resource for recycling



The City Profile



120 sq. km water

297 sq. Km Dry land

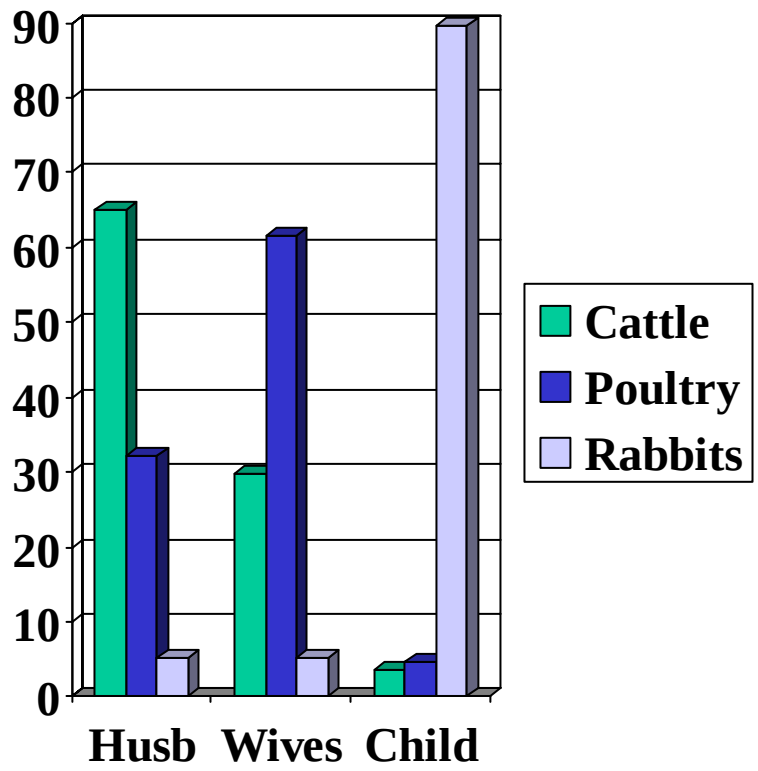
- Pop ~ 345,312 (1999)
- Growing at 2.8% p.a
- Density 828 per sq. m
- 60% pop reside in peri-urban informal settlements
- Approx. 150 housing units per ha informal settlement
- Highest incidence food poverty ~ 53.4%
- UPA (Livestock & Crop)

Infrastructure and Food Supply

- Conventional sewerage coverage 10% (other onsite); Piped Water supply 20,000 m^3/day against 48,000 m^3/day (other- Shallow wells, lake, river – suspect quality)
- ~400 ton SW generated per day, 20% collected: 65% of SW organic character *(Carl Bro a/s, July 2001)*
- Animal manure and domestic wastes contribute about 62.5% of total waste with an estimated nitrogen input of over 40,000 ton per year
- Local food demand outstrips local supply – net importation of food
- Contribution to HH income; 75% Agric, 10% wage, 4% Self employment

Urban Agriculture - Livestock

- Mixed livestock farming practice: Types include; cattle, goats, sheep, pigs, poultry
- Green waste from fruit and vegetable markets used as animal fodder
- Animal waste is mostly applied in farms
- Ownership of livestock is dependant on type (cattle mainly husbands; Poultry wives)



UA - Crop Production

Rich material for organic compost

- Crop farming mostly mixed cropping system (lake shore, foot of hills, flood pains, wetlands)
- Application of animal waste and dry sludge from sewerage plant common
- Types include vegetables, maize, beans, finger millet
- Women mostly involved in crop production
- redn in disposable bulk

Policy Issues on UPA – Ksm Context

- **Local Govt. Shift to Strategic Planning**
  - UPA recognition in City Development Strategy, Municipal Development Strategy
- **Short –Term Development / Action Plans**
  - LASDAP; Community dialogue and consensus building on budgetary allocation for support infrastructure for UPA (e.g markets)
- **Promotional Undertaking / Awareness creation**
  - Collaborative initiatives adopted by Council in using public spaces for demonstration of ‘safe’ UA practice
  - Integrating org. recycling in ISWMP (also Income)

UPA Promotion through Demonstration

The EPC Model

- Demonstration plots ($25m^2$) for organic farm production systems
- Set within central park facility to exhibit the use of organic waste fraction – compost (accessibility)
- Initiative of LVRLAC, supported by Sida and implemented by City Council of Ksm
- Waste sourced from Municipal market and parks waste for compost preparation
- Implementation started Nov 2003

UPA Promotion through Demonstration (cont'd)

The Jomo Kenyatta Grounds Model

- Collaborative initiative btwn CCK, LVTF and KCORE
- Aims at sensitising public on sorting of waste fractions to promote recycling as compliment to city SWM strategies
- On site composting and application on demonstration plots
- Organic waste from municipal market, sorting bins in the grounds and restaurant waste

Lessons

Achievements	Constraints	Opportunities
•Extending knowledge on application of organic waste •Positive influence on policy makers attitude towards UPA •Strong contribution to ISWM plan design for Ksm •Focal point for information and knowledge exchange	•Limited space for demonstrations •Prohibitive legal framework (by-laws) •Disinterest amongst urban community •limited institutional capacity (disconnected with actual practice in UPA)	•Potential case for facilitating review of prohibitive laws •Source for establishing networks •Platform for promoting new technologies

From Waste to Improved Health and Wealth

Charles Woahene
Waste Management Department
Kumasi, Ghana

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THEMATIC TEXTS

MODULE 5. SOLID WASTE MANAGEMENT AND URBAN AGRICULTURE

Prepared by:
Nancy Karanja, Mary Njenga, Pay Drechsel, Andy Bradford and Leah Oyake

BLOCK 4: GENDER, SOLID WASTE AND UPA

Case Studies on Gender and Solid Waste

1. Household Level: *Kumasi, Ghana*

Poverty, overcrowding, inadequate housing, and over-stretched infrastructure and services characterize many residential areas of Kumasi, Ghana. These problems are particularly common in the indigenous areas of the city (former villages now incorporated into the city due to urban expansion) where poor spatial planning and even lower service levels are found. In peri-urban areas located outside the municipal boundary these service pressures are often at the highest; inadequate and dilapidated public latrines, inadequate storm-water drainage, irregular water supply and open refuse dumps plague these areas. In addition, in these areas most households do not have toilet or piped water facilities, so residents are dependent on local public latrines and hand-pump wells for basic sanitary services.

In 2002/2003 as a component of a community waste management feasibility study, a survey of 323 households was undertaken in 6 different peri-urban locations of Kumasi. Despite differing social and economic circumstances amongst the six locations, several characteristics proved common in all six sites and were observed during the survey: unmanaged open waste dumps; indiscriminate dumping of waste on village peripheries; open defecation by children on waste dumps; and disposal of human excrement in plastic bags on waste dumps, the latter practice often called ‘precious package’, ‘wrap and throw’ or ‘flying toilets’.

Results from the survey showed that in 76% of the households the waste was handled by women, while in 23% it was handled by the children (15 years and under), and in only one household did men handle the waste (that particular household consisted of only two males). In Ghana, household activities are clearly differentiated on a gender basis. The Urban Waste Expertise Programme (UWEP) identify that women are far more likely than men to be involved in waste handling, cleaning up, or being associated with faecal waste, especially from children and older family members.

In Kumasi, every morning between the hours of 0500 and 0700 women (or children) from each household will systemically sweep inside their living quarters and also the compound or yard around their respective dwellings. The sweepings will be added to a basket or head-pan along with any domestic waste collected during the previous day and taken to the ‘set-out point’ (defined by UWEP as the ‘point at which whatever has been defined as waste is placed outside of the household for handling by whomever or whatever institution is understood to be responsible for waste’.

In peri-urban Kumasi, where no waste collection services are provided, these set-out points are allocated sites where community members dispose of their domestic waste on ever accumulating open waste piles. These dumping sites are characterized by squalid and hazardous conditions and due to land shortage are often located within the community areas. In the indigenous areas of the city, accumulation of waste even occurs at sites where communal containers (skips) are provided for waste collection by the municipal authorities. Due to insufficient collection vehicles and waste containers, and delayed or even cancelled collection services many of the communal containers are permanently full and at these locations waste is dumped next to the overflowing skips. Effects of urbanisation and modernisation are leading to both changes in waste streams and to higher waste flows, resulting in the growth of unsanitary conditions in many areas of the city.

2. Community Based Waste Management: *City Park Compost Project, Nairobi*

A scoping study was conducted in year 2003 by Urban Harvest and partners in the urban and peri urban Nairobi, to inventorise the existing composting groups, document composting methods and to characterise composts. Out of the 11 composting CBO's, 2 were found to be located and using market generated waste. One of these two is the City Park Environmental Compost Project, which is located at the City Park market in Parklands, Nairobi.

This is the first market based composting group in Nairobi, which was started in 1993 with a membership of 7 men and 8 women with a purpose of income generation, support to destitute children and cleaning the market. This initiative was as a result of funds from the Asian Foundation who incidentary are supporting the vegetable market. The nuisance of market waste due to poor services by the Nairobi City council may have led to the choice of composting making project. Therefore, the Asian Foundation constructed the shade where waste sorting and composing takes place. The association is guided by a constitution that stipulates the rules and regulation upon the members for instance resource management (time, sale of compost and income, external support).

A case study on was done in January 2004, to establish the gender involvement in market waste composting processes. Since its inception, the women sorted the waste and took it to the shade while men arranged the composting heaps in layers, watered and turned once a week until it was mature. Sieving and packing including storage was done by the whole group. One man whose stall was closest to the compost store was allocated the duty of selling and kept the store keys. The cash obtained from the sales was handed to the cashier who is a lady for banking. Income accrued from the sale of compost was shared among the member at the end of the year. A misunderstanding arose in 2002 when the 4 men and the chairlady, took some compost to the Kenya Agricultural Show, made some sales and never remitted the money as agreed although they had been advanced per diem to cater for their sustenance at show. This brought about suspicion in the group as those who didn't go to the show had high expectations in market opportunities and cash. This was followed by a quarrel between the elderly women and

the show team leading to a retrogressive growth of this group which had a lot of potential!

Currently, the group is composed of 8 women, 40% of whom are over 65 years old. This has affected the composting process, since they are unable to perform the heavy duties that are crucial to production of good quality compost for instance collecting different types of organic materials (the group is using banana leaves), watering and turning regularly and packaging. The store keys are kept by one of the elderly ladies who opens the store twice a week, sells the compost herself and the money is shared amongst the four without banking at all! The group therefore does not have any record on quantities of compost produced or the income generated in the last 3 years..

Way forward
-Men developed a proposal and managed to get a donor who was willing to improve compost producing facilities i.e. installation of piped water, storage tank and purchase of an organic waste chopping machine. They would also prefer involvement of neutral persons to produce and manage compost production as a commercial enterprise. Women are opposed to this approach. *Why do you think they are?*
-Women have sworn that they will never work with those men again and continue to do all the work but they need some technical assistance.

3. Private Sector in Solid Waste Management: ***Nairobi Solid Waste Management Associations (NASWAMA)***

NASWAMA is an association of groups and companies involved in commercial waste collection in the informal and formal settlements in Nairobi. Waste management by the private entrepreneurs involved in collection of waste from households, markets, hotels and industries and transporting it to the Dandora dump site. Infrastructure in the dumpsite are poorly maintained and/or managed by the NCC and hence these organizations have experienced a lot of frustrations in achieving their objectives due to breakdown of vehicles, mugging etc. Due to this they saw a need to get together so as to collectively address these constraints. Thus they organized a workshop that bore NASWAMA in 1990. NASWAMA has a membership of approximately 86 organizations which include, 27 CBOs, 6 NGOs and 36 private companies, 2 societies and 18 research and development institutions. Among the 37 companies only 16% are female headed.

An indepth study on gender analysis was carried out on Blue Bins which is a male headed company. Out of a total of 18 employees only 1 is a female who does the secretarial duties. Three of the 17 workers are above 40 years old, while the rest young persons of less than 35 years in age. The three are drivers and mechanics while the rest do heavy duties of collecting and loading garbage into the vehicles. The management role is played by the owner of the company and his siblings, who at the inception stages of the company, they were very young (9-12 years old) but they contributed greatly to promotion and acquisition of clients. The founder of the company is planning to

diversify his income generating activities and leave the total management of the company to the siblings who have matured with the organization.

Eighty percent of Blue Bins clients are women out of which 25% are the owners of homes and 75% are househelp. Where there is no househelp, the children collect and take household waste to designated collecting areas, a practice that is very prevalent in high density and the informal settlement areas. The rest of the clients comprised of bachelors most of whom have a personal relationship with the founder of the company. They have helped the founder with the establishment of the company and in getting him linkages with large-scale waste producers like hotels and industries.

Because of the poor and erratic garbage collection services from the NCC which led to uncontrolled dumping of garbage in the estates, a lot of residents were ready to pay for these services to any interested player and as such, there was no problem in payment. Infact most of the clients prefer paying in advance i.e. every 3 or 6 months or even yearly. The company does not experience any cash flow problems because there is a 95% compliant in payments.

THEMATIC TEXTS

MODULE 5. SOLID WASTE MANAGEMENT AND URBAN AGRICULTURE

Prepared by:
Nancy Karanja, Mary Njenga, Pay Drechsel, Andy Bradford and Leah Oyake

BLOCK 5. LEGAL INSTITUTIONAL AND POLICY ASPECTS OF SOLID WASTE MANAGEMENT AND UPA

A Case Study Illustrating Policy and Institutional Aspects of Waste Management. *The case of Kumasi Ghana*

Objective: To learn about strategies to integrate the re-use of municipal waste into urban environmental management. To learn in particular about stakeholder analysis, policy framework and institutional linkages necessary to ensure sustainability of recycling waste for urban and peri-urban agriculture (UPA).

Background
Though composting seems an attractive option from many angles, projects have been difficult to implement in many developing countries, especially in Africa. Through visiting composting projects in West Africa, it was observed that besides too expensive production, a common problem leading to project failure is poor co-ordination of efforts among institutions and stakeholders, due to weak institutional linkages, and the lack of the enabling institutional framework, including clear legislation and policies [1].

An investigation carried out by IWMI tried to:
analyse the existing legal and policy framework in addressing issues for composting in Ghana (via literature review, stakeholder interviews),
survey the perception of the institutions that can support community-based waste collection initiatives in Kumasi (via stakeholder analysis; perception interviews), and
propose an institutional linkage model suitable for Kumasi.

Existing policy framework (Case Kumasi)
Since 1999, the Environmental Sanitation Policy (ESP), drafted by the Government of Ghana, provides the national regulatory and institutional framework for all activities and actors involved in Environmental Sanitation. The ESP covers relevant aspects such as the establishment of the roles and responsibilities to be played by the public sector, the private sector and the community; legislation and law enforcement; criteria for services and projects; funding; and specifications for equipment and supplies. It was drafted in the context of the implementation of the Urban Environmental and Sanitation Project (URBAN IV) of the World Bank, a project designed among others to address the privatisation of waste collection systems in the five major cities of Ghana and the implementation of sanitary landfills [2]. Although the project perceives composting as a good option for waste minimisation, URBAN IV does not yet include a section on composting. Another factor influencing the ESP is that previous Ghana's experiences on composting are usually associated with the Teshie-Nungua plant, a capital-intensive, mechanic-automated, centralised compost plant, financed by the Swiss Government in 1979. The plant was originally designed with a production capacity of 20 tons/hour (circa 38,000 tons per year), but due to inadequate electricity supply, lack of spare parts and

inadequate maintenance programs, the plant broke constantly [3]. By the time of its opening, the project generated great expectation among municipal authorities, who estimated big revenues on compost sales. Failure brought disappointment, and consequently, the prevailing impression among municipal planners and policy makers that composting is not cost-effective. At present the plant is sub-utilised; it operates more as a dumpsite than as a compost plant. The compost produced is, however, in high demand by real state developers, who pick it up using their own transport, but farmers are unable to buy it because the majority lack means of transport.

Participation of NGOs and CBOs is encouraged in the ESP, but in practice lack of regulatory framework accounted for the temporary cessation of operations of a self-sustaining project in Jamestown in Accra, (the Ashiedu Keteke Community Participation Project, AKCPP), when house-to-house waste collection service was duplicated with a private contractor who was paid per removed waste volume (City & Country Waste).

Though the ESP is the initial step to establish the enabling institutional framework for waste management initiatives, experiences show that amendments and revision of the policy are needed in order to pave the path for project sustainability. After a thorough analysis by IWMI, the following policy aspects were presented to be considered [1]:

There is the need to draft local by-laws for the regulation and evaluation of composting initiatives, in promoting “good practices” to improve waste management, such as source separation of waste, or penalties for public dumping.
As compost is an agricultural input, setting of quality standards and marketing strategies should be responsibility of the Ministry of Food and Agriculture. The policy may include this linkage to Agriculture.
The regulatory framework should include formal schemes (instrumented by contracts) for Small-Scale Community-Based (SS-CB) composting and house-to-house waste collection projects operated by Community Based Organisations (CBOs) and Non Governmental Organisations (NGOs).
In order to assess “net savings of the assembly” it would be necessary to compare net savings of compost production to land filling (considering all costs and externalities). These could be justified best in those peri-urban suburbs not connected to urban waste collection. Here composting would be closer to the farmers, offer local waste dumps a significant relief, and save municipal funds otherwise spent on waste transport.
Also, the “limited market for compost” mentioned by the ESP has not yet been estimated, a gap now closed by IWMI for at least three major cities and their peri-urban areas (see figure 5.1.1).

These points are currently under discussion in Kumasi by the Kumasi Metropolitan Assembly and other stakeholders like communities, donors, scientists, and NGOs.

Perception Analysis among institutions that can support community-based waste collection and composting initiatives in Kumasi

Composting of urban waste is an economic activity involving several interest groups; its effects fall into the scope of responsibility of many institutions. The following institutions were identified in a stakeholder analysis based on interviews with key resource persons and then selected for a survey on perception of compost and composting due to their

potential role in the provision of sanitation services, extension of agricultural services, or as beneficiaries of both services [1]:

Kumasi Metropolitan Assembly-Waste Management Department (KMA-WMD). It carries out waste management through the Waste Management Department (WMD), provides licenses and supervision to operate waste management services to private companies, non-governmental organisations or community-based organisations.
Three suburb's Area Councils (AC) and one Unit-Committee (UC): Buokurom-Duase (AC and UC), Kwadaso (AC), Atonsu (AC). These are political-administrative units representing suburbs in the city. The three face problems due to inefficient waste management; it is only in Atonsu that sanitary conditions are significantly better due to a waste collection program.
Environmental Protection Agency (EPA): The regulatory organism-institution responsible for the setting of standards and guidelines for environmental quality.
Ministry of Food and Agriculture (MOFA): Coordinates and regulates the utilization of agricultural inputs as well as provides assistance and extension of services to farmers.
Metropolitan Health Services (MHS): Provides health data, supports hygiene education activities, and contributes to regulation and standard setting. Data generated by this ministry is used for disease prevention and control.
Non-Governmental Organisations (NGOs): Ghana Organic Agricultural Network (GOAN), and GROWTH Development Projects. GOAN is an NGO with experience in extending training and information dissemination to small-scale farmers in organic farming and compost production. GROWTH Development Projects is an NGO with experience in composting projects and sanitation campaigns in urban areas of Accra.
Organic farmers association in Duase: An association of farmers trained by GOAN in organic farming methods.
Financial Institution: The World Bank, as an institution with wide capacity and experience supporting waste management initiatives in the country.

Elements of the institutional perception survey were: 1) positive aspects perceived in compost and composting; 2) negative aspects (or obstacles) in compost and composting project implementation; 3) supportiveness and willingness to participate in the case a project were to be initiated; and 4) their role to play in such initiative in Kumasi. The results of the survey are synthesised as follows:

All of the institutions perceive compost and composting as a good agricultural input and as a good method for waste minimisation. Some of their particular views are: 1) it is environmentally friendly for the soil and the urban environment; 2) helps farmers to increase productivity; 3) crops are of better quality (in flavour and weight); 4) it opens the opportunity to create environmental and sanitation awareness; 5) it is an opportunity for municipal savings in waste collection and disposal.

Negative aspects and obstacles identified: 1) composting presents technical difficulties in project implementation; 2) to be effective, compost should be applied in large quantities to the soil (that is difficult); 3) prices of compost should be affordable by farmers, that is difficult due external costs (like transport costs) and low income of farmers; 4) projects are prompt fail if the institutional framework is not supportive; 5) in some low-income zones (Buokurom for example) a fee for waste collection would not be affordable; 6) low level of education was identified as the major obstacle making it difficult for people to understand the value of waste separation at the household level.

The institutions expressed positive their supportiveness and willingness to participate in the case a project were to be initiated. It was mentioned that in order to overcome obstacles, care must be observed in all planning stages so that all stakeholders' inputs are considered.

The survey revealed a constellation of stakeholders' roles to play in project implementation based on the expertise and abilities of each organisation (Figure 1). Considering that the majority of these institutions face sever resources constrains, lack of sufficient logistics, and general understaffing, but all of them see in composting an opportunity for improving the urban and peri-urban environment, their coordination and combination of resources, abilities, and strengths, represents institutional potentials to composting initiatives in Kumasi.
At the grassroots level, community representatives mentioned that people would be likely participate in waste collection if they were paid to do so; also, if two buckets were provided by the KMA or an NGO, people would separate their waste into organic and inorganic. They believe, because this is an opportunity to generate income and employment, that Village Chiefs would be supportive to facilitate land for the project.

The Organic Farmers' Association in Duase mentioned that even though they receive no support from superior levels to increase their productivity, they continue using and producing compost because their vegetables are of better quality, heavier, with better flavour, and are more nutritious; especially children like organic vegetables. They use their yields for self-consumption.

Institutional linkages to strengthen composting initiatives
Although abilities and expertise are available among institutions in Kumasi, weak inter-institutional linkages and lack of coordination can hamper effective implementation of plans and programs. From field visits to composting projects in four countries of West Africa [1], it was identified that successful projects are characterised by having strong inter-institutional linkages; this means, this projects have formally established channels and procedures of cooperation and communication with the community, research institutions, funding organisations, the local government, village chiefs, and marketing channels (among others). On the other hand, it was identified that projects that have failed are characterised by having poor partnerships and weak or lacking institutional linkages. Through the comparison of projects it was concluded that the number, the quality, and the type of institutional linkages a project has, influence its sustainability.

	Activity	Institution taking action									
		EPA	MHS	MOFA	KMA-WMD	NGO GOAN	NGO GROWTH	WORLD BANK	Village Chief	Unit Committees	Assemblyperson
Activities proposed by the institutions	Support sanitation awareness creation	■	■				■		■	■	■
	Support Waste collection initiatives	■	■		■		■		■	■	■
	Financial support of initiatives						■	■			
	CBO capacity building						■				
	Quality control monitoring	■		■							
	Monitoring & Evaluation of operation	■	■		■		■			■	■
	Licensing operation	■									
	Monitoring Safety & environmental impact	■	■								
	Promotion of sales of compost			■		■					
	Coordination of stakeholders				■		■				
	Education of farmers			■		■					
	Facilitate land to site the plant				■				■		
	Involvement in Management	■			■		■			■	■

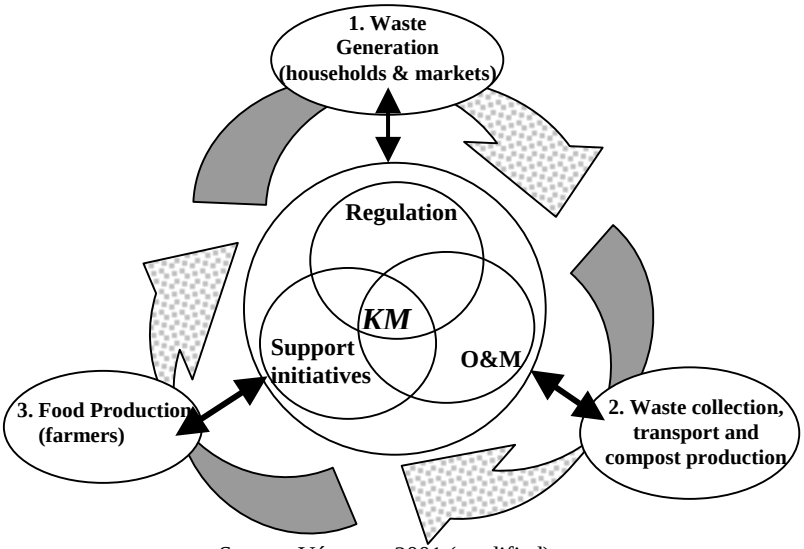
Source: Vázquez, 2001 (modified)

Figure 5.1.1. Potential Institutional & Stakeholders' Support

One approach to characterise the relationship among different stakeholders in the recycling of municipal organic waste is based on the rural-urban nutrient cycle or loop. Besides its bio-technical aspect of materials recycling, this model represents the

interactions between different social groups: 1) urban population, 2) waste collectors and compost producers, 3) farmers. This loop represents also an economy of scale through generation of income on each stage; positive generation of income becomes not only a cycle, but also a spiral of improved standard of living. In the centre of the cycle, the legal, institutional and communal settings may facilitate its social and economic aspects.

From the institutions listed in the perceptions survey, it is possible to group them into four general clusters: **1) Regulators**: are institutions in power to draft by-laws, legal instruments, and policies; **2) Organisation & Management**: institutions in charge of running composting plants; **3) Supporters** of initiatives: institutions providing external support (financial, material, knowledge); **4) Beneficiaries**: users of sanitation services (households and markets), communities and workers receiving income through composting (composting producers), and farmers (users of compost). Beneficiaries coincide with the groups representing each of the stages in the rural-urban nutrient cycle. Some of the institutions fall into more than one cluster; they are in the position to work as inter-cluster channels of linkage facilitating the flow and exchange of information. A model integrating the rural urban cycle and the clustering of institutions is proposed in Figure 5.5.2.



Source: Vázquez, 2001 (modified).

Fig: 5.52. Institutional platform supporting the rural-urban nutrient cycle

The institutional platform at the centre of the rural-urban nutrient cycle is to facilitate the framework of regulations, managerial and organisation skills, and external support to the beneficiaries. At the very centre is the Kumasi Metropolitan Assembly (KMA), this institution plays a role as regulator, a manager, a supporter of initiatives and as a beneficiary due to municipal savings; its central role doesn't mean it should be the chief institution or the one in charge, but it should be the main facilitator. Bi-directional arrows link the cycle to the institutional platform, meaning that the relationship may not be characterised as patron-client relationship, but as a mutual benefit relationship.

References

Vázquez, R. (2001). Municipal Waste Management in Kumasi: The Prospects of Building and Operating Small-Scale Community-Based Composting Plants in Kumasi. Faculty of Environmental and Development Studies. Kwame-Nkrumah University of Science and Technology. Kumasi, Ghana; pp 4, 18-19, 35-52, 60. 2001.

World Bank. Urban Environmental Sanitation Project. Project Appraisal, Credit and Project Summary. West Central Africa Department. Washington, DC; p. 66, 1996.

Etuah-Jackson, I., Klaassen, W.P., Awuye J.A. Turning Municipal Waste into Compost: The case of Accra. In: Waste Composting for Urban and Peri-Urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa. eds. P. Drechsel and D. Kunze. Wallingford Oxon, UK. p. 84-95, 2001.

Main reference:

Vázquez, R., Cofie, O.O., Drechsel, P. and I.F. Mensa-Bonsu, 2002. Linking urban agriculture with urban management: A challenge for policy makers and planners.

In: C.A. Brebbia et al. (eds.): The Sustainable City II. Urban Regeneration and Sustainability, WIT Press, 925- 934

THEMATIC TEXTS

MODULE 5. SOLID WASTE MANAGEMENT AND URBAN AGRICULTURE

Prepared by:
Nancy Karanja, Mary Njenga, Pay Drechsel, Andy Bradford and Leah Oyake

BLOCK 2: WASTE AS INPUT FOR UPA

Demand: Perceptions and Willingness to Pay

This section describes a case study on the analysis of the **demand segment** of the recycling loop (figure 5.1.1).

Objective: The demand side of the loop aims at the identification and characterization of actual and potential compost users under consideration of attitudes/perception towards the use of waste compost, actual demand and its quantification and its likely development, as well as an estimate of consumers ability and willingness to pay for compost under consideration of compost transport costs.

The study was designed to address the following specific objectives.

- To examine and document farmers' perception, knowledge and socio-cultural acceptability of compost made from solid and liquid[1] urban organic waste.
- To determine the socio-economic factors that are likely to affect farmers' willingness to pay for co-composted urban organic waste.
- To determine how much farmers from different farming systems are prepared to pay (willingness-to-pay) and are *de facto* able to pay for composted urban organic waste.
- To determine which farming system(s) have the highest potential to use waste compost.
- To determine how much other buyers (outside the agricultural sector) are willing to pay.

Based on these objectives the major **research questions** arising from the comparison of different cities (regions) in Ghana are:

- ✓ What is farmers' perception about composted waste in Ghana with regards to differences in their cultural and socio-economic background?
- ✓ What is the actual demand for compost in the study area ? (which influences the design capacity of the proposed compost stations)

Methodology

Primary and secondary data (both qualitative and quantitative) were used as the main sources of information. Questionnaire administration was adopted in the collection of data in the cities. Primary data was collected through direct interviews. The surveys included:
Identification of potential customers, e.g. the different urban and peri-urban agriculture (UPA) farming systems, estate developers, garden operators, landscape designers, etc. The Identification was followed by ***stratification*** for representative sampling using structured questionnaires (open and closed) with a given scenario to elicit willingness to pay, and focus group discussions to analyse the perception as well as the demand for co-compost**.**

Analytical Approach

The statistical software used in data analysis was SPSS 10.0. Both descriptive and inferential analytical tools of research were used to pursue the stated objectives. For the willingness to pay (WTP) for compost, ***contingent valuation*** method was used (Alberni and Cooper, 2000; Whittington *et al*., 1990). This involves direct questioning of individuals in a survey to determine if and how much they are willing to pay for waste compost. This can results in a bidding game, which helps to determine the maximum

[1] Nightsoil (human excreta). If mixed with solid waste the process is called co-composting.

amount the consumers are willing to pay (WTP) for the product or service (Hanley *et al*., 1997).

- ***WTP Questions***: At the start, the farmer had an opportunity to explain his/her current soil inputs, their advantages and disadvantages. After this, co-compost samples were handed out where the product was not yet known. Farmers compare it with known soil inputs, described experiences, or in those cases where farmers were not familiar with the product the interviewer explained both advantages and disadvantages without biased promotion. Then farmers were asked whether they are willing to pay (or not) for co-compost as a soil improver. If yes, they were asked how much they are willing to pay for a common 50 kg sack. This allowed assessing also zero willingness to pay and the mean WTP. Further questions were on socio-economic characteristics, income, experience with/without compost and perception of compost quality to get estimates for explanatory variables for the probit analysis.
- To give the WTP answers a reality check, the different UPA farming systems were analyzed for their farm finances and de facto ability-to-pay for compost**.**

Key Results and Discussions

The clients of compost in Ghana

In this study, the following potential clients were identified in the three cities:

[a] Urban farming systems: 1) Open space vegetable farmers; 2) Staple crop farmers; 3) Backyard farmers; 4) Ornamental flower producers, and 5) Valley bottom sugarcane farmers

[b] Peri-urban farming systems: 1) Vegetable farmers, 2) Staple crop farmers, 3) Fruits plantation farmers; and 4) Cotton plantation farmers.

[c] Real estate developers and landscape designers.

Farmers' perception of compost and co-compost

In general, the study revealed that farmers' perception of compost and co-compost was largely positive in all the farming systems (Table 5.2.1).

Willingness-to- pay (WTP) responses

Nearly all farmers with positive perception were willing to pay for municipal compost (70%) while 30% were unwilling though also these farmers acknowledged soil improvement as very important. Those who did not express WTP argued that they first have to test the product to know its effectiveness (in terms of yield and returns). See Table 5.2.2.

Table 5.2.1 Farmers' perception on co-compost in the three cities

Farming systems	Kumasi			Accra			Tamale		
	Negative %	Positive %	Indifferent %	Negative %	Positive %	Indifferent %	Negative %	Positive %	Indifferent %
Urban vegetable	3	97	0	12	73	15	3	90	7
Urban staple crop	0	63	37	0	0	0	8	82	10
Peri-urban vegetable	5	92	3	10	90	0	33	67	0
Peri-urban staple crop	16	71	12	0	0	0	4	88	8
Ornamental	9	82	9	10	80	10	0	100	0
Backyard	0	93	7	30	70	0	0	100	0
Pineapple	0	0	0	0	100	0	0	0	0
Total	6	83	11	8	80	12	8	88	4

Source: Danso et al., 2002

Table 5.2.2. Farmers' mean willingness-to-pay for 50 kg compost

Clients	Mean WTP $US	Std. Dev. $US
Kumasi		
Vegetable farming, urban	0.1	0.1
Vegetable farming, peri-urban	3.0	1.9
Staple crops, urban	2.0	1.6
Staple crops, peri-urban	2.7	1.0
Backyard, urban	1.4	0.9
Ornamentals	0.6	0.4
Accra		
Vegetable farming, urban	0.2	0.2
Vegetable farming, peri-urban	0.7	0.5
Pineapple	7.0	4.3
Backyard, urban	1.5	1.7
Ornamental	1.3	1.4
Tamale		
Vegetable farming, urban	2.0	1.3
Vegetable farming, peri-urban	1.4	1.3
Staple crops, urban	1.6	1.4
Staple crops, peri-urban	1.8	1.5
Backyard, urban	2.6	1.5
Ornamental	2.3	1.9

Source: Danso et al., 2002

Impact of Compost Knowledge on WTP

Table 5.2.3 shows farmers' mean WTP and standard deviation (SD) differentiated according to prior experience with compost. It shows that the WTP of compost-users can be lower than of (still) non-users.

Table 5.2.3: WTP and compost experience

City	Non-compost users (US$)	SD (US$)	Compost users (US$)	SD (US$)
Kumasi (vegetables)	0.1 (n=40)	0.1	0.3 (n=28)	0.8
Accra (vegetables)	0.5 (n=30)	0.5	0.2 (n=22)	0.1
Tamale (staple crops)	1.0 (n=67)	0.9	0.5 (n=16)	0.3

Source: Danso et al., 2002

Hypothetical Demand Analysis for Compost in The Cities

The study revealed that there is a significant demand for compost in the cities by different interested groups. In Accra, the **theoretical** demand was estimated that about 18,500 t, in Kumasi 11,000 t and in Tamale 5000 t. A detailed estimation for Kumasi has been presented in table 5.2.4.

Scenarios with Marketing of Co-compost

Two basic scenarios were calculated to analyse how many farmers could **actually** benefit from compost or what is the likely compost demand with and without price subsidies taking into consideration actual compost production and transport costs as well as the theoretical demand, WTP and ATP for compost. This figure is crucial for the planning of the capacity of the compost station(s). In this analysis, the basic scenarios were:

[1]. It is assumed that the compost production is completely subsidized, i.e. farmers only pay for transport of compost to their farms, a situation comparable to poultry manure

[2]. It is assumed a 50kg sack of compost costs 3 USD (based on coverage of running costs at the pilot co-compost station in Kumasi).

The example of urban vegetable farmers:

With subsidies, it is clear that all urban vegetable farmers living at the compost plant could use the compost. We can then transform the WTP for compost into transportation costs, which shows that 14% of these farmers would pay $1-2 for transportation, 5% could pay $3 and 38% could pay about $5 or 6 (Fig. 5.2.2). According to figure 5.2.2, it implies farmers within 35 km radius could come for the co-compost.

Without subsidies, on the other hand, the price per bag of compost (US$3 for 50kg) would discourage the majority of these farmers, given their low WTP.

Other Potential Buyers

Based on interviews with real estate companies and the house building rate around the city the demand for ‘black soil’ or compost per garden could be analysed and the annual demand (and WTP) of the real estate sector for compost estimated.

Table 5.2.4: Farmers' WTP and Theoretical Demand Estimate for Compost in Kumasi.

Potential Clients (Kumasi)	Estimated number of farming households in and around the city (total)	Average farm size per farmer Ha	Number of farmers willing to pay (extrapolated from sample size)	Average WTP (US$)	Qty/year in 50 kg-bags per farming household	Total theoretical demand of compost in tons per year *	Total demand with assumed compost cost of US$3/50kg[1]
Vegetable (urban)	200	0.1	126	0.1	214	1348	0
Vegetable (peri-urban)	280	0.8	260	3.0	28	364	157
Staple crops (urban)	115	0.2	67	2.0	5	17	7
Staple crops (peri-urban)	15000	0.8	5550	2.7	14	3885	1166
Urban backyards	85000	0.02	71000	1.4	3	5325	1225
Urban ornamentals	50	0.02	40	0.6	33	66	0
Total	100,645		72,294		297	11,005	2,555

Source: Danso et al., 2002

- *Calculation example: (urban vegetable farming) 214kg y^{-1} x 50kg ÷1000 = 10.7t y^{-1} = 10.7 x 126 farmers wtp = 1348t y^{-1}. Compost application was assumed to be twice a year for vegetable farmers (urban and peri-urban) and at least once for the other farming systems. Although 8 of 10 backyard owners were willing to pay for compost it is assume that only 50% could actually use compost for their crops (the same for the other two cities).*
- *Total demand calculated is based on the actual WTP plus ATP (not on the average) of all the farmers in Kumasi.*

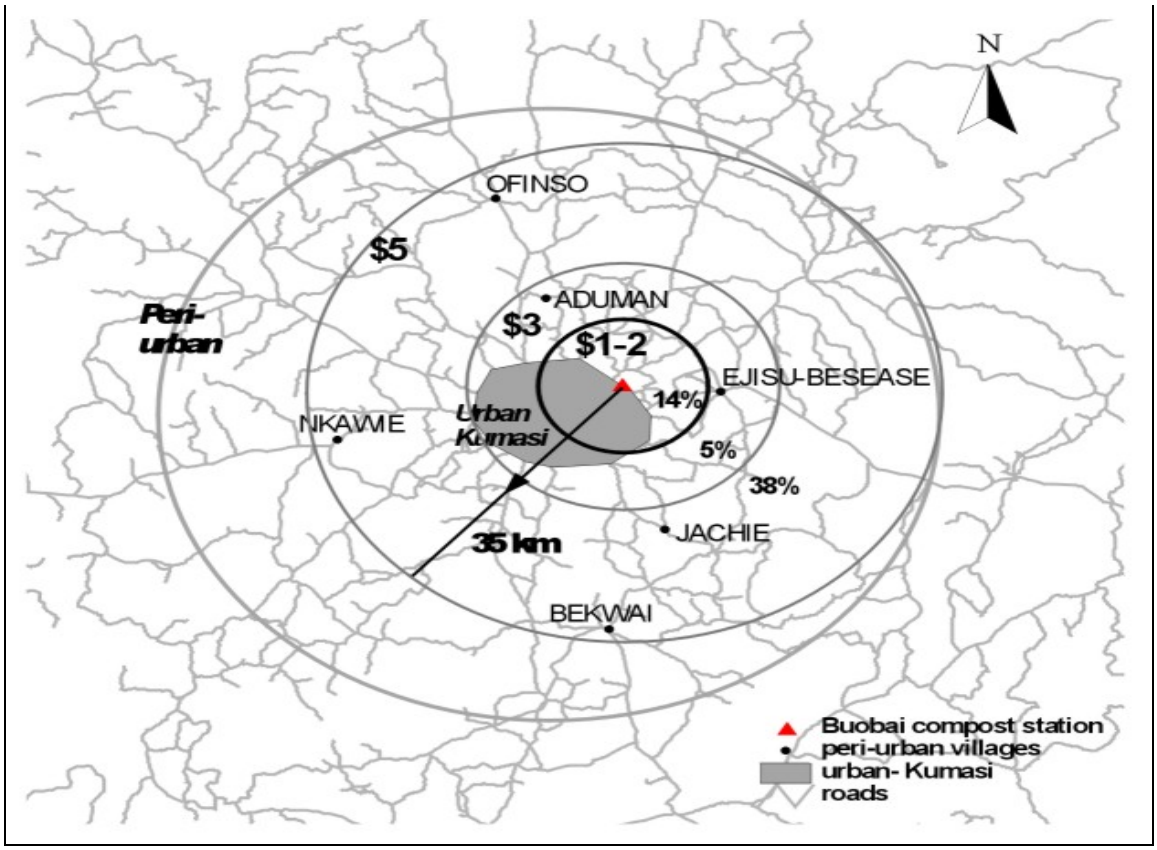


Fig 5.2.2. Marketing of co-compost under different scenarios in Kumasi (IWMI, unpubl.)

References

Alberni, A. and Cooper, J., 2000. Application of the contingent valuation methods in developing countries. A survey. of FAO Economic and Social Development Paper number 146.

Danso, G., S.C. Fialor and P. Drechsel, 2002. Farmers' perception and willingness-to-pay for urban waste compost in Ghana. In: Almorza, D. et al. (eds.) Waste Management and the Environment, WIT Press, 231-241

Hanley, N.J. Shogren and B White.1997. *Environmental* ECONOMICS In Theory and Practice. Published by Oxford University Press, Great Britain.pp356-418

Whittington, D., Briscoe, J. Mu, X. and Barron, W., 1990. Estimating the willingness to pay for water services in developing countries: A Case Study of the Use of Contingent Surveys in Southern Haiti. Economic Development and Cultural Change 38: 293-311

THEMATIC TEXTS

MODULE 5. SOLID WASTE MANAGEMENT AND URBAN AGRICULTURE

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BLOCK 3. TECHNIQUES AND PRACTICES IN COMPOST MAKING

Community Based Compost Producing Processes and Quality: The case of Nairobi.

Introduction

The case study is meant to illustrate different community based composting processes and their effects on quality

The data was compiled from a scoping study conducted in 2003 on management of organic waste and livestock manure for enhancing agricultural productivity in the urban and peri urban Nairobi. The study was carried out by Urban Harvest in partnership with ILRI, ICRAF, Kenya Agricultural Research Institute (KARI) and Kenya Green Towns Partnership Association (KGTPA). During the study 11 composting groups were interviewed.

Composting Groups

The compost producing CBO,s had a combination of objectives which guided their activities namely income generation, environmental management, public health awareness raising and street children rehabilitation. Income generation was the main objective of all the groups. The second objective for all the groups was environmental management except for 1 group, which was located in a central dumping site. As a third objective, 4 of the groups had public health awareness raising while two groups had street children rehabilitation. Only one group had all the four objectives while one other had only two (table 5.3.4).

Table 5.3.4. List of Composting Groups in Nairobi and the Activities Conducted

Objective / Group	Type of group	Income Generation	Environmental Management	Public Health	Street Children Rehabilitation
Tuff Gong Garbage Recycling Group	Compost production	X	X	X	X
Kuku Women Group	Compost production	X			
Kayole Environmental Management Association	Compost production	X	X		
Mukuru Recycling Centre	Compost production	X			X

Mathare Borea Composting Group	Compost production	X	X		
Garbage Recycling Programme (Save The Children)	Compost production	X	X		X
City Garbage Recyclers S.H.G	Compost production	X	X		
Youth United Against Environmental Pollution	Compost production	X	X	X	
Soweto Youth In Action	Compost production	X	X	X	
City Park Environmental Group	Compost production	X	X		
Kawangware Afya Bora S.H.G	Compost production	X	X	X	

The objectives and activities of the groups are in line with the Kenya National Policy Sessional Papers as they either directly or indirectly address poverty, hunger, healthy environment and sustainable development. All the CBO are legal entities and are registered as self-help groups under the Ministry of Culture and Social Services. Each group's objectives are well stipulated in a constitution that is also used for guiding the activities and for penalising members in times of misconduct. The legal framework in Kenya is yet to formally incorporate urban agriculture in its urban planning policies, and hence the groups activities on waste management would be termed illegal. However there are multi-stakeholder forums that are working towards policy development on private sector waste management and urban.

The CBO use a diverse range of techniques for compost production which are simple, cheap and easy to adopt. For most of the groups the techniques have been developed from within while a few have learnt through training. The CBOs are linked to various institutions such as universities, churches, international and local NGOs, Embassies and the government e.g. municipal councils. The CBOs are linked to these institutions mainly for capacity building, resource mobilisation and establishment of market opportunities. There is high availability of solid waste e.g. from households, food kiosks, farm based industries and crop produce markets, with a proportion of organic component of over 60%. Market waste has even a higher proportion of organic component which is over 80%. Despite the high availability of solid waste in and around the city, the groups receive the waste as a mixture of organic and inorganic components which they have to sort. There are various unexploited market opportunities for compost e.g. from urban landscapers and plant nurseries, rural large-scale flower farms and urban and rural farmers. The CBOs are faced with the challenge of lack of space as they carry out their activities on public land which they rent in or are allowed to use for free through temporal arrangements with the administration. Only one group has officially been allocated a ¼ acre plot by the city council. Although the CBOs are involved in garbage collection and composting, the mandate lies within Nairobi City Council and hence, if the N.C.C. improved on its garbage collection services under the current legal framework, composting activities could be threatened. However the on going process in policy development on urban agriculture and private sector involvement in waste management is

a good opportunity that will enhance compost production and utilization. Data challenges the experience by the groups, as one group has been officially allocated a quarter acre plot by the city council. Lack of information on market opportunities for compost, has made compost production lose its position as a priority activity for 3 groups while 1 group has stopped the activity completely and only hoping to resume when a market opportunity is established. Other activities that are becoming more important than compost production among the compost producing groups include, production of briquette, paid for household garbage collection and public health awareness raising e.g. on HIV/AIDs.

Composting Processes

Different types of organic materials were used for compost production namely, household waste, market waste, waste food from kiosks and hotels and industrial waste i.e coffee husks. There were three main categories of composting processes applied by the groups namely, open (surface) heap/pile composting which was either windrow or static, pit composting which was mainly windrow and dumpsite mining (table 5.3.5)

Table 5.3.5 Methods of composting and groups/individuals involved

Groups \ Methods	Open heap/pile composting		Pit composting	Dumpsite mining	Adding of other materials
	Layering heap/pile composting	Non Layering heap/pile composting			
Tuff Gong Garbage Recycling Group	T S/C				EM1 Manure Tithonia
Kuku Women Group	W S/C T				
Kayole Environmental Management Association	S /C T				
Mukuru Recycling Centre	W S/C T				
Mathare Borea Composting Group	WT				
Garbage Recycling Programme (Save The Children-Kenyatta Mkt)			X		
City Garbage Recyclers S.H.G		S/CT			
Youth United Against Environmental Pollution Ruiru				X	EM1 Manure
Soweto Youth In Action	S/C T				
City Park Environmental Group		W S/C T			
Kawangware Afya Bora S.H.G	W S/C T				

W =watered, T=turned, S/C= shaded or covered, EM1 is a microbial culture inoculant

The choice of process was based on availability of resources such as land and waste materials and the level of knowledge. Open heap or pile composting was practised by 9 groups who also turned the materials hence applying windrow method while the remaining 2 did not turn the materials hence using static pile method. One of the two groups applying static method used pit composting while the other did dump site mining. Among the groups applying open heap composting, 7 of them arranged the composting materials in layers. Co-composting of organic waste with manure was done by 2 groups. One group produced compost through mining dumpsites where materials went through natural decomposition. Out of the 11 groups applying different composting methods, 5 watered the composting materials while 8 shaded or covered the composting materials. The different processes used in composting had an effect on quality of the product as indicated in table 5.3.6

Table 5.3.6. Composting methods, organic substrate, nutrient and heavy metal

Compos-ting Method	Organic materials (Substrates)	Nutrient Content				Heavy metal content			
		N gkg-^{1}	P mg kg-^{1}	K g kg-^{1}	C/ N	Pb mg kg-^{1}	Cu mgkg-^{1}	Zn mg kg-^{1}	Cr mg kg-^{1}
Windrow	Assorted organic wastes	13.1	4.4	21.5	8	103	**133**	495	38
Windrow	Market wastes, EM1,	12.9	3..30	17.2	7	21	47	210	14
Static -pile	Markets waste household waste, EM1 Ash charcoal dust	10.0	4.9	17.3	12	Trace	**108**	**630**	34
Co-composting	Household waste and manure	**22.3**	**7.5**	**20.7**	11	Trace	45	305	8
Manure	Cow dung,	11. 4	6.6	18.8	10	Trace	80	**660**	3

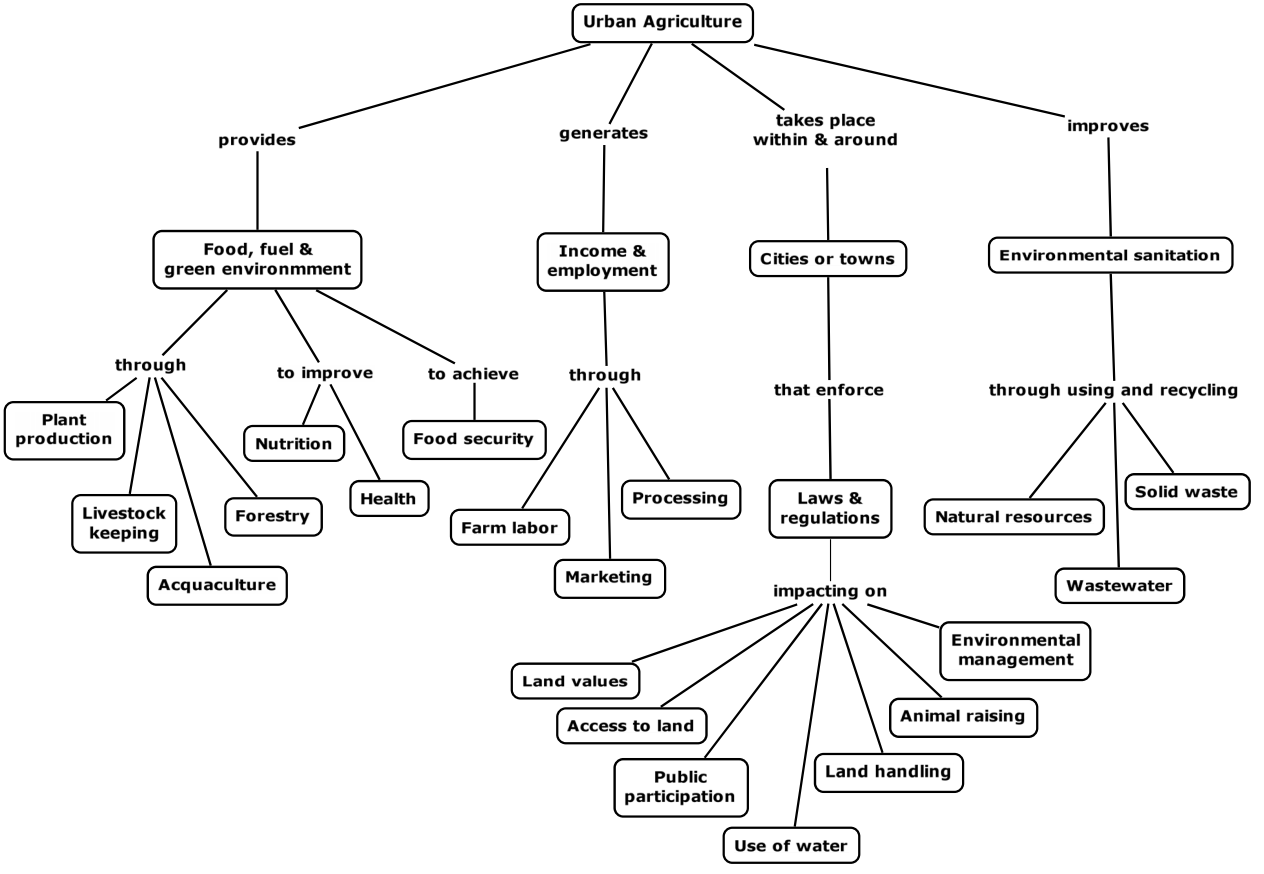
composting (zero grazing)	wood or sawdust and feed left overs								
Acceptable critical levels		**17**	**15.5**	**20.7**		**150**	**80**	**300**	**50**

EM1= Effective Micro Organism is a culture or micro organisms.
Anything below the nutrient levels is not acceptable as a fertilizer but may qualify for conditioning. Anything above the levels of heavy metals is toxic: Source World Bank 1997a and Based on NRC (1996)

References

National Research Council (NRC), 1996. Use of Reclaimed Water and Sludge in Food Crop Production. Washington, D.C. National Academy Press.

World bank, 1997a. The Use of Compost in Indonesia: Proposed Compost Quality Standards. Infrastructure Operations, Country Department III, East Asia and pacific region Washington, D.C., USA, June.


Urban Agriculture
provides
generates
takes place within & around
improves
Food, fuel & green environmment
Income & employment
Cities or towns
Environmental sanitation
through
to improve
to achieve
through
that enforce
through using and recycling
Plant production
Nutrition
Food security
Livestock keeping
Forestry
Health
Farm labor
Processing
Marketing
Laws & regulations
Natural resources
Solid waste
Acquaculture
Wastewater
impacting on
Environmental management
Land values
Access to land
Animal raising
Public participation
Land handling
Use of water

ANGLOPHONE AFRICAN REGIONL TRAINING COURSE

MODULE 7: INTEGRATING UA IN URBAN PLANNING AND DEVELOPMENT

Complementary reading materials

PARTICIPATORY POLICY DEVELOPMENT AND ACTION PLANNING

Urban agriculture is a cross-sectoral issue that requires a multi-actor approach and the active participation of the direct stakeholders (farmers' groups, small enterprises, consumer groups) and indirect stakeholders (city authorities, extension services, credit services, health departments, etc.) in the planning and implementation of policies and action programmes.

Such action programmes might be specifically focussed on urban agriculture. But experience has shown that urban agriculture is most viable where it is mainstreamed into robust strategies for urban land use planning, public health, local economic development, and sound urban environmental management

Creation of an appropriate Institutional Framework

The legal, institutional and organisational context for urban agriculture is defined on many levels. Multinational institutions like the European Union, national governments, regional institutions and finally local governments have developed rules and regulations applicable to urban agriculture. It would be beyond the scope of this paper to reflect all the different rules and regulations on the national level. Of course, there are many differences between countries regarding the division of competencies between levels of government especially concerning planning authority or legal regulations. As this paper is focussed on policies for local governments, it will concentrate on the local level and perspective as a basis for a multi-stakeholder approach to policy development and action planning regarding urban agriculture.
As described in detail above, the roles and functions of urban agriculture within local policies are manifold. In order to develop its full potential to contribute to a sustainable urban development, it is important that this potential is also recognised by the urban administration. This recognition should not only be reflected in the relevant political programmes and plans but should also be part of the organisation of the administration.

Recognition of Urban Agriculture by local policy makers and administration

Awareness raising

A prerequisite for any policy related to urban agriculture is the *recog*nition of the value, the benefits and the resulting needs of UA by the political leaders and the heads of administration on the local level. Therefore it is necessary to raise their awareness for the issue as far as possible, if they are not already on top of things. Thus it is necessary to provide them with adequate information. It would also be useful to demonstrate the

positive aspects of urban agriculture with some local examples. To achieve this best it is always recommendable to involve relevant local stakeholders as far as possible (see also below).

The allocation of responsibility within the administration

The clear allocation of responsibility for urban agriculture

Urban Agriculture needs an institutional home. Often it will not be possible to create an own department for UA, but the local authority should allocate the responsibility for the subject with one department. The link to green space planning and management seems an obvious one. This should help to create a focal point for all questions linked with Urban Agriculture within the administration which then should also be responsible for the internal coordination across departments whenever necessary.

The creation of a framework for coordination between departments

Urban Agriculture is relevant for many areas of local policy. Even though a clear responsibility must be allocated in one department it is still necessary to coordinate the work across the departments in a structured way in order to achieve optimal results taking into account all aspects to be considered. This could either happen through a regular working group or through fixed procedures for involvement of different departments in case issues relevant for urban agriculture are discussed.

The creation of opportunities for public participation

The variety of urban agricultural activities is matched by the variety of people and organisations involved in them. Some of them might be well organised (farmers organisations, allotment gardeners etc.) others (socially disadvantaged or ethnic minorities) might be less. However to fully develop the potential of Urban Agriculture and its benefits for sustainable urban development and for the successful implementation of policies it is very helpful to involve the people that are immediately concerned. Therefore the administration should offer possibilities for participation of selected stakeholders during the planning and decision preparation processes. In order to come to a concentrated and result oriented process, it is important, to select only those stakeholders that are relevant for the plan or decision envisaged. On the other hand, it should be taken care, that no relevant organisation or group of people is excluded.

A participatory multi-stakeholder approach to urban agriculture

It is recommendable to elaborate a local action plan[1] for sustainable urban agriculture, based on the model presented below. The approach described is inspired by Local Agenda 21[2] action planning and its core principle, community involvement.

[1] **Action Planning**: participative process of fixing priorities, finding targets, formulating measures and taking action.

Any planning process includes a series of activities, starting from the organisation of the process itself and the mobilisation of stakeholders, to the creation of the action plan. The methodology described below can be used for an overall strategic planning approach to urban agriculture as well as being adapted to single plans or policy measures.

Preliminary activities: organisation of the process, mobilisation of the public interest

Organisation

Coordination
The local authority is most indicated to co-ordinate the planning process. It has the legitimacy and the capacity to bring together all sectors around a common project and is therefore the most appropriate body to manage the process.Commonly, one department of the administration will be designated to be responsible for the organisation of the planning process. Among other tasks, co-ordinators will organise and animate meetings, spread out information to the stakeholers, keep minutes of the meetings. Officers from other departments should also be involved in the discussions. This would ensure that all relevant aspects to urban agriculture, from environment to urban planning, economic development to health and social issues will be given sufficient consideration in the action plan or policy.

Community involvement
To ensure, that the action plan for urban agriculture will represent all interests, address all issues and problems, relevant stakeholders should be involved in its elaboration.
Therefore, one of the co-ordinator´s first tasks will be to inform the community about the project of an action plan for urban agriculture, to identify all relevant stakeholders and invite them to take part into the process.

Identification of the stakeholders

Some effort has to be put into identifying these groups and motivating them to participate. The number and composition of these stakeholders differ almost from City to City. That is why this paper cannot provide a comprehensive list but gives general ideas about potential stakeholders to be considered and their possible role in the planning process.

Elected councillors

The initial idea to put urban agriculture on the political agenda may come from officers of the local authority, from the elected councillors or from outside the authority, from citizens groups, environmental organisations, etc. Wherever the initial impulse comes from, the interest of the elected council should be engaged and a resolution made to support the work with the resources of the administration. Indeed the local authority is already engaged in many areas of service provision and regulation, such as urban

[2] **Local Agenda 21** can be defined as the action plan for a sustainable development of a municipality, set up by a local authority together with the local stakeholders and citizens.

planning, water treatment, waste collection, which have direct interactions with urban agriculture. Activities begun without the council involvement may achieve little in the long term.
Therefore, it might be appropriate to involve councillors in the discussions all along the planning process, in order to acknowledge their opinion and suggestions, provide feedback in council meetings, overcome possible resistance and eventually gain support from the council.

Local administration
In case the local authority takes over the planning process for urban agriculture, administration officers will be in charge of organising the process and draft the action plan or policy.
During meetings, they will also provide expertise and advice to the stakeholders, regarding municipal policies, projects and areas of service provision.

Professional Farmers and Gardeners (Associations, Representative Bodies)
The involvement of professional farmers will be particularly important because a key part of the action will be to help them making environmentally informed choices and to promote their products on the market. However, one should bear in mind that professional farmers are governed by economic interests, requiring energy and raw material at the lowest possible costs and needing to dispose of their waste as cheaply as possible. Therefore some might be reluctant to implement sustainable agricultural practices.
Involving professional gardeners is essential also as they can provide expertise and advice to the administration regarding urban agriculture.

Subsistence and hobby Farmers and Gardeners (Associations, Allotment Organisations, Informal and non-organised groups)
As for professional farmers, the involvement of subsistence and hobby farmers and gardeners in the planning process will be particularly important because the action plan will aim to incite them to use sustainable agricultural practices ie. use of rain water for irrigation, use of natural fertilisers and also these stakeholders will provide their expertise, local knowledge and perspectives in the discussions.
However the focus on their activity should not be forgotten and they may appear to be pushing for urban agriculture developments regardless of any other issues.

Micro-entreprises involved in urban agriculture
Next to the intra-urban and peri-urban farmers and gardeners themselves various micro-entreprises are involved in the production of agricultural inputs (e.g composting), the processing of agricultural produce (eg. cheese making, jams and marmelades, dried fruits and flowers) and its marketing (e.g. street vending of fresh products or prepared food, sales in small shops and on local markets, food box schemes, etcetera).

Minority Groups and Social Organisations
As already mentioned, urban agriculture plays an important social role: it contributes to supply healthy food to the urban population and acts as a tool for integration of excluded populations. Actions to promote urban agriculture in its social role should be discussed with the targeted populations (i.e. disabled people, women, ethnic minorities) and their associations.

Social organisations can have various roles in the creation and implementation of the action plan: they will provide expertise and knowledge regarding urban agriculture projects aimed at hard-to-reach groups. This will enable to better tailor actions.
They will also act as a link between the local administration and minority groups.
Finally, social organisations will often help finance and implement projects, and as such are entitled to take part in the discussions.

Residential Neighbours and Community Based organsiations
Local citizens are represented by elected councillors. However, without involving the whole council, it might not be possible to represent people from all sectors and all situations.
Among citizens, it would be important to involve individuals or groups, whose habitations or activities are located near sites of urban agriculture and who might be affected by future projects.

Experts and technical support organisations (Governmental or NGO)
Local authority officers and urban gardeners may lack expertise regarding specific aspects of, or related to, urban agriculture (i.e vermicomposting installations...). They might consider getting advice and guidance from external consultants, for example from universities or environmental agencies, and involve them in the planning process.

Representatives of other local governments and other levels of government, regional bodies if relevant
Urban agriculture issues are not always bound by the same borders as local authority areas. Therefore, it should be considered at the beginning of the process whether co-operation with neighbouring local authorities is a sensible way forward. Resources can be shared and actions increased in effectiveness. Organisation into groups or working through an existing regional level of local government may be the most effective way to action.
The type of stakeholders involved and their level of participation in the planning process will vary depending on local circumstances. In any case, early co-operation between all participants in planning and implementing actions and decisions for urban agriculture, can smooth many obstacles from the path of the planning and implementation process.

Steps of the planning process

<u>Stakeholders should be involved in the discussions taking place at each stage of the planning process.</u>

Situation analysis: description of the existing state of local urban agriculture
The first task in the planning process is to define the present state of urban agriculture in the local authority. This includes for example, to determine the location of sites, the functions of urban agriculture locally (professional or private), the specific problems encountered and their causes, as well as changes that might affect urban agriculture in the future (ie. in relation to land use pressure, transport network development...).
In order to have clear base line data, the existing state of the local urban agriculture should be measured and recorded when possible, for instance using indicators such as:

surface devoted to urban agriculture, land price levels, number of posts provided by urban agriculture, proportion of gardeners out of the local population, indicators regarding the soil, air and water quality.
Once the data have been collected and analysed, they can be made into a public document.

Definition of objectives
The stakeholders will then formulate a series of objectives for local urban agriculture, based on the prior identification of problems and their causes. Objectives are concrete goals, which the community wishes to achieve. These can be economic, social or cultural, long or short term aims, measurable or not.
For instance, one objective could be to increase access to land for urban agricultural activities. Another goal would be to increase the use of rainwater for irrigation.
These objectives once agreed by the participating stakeholders can be submitted to the council for adoption. As the objectives will influence the formulation of all the following stages of the planning process, it would be best to have them adopted by the council as early as possible.

Options for action
Next, a list can be made of actions needed to attain each objective. These actions will not necessarily be carried out by the local authority. Therefore, this list should be done by the local authority in partnership with the relevant stakeholders for urban agriculture.
These actions can be either specific projects, or the use of regulatory, economic and communicative instruments to influence behaviour in a positive way. For example, under the objective "increase access to land for urban agriculture", possible actions would be: to designate areas of urban agriculture in the local land use plan, protect these sites from further urbanisation, allot shares of public land to poor people, schools, social organisations for agricultural activities, improve public transport connections to zones of urban agriculture, require developers to provide gardens for each new housing development, offer cheap loans to buyers of agricultural land.
Each option for action should be analysed for its environmental and social impact. It is not possible to foresee all the effects of an action, but it is important to try to find as many as possible. This could involve discussions with those who will have to implement the actions (professional and private farmers, social organisations...), or seek advice from other local authorities who have implemented similar schemes.
For each objective, targets should also be set up. These should be achievable, measurable and include a time element. One example of target would be to have increased the proportion of private gardeners by 10 % over a five year period. It would be useful to involve the indicators previously identified.
The targets should be approved by the council, as they commit the local authority to taking action.

Formalise into action plan
An action plan will then be written by the administration. This document would include both the process and its results :

- How the decisions were made
- Who took part in the process
- The existing state of the local urban agriculture

- The objectives
- The actions and targets

A draft of the action plan will be submitted to the participants of the process and to the council as a whole, for discussion. Wide opportunities for the public to comment on the draft is also important. By encouraging public debate, and comment through the local media, and making sure that points made are included (or the reasons why they are not included are made public), greater public acceptance and ownership of the plan will be achieved.

Implementation
This phase is very critical: often cities elaborate a comprehensive action plan, but have difficulties in implementing actions, due to a lack of political and financial support, or because the implementation phase was not carefully planned.
The council will identify the department in the administration who will be responsible for implementing a specific programme. This department might only have a co-ordinating role where many projects are carried out by organisations outside the local authority. The officer will still be responsible for reporting on the progress of the actions and recommending any necessary mid-course reorientation.
Sometimes, implementation will involve only a reorientation of activities, which are already happening and will not imply input of resources. More often actions will require additional funding. Realistic budgets should therefore be devolved to the department in charge of the implementation.

Evaluation
The evaluation of actions should be carried out continuously during the implementation phase and at the end of the programme period.
Monitoring aims to ensure that actions have been fully implemented, that they are having the desired impacts and are not creating negative side-effects.
One way to control if actions have the expected results is to assess indicators and targets determined in the action plan.
When monitoring shows that Programmes are not achieving the desired effects or that they have unexpected negative effects, they must be assessed to determine the causes and see what changes are required.
The results of the evaluation should be made public and be used to revise the action plan. A second planning process will result in a new action plan, with new targets and action programmes.

Extract from:
Chapter 4. Green and productive cities
A POLICY BRIEF ON URBAN AGRICULTURE
H.de Zeeuw and W. Teubner
An ETC/ICLEI publication (2001)

Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance

Governador Valadares/MG/Brasil

Product 11: Report on the elaboration and legislation of instruments for granting land that guarantees the use of public and private land by producers for Urban Agriculture

The current document, presented as Product 11 of the project “Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance”, describes the instruments that will be used for granting or ceding public and private lands for Urban Agriculture.

The opinions contained in these documents are exclusively those of the authors and do not necessarily reflect the opinions or beliefs of the Urban Management Program, the United Nations Center for Human Settlements or the United Nations Development Program.

CONTRACT FOR THE GRANTING OF LAND FOR A FIXED PERIOD FOR THE SPECIFIC ACTIVITY OF URBAN AGRICULTURE

IDENTIFICATION OF THE CONTRACTUAL PARTIES

GRANTOR: (name), (nationality), (profession), (civil status), Identification card no. xxx, C.P.F. no. xxx, residing at Rua xxx, number xxx, neighborhood xxx, City xxx, zip code xxx, in the State of xxx.

GRANTEE: (name), (nationality), (profession), (civil status), Identification card no. xxx, C.P.F. no. xxx, residing at Rua xxx, number xxx, neighborhood xxx, City xxx, zip code xxx, in the State of xxx.

The parties identified above have legally accorded the present Contract for a Fixed Period Land Grant, which will be regulated by the following clauses and subject to the conditions described herein.

ON THE SUBJECT OF THE CONTRACT

Clause 1. The SUBJECT of the present contract is the property of GRANTOR, located at Rua (street) xxxx, in xxxx neighborhood, in the municipality of Governador Valadares, in the State of Minas Gerais, under Land Registry Number (xxx) in the registry of xxxx, Office of Land Registry, free from liens or debts.

ON THE USE OF THE PROPERTY

Clause 2. The property granted upon the date of signature of the present contract, by GRANTOR to the GRANTEE should be used for the specific purpose of Urban Agriculture, and should be used appropriately, conserving it and assuring that its use and enjoyment are peaceful and harmonious, principally with respect to neighboring residents.

Clause 3. For effects of this contract Urban Agriculture is considered as defined in Law 5265/2003 which creates the Municipal Program for Urban Agriculture.

Clause 4. Should the land be used in any other fashion than that agreed upon, the GRANTOR has the right to demand losses and damages, as well as to rescind the present contract in its entirety.

Clause 5. It is prohibited for GRANTEE to undertake any kind of modification of the property, except those necessary for the exercise of Urban Agriculture activities, as it is prohibited to sub-lease the terrain or pass its title to any other party.

ON THE RISKS

Clause 6: In case of risks to the plot referred to in the present decree and its accessories, or to the belongings of GRANTEE, it is this party who is responsible for its own possessions, and this party is also responsible for possible damages incurred by the GRANTEE, which will determine cause, exercise *force majeure* or undertake other appropriate action.

ON THE DURATION

Clause 7. The present contract has a duration of (xx) years, effective from the date of signing, for the specific purpose of Urban Agriculture. At the expiration of the contract the land should be returned in the same conditions in which it was received, recognizing that the GRANTOR does not have the right to charge GRANTEE for the expenses derived from the use and enjoyment of the leased land.

Clause 8. Special Dispensations

I – The present contract is regulated by articles 579 to 585, of the Civil Code, which are supplementary to the same.

II – The parties commit their heirs or successors to completely respect the terms of this contract.

III– In case of any conflict deriving from this decree, the parties agree to submit the case to the Chamber of Commerce of Governador Valadares for arbitration.

The parties to the present instrument are hereby in agreement and contracted, upon their signature below together with (2) two witnesses.

Governador Valadares, ____ of _____ of 200_

_____
(Name and Signature of Grantor)

_____
(Name and signature of Grantee)

_____
(Name, RG, CPF and signature of Witness 1)

_____
(Name, RG, CPF and signature of Witness 2)

THE MUNICIPALITY OF ROSARIO

Has approved the following

ORDINANCE NO. 4713

Article 1: The Executive Department is commended with establishing and launching operations of the Municipal Community Garden Program, according to that put forth here, which will be under the direction of the Secretariat of Social Promotion

Article 2: The community gardens will be developed on public and private lands. In the former case and when the property is not a municipal heritage site the appropriate authorizations will be arranged. In the latter case, all property owners are invited to cede the temporary use of their lands to the City of Rosario for use by the Community Garden Program, for a period of two (2) years. The Municipality reserves the right to accept or reject any such offer.

Article 3. The proposals offered based on the invitation previously referred to will be considered and studies, before intervention by the Secretariat of Social Promotion, the Secretariat of Planning and the Department of Parks, all of which will comment on the advisability of accepting or not accepting the offer.

Article 4. During the period that the land is being ceded according to this Ordinance, it will be exempt from property tax as per the Tax Code, by way of compensation. Additionally, the Executive Department will be requested to process the exemption through the Provincial Tax and Revenue Department.

Article 5: Staff for the implementation of the program will be chosen competitively among municipal personnel.

Article 6: The community gardens to be established will be assigned with preference to:
a) unemployed and underemployed
b) nuclear family units
c) senior citizens
d) secondary and university students
e) recovering drug addicts
f) service entities (cooperatives, clubs, neighborhood groups, educational institutions, etc.)

Article 7: The Municipality of Rosario will provide the following in each case:
a) Orientation and supervision
b) Land in workable condition
c) Seeds for the first planting
d) Sheds to store tools and seeds
e) Water for irrigation through the DIPOS

Article 8: The Executive Department has the authority to create agreements with:
a) businesses and institutions for the provision, for free where possible, of seeds, materials and tools.
b) DIPOS for the provision of water for irrigation
c) Universities and other institutions for technical training
d) Individuals and public and private entities for the granting of land
Article 9: The produce harvested will be distributed thus:
a) 80% for the group who the garden is assigned to
b) 20% for public institutions for use for the common good. The intervening entities could donate part of their percentage as a support for their participation in some type of national or provincial plan or agreement.

Article 10: The following are part of the present Ordinance:
a) Basic project profile
b) Background on community gardens in Spain
c) Bibliography on community gardening

Article 11: Communicate to the Mayor's

MUNICIPAL PREFECTURE OF GOVERNADOR VALADARES
STATE OF MINAS GERAIS

The Municipal Prefecture of Governador Valadares – State of Minas Gerais, in use of its legal attributions and in light of line "g" of clause "I" of article 78, combined with Paragraph 3 of article 88, the Organic Law of the Municipality of Governador Valadares,

DECREES,
Article 1. Permission for Use of public areas belonging to the Municipal Prefecture of Governador Valadares is hereby authorized for

Art. 2. The Permission for Use referred to in the previous article will pertain to the specific use of Urban Agriculture, respecting the clauses of this decree.

Art. 3. This Decree enters into force on the date of its publication.

ON THE USE OF THE PUBLIC SPACE

Clause 1. The public space conferred on the date of signing of this decree, by the Municipal Prefecture of Governador Valadares to BENEFICIARY shall be used for the specific end of Urban Agriculture, and should be used appropriately, conserving it and assuring that its use and enjoyment are peaceful and harmonious, principally with respect to neighbouring residents.

Clause 2. For effects of this contract Urban Agriculture is considered as defined in Law 5265/2003 which creates the Municipal Program for Urban Agriculture.

Clause 3. For effect of this contract, the Responsible Party is understood to mean the non-governmental organization, legal entity or individual representing collective work groups or families

Clause 4. Should the space be used in a form contrary to that established here, the Municipal Prefecture has the right to demand damages and losses, as well as to rescind the present contract.

Clause 5. It is prohibited for RESPONSIBLE PARTY to undergo any kind of modification of the public space, except those necessary for the exercise of Urban Agriculture activities, as it is prohibited to rent out the terrain or pass its title to any other party.

RISKS

Clause 6. In case of risks to the plot referred to in the present decree and its accessories, or to the belongings of RESPONSIBLE PARTY, it is this party who is responsible for its own possessions, and this party is also resopnsible fore possible damages incurred by the Municipal Prefecture of Governador Valadares, which will determine cause, exercise force majeure or undertake other appropriate action.

DURATION

Clause 7. The present contract has a duration of 2 (two) years, dating from its signature, for the exclusive purpose of Urban Agriculture. At the expiration of the contract the land should be returned in the same conditions in which it was received, or improved as the case may be, recognizing that the Public Authority does not have the right to charge RESPONSIBLE PARTY for the expenses derived from the use and enjoyment of the leased land.

Clause 8. Special Dispensations
I – The parties commit their heirs or successors to completely respect the terms of this contract
II – In case of any conflict deriving from this decree, the parties agree to submit the case to the Chamber of Commerce of Governador Valadares for arbitration.

Governador Valadares, ____ of _____, 200_

THE MUNICIPALITY OF ROSARIO

Has approved the following

ORDINANCE NO. 7341

Honorable Council

The Commissions of Budgeting, Housing and Production and Health and Social Action have considered the proposed ordinances presented by Councilmembers Gianni and Svatetz, Javkin and Rosa, who express the following:
Given: The alarming rates of underemployment faced by the city of Rosario and the necessity to foment productive activities that at the same time preserve the environment and
Considering: That the need to create real jobs is crucial,
That the state should favor the substitution of work programs for the unemployed with jobs that are autonomous and sustainable through time,
That the State should be the source of solutions for the economic crisis that the country is facing,
That the Municipality of Rosario has the necessary infrastructure to make these types of enterprises possible,
That the foodstuffs produced will bring with them an improvement in the quality of life of the consumers, especially in the social classes with fewer resources and higher rates of malnutrition,
That the world trend toward the consumption of organic and natural produce is growing giving the proven advantages of this class of products,
That the economic situation in the country makes possible the placement of these types of products in foreign markets,
That for the above reasons the undersigned Council members propose the following:

ORDINANCE

ARTICLE 1 – Through the present ORDINANCE the MUNICIPAL PROGRAM FOR THE DEVELOPMENT OF ORGANIC AGRICULTURE is created, dependent for its implementation on the Secretariat of Social Promotion, through its Urban Agriculture Program and the Secretariat of Production. Likewise, a Coordination and Execution Unit of this Program is established, made up of representative of the two entities on which it depends.

ARTICLE 2 – The objectives of the Program shall be:
- Generating local models of production, processing and commercialization of high quality produce, vegetables, legumes, organic fruits and aromatic and medicinal plants, as well as associated micro-enterprises such as organic biofertilizers, compost, and production of tools and posts.

- Promoting productive community farms and farming cooperatives which allow the participants to achieve a sustainable income
- Train the participating beneficiaries in the production and commercialization of ecological vegetables and associated enterprises
Establish a model for small socially-oriented enterprises in production, processing and commercialization
- Promote an associated system of production and commercialization that allows a minimum level of income per beneficiary, making the socially responsible business sustainable.
- Supply technical, scientific, educational and financial resources for the development of the association dedicated to the production of produce, vegetables, legumes, organic fruits and aromatic and medicinal plants, fresh or packaged, and associated enterprises within the framework of organic agriculture and biodiversity, with innovative techniques of management, commercialization and packaging.
- Facilitate the placement of the products of these enterprises on local supermarket shelves and provide all the cooperation necessary to facilitate the export of these products.

ARTICLE 3 – The program recognized the community farm as the productive unit, installed in public or private lands, the former being provided by the Executive Department and the latter through the interested property owner. The regulation will establish a minimum production unit.

ARTICLE 4 – The private person or entity who donates their land shall do so for a minimum period of two (2) years and will be exempt from payment of the General Property Tax during the time that the Program makes use of the land.

ARTICLE 5 – The Executive Department will create a registry of those interested in participating in the program, with priority in selection for unemployed heads of households and unemployed youth.

ARTICLE 6 – People living within a 10 block radius of the terrain to be assigned for the community enterprise shall have priority for participation in the program

ARTICLE 7 – The Executive Department will study the feasibility of operating a system of subsidy and/or temporary work program for the participants, until the enterprise matures and becomes a self-financing productive and commercial project.

ARTICLE 8 – The Program will provide seeds to the beneficiaries for the first planting, adequate irrigation and technical assistance for the development of the project.

ARTICLE 9 – The crops produced should have a community brand which encompasses the social orientation of the enterprise as well as the level of natural or organic certification

ARTICLE 10 – For marketing and sales purposes, an Organic and Home-grown Products Fair will be held, at a place and with a frequency to be determined by the Executive Department.

ARTICLE 11 – The commercialization of the production can be carried out in said Fair or through associative means duly supervised and overseen by the public officials responsible for the Program.

ARTICLE 12 – The above-mentioned Program will be launched from the Municipal Executive Department through the signing of an agreement between the Municipal Government, farming cooperatives, representatives of the private sector, and other actors interested in the promotion and development of organic agriculture. In the agreement, which will be made effective according to the conditions established in Chapter III Section I of National Law 19.550, the signatory parties commit themselves to contributing various resources for the coordination and implementation of the Program.

ARTICLE 13 – Communicate to the Mayor's Office, publish, and add to the D.M.

City Council Chamber, 17 June 2002

ANGLOPHONE AFRICAN REGIONL TRAINING COURSE

MODULE 7: INTEGRATING UA IN URBAN PLANNING AND DEVELOPMENT

Complementary reading materials

GOVERNMENT INTERVENTIONS

There is broad consensus nowadays that urban agriculture is an important area of government intervention at national and especially at municipal level.

National governments have a role to play in:

- *The creation of an institutional home for urban agriculture* by selecting a national lead agency on urban agriculture and the establishment of an interdepartmental committee on urban food production and consumption
- *The creation of an appropriate legal framework for urban agriculture*
- *Stimulation of policy and action oriented research on urban agriculture,* including research on the functioning of informal networks in urban agriculture, technologies for safe re-use of urban wastes and waste water, space confined and water saving technologies, IPM and other ecological farming practices, small scale food processing techniques, a/o.
- *Facilitating awareness raising among city administrators, urban planners, technical departments and NGOs* through seminars and workshops that provide them with reliable data and positive examples ("best practices")
- *Co-financing of City urban agriculture programmes*

Municipal authorities can play a key role in enabling and regulating urban agriculture, amongst others by:

- *Stimulating the dialogue and co-operation among the direct and indirect stakeholders in urban agriculture* a/o by setting up a City Working Group (or similar platform) on urban agriculture that organises the joint analysis of the presence, role, problems and development perspectives of urban agriculture in this city and coordinates the process of interactive formulation of policies and the planning and implementation of action programmes by the various actors
- *Review and revision of existing Municipal bylaws and regulations regarding urban agriculture*
- *The integration of urban agriculture in sector policies* on poverty alleviation and social inclusion, health and nutrition, environmental and waste management and economic development.
- *Securing access to land and enhancing security of user rights of urban farmers* by making an inventory of open spaces in the city, the integration of urban agriculture in urban land use planning and zonification plans, provision of vacant public land in medium term lease to poor urban farmers and the promotion of multi-functional land use (combinations with recreation, water management, landscape management, maintenance of buffer zones, a/o)

- *Promotion of safe re-use of urban organic wastes and wastewater in agriculture* a/o by establishing quality criteria for compost and waste water used for irrigation, establishment of low cost facilities for sorting of organic wastes and production of compost, animal feedstuffs or biogas, implementation of pilot projects with decentralised collection and treatment of household wastewater with view on its re-use in local agricultural production, farmer education regarding the health risks associated with re-use of urban wastes and ways to mitigate those risks (proper crop choice, selection of irrigation methods a/o)
- *Stimulating enhanced support to processes of technological innovation in urban agriculture* by improving the coordination between research institutes, agricultural extension, NGO's and groups of urban farmers, improving access of urban farmers and related micro-enterprises to credit programmes and by strengthening organisations of urban farmers and related micro enterprises
- *The promotion of ecological farming practices* by farmer training and local experimentation with ecological farming methods, provision of licenses and incentives (e.g. tax reduction) to micro-enterprises that produce and supply of ecological friendly inputs (like compost , bio-pesticides, quality seeds, a/o)
- *Facilitating the local marketing of fresh urban produced food*, by authorising local farmer markets, food box schemes and other forms of direct selling of fresh agricultural produce to local consumers and creation of the minimum infrastructure required for local farmers markets, as well as by enhancing urban producers' access to market information and reconciliation.

Summarised from:

Chapter 1. Green and productive cities
A POLICY BRIEF ON URBAN AGRICULTURE
H.de Zeeuw and W. Teubner
An ETC/ICLEI publication (2001)

and Series of Policy Briefs on UA
An IPES/UMP-LAC/IDRC publication (2003)

Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance

Governador Valadares/MG/Brasil

Product 13: Report on the development of proposed legal instruments (fiscal and economic incentives) for the reduction of water and sanitation tariffs to encourage the productive use of private spaces.

Governador Valadares, October 2003

The current document, presented as Product 13 of the project “Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance”, proposes legal instruments that can be used as incentives for the productive use of private spaces through the reduction of water tariffs.

The suggestions presented in the first part of the document, referring to legal proposals, were incorporated into the proposed law that created the Municipal Urban Agriculture Program. The proposed Agreement, the second part of the document, is a suggested contract format to facilitate the free provision of water by the SAAE to entities with philanthropic objectives.

The opinions contained in these documents are exclusively those of the authors and do not necessarily reflect the opinions or beliefs of the Urban Management Program, the United Nations Center for Human Settlements or the United Nations Development Program.

WATER, SEWER AND SANITATION TARIFFS

Community UA (Urban Agriculture) activities will be exempt from tariffs through AUHCOMUT (Association of Urban Agriculture and Community Farming) with an amplification of the exemptions described in Art. 8 of Law 3168 of 5 April, 1989.
The exemption will be for a quantity of water in accordance with the profile of the activity
In case the user does not carry out UA, according to standard practice, the penalty will be to return to the public treasury an amount equal to the reduction in tariffs.

Suggestions of Details (Common Law):

(Preferably, insert here the study of Council member Elisa Costa, who created the Urban and Peri-Urban Agriculture Program of the Municipality of Governador Valadares).

Law No. _____

Art. _____. The singular paragraph, of Article 8 of law 3168 of 5 April 1989 shall be in effect with the following amendments:

"Paragraph 1. The following are exempt from payment of sanitation, water and sewer tariffs:
I – properties of philanthropic entities, recognized as having public/municipal benefits and who provide free assistance to their beneficiaries;

II – public properties of municipal and state educational systems, as well as municipal properties located in districts and towns which are connected or are in being connected with the SAAE network.

"Paragraph 2. Exemptions from payment of sanitation, water and sewer tariffs are in force for the period established in the regulation (considering the importance and profile of the activity), for properties registered with the SEMA – Municipal Secretary of Environment, Agriculture and Food Supply, the Urban Agriculture Program and the Association for Urban Agriculture and Community Gardens – AUHCOMUT."

Suggested Agreement between the SAAE and the AUHCOMUT

COOPERATION AGREEMENT BETWEEN THE MUNICIPALITY OF GOVERNADOR VALADARES – MINAS GERAIS, THROUGH THE AUTONOMOUS WATER AND SEWER SERVICE – SAAE AND THE ASSOCIATION OF URBAN AGRICULTURE AND COMMUNITY FARMING (AUHCOMUT) WITH THE MODERATION OF THE MUNICIPAL OFFICE OF ENVIRONMENT, AGRICULTURE AND FOOD SUPPLY.

AUTONOMOUS WATER AND SEWER SERVICE – SAAE OF THE MUNICIPALITY OF GOVERNADOR VALADARES – MINAS GERAIS, hereby referred to as the CONVENOR, located at _____Street, Governador Valadares, Minas Gerais, registered in the CNPJ/MF No. _____, in this act represented by Sr. EDUARDO BYRRO, carrying CPF No. _____, CI No. _____ and the Association of Urban Agriculture and Community Farming – AUHCOMUT hereby referred to as the CONVENED, CNPJ No. _____ located at _____ Street, Governador Valadares, Minas Gerais, in this act represented by Sr./Sra _____, carrying CPF No. _____, CI No. _____, with the involvement of the MUNICIPAL OFFICE OF ENVIRONMENT, AGRICULTURE AND FOOD SUPPLY, resolve to enact the present mutual cooperation agreement, under the following clauses and conditions:

FIRST CLAUSE – SUBJECT OF THE AGREEMENT
The subject of the present agreement is the exemption from water tariffs for community groups which implement community farms through the Urban Agriculture Program – PROAGRU executed by the Municipal Prefecture of Governador Valadares – PMGV through the Office of Environment, Agriculture and Food Supply – SEMA.

SECOND CLAUSE – OBLIGATIONS
1) Obligations of SAAE:
a) Exempt from the payment of tariffs the use of water for Community farms linked with the municipal Urban Agriculture Program – PROARU, to the extent determined by regulation (given the size and profile of the enterprise in question).
b) Organize, through the Secretary of Environment, Agriculture and Food Supply, the registry, organization and processing of requests for exemption from payment of water tariffs for the specific purpose of implementing and maintaining community farms;
c) Oversee, together with the users, the utilization of water for the purposes identified.

2) Obligations of the Association of Urban Agriculture and Community Farming – AUHCOMUT:

a) Monitor the use of water exempt from tariffs, assuring that it is being used for the purposes it is intended for;
b) Process the requests presented to SEMA, for registration, organization and follow-up of the requesting community groups.

3) Obligations of SEMA

a) Intermediate between the CONVENOR and CONVENED parties, attention to the requests presented by the public, specifically groups organized for the purpose of implementing and maintaining community farms.

THIRD CLAUSE – TERM
This contract will be effective for six (6) months from the date of its signature, at which point it can be extended or amended.

FOURTH CLAUSE – FORUM
The Forum of Governador Valadares – Minas Gerais is selected as the body to resolve and questions or doubt arising from this agreement.

Being in agreement, the parties sign the present document in quadruplicate in the presence of the undersigned witnesses.

Governador Valadares, _____ of _____ of _____

_____
JOAO DOMINGOS FASSARELLA
Mayor

_____
Director General of SAAE

_____
Municipal Secretary of Environment, Agriculture and Food Supply – SEMA

_____
Association of Urban Agriculture and Community Farming – AUHCOMUT

WITNESSES:

_____

_____

Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance

Governador Valadares/MG/Brasil

Product 10: Report on proposals for the inclusion of UA in the City's Master Plan based on the City Statute

Governador Valadares
October 2003

The current document, presented as Product 10 of the project "Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance", describes proposals for the inclusion of UA in the Master Plan of the city based on the City Statute, and proposed revisions of the Governador Valadares Master Plan, which is planned to begin in November, which will be focused on the planning of space as an input for the definition of a development model that the Municipality and the population could choose.

The proposal described was debated in the Meeting of the Urban Agriculture and Food Security Forum on Oct. 19, 2003. The understanding is that this proposal will be the point of departure for the interventions and suggestions of the UA Forum in the discussions on the revision of the Governador Valadares Master Plan.

The opinions contained in these documents are exclusively those of the authors and do not necessarily reflect the opinions or beliefs of the Urban Management Program, the United Nations Center for Human Settlements or the United Nations Development Program.

Proposals for the inclusion of Urban Agriculture in the Master Plan of Governador Valadares:

The current proposal takes into consideration the existing Master Plan, but could also be considered as proposed language for a new Master Plan.

Art. 1 – Objectives of the Urban Development and Growth Policy of the Municipality

A modification is proposed to Clause III of this article – Promote local integrated development through the harmonious use of urban space, in order to foster urban agriculture, food security, environmental protection and regeneration and social inclusion.

In addition, the inclusion in Chapter V which deals specifically with the Directives for Social Development of the Municipality of the current Master Plan of articles which intentionally relate to Urban Agriculture are proposed, such as:

Art. 2 – The objectives of Urban Agriculture are:

I. Encourage the collective and/or family-based production of foodstuffs guaranteeing the population access to healthy, quality food, thus combating hunger and promoting nutritional security:
II. Stimulate the generation of employment and income through urban agriculture including the processes of production, processing, distribution and sales of the products
III. Stimulate diverse environments of coexistence in order to promote personal and social development that encourage people to exercise new attitudes that take into account environmental issues, and social relations with respect to gender, age and ethnicity;
IV. Promote social inclusion through the improvement of family income and the participatory design of public policies for urban agriculture;
V. Enhance urban environmental management, facilitating the use of vacant lots and wetlands as spaces for urban agriculture, promoting the recuperation, conservation and sustainable use of natural resources.

Art. 3 The Directives for Urban Agriculture are:

I. Design practices that stimulate the use of public and private spaces (land and water), for urban agriculture practices, including the production, processing, distribution and sale of products and services;
II. Develop policies that promote the sustainable use of natural resources, prioritizing the use of rain and residual waters and the recycling of organic and inorganic wastes;
III. Stimulate the use of agro-ecological techniques for urban agriculture activities in the production, processing and marketing processes;
IV. Design support policies, making credit and inputs available, to foster urban agriculture practices;
V. Stimulate citizen participation, seeking to involve people through processes of popular education, focused on the construction of public policies geared towards

environmental management, food and nutritional security, and social relations involving gender, age and ethnicity and solidarity.

Art. 4 The strategic activities of Urban Agriculture are:

I. Create the Municipal Program of Urban Agriculture, by law;
II. Encourage productive activities that are collective and solidarity-based;
III. Define spaces for the practice of urban agriculture according to their aquatic and soil characteristics;
IV. Stimulate the use of rainwater and/or treatment and reuse of residual water through collective and household methods;
V. Encourage the use and recycling of organic and inorganic solid wastes, both for compost as well as for the infrastructure of the UA plots;
VI. Encourage local development and the generation of employment and income through the commercialization of products and services, with household, collective, local and/or municipal initiatives, promoting the organization of associations and/or cooperatives;
VII. Carry out technical training and citizen education courses for the families and groups involved in the municipal urban agriculture program;
VIII. Offer technical assistance for families and groups involved in the municipal urban agriculture program;
IX. Guarantee legal incentives, such as the reduction in property taxes (IPTU) and in water, sewer, and sanitation tariffs, for those who practice urban agriculture in vacant public or private land or water-based areas;
X. Create a micro-credit fund to promote the practice of urban agriculture in the municipality;
XI. Put into place a land registry documenting the spaces available for urban agriculture and the groups interested in practicing UA;
XII. Stimulate and accompany the formation of a Forum which brings together actors interested in the issues of urban agriculture and food security;
XIII. Promote the recovery of land and water-based areas, prioritizing research and activities that make possible irrigation from underground water sources, and the recuperation and maintenance of streams, rivers and lakes;
XIV. Develop educational campaigns focused on environmental management, agro-ecology, food security and social inclusion.

Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance

Governador Valadares/MG/Brasil

Product 12: Report on the elaboration of proposals of legal instruments (fiscal and economic incentives) for the use of progressive and regressive taxing polices to encourage the productive use of private spaces.

The current document, presented as Product 12 of the project "Optimization of the use of vacant spaces for Urban Agriculture through participatory planning and management to promote food security and participatory municipal governance", proposes legal instruments that can be used as incentives for the productive use of private spaces, related to the use of vacant lots and exemption from water tariffs for community gardens.

It was decided to pass the proposed legal mechanisms through the Municipal Council, as it was the quickest means available to implement a reduction in taxes (IPTU) in 2004.

The opinions contained in these documents are exclusively those of the authors and do not necessarily reflect the opinions or beliefs of the Urban Management Program, the United Nations Center for Human Settlements or the United Nations Development Program.

SUGGESTED FISCAL INCENTIVES TO PROMOTE URBAN AGRICULTURE

These suggestions are to be passed on to the Municipal Executive, for adoption by the legislature, for the purpose of granting concessions for fiscal incentives like the IPTU (Property Tax).

IPTU

Proposed Objectives
- Urban Agriculture (UA) lots can be considered occupied for the purposes of tax reduction, with the resulting average maximum tax rate being reduced from 3.0% to 6.0%;
- Ensure that UA lots are not subject to the progressive IPTU;
- Provision of penalties in the case that such lots are not used for UA, as defined conventionally, paid to the public coffers in the amount of the reduced taxes.

Suggested Notes:

Amendment of the Master Plan

Complementary Law No. _____

Art. ____ - For effects of the IPTU, the particular plots inscribed in the Urban Agriculture program will not be subject to progressive taxation, as long as this use is in effect.

Amendment to the Municipal Tax Code

The Complementary Law No. 34, or 14 December 2001, put into effect the following amendment:

Art. 51 – The tax will be calculated through the application of the following rates on the market value of the property:

Paragraph 7. On undeveloped lots designated for Urban Agriculture, a rate of 0.60% (six-tenths of one percent) will be applied, given that the requirements established in municipal law are fulfilled.

Amendment to the regulatory legislation governing urban agriculture

Art. _____ - For effects of the IPTU property tax, the undeveloped lands destined for urban agriculture will be considered developed non-residential land, with a tax rate of 0.6%, when the following conditions are fulfilled:

I – They are registered with the Municipal Secretary of Environment, Agriculture and Food Supply – SEMA

II – 1/3 of the produced crop will be donated to a philanthropic or educational organization, registered with SEMA

III – the urban agriculture activity will be implemented for at least 2 (two) consecutive years.
Paragraph 1. The requirement of clause II will only be required after six months following registration with the responsible municipal bodies (SEMA – Municipal Secretary of Environment, Agriculture and Food Supply, SEPLAN – Municipal Secretary of Planning and SMF – Municipal Housing Secretary).

Paragraph 2. The provisions contained in this article have the principle of seniority

Art. _____ - the owner of the undeveloped property who wishes to benefit outlined in the previous article, and who does not him/herself carry out urban agriculture activities, may cede their land to third parties for this purpose.

Singular Paragraph. To comply with this article, the owner should sign a proper contract together with the responsible municipal bodies (SEMA – Municipal Secretary of Environment, Agriculture and Food Supply, SEPLAN – Municipal Secretary of Planning and SMF – Municipal Housing Secretary).

Art. _____ For IPTU taxation purposes, the specific plots inscribed in the Urban Agriculture program will not be subject to progressive taxation, as long as this determination holds.

“Art. _____ - The singular paragraph or Article 8, of law No. 3.168 of 5 April 1989, is hereby amended as follows:

Paragraph 1. The following properties are exempt from sanitation, water and sewer tariffs:

I – properties of philanthropic entities, recognized as having public/municipal benefits and who provide free assistance to their beneficiaries;

II – public properties of municipal and state educational systems, as well as municipal properties located in districts and towns which have implemented or are in the process of implementing the SAAE system

“Paragraph 2. Exemptions from payment of sanitation, water and sewer tariffs are in force for the period established in the regulation (considering the importance and profile of the activity), for properties registered with the SEMA – Municipal Secretary of Environment, Agriculture and Food Supply, the Urban Agriculture Program and the Association for Urban Agriculture and Community Gardens – AUHCOMUT.”

Art. ___ In cases where the user does not practice UA, as defined conventionally, the user must return to the public treasury an amount equivalent to the reduction in tariffs and taxes.

Optimization of Use of Vacant Land for Urban Agriculture in the Municipality of Rosario, Argentina

Marielle Dubbeling (IPES/UMP-LAC)[1]

Introduction

This paper describes the results of a process of participatory consultation and action planning developed in the city of Rosario (Argentina) with the purpose of providing poor families with secure access to vacant lots for farming. The process, implemented from September 2002-December 2003, has led to the formulation and institutionalization of an enabling regulatory and legal framework for urban agriculture. The process was promoted by the local government of Rosario, non-governmental institutions, universities and the community. Currently, 10,000 families are involved in the urban agriculture programme and occupy more than 60 ha of private, institutional and municipal land.

Background

The city of Rosario (Argentina), with 17,869 ha, lies in the core of the Metropolitan Area, which bears its name. According to preliminary data from the National Population Census of 2001, it is ranked third among the most populated cities of the country. According to the same source, it has a population of 1,164,800 inhabitants.

During the last thirty years, the systematic enforcement of neo-liberal policies and the opening of markets have led to the economic failure of most of the industries located in the area, as well as to the disappearance of a large number of small and medium enterprises historically relevant as important sources of employment.

The belt around Rosario grew over time as an area with irregular settlements, mostly inhabited by groups of poor families, as result of the level of unemployment in the region and a strong rural and urban immigration from provinces in the north of the country.

Unemployment and its effect on the lack of social coverage for growing groups of the population fostered activities conducted by several NGOs that progressively assumed a greater role in social development programs, with UA as one of the key axis of their work. On its part, the municipality progressively transformed its development experiences into social programmes and policies aimed at tackling the situation of these sectors excluded from the formal labour market.

As in many cities in Latin America and the rest of the world, Urban Agriculture activities arrived in Rosario hand in hand with the economic crisis.

One of the strengths of the city for the development of urban productive activities is the existence of numerous public and private vacant lots that can become suitable production areas for groups of poor families. Within this framework, facilitating land access and tenure of these productive spaces to low-income sectors is key in order to achieve their social inclusion in society.

The project "Optimization of the use of vacant land for Urban Agriculture"

The municipality of Rosario implemented a programme for the **"**Optimization of the use of vacant land for urban agriculture through participatory planning and management, to promote municipal food sovereignty and participatory governance". This project was developed as part of a programme that is simultaneously being carried out in three cities in the region: Governador

[1] This paper is based on project documents elaborated by Elio Di Bernardo, Laura Bracalenti, Laura Lagorio, Virginia Lamas and Marina Rodriguez of the Centro de Estudios del Ambiente Humano (CEAH) , Facultad de Arquitectura, Planeamiento y Diseño, Universidad Nacional de Rosario, Argentina

Valadares in Brazil, Cienfuegos in Cuba and Rosario in Argentina, promoted by the Urban Management Programme-Regionmal Coordination for Latin America and the Caribbean (UMP-LAC) as part of the United Nations Program for Human Settlements UN-HABITAT and the United Nations Development Programme (UNDP), the International Development Research Centre in Canda (IDRC) and IPES – Promotion of Sustainable Development (Peru).

In the city of Rosario, the project is co-ordinated by the Municipal Urban Agriculture Programme, which is implemented by the Secretariat for Social Promotion of the Municipality of Rosario, the Centre for Agro-ecological Production Studies (CEPAR) and the Centre for Human and Environmental Studies (CEAH) of the School of Architecture, Planning and Design of the National University of Rosario. Community based institutions and NGOs, such as Nacimiento, have actively participated in this initiative. Also several municipal departments involved in the management of urban land, such as the Secretariat of Planning through the Master Plan, the Public Housing Service, the Parks and Gardens and the Topography and Cadastre Offices gradually got involved in the project. The strong involvement of the team that prepares the Master Plan of the city resulted in a notable boost of the project.

Urban land use is a dynamic and complex process, where many variables inherent to the various dimensions of social and economic development interact in the same territory. An attempt was made to optimize the use of municipal land for Urban Agriculture, by analyzing the social and productive as well as the aesthetic and environmental potentials thereof in the specific urban context of Rosario.
Urban Agriculture (UA) in Rosario is mainly a spontaneous practice of diverse types of production implemented by underprivileged groups, making use of the fact that UA requires little capital and can make good use of available idle resources (vacant land, unemployed labour, abandoned infrastructure, organic waste). UA provides jobs and food to poor social sectors, can co-exist with other kinds of activities (residential, recreational, educational, etc.) and preserves green areas that provide environmental services.

Vacant land in the city and its productive use

The city has a large amount of vacant or partially vacant land (in total 35% of the municipal area), much of which has the potential to be used for UA given its closeness to marginal settlements and existing housing projects. In fact, a high percentage of urban gardens – spontaneous or fostered by the municipal Urban Agriculture Programme – are located in these areas and are managed by the population living in irregular settlements or shantytowns.

Most of the plots currently in use for UA were peacefully “taken” by the people (“peaceful usurpation”) or obtained from public entities or the municipality under an Ordinance that promotes the temporary assignment of public and private land for community and productive use.

The Ordinance stimulates the establishment of community gardens on vacant public and privately owned land. In the case of public land, user permits may be obtained from the relevant authorities. In the case of privately owned land, land owners are invited to temporary lease their lots to the Municipality for a period of two years. The municipality on their turn leases the land to urban farmers or farmers groups. During this period the private owner is exempted from paying property taxes over the land. (See the full text of the Ordinance in the Web page of RUAF (www. Ruaf.org/E-conferences)

Many of the vacant lots have been degraded as a result of numerous urban activities and others have characteristics that limit their use in UA (low quality of the soil, lack of water, location). Therefore, it is important to carefully analyze the situation of vacant urban and peri-urban land in order to determine its potential for UA.

In order to be able to do so, in Rosario a framework was developed with the relevant variables that determine whether a vacant plot can be used successfully in UA or not. Subsequently the required data were collected and applied to characterize all available vacant open land in the city area. The main method of data collection and interpretation applied was through participatory base-line studies and analysis.

Having done so, it became much easier to integrate urban agriculture in formal city land use planning and to take decisions where land would be destined to UA, for how long and under what preconditions it should be managed.

Diagnosis and planning of land use

Detection and characterization of municipal non-built up land

The available vacant open spaces in the city were identified on the basis of the *interpretation of digitized photogrammetric mosaics* [2]. Only lots of more than 5,000 square meters in peripheral areas, and more than 2,500 square meters in intra-urban areas were identified. These minimum plot sizes were chosen, considering them as a minimum and sound basis for collectively cultivated areas that provide sufficient production and allow commercialization.

The identified vacant open spaces were *classified* on the basis of the following *typology of vacant spaces* and with use of recently updated cadastral information regarding the *type of ownership* of the vacant lots:

Private spaces	1. Private vacant 2. Private with fiscal debts
Green areas	1. Squares 2. Urban / recreational parks
Institutional spaces	Hospitals, Schools, Jails, Public buildings
Public spaces	Municipal, provincial or national
Areas not suitable for construction	1. railway tracks 2. river/stream banks 3. sidewalks/ roads/ quarries 4. corridors along highways 5. Flood prone areas
Ecological reserves/protected areas	1. Ecological Reserves 2. Parks and forests
Treatment areas	1. Sanitary landfill

A geo-referenced base map of all vacant open spaces was developed, which is used for the planning and monitoring of urban agriculture in the Municipality of Rosario.

Development of assessment criteria

[2] ([2]) This material was handed over by the Office of the Master Plan. The scale of the mosaics is 1:3000 (scale which allows to clearly observe the level of resolution of the image). In total 182 mosaics were used.

The following concepts[3] were developed for the participatory base line studies regarding vacant land in the city:

- **suitability** (whether or not the land parcel qualifies for UA), and
- **accessibility** (whether or not it is possible to get access to this land for urban agriculture).

To define the **suitability** of the land, the following variables were selected:

- *environmental quality* (degree of chemical and biochemical pollution),
- *soil quality* (based on technical agronomic - productive considerations),
- *current and previous uses* (e.g. dumps, industry or other hazardous activities)
- *water availability & supply*
- *location* (with regards to the poor population groups interested in UA)

For the vacant land identified as suitable (with help of the variables listed above) the **degree of accessibility** was determined on the basis of the following variables:

- *legal status of the vacant land* (type of ownership, subject to juridical-legal proceedings due to bankruptcy: unknown owner, sold, leased or assigned to other institutions or persons recently)
- *current regulations of access and tenure of land for UA* (the existence and scope of duly regulated ordinances that foster, promote and formalize the assignment of land for alternative uses like UA)
- *fiscal debt* (the identification of plots with fiscal debt is an important land management strategy as it facilitates negotiation between the land owners and local government: swapping fiscal debts for access to land for UA)
- *public policies and plans* (urban development projects included in the Master Plan, in the Public Housing Service, in Public Works, etc., building spaces and areas destined for projected green areas, specific uses and locations; date expected for the beginning of works and phases thereof; location and status of land to be protected from illegal occupation)
- *value of the vacant land* (indicator of the attractiveness of the vacant land for the real estate market; land value is required also to enable eventual expropriation of the vacant land earmarked for UA).

Participatory Consultations

The baseline study combined different sources of information:

- Available land use planning documents and other secondary information,
- Interviews with technicians, municipal officials and urban producers,
- Participatory workshops held with representatives of 70 community gardens located on the flood areas of the Ludueña and Saladillo streams (see below),
- Meetings with municipal departments, Universities, NGOs,
- Consultations with food self-production programmes such as Prohuerta (at national level) and Crecer (at municipal level).

Based on the identification of the availability of vacant areas and the characterization of potentially usable land, the for UA most suitable and accessible land areas were identified (see maps Nº 1 and Nº 2 in www.ruaf.org/E-conferences).

([3]) These concepts and their corresponding variables were defined by consensus during the participatory workshops held with gardeners and municipal officials (see participatory consultation below)

Participatory workshops with urban farmers
The first participatory workshop: **"Presentation of the optimization of land use project"** was aimed at socializing the contents and purposes of the project, sharing information on study areas and collecting data on the difficulties experienced by each group during the process of development and production of the gardens. Cartographic maps were prepared to show general information on land use, regulations, ownership etcetera. The maps also served for participants to locate their urban gardens and potential vacant land areas for UA[4]:

The Second Participatory Workshop: **"Status of existing gardens"** aimed at making an in-depth characterization of the gardens in operation (social groups that participate therein, organisation and management practices, problems experienced) as well as at collecting supplementary information to determine the suitability and level of accessibility of identified vacant lots.

Participatory land maps were prepared with the social actors, detecting the restrictions identified for the integration/inclusion of UA in land planning, municipal programs and policies, and collecting practical solutions and strategies formulated by the social actors responding to the identified restrictions.

The Third Participatory Workshop, **"Development of proposals**" further developed understanding of the problems identified to gain secure access to land; to define the conditions or requirements that a group or organization wishing to benefit from the assignment of a lot must meet; to determine the feasible commitments that beneficiaries can assume and to collectively build on the recommendations that will be considered in the development of a municipal legal framework that will facilitate the assignment of lots to be used in Urban Agriculture.

Participatory workshops with municipal departments
The proposals made by the community were disseminated among several municipal departments During the two inter-departmental workshops, the community proposals were analyzed in order to define the restrictions and possibilities of UA in Rosario. These workshops aimed at elaborating "Proposals for the organic integration of Urban Agriculture in municipal public policies in Rosario" (see chapter 3: Action Plan)

Soil quality and management study; manual

The community workshops also led to the identification of the need to improve the quality of the land in the areas identified for UA.
In order to identify through what measures this could be done a study was implemented including the identification of characteristics and soil quality of land areas used for or with potential for Urban Agriculture and the development of proposals regarding recovery and maintenance of soil fertility and appropriate crop choice per type of soils. On the basis of the study, a manual of techniques for the management and recovery of several soil types with specific restrictions was developed specifying adequate crops and cultivation techniques for lowland areas, former dump sites, flood prone areas, decapitated soils, a.o.).

Action Plan

[4] Based on this experience, it is recommended to use maps on a scale that allows good visualization of land parcels and the inclusion of street names. We therefore recommend to use maps at a scale of 1:1000, appropriately associated to general maps (area and city), indicating street names and names of neighbourhoods.

The Action Plan prepared in Rosario incorporates activities aimed at the design of vacant spaces for productive use, the improvement of the quality of soils to facilitate their use in UA, and the formulation and institutionalization of facilitating public policies.

Design workshop

In June 2003, a **"Comprehensive Design Workshops"** was implemented to enable the definition of guidelines for the design of UA spaces.

These workshops provided a space for debate and proposals open to technicians working in the project and to members of municipal planning units, and resulted in:

- *Development of Maps with proposed Land Use*. The *Proposed Land Use Maps* represent plots of land suitable for UA, characterized by their degree of accessibility. These maps are useful tools in the planning of land potentially usable for UA.
- *Design of Garden Parks in public spaces or along banks of urban streams* (see 3.2)
- Development of different set ups for the organization and management of the gardens taking into account the local land characteristics (soil type, location, orientation, relation with roads, flood risk, etc.)

Proposals for the organic inclusion of Urban Agriculture in Municipal Policies.

Integration of UA in the overall Urban Design
The Master Plan is a public municipal agency that works on two issues. On the one hand, it interprets the processes of change in the physical and spatial aspects in the city, and on the other hand it defines –based on that interpretation– land strategies, spatial and functional policies and programmes and urban development projects to transform the city (physical projects / regulatory projects / management projects).

As a result of the participation of the Master Plan team in the UA project, it included the following among its objectives:

- Integration of social and productive programmes, such as UA programmes, with city planning and environmental programmes in order to recover landscape and re-habilitate neighbourhoods,
- Promotion of active involvement of various actors in the implementation of these programmes and projects,
- Linking these programmes to other public activities and projects (green areas, equipment, housing, infrastructure, transportation, etc.) so as to strengthen the urban rehabilitation or renovation strategies of the Plan,
- Generation of a new type of public space in the city and city periphery , that could be called "Garden Parks", with innovative characteristics by combining recreational, green and productive land uses
- Consolidation of the management of Urban Agriculture by incorporating it in its general programme.

"Setting up a Municipal Land Bank for UA"
The objective is to carry out the permanent identification and inclusion of vacant land suitable for UA in the Municipal Land Bank of the City of Rosario, in order to facilitate the process of assignment of this land to UA community groups.

“Decentralized system for the management of vacant lots for UA”
The management and administration of vacant lots for UA has been centralized in the Secretariat for Social Promotion (which manages the municipal Urban Agriculture Program).
On its turn, the Secretariat co-ordinates its activities with the Cadastre and Planning Office and the Parks and Promenades Department. Requests for the (temporary) use of vacant lots will be qualified and prioritized using several criteria defined in the participatory workshops, such as community commitment (to work as a group, to co-operate with other neighbourhood organizations), the time the group of gardeners has been operating and their level of responsibility (to keep the land in good condition). Groups of unemployed persons are given priority.

Annexes (see www.ruaf.org/conferences):

- Municipal Ordinance for temporary allocation of vacant plots
- Map identifying the vacant plots
- Map identifying plots that are most suitable and accessible for UA

Decree No.

Rosario,

GIVEN

Ordinance No. 4.713 of the Honorable Municipal Council in which the Executive Department is charged with the design and implementation of the Municipal Program of Community Gardens, which is under the direction of the Secretary of Social Promotion.

Ordinance No. 7.341 of the Honorable Municipal Council which creates the Municipal Program for Development and Assistance to Organic Agriculture, under the auspices of the Secretary of Social Promotion through the Urban Agriculture Program.

Decree No. 809/2003 of the Municipal Executive Department which calls for the creation of an Area of Employment and Social Entrepreneurship, which is charged with coordinating the Urban Agriculture Program and Decree No. 808/2003 of the Municipal Executive Department which calls for the creation of the Urban Agriculture Program, to be dependent on the Area of Employment and Social Entrepreneurship of the Secretary of Social Promotion of the Municipality of Rosario.

AND CONSIDERING

That it is necessary to regulate the scope of Ordinances Nos. 7413 and 7341 of the Honorable Municipal Council in order to implement a system that favors the fulfillment of the objectives of the above mentioned legislative and executive articles.

THE MAYOR

DECREES

ARTICLE 1: IT IS ESTABLISHED that the Program for Development and Assistance to Organic Agriculture will be overseen by the Urban Agriculture Program, which is a dependence of the Area of Employment and Social Entrepreneurship of the Secretary of Social Promotion of the Municipality of Rosario, being the most appropriate area for such purposes.
Said area will have the objective of promoting participatory and solidarity-based forms of production, transformation, marketing and consumption of healthy foods through the development of social enterprises with gender equality, in order to achieve social integration of the families who are excluded from the labor market in the city of Rosario, as well as the improvement of the local environment.
It will develop and coordinate activities related to the production, processing and commercialization of crops, medicinal plants, and associated enterprises such as the production of compost, posts, tools, biofertilizers, etc. in accordance with Article 2 of Ordinance No. 7.341 of the Municipal Council and Art. 1 of Decree No. 808/2003 of the Executive Department of the Municipality.

ARTICLE 2: IT IS ESTABLISHED that the minimum area required for community gardens, in accordance with Art. 3 of Ordinance No. 7.341 of the Municipal Council, shall be a surface of 100 square meters. An area of 500 sq. meters per person is considered optimal for production for commercial purposes.

ARTICLE 3: The Urban Agriculture Program will administer a Land Bank, with all of the lands belonging to the Municipality of Rosario, to be used for the activities established in Art. 1 of this Decree. In order to be used for these ends they shall be ceded by the entity holding the land by specific resolution for a minimum period of two years. In order to access the use of public lands that are the property of the Province, the Nation or other entity apart from the Municipality of Rosario, specific land grant agreements shall be established.

ARTICLE 4: The Urban Agriculture Program will administer a bank of private lands, held by individuals, businesses, institutions, foundations, etc. which voluntarily donate these lands. A land registry of these properties will be opened.
Whosoever offers these lands for Urban Agriculture activities and wish to enjoy the benefits contained in Ordinances Nos. 7.413 and 7.341 of the Honorable Municipal Council must present a specific not in the General Intake Desk of the Municipality of Rosario signed by the property owner(s), accompanied by a copy of the TGI which details the condition of the land and an authenticated copy of the land title, in order to create a file.
The file will be evaluated by the Department of Social Promotion on the basis of the documentation provided and the adequacy of the terrain for the proposed purposes, if the documentation is sufficient for the process to continue.
The file will then be sent to the Department of Topography and Surveys for verification of the information contained therein.
Next, the Department of Social Promotion will draw up the necessary agreements, to be signed by the property owner and the Department, and ratified by the Executive Department.
The Secretary of Social Promotion will sign a separate agreement with the community or social group interested in implementing urban agriculture activities, establishing the rights and responsibilities of each party.

ARTICLE 5: The Urban Agriculture Program will open a registry of those interested in carrying out productive urban agriculture activities described in Article 1 of the present decree on said lands.

- The agro-productive enterprise should of a social, group or community
- character.
- The beneficiaries should primarily be persons excluded from the formal job market: the unemployed, youth, and differently-abled people.
- The techniques of production should be ecological, without the use of chemicals (chemical fertilizers, pesticides, herbicides, fungicides, etc.).

In order to maintain tenancy of the lands granted the productive groups must comply with the requirements that are established in the agreement established at the appropriate time.

ARTICLE 6: The Secretary of Social Promotion through the Urban Agriculture Program, will facilitate inputs for production, processing and marketing through the provisi8on of supplies, technical assistance and training to the productive groups.

ARTICLE 7: It is established that in the case of private lands being offered for use as community farms, the respective file will not be sent to the Secretary of Planning or the Department of Parks, dependencies of the Department of Public Services of the Municipality of Rosario for their review, rather it will be evaluated by the Urban Agriculture Program.

ARTICLE 8: This Decree shall be communicated and delivered to the General Government Office.

MODEL AGREEMENT
Secretary of Social Promotion, Municipality of Rosario and Property Owner

The Municipality of Rosario represented in this act by the Secretary of Social Promotion, _____, on the one hand, located at Calle Santa Fe 638 of the city of Rosario, and Mr./Ms. _____, D.N.I. _____, residing at _____ in the city of Rosario, together agree to the present contract, subject to the following clauses:

FIRST: Mr./Mrs. _____ grants in the quality of a loan to the Secretariat of Social Promotion of the Municipality of Rosario, for a period of two years dating from the signing of this contract and freely according to Ordinance 4713/89, the land located at _____ in the city of Rosario, of xx meters in length by xx meters in width to be used by the Urban Agriculture Program, a dependency of the Secretariat of Social Promotion, for the development of community farms, gardens for medicinal plants, decorative plants, vermiculture or other agro-productive use.

SECOND: The parties agree that during the period of the present agreement the Municipality of Rosario will not charge the General Property Tax corresponding to said terrain, parcel no. _____, and the Secretary of Social Promotion commits to returning the loaned land to the owner upon expiration of the contract.

THIRD: Similarly, the Secretariat of Social Promotion commits to conserve the land in good condition and use it appropriately.

FOURTH: Following is a transcription of Article 18 of the Organic Municipal Law: These norms will form an integral part of this contract.
Article 18 of the Organic Law of Municipalities No. 2756: “When a Municipality is sentenced to pay a debt of any kind, the corporation will determine the method of verifying payment within six months following the notification of the respective sentence. This prescription will form an integral part, under threat of nullification, of all acts or contracts that the community authorities undertake in representation of the municipality, and should be transcribed in all public documents or contracts that are made with private individuals or entities.”

Also an integral part of the present contract is Resolution No. 184, which is transcribed following: “In light of the fact that is necessary that every contract singed by the municipality includes the true domicile of the other party, it is respolved: 1) In all contracts of which the municipality is a party, the true domicile of the other contracted party shall be included; 2) While the contract is in force, any change of domicile shall be informed of in writing to the corresponding municipal entity. If this is not done, any notification sent to the domicile registered in the contract will be in full effect; 3) This resolution must be inserted into every contract as a part of said contract; 4) submitted by the subsecretary of Housing with knowledge of the General Accounting Office and the Finance Department, to file.” The contracted parties have included their places of domicile above, where any judicial or extra-judicial notifications relevant to the agreement will be sent and valid.

Agreed upon this __ day of ___, 200_ by the undersigned,

MODEL AGREEMENT
Secretariat of Social Promotion of Rosario and Producer Group

Between the Municipality of Rosario represented in this act by the Secretary of Social Promotion, Miguel Zamarini, on the one hand, with domicile in Santa Fe 638 in the city of Rosario, and Mr/Ms _____, D.N.I. No. _____, with domicile in _____ Street in the city of Rosario, in representation of _____, the present contract is agreed upon, subject to the following clauses.

FIRST: The Secretariat of Social Promotion of the municipality of Rosario cedes in the form of a loan to the _____ community group, for a period of two years with no cost from the date of the signature of the present agreement and in accordance with the agreement signed between the Secretariat of Social Promotion and the titleholder of the land located at _____ Street in the City of Rosario, xx meters in length by xx meters in width, to be used for the development of Community Farms, gardens for medicinal plants, ornamental plants, vermiculture, or other productive agricultural activities, as put forth in Ordinances 4713/89 an 7341/02.

SECOND: The _____ community group commits to conserving the land in good condition and using it for the ends indicated, and is expressly prohibited from erecting permanent constructions on it.

THIRD: In order to maintain tenure of the land for the period established in Article 1, the community group must follow these requirements:

- The agroproductive enterprise should of a social, group or communitary character.
- The beneficiaries should primarily be persons excluded from the formal job market: the unemployed, youth, and differently-abled people.
- The techniques of production should be ecological, without the use of chemicals (chemical fertilizers, pesticides, herbicides, fungicides, etc.).

FOURTH: The community group promises that the Community Farm to be installed will comply with the following objectives:
- promoting participatory and solidarity-based forms of food production that contribute to the food security of its members
- improve the local environment and habitat
- Intgegrated the farm into solidarity-based networks of production, distribution and consumption of healthy foods in the city
- Generate income for the members of the farm
- Play a social role for the neighborhood or community in which it is located, for which activities should be considered like: destining a part of the production for community consumption, or using the farm as an educational and demonstrative space.

FIFTH: The _____ community group promises to return the loaned land at the end of the contract period.

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Sub-urban development on prime agricultural land, Toronto, Canada

Charlie Clark

the Integration of Urban and Peri-Urban Agriculture into Planning

In regions of the world characterised by economic collapse, such as those in East and Southern Africa, the last decade has witnessed a tremendous increase in total city area under informal urban food production. Associated with this has been an unprecedented increase in worldwide attention to urban agriculture (Bakker et al. 2000; Mbiba 2001). Yet, the overall picture shows that formal recognition and integration of agriculture into urban planning and city development has hardly changed, save for a reduction in prohibitive or anti-urban agriculture interventions.

Editorial

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Problems and conflicts remain that constrain integration into planning. In many urban areas, the transformation of city responses from prohibitive models towards permissive or enabling ones has hardly materialised nor been formalised. The perceptions and responses to urban agriculture among actors in a certain city at any given time are not consistent, and conflict remains the norm.

In this context, the following questions are pertinent:

- Why does urban agriculture remain marginal in the urban planning process?
- What factors determine urban agriculture's integration into urban planning and sustainable development?
- What is being done, or what should be done, to facilitate the integration of urban agriculture into urban planning in different contexts of the world?
- In the few instances where integration is taking place, how has this resolved questions of land - access and use - conflicts? What lessons if any, can we learn from these instances?

DETERMINANTS FOR CHANGE

The change from prohibitive to facilitating approaches and integration of urban agriculture into urban planning and development requires (and is dependant upon) structural changes in perceptions, in institutional regimes that govern or manage cities and in social values upon which production and consumption in cities is anchored. The cases in this volume highlight, as other cases do, that these structural changes do not arise primarily from people's simple exchange of ideas and verbal assent. Instead, structural changes (and hence the need for integration of agriculture into city development) is partly a consequence of some sort of crisis in a given context; this could

A differentiated and flexible approach is needed

be drought, economic collapse (as in East and Southern Africa today), or political and economic change (like in Bulgaria), lack of confidence in current agricultural practices (the Netherlands), waste disposal problems (as in West Africa – see no. 3 of the *UA-Magazine* – and in the Philippines) or food insecurity.

If we accept this "crisis" model, the question that arises is "what would happen to (the attention on) urban agriculture, once the crisis is over?" The European scenario of allotment gardens from World War 1 to the present (see Howe and White on page 11 and Mbiba 1995) suggest that the activity will decline as the crisis disappears. However, gardens will re-emerge to serve new needs such as leisure and education (see the article on Portugal and Brazil in this volume), or integrated with other uses of the land (see the case on Delft, the Netherlands). Planning might cease to give it significant standing and planners will move on to deal with new crisis issues. Hence even in European cities where urban food production was once a key aspect of national survival strategy (see Garnett 1996) most planning departments have no 'space' for urban agriculture. As concluded by Martin and Marsden (1999: 389) for England and Wales, planning departments are hardly engaged in the broader aspects of the politics and local economy of urban food issues and there is a progressive decline in allotment provision. In the capitalist production-consumption environment prevailing today, urban agriculture as a land use will be left to compete against other potential users of the same urban spaces (as is illustrated in the case of Lusaka, Zambia). It is an environment where power prevails and planning has to be understood accordingly. There is a need for innovative approaches in the urban planning process to enhance a sustainable and equitable development of cities.

THE IMPORTANCE OF URBAN AGRICULTURE FOR CITY AUTHORITIES

According to Fainstein (1999) the reality of planning is one of conflicting interests in a very unequal society; planning provides justification to the interests of the powerful while giving token attention to the rest. The testimonies from articles in this volume endorse a picture where urban agriculture is marginal to/in city

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Urban Agriculture Support Programme for Madhyapur Thimi Municipality in Nepal

Traditionally, municipalities in Nepal are defined on the basis of (the accumulation of) non-farm activities. Agriculture is considered to be a rural activity, which is one constraint to the promotion of urban agriculture. How this problem was overcome is narrated in this article, which describes the integration of urban agriculture into the land-use planning of Madhyapur Thimi municipality located in the centre of Kathmandu Valley in Nepal.

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Urban Agriculture and City Planning in Bulgaria

Current urban planning and development in Bulgaria does not take into account the existence of urban and peri-urban agriculture. The SWAPUA project, operating in 10 cities in five CEE countries, has identified characteristics of the various types of farming and the main problems associated with urban and peri-urban farming, with an emphasis on soil and water management issues. Here, the case study of the Bulgarian city Trojan is presented.

Dear Readers

Again, the amount of articles submitted to the magazine was very high, for which we thank you. It was decided to accept quite a lot of these articles, since the wealth of experiences is illustrated and the broad topic could only be covered sufficiently this way. The guest editor for this issue was Beacon Mbiba from Zimbabwe, Co-ordinator of PeriNET (Peri-Urban Transformations Research Network), South Bank University, London, UK. Further input was received from Axel Drescher, from the University of Freiburg, Germany. The latter reports on the FAO-ETC E-Conference session on Planning (held in September 2000) in this issue. We offer you sixteen articles on a diversity of topics surrounding the theme; Integration of Urban Agriculture into Urban Planning. Articles cover all regions again, although West-Africa is not represented sufficiently this time.

Great news from Latin America: the first edition of the UA-Magazine in Spanish has been released by our colleagues in Quito, Ecuador. Spanish readers are suggested to contact UMP-LAC (see page 35).

You are invited to contribute to future issues of the Urban Agriculture Magazine. Same of the topics considered for 2002 are given on the back-page of this magazine. As suggested in the Editorial Board we welcome your contributions on any subject. Articles would ideally be up to 2,500 words in length, and preferably accompanied by illustrations (digital and of good quality), references and an abstract.

Looking forward to hearing from you.
The Editor

planning; of no importance to city leaders, not competitive *vis à vis* other urban land uses such as housing, and remains incidental rather than a primary consideration in city programmes. The questions generally asked have to do with what city authorities and planners should do for urban agriculture to flourish. However, the way forward may be to ask the question from the other side: "what can urban agriculture do for cities, city authorities and planners?" For example, what difference can it make to the fortunes of a local councillor and to the city budget? It is furthermore important to understand the planning process, the constraints and opportunities, and how urban agriculture could assist in improvement. From the case study of St Petersburg (and others) the problem of insufficient budgets is highlighted. Agricultural activities could assist in overcoming part of this problem (see also the case study on Trojan, Bulgaria, and the proposal to re-develop suburban areas in Toronto, Canada). The evidence from the papers is that, unless urban agriculture can perform better on these questions than other, competing activities, its integration into planning will not materialise.

THE NEED FOR A FLEXIBLE APPROACH AND DIFFERENTIAL TARGETING

The papers in this volume further illustrate that regional- and local-level diversity influences the success of integration of urban agriculture into planning. But, there is more to it. Proponents of urban and peri-urban agriculture tend to present these activities as one homogenous industry and expect wholesale acceptance and integration of the activity into cities; this is not reality, nor will it ever work. What seems to work, and what will lead to integration is a more differentiated approach. Firstly, this should be considered per activity; for example, crop production versus livestock, but even further: vegetables versus cereals and large animals versus poultry, and so on. The cases and other papers in earlier issues of the *UA Magazine* clearly show that authorities and by-laws favour crops in the city, especially vegetables; cities world over will not promote livestock within their borders, but rather envisage animals (save some poultry perhaps) in the peri-urban areas: see for instance in Accra, Hubli-Dharwad, Havana and Dar es Salaam (Bakker et al. 2000).

Efforts towards engaging rather than abandoning planning

Secondly, there is a need to differentiate by spatial focus; the consideration of urban agriculture in built-up areas (on-plot), on large city spaces (off-plot) or on the more rural interfaces (peri-urban). Again city authorities and planners have always promoted peri-urban agriculture and on-plot vegetable production. It is in the off-plot category where there is greatest disagreement. Consequently, to a very large extent the city cases show that urban agriculture (if specified) has already been dealt with in urban planning worldwide.

Thirdly, the beneficiaries have to be clear: it must be specified whether the activity is for subsistence and for the poor, or for the market and exports. Evidence from the articles in this magazine underlines that when urban agriculture produces for the latter ends, city authorities are ready to integrate the activity and increase land security to the farmers (cases in Gabarone and Bulgaria). In this form, the

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Multifunctional Land Use: an Opportunity for Promoting Urban Agriculture in Europe

Politicians and planners are faced with many competing claims for the use of scarce land in and around cities in industrialised countries. Multifunctional land use – combining different functions within one area – offers a solution. On the basis of a case study in the heavily populated west of the Netherlands, the authors aim to demonstrate that urban agriculture can be promoted as one element land-use offering valuable functions to society.

activity has something positive to offer to the city balance sheet. But as confirmed by the Gaborone paper, where UA is commercial and capital investments are high, the participation levels decrease and claims of direct benefits to the poor become more doubtful.

ENGAGE WITH PLANNING, NOT ABANDON IT

Comprehensive land use planning is still dominant in the cities reported here, and evidence suggests that this will remain so in the near future. In this context, efforts should be towards engaging with, rather than trying to abandon, planning. Urban agriculture could be integrated better if efforts were to be made to increase the participation of diverse groups in the planning process to determine what goes into those plans; for example in the by-laws (Gaborone, Dar es Salaam, Quito and Santiago de los Caballeros). Also, innovation in conflict resolution comes up as a recurring theme in the articles (e.g. Marilao, Lusaka). Cities are domains of maximum differences where, according to Healey (1997: 3), planning is about "managing our co-existence in shared space". Rather than *claiming* space for urban agriculture, ways to *share* urban space with other users has to be sought.

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Planning in a Changing Environment: the Case of Marilao in the Philippines

Marilao, located on the fringe of Manila in the Philippines, faced a typical peri-urban dilemma a few years ago, when its mayor could not find affordable land for a new waste disposal site. There were more than 850 business firms and housing projects that competed for the use of municipal land. Not only the question of where to bring the waste was a problem, also what to do with recycled waste and changes in policy and urban management needed to be tackled.

Views from **Municipalities**

Interviews with planners and policy-makers

For this issue on integration of urban agriculture in planning, we asked our partners to interview planners and policy-makers of a number of cities and ask them about urban agriculture and planning related issues. What follows are quotations from the interviews, brought together by the editors under specific questions.

The interviews we received are from Ghana, the Philippines and Zambia with:
- **Dr. Daniel Sackey**, head of the Directorate for Food and Agriculture, Accra, Ghana (interview by Dagmar Kunze and Pay Drechsel)
- **Mayor Duran**, Marilao Philippines, (interview by Joseph Batac)
- From Lusaka, Zambia: **Mrs Judith Simuzya**, Councillor for Lubwa Ward; **Mr Fisho Mwale**, Ex-Mayor, Lusaka City Council; **Mr T. Hakuyu**, Assistant City Planner; **Mrs Phiri**, Housing and Community Services; **Mr Enock S. Mwape**, Chief Housing Officer, Peri-Urban Areas (interviews by Beacon Mbiba).

Full text interviews can be found on www.ruaf.org

Min. of Information, Accra

Dr. Sackey (left) handing an award to a farmer at the 2000 Farmer's Day Celebration

What is your personal view on urban agriculture, and how did you get involved in the subject?

The solid waste disposal in the city was a major concern to me. When the solid waste management project was able to generate compost from biodegradable waste, I consulted non-government organisations and community residents if they were interested in bringing back some of the greeneries. When I got a resounding positive respond, I knew urban agriculture would be defined and shared by this desire of my constituents. *(Mayor Duran, Marilao, Philippines)*

To me, urban agriculture is an issue of land. People grow vegetables for their own consumption, to be self-reliant. In my backyard I also grow cassava, okra, sweet potatoes and vegetables. Urban farmers are not supported because of fear of mosquitoes. *(Judith Simuzya, Lusaka, Zambia)*

Urban planning does not institutionalise agriculture in the city. To do that, there are profound changes in legislation necessary. And one has to consider the planning process, since it means re-planning the city all the time. Like any other form of agriculture, its urban form requires land, which has attained a value since 10-15 years ago. Few people will afford land for urban agriculture. *(Fisho Mwale, Lusaka, Zambia)*

Urban agriculture is firstly a small backyard garden, like mothers who go out on land not utilised. Then there are the weekend farmers, who live in town and go out to their plots on land leased from the government. The constraint is that land does not belong to the cultivators. One would be happy to have secure tenure, because agriculture contributes to food security. *(Mrs Phiri, Lusaka, Zambia)*

Urban agriculture is a means of securing incomes, and therefore has an important role in urban planning. Urban agriculture also converts idle laying land into green space, and green zones and green belts are important for the city authorities. *(Daniel Sackey, Accra, Ghana)*

How is urban agriculture perceived in the Council or Municipality?

In Accra, the biggest group practising agriculture is the group of fishermen and women. Their contribution to the economy of the city is very important. The livestock holders, we rather try to discourage within the city boundaries. They are

Generally, and more so in the case of urban agriculture, planning is continually criticised. Therefore, the editors had wished this volume to provide an exchange platform for planner practitioners and the other urban actors. Our efforts to get participation of urban planners have been limited. This is crucial for we know that criticism ignores that planners are overloaded with diverse demands, work in under-resourced offices and an environment that gives little time or encouragement to keep abreast with expanding knowledge frontiers upon which planning innovations depend. We were happy to receive the articles on Dar Es Salaam, Harare, Marilao written by, and other articles written with city authorities. Going with this editorial are excerpts from interviews with the representatives of Marilao, Philippines, Accra, Ghana and Lusaka, Zambia, illustrating other issues not touched in this editorial, nor in the papers.

Planning is an environment in which there is little incentive to be a reflective or deliberate practitioner but to remain very bureaucratic. Thus, if the breadth of new knowledge in urban agriculture is to make a difference in how cities are planned, we must address not only the politics, spirit and purpose of planning

REFERENCES

- Bakker N, Dubbeling M, Gündel S, Sabel-Koschella U and de Zeeuw H (eds). 2000. Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. Feldafing: *Deutsche Stiftung für internationale Entwicklung*.
- Forester J. 1999. The Deliberate Practitioner. Boston/London: MIT Press.
- Garnett T. 1996. Growing Food in Cities: a report to highlight and promote the benefits of urban agriculture in the United Kingdom. London: National Food Alliance and Sustainable Agriculture, Food and Environment (Safe).
- Healey P. 1997. Collaborative Planning. London: Macmillan.
- Martin R and Marsden T. 1999. Food for urban spaces: the development of food production in England and Wales. *International Planning Studies* 4 (**3**): 389–412.
- Mbiba B. 1995. Urban agriculture in Zimbabwe: implications for urban management and poverty. Aldershot: Avebury.
- Mbiba B. 2001. The Political Economy of Urban and Peri-Urban Agriculture in Eastern and Southern Africa: Overview, Settings and Research Agenda. Keynote Paper for the IDRC & Municipal Development Programme, East and Southern Africa workshop, "The Political Economy of The Political Economy of Urban and Peri-Urban Agriculture in Eastern and Southern Africa", Harare, February 28 - March 3.
- Schon D. 1983. The Reflective Practitioner. New York: Basic Books.

encouraged in the peri-urban areas. Many poultry producers are now moving into these areas, which is not so much an effect of our strict control, but more of their ability to acquire land outside their private grounds and to keep a proper hygienic and good environmentally healthy atmosphere to prevent Zoonosis. *(Daniel Sackey, Accra, Ghana)*

We see urban agriculture, including horticulture and forestry, as a more sustainable way for urban greening. Urban agriculture is the fruit of good solid waste management and a practical way of improving urban areas and addressing food supply and distribution. *(Mayor Duran, Marilao, Philippines)*

The council does not promote agriculture on open spaces, but on smallholdings 5km away from the city. Agriculture encountered on open spaces, is discouraged but we do not slash crops. Support for smallholdings is through NGOs. The major problems are water, street lighting and the lack of government grants. There is a problem of party cadres illegally allocating land, some even for financial gain. *(Judith Simuzya, Lusaka, Zambia)*

Firstly, there are smallholdings (5 to 20 acres) around, but within the boundary of, Lusaka, then there are the people in the peri-urban areas who rent land from the owners of open spaces in the city. People use it for agriculture until it is taken over by town planning. There are also kitchen gardens confined to the house. Within these areas, people are warned not to grow maize within the housing areas because of the mosquito risk. *(Enock S. Mwape, Lusaka, Zambia)*

Is there an institute or institution, which facilitates (or facilitated) the process of integration?

The Accra Metropolitan Assembly (AMA) has a planning unit, to which all the yearly projects and budget proposals have to be submitted for approval. In respect of the by-laws as well as zoning, the Directorate for Food and Agriculture is playing a leading role. Generally, we have much support within AMA, but less support from the Ministry of Food and Agriculture, especially in terms of funding. We are on the brink of getting a by-law for the green belt - green zone areas passed, which will allow these spaces to remain green and only permit farmers to use them, until the Government decides otherwise. *(Daniel Sackey, Accra, Ghana)*

Open space policy is at two levels: a Central Governance Policy and City Council policy In practice urban agriculture is excluded in the City Council policy. There is no regional plan to guide urban-peri-urban area relations. The Ministry of Agriculture has taken up the role to fill the vacuum left by the Ministry of Local Government and Housing. Planners do not control urban agriculture, and have not taken up the challenge. *(T. Hakuyu, Lusaka, Zambia)*

Which issue triggered off the interest and what were the main activities by the Municipality?

We wanted to teach the community how to grow vegetables as a source of micronutrients, as well as the benefits of the practice of segregation of household wastes. We handed out the compost substrate and the potted flowers and vegetable seedlings, with the message that these materials can be used to re-green their surroundings and to raise safe and nutritious food for the family and the community. At first, the farmers thought we were crazy, but now the urban growers are more than happy since this is additional income for them, and they are urgently requesting guidelines on the use of the compost and crop choice. *(Mayor Duran, Marilao, Philippines)*

Urban agriculture is regulated by by-laws, which regulate and support certain activities, such as vegetable production or fish handling and trading, and ban other activities, such as livestock keeping within the city boundaries. The Directorate collaborates with many of the other 31 Directorates within AMA. For example with the Directorate for Town and Country Planning, who are doing an aerial survey to determine all government land, which should be given to farming. So far, we have zoned 40 ha in Teshie and 60 in La area. Current activities are the construction of 6 markets, access roads and parking space under the Village Infrastructure Program. In conjunction with the Ghana Export Promotion, UNDP and the International Trade Centre, Geneva we are promoting a fish processing plant at Teshie, mushroom production for export to Europe and the USA, and the production and pre-packaging cut flowers, also for export. AMA further contributed financially to the supply of pipe born water to vegetable producers to avoid health hazards of the use of unsafe water in agriculture. A further step will be the aerial zoning plan of green spaces and government lands and the respective by-law that we are about to push through. *(Daniel Sackey, Accra, Ghana)*

How did the urban farmers participate?

The committee on export promotion under AMA consists of members from Town and Country Planning, City Engineers, Parks and Gardens, Architects, EPA (Environmental Protection Agency), Ghana Standard Board and our Directorate plus 2 farmers representatives who are active in this committee. The vegetable growers are represented by their General Association. The fishermen and women by their Community based Management Fisheries Organisation", which also includes the chiefs of the respective areas. The zoning of government land and the occupation of this land, is left up to the farmers to decide, since most land is already being cultivated. We only want to make sure that no additional house construction is taking place on government land. Women's role in urban agriculture in Accra is explicitly on the marketing side. In livestock and vegetable production they are a minority. Women are represented in the farmer's association. If loans are to be given, the

but also the internal environment within which planners work. Simply put, in many circumstances, our planner practitioners are not the villains but rather the victims of the systems within which they operate (see the article on South Africa). The need for more information for city planners on the subject is further shown in interviews held in the UK.

The contributions have a word on collaboration and partnership not only among local institutions or cities within one country (see the article on Marilao in the Philippines) but also among cities in different countries (the case of Santiago de los Caballeros in the Dominican Republic) and incentives by donors (see for instance the cases of Dar es Salaam and Harare). The articles underline that integration is possible from multiple entry points that are very much context-specific. In the future, 'private developers' must also be engaged, whose activities and investment decisions influence how land will be developed and whether urban and peri-urban agriculture will have space in their development schemes. With the possible exception of the Toronto case, the articles have little to say on these crucial actors.

PLANNING TOOLS

In our call for contributions, we asked for experiences on using zoning, GIS, and participatory approaches to integrating urban agriculture into planning. As can be seen from the different maps from Dar, Gaborone, Delft and Madhyapur Thimi, GIS is used extensively. Zoning for urban agriculture is also highlighted in the Dar es Salaam, Madhyapur Thimi, and Gaborone papers. Drescher summarises the discussions in the FAO/ETC e-conference, and gives a range of other tools to facilitate the integration of urban and peri-urban agriculture into planning processes.

There are 16 experiences described in this issue, of which two from Asia, two from Latin America, five cases from cities in Southern and Eastern Africa, two from CEE countries, two West European and one from Canada. As a package, these articles elaborate on the complex web of variables that impinge on the integration of urban agriculture into planning.

Reactions: ruaf@etcnl.nl

new government is now leaving the decision to the agriculture subcommittee to decide and men and women equally qualify. *(Daniel Sackey, Accra, Ghana)*

We build models in several areas. We bring the potential adopters of urban agriculture to these models and ask them how they can do the same. We subscribe to the old notion that people will do it when they see, feel and believe in it. We invest in the replication process by having staff for education campaign and logistics support. Also, we had to develop the compost substrate in a way that suites each type of crops. *(Mayor Duran, Marilao, Philippines)*

What Factors Determined Success and Failure?

To integrate agriculture into urban planning, you need some kind of established office with the responsibility to lobby for the farmers. Sometimes we have visitors from other assemblies, where agriculture has no voice and I am asked how I have been able to get the Food and Agriculture Department integrated into AMA. *(Daniel Sackey, Accra, Ghana)*

There is need for managerial and political appreciation of capacity problems. With a stronger institute, more pressure can be applied. People are not aware of town planning – even internally in the city council there is little awareness. This has caused lack of reviews of the 1975 plan - until the World Bank came in to draw up the Lusaka Integrated Development Plan. *(T. Hakuyu, Lusaka, Zambia)*

Slowly, the farmers are beginning to use the technology we have developed for urban agriculture, which include drip irrigation system, grafting, netting structures and green housing. The process is about doing, rather than talking. *(Mayor Duran, Marilao, Philippines)*

To secure land ownership and use of land, we are passing a by-law. We want the available land in Accra to be placed into a zoning plan, so it can be visible for everyone who intends to construct on this land to know that such a land is reserved for urban and peri-urban agriculture as well as parks and gardens. Generally, there is less risk for farmers to be pushed from the land, if they grow high value crops and contribute more to the urban economy. This is why we promote export crop production such as mushrooms and flowers. *(Daniel Sackey, Accra, Ghana)*

Mayor L.S. Duran

With secure land ownership, people invest: build houses and small shops and use these as income sources other than agriculture. Most of the land in Lusaka is title land, which is for a 99 year lease. There is competition for land in the city. The question is: "who are the stakeholders?" Is it the guy growing vegetables around his house, or is it the farmer in a designated small area around the city? I think the second case is more appropriate for Lusaka in terms of policy focus. *(Fisho Mwale, Lusaka, Zambia)*

No spaces are designated for agriculture except on the fringe of the city, as created by the Ministry of Agriculture and Lands. The City has no relationships with these smallholdings. The implications of the recent (1995) policy changes on land, is that everyone has to pay rates, meaning income for the city council, but also that now there is a open land market. Squatters move into areas that have not been developed. Evictions become an issue since the invasions are politically motivated at the local level e.g. by ward political leaders who want to wield power through land allocations. *(T. Hakuyu, Lusaka, Zambia)*

Ghana introduced the "Farmer's Day" as a national holiday 16 years ago, on which we honour our farmers and fishermen throughout the country and where awards are given to best urban and peri-urban farmers too. There are awards to individuals in the groups of local and exotic vegetable production, fishing, fish processing, poultry, the best IPM farmer, and also to the best Agricultural Extension Agent. In 2000 we introduced awards for the best farmers in secondary schools, since we want to promote agriculture for schools and we also introduced a category of rabbit and bee keeping and mushroom growing. Apart from the quality and quantity of the produce, we also judge the application of techniques, the use of safe water in vegetables, the hygiene in animal keeping, the type of shelter construction, fodder and water supply, and the degree of self-organisation. *(Daniel Sackey, Accra, Ghana)*

Some summarising issues from the interviews are:

- Interest from planners and policymakers is often triggered by personal interest or a crisis situation;
- This interested party is a major facilitator in the process of integration of urban agriculture in urban planning until a (usually one) lead institution can take this facilitating role;
- Land is the most relevant issue for planning in relation to urban agriculture;
- Urban agricultural activities seem more interesting for planners when related to crisis management or when the activity is an important economic activity (high output);
- In that sense one could say that urban arable farming is often allowed, livestock is generally pushed to the periphery, and greening/forestry, fishery or high value crops are stimulated and regulated;

Urban and Peri-urban Agriculture

Report of the E-Conference

on the Policy Agenda

A virtual conference on "Urban and peri-urban agriculture on the policy agenda" was jointly organised by FAO and ETC-RUAF, from August 21 - September 30, 2000. The conference was divided into three main themes: Household Food Security & Nutrition; Urban and Peri-urban Agriculture (UPA), Health & Environment; and UPA and Urban Planning. The conference attracted 720 participants from around the world (45 countries). This short article will revisit some issues regarding the nature of planning, the diverse opportunities for intervention and potential UPA enhancement tools.

Min. of Information, Accra

Director of Food and Agriculture, Accra, handing over an award to a fisherman, at the Farmer's Day Celebration

FAO/ETC joint Electronic Conference August 21 - September 30, 2000

Reflections on the Discussion Group on Urban and Peri-Urban Agriculture and Urban Planning

Although it is difficult to capture the rich information generated in the discussions, any interpretation should capture/recognise both political as well as technical/procedural elements of urban planning. Many contributions stressed that differences between local contexts and cultures should underpin the understanding of the nature of planning and of the opportunities for integrating UPA into planning. This requires not only a grasp of agricultural production issues but also of a range of interrelated matters, like urbanisation, social change, culture, planning, governance and gender.

It was noted that, to a large extent, planning represents and reflects a given society's social contours of power, resource mobilisation and distribution. In both political and technical terms, urban planning endeavours to reduce or manage conflicts associated with different users or competing uses of limited space. Integration of UPA into urban planning will require adaptive conflict resolution skills and approaches within which the poor can organise for enhanced political power.

THE LAND QUESTION AND ITS MANAGEMENT

Consensus was observed in the central importance of land resources, specifically of open spaces, the soil, water, forests; and in the conclusion, that the integration of urban agriculture into policies should be approached from the context of conflicts relating to the use of these resources. The participants emphasised that land access, ownership and tenure make a big difference in the profitability of UPA.

PARTICIPATION

The need for the participation of all involved in planning and subsequent activities was also

Recommendations for action by the participants:

- ❖ Strengthen the organisation of UPA practitioners (farmers' groups, farmers' associations, clubs, etc.).
- ❖ Connect UPA to ongoing urban programmes (Sustainable City Programme, Urban Management Programme, Local Agenda 21).
- ❖ Strengthen institutional capacity at the local level.
- ❖ Develop guidelines for land-use regulations that protect urban agriculture uses, encourage investment in UPA and make credit use viable.
- ❖ Assess land and water tenure / access conditions - develop policy reform proposals and tools.
- ❖ Develop training materials related to planning for UPA (including use of GIS and remote sensing for urban planning).
- ❖ Organise regional workshops on the integration of UPA into urban planning with the broad approach of considering food security, health, environment issues, and sustainable city development.

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emphasised. However, in practice, an exclusionary status quo reality prevails. The reality of inequities between North versus South, men versus women, elites (including researchers, donors, technocrats) versus the poor were among those pointed out. An example is the need for planning tools that are anchored in local contexts.

Focus on process rather than product

Indeed local contexts, history and culture may dictate that "urban agriculture is not necessarily a desired activity by the poor". In the context of the collaborative city planning model (e.g. the cases of the Philippines and Tanzania in this issue), efforts have been made to enhance participation of the poor. But in Dar es Salaam, Tanzania, results show that these efforts seem not to have made much difference.

THE INSTITUTIONAL CONTEXT

It was seen that UPA needs to be a more "official" or "formal" activity in and around cities, in order to be integrated into urban planning processes. However, little was said on the role of institutions with respect to UPA, a topic, which could be an important entry point into the discussion. As historical experience from Europe proves, institutionalisation of UPA has been one precondition to achieving greater land security, higher participation of farmers in policy decision-making and the stimulation of the democratisation process. Approaches are needed that focus on process rather than product so that participation by the poor is enhanced. Participants noted that for that participation to be meaningful, some political organisation would be required.

The creation of urban farmers' associations might be an important step into a more participatory process of urban planning. One lesson learned from this conference is the need to claim these rights, and that urban agriculture has to be negotiated just as any other city development issue. To "sell" the idea of UPA to policy-makers and planners, appropriate arguments must be used, such as its contribution to the welfare of people in small cities (thereby reducing migration); urban habitat improvement and biocultural diversity; the creation of markets for local produce or the recycling of "green wastes" into compost.

INTEGRATION OPPORTUNITIES

Within the matrix of linkages that UPA has with other citywide processes, diverse opportunities exist for integration. A single blueprint cannot be prescribed for this, as future activities would have to select a spatial and sectoral focus relevant to the local context.

The role of education and information is underestimated. School gardens, garden exhibitions, educational materials (books, videos, press releases, etc.) are important means to creating awareness of UPA in the public and among policy-makers. Changes in the extension approaches are essential to assure safe food production in urban and peri-urban environments. Another window of opportunity was seen in sustainability and waste management. In order to contribute to sustainable city development, UPA needs to be more than just agriculture that happens to be in or next to built-up areas. Embedding UPA into the greater context of sustainable urban development forces urban administrators to review their anti-UPA planning principles. Thus in the Philippines, solid waste had been served as one entry point to UPA and over time created the chance "to modify efficiently the traditional hierarchical system of city management." Linking UPA to Sustainable City Development Programmes is a major issue for integration of agriculture into educational, recreational and environmental issues.

PLANNING APPROACHES AND PLANNING TOOLS

In procedural and technical terms, Geographical Information Systems (GIS) and remote sensing were identified as tools potentially useful for integrating UPA into planning. The use of GIS could also act as an obstacle, because of high purchasing costs and difficult maintenance. However, it is necessary to say that costs of simple GIS applications are reasonable today. The advantages of such systems are the avoidance of double work, allowing integrated planning, and the establishment of an urban database that would otherwise have to be placed on other computers.

The process of integration also requires other tools for problem analysis and diagnosis. Examples like Participatory Technology Development (PTD) or Sustainable Livelihoods Analysis (SLA) were given. Furthermore, tools for conflict management, communication information exchange, impact assessments (such as Environmental Impact Assessments (EIA)) were suggested.

The introductory and final papers, and the discussion of the e-conference can be found on the FAO website:
www.FAO.org/urbanag
or on the RUAF website
www.ruaf.org/news_and_agenda_fr.htm

Magaret Armar-Klemese

Discussing the future of the neighbourhood

Newbuilt low-cost housing area with minimal space for gardens near the houses. Missionvale, PE, South Africa

Lena Jarlov

This article is a synthesis of insights from a short period of participation in a comprehensive urban planning project (Sida funded) in Kimberley and Port Elizabeth (South Africa) in 1998 and 1999. All statistics used in this article originate from the First Comprehensive Urban Plan (draft), City of Port Elizabeth (May 1999).

The western concept for urban planning used today is developed to fit a society of labour-based employment. In many growing cities in the Third World, however, the vast majority of the inhabitants is unemployed and has to survive in other ways. There is a need for a more flexible planning concept that enables other means for livelihood security such as from urban agriculture. Both politicians and planners keep up the idea of a western consumer lifestyle as the blueprint for development, even though it is unrealistic for the majority of urban inhabitants in the developing world.

Why We Need
Insights from South Africa
New Urban Planning Concepts

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According to basic knowledge, the aim of physical planning should be to organise the system of maintenance of a human society in space. The agricultural society has its own characteristics, which are different from those of the industrial society. The meaning and function of work, recreation, housing, working place, consumer and producer differ between the two. However, the cities of South Africa represent neither of these two types of society. They are not agricultural societies as the majority of the inhabitants do not own or have access to any means of agricultural production like land or animals; neither are they industrial, as the majority is not employed, has little or no income, and limited consumption. They represent an exception and therefore need to be handled in a different way by the planners.

PLANS WITHOUT POWER

Planners, however, seem to be unaware of this fact. Their main goal continues to be to try to develop these cities as industrial cities with a functional separation between housing areas, working areas and shopping areas and a focus on the transport system. This planning concept leads to extremely dense housing areas, with very little space left over for agriculture and other productive activities near the dwellings, space that could be used by unemployed people without means of transport, and women with children to look after.

Unfortunately, the planners have no power to attract the necessary industries to the planned areas! They simply devise schemes and hope and pray, and in some ways facilitate for the investors to come. Many big investors need to be attracted to employ all the unemployed as well as all the newly arriving poor people migrating in from the countryside every day.

Lena Jarlov

Inhabitants of a peri-urban squatter camp are planning to develop a settlement with agriculture. Joe Slovo Settlement, Port Elizabeth

DECREASING EMPLOYMENT IN SPITE OF A HIGH ECONOMIC GROWTH RATE

In 1998, the growth rate of the population of Port Elizabeth was estimated to be increasing from approximately one million to 2.3 - 2.9 million by the year 2020. At the same time, the formal sector employment was estimated to rise to between 95,000 and 285,000 persons (depending on the economic growth rate: 3 % or 6 %). The draft Comprehensive Plan (1999) states:

"Both scenarios assume a higher growth in the total economy than over the last 25 years. The gap between employed in the formal sector and the rest of the population will tend to increase in both scenarios. However, in the High Growth scenario the public sector will have the economic capacity to increase transfers and maintain services for the entire population. The assumption is that it will be difficult in the Low Growth scenario."

The above thinking reflects a very fragile foundation for the physical planning of the future society. A society where the majority of people will depend on production by a minority is not sustainable, especially not if the precondition is a permanent extreme growth rate of 6 %. The discussion about jobs in the informal sector and the areas for small industries and handicrafts, is still within the concept of the industrial society. Urban agriculture is mentioned, but in practice it is not given requisite attention in the plan. Urban gardening can be applied in allotment areas in some places where the space is not needed for anything else. The private plots for housing are planned to be extremely small in order to obtain high density.

NEW PLANNING CONCEPTS

Maintenance systems that are more suitable to the cities of South Africa as well as other parts of the developing world, must be systems that enable not only entrepreneurs and employed people, but also unemployed people without the resources to earn a decent living. Instead of the industrial city concept, it ought to be a mixture of agricultural, industrial and handicrafts systems, where the limits between producers and consumers, work and recreation, housing areas and working places are weakened or nullified. Allocation of land for food production must be an important part of the infrastructure and as important for the design of the city as the transport system.

CONSUMPTION-BASED MODEL AND GLOBALISED CULTURES

To change the prevalent planning concept will certainly not be easy. It will also not be enough because the development of societies is not conducted by theories. The driving forces are complicated mixtures of cultural and economic factors. Many strong forces drive the industrial planning concept. The attitudes among ordinary people today are highly affected by global influences through the television. The western lifestyle stands as an ideal for many people in the developing world. It is the ideal of consumption, supported by strong commercial forces. But clearly, this lifestyle will never be achieved by the majority. This is most obvious in developing countries, where conditions will continue to be very rudimentary or deteriorate if the physical planning of their cities remains based on principles that have been developed for a completely different maintenance system. Politicians often take on the role of optimists, encouraging their people. The main criticism of the comprehensive plans for Port Elizabeth and Kimberley is this unfounded optimism, or rather the illusions it supplies, including the illusion that the people will become well-adapted members of a consumption society.

Strong forces drive the industrial planning concept

Another part of this topic is the influx to the cities. In the townships of Kimberley and Port Elizabeth, one would doubt the prevailing view of the positive connection between urban growth and living standard. As long as this connection is taken for granted and is spread by authorities who do not provide strategies for developing the countryside, rural people without assets will go on setting their hope on a new and better life in the city. If access to land for small-scale farming and basic services in the countryside and small towns were to be increased, a great part of the rural population would stay there rather than moving into a dense township in a big city.

Furthermore, in order to ensure a global sustainable future, people in the richer world must also adapt their consumer lifestyle for one that takes greater care of nature, the resources and our fellow people in the less well-off parts of the world. All of these variables impact (directly and indirectly) upon the prevailing planning model and the options for alternative ones.

Unemployed men, preparing for vegetable gardens on a temporarily vacant site. Walmer township, PW.

REFERENCES

Municipality of Port Elizabeth. 1999. The First Comprehensive Urban Plan (draft). Port Elizabeth: City of Port Elizabeth.

Women in a township have invited a councillor to ask for gardening land. New Brighton, PE.

Lena Jarlov

Awareness and Action in the UK

Recently, richer industrial nations began to consider the possibilities of urban agriculture and its potential benefits to relevant policy-makers (Garnett 1996, Howe and Wheeler 1999). This literature highlights the value of urban food growing projects as a powerful vehicle for tackling intimately linked social, economic, educational and environmental concerns, arguing that the rationale for urban agriculture has never been stronger. In the UK, there is increasing awareness of the interlinked benefits of urban food growing. Planning, as an inclusive, future oriented vocation, which seeks to enhance the liveability of localities is ideally placed to strengthen community food systems. Nevertheless, the role played by UK local planning authorities in regulating urban agriculture has received only scant attention to date (Howe 2001, Martin and Marsden 1989).

Allotment garden

Sustain

This paper redresses this deficit by presenting findings from a UK Government Economic and Social Research Council (ESRC) funded survey examining the role played by planning in regulating urban agriculture on allotments, community gardens and city farms. The survey of all metropolitan planning authorities produced 32 usable replies, representing a response rate of 46%. The survey was concerned with:

- exploring planners' attitudes to and knowledge of urban food production; and
- examining the regulation and coordination of urban food production.

Planning conditions with regards to health issues acquires considerable importance

Respondents varied in seniority, ranging from Principal Planning Officer to non-planners involved in urban food schemes.

PLANNERS' ATTITUDES TO AND KNOWLEDGE OF URBAN FOOD PRODUCTION

The survey revealed that there was an encouraging awareness, and perceived significance, of urban food issues amongst planners (more details are given on the RUAF website in tables of the survey results):

- Of the respondents, 47 % claimed to have low levels of awareness regarding food issues, with 22 % claiming to have a high level of awareness.
- Sustainability targets and health were seen as being the most significant potential benefits of urban food schemes (22 %).
- Fifty percent regarded urban food growing as having a significant role in environmental factors, 41 % in social factors, 47 % in education and 22 % in urban regeneration.
- Of minor importance is the economic role of urban food production, according to 21 percent.

The data suggests that a link may exist between the claimed level of awareness of urban food issues and the perception of the relative importance and benefits of urban food growing.

It also appears that a distinction may be drawn between planners' knowledge of the issues surrounding urban food production and their knowledge of land-use issues, notably on allotments. A number of the comments made by respondents point to a higher level of land-use knowledge than specifically for urban food. This suggests a tendency for planners to view issues purely from a land-use perspective.

THE REGULATION AND COORDINATION OF URBAN FOOD PRODUCTION

In examining the regulation of urban food production, the survey initially explored the planned local coverage of urban food (see box).

The plan coverage provides a strong indication of the way in which urban food production might be viewed by the land-use planning system and, to a significant extent, sets the context within which it is to be regulated. While clearly a small sample, the potential difference in treatment by the planning system of allotments, community gardens and urban farm sites resulting from this division in policy coverage may also be significant. The different plan coverage raised the question of whether planning protection strategies and mechanisms would differ between various

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REFERENCES
- Garnett T. 1996. Harvesting the Cities. *Town and Country Planning* 65 (8): 264-265.
- Howe J. 2001. Nourishing the City. *Town and Country Planning* 70 (1): 29-31.
- Howe J and Wheeler P. 1999. Urban Food Growing. *Sustainable Development* 7 (1): 22-36.
- Martin R and Marsden T. 1999. Food for Urban Spaces. *International Planning Studies* 4 (3): 389-412.

urban food sites or whether the dichotomy between the planning regulation of allotments and urban farms and community gardens would persist.

Essentially, none of the responding planning departments appears to treat urban food production as a discrete issue specifically within the statutory planning arena. This is reinforced by the comments of a number of authorities, and in several instances, the siting of urban food production as a "Local Plan" or "planning" issue was questioned. Two respondents suggested that the Local Agenda 21 process was a more likely arena for this issue, and one questionnaire was passed from the planning department to a community allotments' officer for completion. Nonetheless, it remains clear that a number of planning departments are involved in schemes which do relate specifically to urban food and extend beyond purely land-use considerations. Significantly for the input of the statutory land-use planning system it appears from the data concerning revised development plans that certain steps are now being taken towards identifying urban food production as a planning theme in its own right. This suggests a potentially significant impact upon the input of the planning system into the regulation and coordination of urban food, with more focused statutory treatment accompanying the broader framework for contribution.

In considering the response of the planning system to urban food, the survey revealed that:

- The greater number (44%) of respondents thought that their policy framework neither encouraged nor discouraged the development and protection of urban food production, though a significant proportion (31%) said their policy framework actively encouraged this. No respondent thought their framework actively discouraged urban food schemes.
- 47% considered that their local policy framework gave urban food about the right level of significance, than gave too little (28%).
- At the national level, this situation was reversed: 38% of respondents thought the national policy framework gave too little significance to urban food production against 25% who considered its significance about right.

In relation to development control, the survey revealed that:

- Only one authority suggested that a planning application had been received specifically for development on an urban food site.
- Planning conditions were imposed on urban food sites in three authorities. These related mainly to health issues, e.g. the condition of the soil at the site.
- If the demand for urban food sites was no longer sufficient, the majority of respondents stated that retaining some form of open space or recreational area would be desirable. One authority stated that sites might be used mainly for residential development, since they were primarily located in areas denoted in the development plan as "primarily residential use."
- Conflict regarding urban food sites had arisen in 12 districts. Of these, nine related to pressure to develop on allotment sites, particularly where these were considered under- used.

These issues of demand for, and potential changes of, use at urban food producing sites are related to the issue of conflict between food production and other forms of land use, either during plan preparation or in development control. Since this relates directly to land use, this issue appears particularly salient to the planning system. In addition, the possibility of planning conditions with regard to health issues acquires considerable importance in the context of the use of brownfield sites and seems to be an area in which the land-use planning system can exert a direct effect through its statutory powers.

CONCLUSION

The rising interest in food growing as a recreational activity combined with consumers' desires and indeed the need for healthy food are combining to make urban agriculture an emerging and dynamic activity. However, the development of urban agriculture is dependent upon the supply of land. Urban land is a highly prized, and priced, commodity and urban food production faces fierce competition for land and financial resources from land uses with higher profiles or offering greater returns, such as housing and industry. This puts pressure on urban food producing sites, and it is for planning to legitimate their position within the urban environment.

In general, planning's direct role in relation to food growing is relatively small in the UK. Indeed, urban agriculture sits uncomfortably within the UK planning framework. Nevertheless, planning's apparent low level of involvement is perhaps perplexing given the significance of food to the metropolitan system. Cities are complex, dynamic entities within which food production and consumption are important components. The challenge for the statutory framework is to recognise and integrate every aspect of the urban system, including food production, into sustainable development strategies.

- Of the 32 authorities responding to the questionnaire, 26 had policies in their development plans relating to allotments. Only four had policies relating to urban farms; three to community gardens, and eight to various "others", notable among which were open/green space policies, and policies dealing with rural agriculture in boroughs containing rural land.
- Of the 20 respondents providing details of the development plan chapter headings under which specific allotment policies fell, 14 cited headings broadly relating to leisure and recreation; four related to the environment, and two to open/green space.
- Only three respondents regarded their development plans as specifically designating sites for urban food production.
- Of the four authorities whose current plans contained no policies aimed at any form of urban food sites, two said future plan revisions were likely to contain such policies and two thought they were not.
- Of the 28 respondents whose development plans contained policies relating to at least one form of urban food site, 12 said that no policies specifically related to urban food production were to be introduced. The other cases, however, suggested that policy in this area is to be developed further.

Oleg Moldakov

Opening-ceremony of community garden

In Russia, agricultural activities of the urban inhabitants are taking place at significant distances from their urban homes (see Moldakov 2000). The term "urban agriculture" refers more to agricultural activities of city dwellers than to agricultural activities within the city boundaries only. The agricultural sites, usually with a house, are called dachas and are located between 6 and 60 km from the city.

Support for Urban Agriculture
In St Petersburg

The importance of agricultural activities, especially the production of food for subsistence consumption for urbanites increased after the disintegration of the Soviet Union. The demand for land by those without dachas became so high after 1991-92 that urban authorities started to organise small plots on open space (non-building development sites) within the urban territories. This was then followed by other urban inhabitants who started to occupy land adjacent to motorways and railroads, without permission from the authorities.

Federal law defines how local administrations use city budgets for the necessary infrastructure in these areas (like health and safety services). The organisation of the plots outside city boundaries results from negotiations and agreements between the municipal and regional (rural) administrations. The St Petersburg city and regional administrators were sensible and clever enough to organise, regulate, and formalise the access-to-land process.

These two administrative units have different motivations. City authorities have an interest in (peri-)urban agriculture mainly to solve social problems, but their interest is focused on practices outside official city boundaries. They assist in organising plots close to the city, but not within the city. The regional (rural) administration however, does not really welcome new plots and new summer inhabitants because of the need for waste recovery and health services, extra pressure on the rural roads, and the increase in public transportation, water discharge, etc. They would like to win support from the city administration, something they do not currently receive.

In 1995, "The Gardening Office" (Department for the Development of Horticulture and Gardening in St Petersburg and the Leningrad Region) was created. The Gardening Office coordinates, together with other departments, the development of urban agri-culture, activities of state agencies, local government, private enterprises, and other organisations in St Petersburg.

Urban farmers themselves have created public organisations like the "Union of Gardeners". Gardeners discuss their problems within their units (Community Garden or Dacha Cooperatives), whose chairpersons report to the Union of Gardeners' meeting with "The Gardening Office", which will further act on the problems in need of support from urban authorities and coordinate with sectoral departments.

URBAN PLANNING AND AGRICULTURE

This positive story about support of urban agriculture is, however, not fully reflected in a firm integration of agriculture in urban planning and land zoning. The emphasis of the St Petersburg/ Russian urban planners still lies with industry, tourism, services, science and education.

Urban farming currently consists of 154 community gardens within urban boundaries, and the authorities consider these to be part of the urban landscape, as one official separate zone. This is a serious step towards the integration of urban agriculture into urban planning. However there have been, and still are, no functional zones taken up in city planning, for the development of urban agriculture. City authorities believe that, with the improvement of the economic situation in Russia, the use of temporary plots of land will lose status and will decline on its own, to be replaced by further development of private and community gardens without the need of support by authorities.

City authorities do not mention, nor care about (though at least they do not ban), informal agricultural plots along the less important roads, under electricity lines, on land bordering upon railway tracks, or on other open spaces that are not needed in the short term. These places however have no agricultural future.

The open spaces (land with poor soil) on the urban outskirts are temporarily authorised for agricultural purposes to selected groups (veterans and pensioners). Other poor land around the cities is informally used, unsanctioned by the authorities.

The St Petersburg' experience shows the important role of the The Gardening Office within the municipal administration. However, there is an important and necessary role for NGOs, like the Union of Gardeners to provide further support to the gardeners. Training programmes and extension on agricultural technologies need to be financed partly from urban administration and partly from payments based on fees collected by regional and urban branches of the Union of Gardeners from their members.

The integration of urban agriculture into urban planning and development will only be feasible when the majority of the people living in the city, consider agricultural activities not only as a means of additional income and self-maintenance, but also as a necessary element of the sustainable development of the city.

REFERENCES

- Moldakov O. 2000. The Urban Farmers of St Petersburg. *Urban Agriculture Magazine* 1 (1): 24-26.

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Current urban planning and development in Bulgaria does not take into account the existence of urban and peri-urban agriculture. The urban planning guidelines included in the Law for Territorial Development (2001) refer to zoning, densities for buildings, heights, distances and other technical parameters related to construction, roads and green open space, property issues and control. Issues related to farming and livestock breeding in the city are not treated as they are not expected to occur in urban areas. However, reality is different. In most cities in Bulgaria, urban agriculture is a common and permanent phenomenon There is a need for innovative urban planning approaches.

Antoaneta Yoveva

Gardening in Sofia

Using Urban Agriculture for *The Case Of Trojan* **Sustainable City Planning** in Bulgaria

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In the last decade, Bulgaria has gone through a process of political and economic transition. The share of agriculture within the GDP increased significantly (up to 26 % in 1999). As a response to the economic decline and the introduction of open market principles in this transition period, the importance of urban agriculture for the subsistence of many urban households has also increased substantially. Agriculture increasingly functions as a social safety net for the poorer sectors of the urban population and forms an important complement for middle income groups. Agricultural production in urban and peri-urban areas also has an important potential for urban landscape management, nature conservation, recreation and ecological education, as will be shown later on.

Here, the case study of the Bulgarian city Trojan is presented, and some guidelines for the integration of urban agriculture into urban policies and development planning are presented.

FARMING IN AND AROUND TROJAN

About 80 % of the houses in Trojan have their own yards, which, in general, are used for agricultural production. However, agricultural activities are not the basic occupation of the urban gardeners, who usually have another job (small tradesmen, technicians, office clerks) or are retired. Most urban gardeners and farmers are between 50-75 years of age. About 15 % of the population of Trojan is older than 60 years, while the unemployment rate is about 17 %.

In general, the urban gardeners and farmers are less educated and have below average income.

The majority of urban agriculturists garden for self-consumption, which on average satisfies over 50 % of the household food needs (and in this way allows for important savings). Only 15 % of the interviewed households have income generation as their main motive, selling their produce directly from the garden or farm to consumers.

The production of vegetables is very intensive. Chemical fertilisers and pesticides are hardly used, but organic fertilisers are applied (about 1 ton or more/ha). Vegetables are grown by 88 % of the interviewed households, with on average a total area of less than 100 m^2. Fruits are cultivated by 75 % of the interviewed households and grapes by 13 %. Many families also raise animals, mainly poultry (63 %, with on average 18 fowl) and cattle (50 % of the farming households breed an average of 3-5 animals), but also sheep or goats (25 %), and/or pigs (38 % keep an average of two animals). Most animal feed is produced on-farm. Cultivation practices are rather basic: crop rotation is hardly practised, and animal husbandry practices are primitive and not monitored by contemporary veterinary services.

TENDENCIES IN URBAN FARMING

Most of the farmers and gardeners interviewed do not have clear ideas regarding future develop-

The SWAPUA project (Soil and Water management in Peri-urban and Urban Agriculture in CEE countries) is operating in 10 cities in five CEE countries. Its aim is to explore the presence and impacts of urban and peri-urban agriculture and to facilitate the development of local policies that accommodate, and plan for, urban agriculture as an integral part of sustainable city development.

ment. Most want to continue in the present way. Only 8% of the farmers are looking for ways to improve and/or enlarge the scale of their agricultural activities. About 5 % want to specialise more. The very low percentage of farmers willing to take out a loan indicates that the group which would invest in urban agriculture (including willingness to take entrepreneurial risks) is very small. This might be explained by the main motivation (growing food for self-consumption), or by the low profitability of market oriented farming under the present conditions.

PARTICIPATORY PLANNING

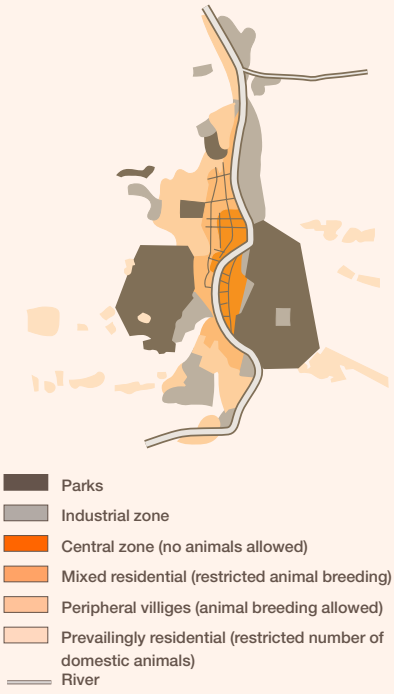
Based on the results of the city survey, a participatory process of policy and action planning was initiated, starting with an inventory of the stakeholders involved, in one way or another, in the use and management of this territory. Subsequently, a meeting with representatives of these stakeholders was organised, where the results of the survey were presented and their participation in a policy and action planning process was requested. The meeting resulted in an agreement to cooperate in the planning process initiated by the SWAPUA-project and to meet periodically. It was decided to focus the participatory process on the southern periphery of the city, which is the contact zone adjacent to the "Central Balkan" National Park. A planning team was formed consisting of the Bulgarian SWAPUA-team member, a local consultant (a professor in economics), a planning expert from the municipality and the deputy director of the Research Institute for Mountainous Animal Breeding located in Trojan.

Agricultural production has an important potential for urban landscape management

Meetings with local farmers and gardeners were organised in the area, to discuss the needs and problems and to generate ideas on required actions and policy measures. In general, the findings of the survey were confirmed. A problem of special interest to the farmers was the shortage of land for grazing the animals or to grow fodder. The interest of the peri-urban farmers in the provision of credit and assistance in marketing was higher than found in the survey. The planning team also consulted experts and representatives of a variety of local organisations.

On the basis of the results of these meetings and a review of the changes in land use and other tendencies in the southern periphery of Trojan, the planning team revised the outdated urban development plan for the southern zone of the city and drafted new municipal regulations for urban agriculture. The new development plan focuses on organic agriculture in combination with development of agro-tourism and landscape conservation. This draft action plan was first discussed and revised with the local farmers during follow-up meetings. The action plan was presented and discussed at the Trojan Municipal and Citizens' Forum, in which all major local groups were represented to advise on priority issues for the city. During the first meeting, the plan and regulations were presented and later published in the local newspaper. In the second meeting, the plan was discussed and it was accepted for the development of peri-urban agriculture in this zone.

Specific urban rules and standards for urban agriculture in Trojan



THE ACTION PLAN

The action plan includes a number of activities, indicating the organisation(s) responsible for implementation, the source of financing, the period of implementation and the expected results. The most important ones are summarised below:

The **Municipality** will play a coordinating role, to stimulate and regulate urban and peri-urban agriculture through:

- integrating urban agriculture in the general municipal development plan;
- adopting a set of specific norms and regulations regarding urban agriculture for different zones of the city;
- improving access to land for urban agriculture by selling and renting municipal land to family farms and providing land, directly or through gardening associations, for temporary agricultural use (medium-term leases), to those households registered as "being in need";
- encouraging organic production and regulation of the application of fertilisers and pesticides;
- periodically monitoring of the degree of pollution of soils and water in the urban agriculture plots, applying the municipal regulations regarding use of fertilisers and pesticides, and preventing ecological damage and public health problems;

Trojan is a typical Bulgarian town - about 50 % of Bulgarian cities have very similar characteristics. The population of Trojan counts 25,260 persons. Agriculture is one of the leading economic sectors, both in the region and in the city. Around the city centre there are two belts of residential zones varying in density and characteristics. In the peri-urban zones, some villages have more traditional farming functions (see map). Trojan is implementing the project "Civil development and local self-government". Because of its geographic location, size, economic activities and scale, Trojan was selected for the implementation of the exploratory survey. Respondents came from the various farming types and from both urban and peri-urban areas.

REFERENCES
- Government of Bulgaria. 2001. Law for Territorial Development. Sofia: State Gazette, No 1, 2.1.2001
- Government of Bulgaria, Ministry of Health Care. 1992 (amended 1994, 1996 and 1997). Regulation N7. Sofia: State Gazette N46.
- Government of Bulgaria. 1997. Law on Limitation of Harmful Influence of Waste Upon the Environment. Sofia: State Gazette N86.
- Government of Bulgaria. 1969, 1997. Law on Waters. Sofia: State Gazette N29 and N 87.
- Government of Bulgaria. 1963 and 1998. Law on Protection of Waters, Air and Soils from Pollution Sofia: State Gazette N84 and N11.

Main problems encountered by the urban gardeners and farmers in Trojan

- lack of feed and inputs (25 %);
- lack of capital (50 % - nearly 100 % replied no to taking out a loan if possible);
- lack of labour (38 %);
- lack of marketing (38 %);
- lack of transport (25 %); and
- lack of access to land or fear of eviction (50 %)

- assisting in the identification and solution of marketing problems, amongst others by creating the infrastructure for a local farmers market and by further facilitating arrangements between local farmers and schools, hospitals, and restaurants in Trojan and the neighbouring city of Lovetch;
- improving the roads;
- facilitating the provision of credit;
- stimulating the processing of local produce (canned, frozen, pickles and other forms);
- stimulating the (regulated) use of semi-public open spaces for urban agriculture for educational purposes and consumption in schools, hospitals, kindergartens; and
- including provisions for landscape development, recreation and gardening in building plans.

The **Research Institute on Mountainous Livestock Breeding and the National and Local Extension Services** will be active in providing technical advice and training to urban agriculturists on organic farming techniques, fodder production, animal reproduction, prevention of ecological damage, performing soil and water analyses, farm planning and information on available credit lines.

The rules are still experimental

The *Central Balkan National Park,* in cooperation with the *State Forestry Division,* will provide permits to the peri-urban farmers for grazing of animals, harvesting of herbs, forest fruits, and mushrooms, etc. in the territory of the National Park.

The **Swiss Foundation for Support of Sustainable Development of Farming in Bulgaria** and the *Bulgarian Swiss Foundation FAEL* will promote organic farming methods through distribution of publications, farm demonstrations, technical advice and training, and will provide credit support and supervision, and will assist in the regional marketing of farming products.

The **Tourism Association Central Balkan** and the *Trojan Tourism Bureau* will support the development of agro- and eco-tourism in the region, both by assisting farmers in providing recreational services as well as by attracting tourists and organising educational tours of students and schools.

ZONIFICATION AND MUNICIPAL REGULATIONS REGARDING URBAN AGRICULTURE

Agricultural activities and their influence on the settlements are covered by Regulation N7 of the Ministry of Health Care, which defines the mandatory requirements and standards for the protection of health and sanitation. For example, it delineates seven zones of sanitation levels, depending on the number and type of animals allowed in different types of residential areas. The Law for Territorial Management includes a specific supplement on sanitation-hygiene requirements for agriculture for various types of urban territories.
On the basis of these legal requirements and the information generated in the SWAPUA city survey on the presence and character of urban agriculture in the various districts of the town, the planning team developed *zonification* for urban agriculture in Trojan. This aims to facilitate backyard gardening and other forms of urban and peri-urban farming whilst preventing associated ecological and health problems. The zonification also includes a set of norms regarding agricultural land-use and guidelines for urban planning. The rules are still experimental and await endorsement by the municipal council.

CONCLUSION

The Trojan case illustrates a number of important issues:
- Urban agriculture is widely practised in Trojan, a city that is representative of a large group of cities in Bulgaria.
- Urban agriculture plays an important role in the food security of a substantial number of households and has provided a safety net during the transition period; for a smaller group, urban agriculture is an important source of income.
- A relatively limited group of urban farmers and gardeners in Trojan is interested in further growth and development into commercial farms.
- Rather than excluding urban farmers and gardeners from city development plans (as is current practice), they must be integrated into urban planning to prevent negative impacts from unregulated urban agriculture. Optimal use can also be made of the role urban farmers and gardeners can play in the protection of nature, landscape management, provision of recreational services to urban citizens and ecological education of the youth and citizens.
- When a participatory and multi-actor approach is applied, with relatively little financial means, a good quality plan can be made and implemented, combining expertise and resources of various local actors, including the urban farmers.

Antoaneta Yoveva

Open space in Sofia

The growth and geographical spread of urban agriculture in Zimbabwe is largely attributed to the harsh effects of economic structural adjustment programmes (ESAP). The negative impact of ESAP has been manifest by the erosion of basic wages, escalating prices of basic commodities and the widening of the gap between rich and poor households. Studies by ENDA-Zimbabwe (1994) indicated that the total land under cultivation in the City of Harare increased dramatically, by 92.6% between the years 1991-1994. This period coincides with the early phases of ESAP launched in 1991. The land under cultivation has also increased under the economic hardships of the last years. The responsiveness and actions of urban local authorities in addressing the pressing needs of the urban community has become of utmost significance.

Beacon Mbiba

Women selling maize in Harare

The Urban Planning Dilemma in Harare, Zimbabwe

In Zimbabwe, the nature and practice of agricultural activities within the urban environment are posing chronic headaches to the largely conservative urban planners, who are keen to observe and perpetuate the status quo. Traditionally, urban environments have been identified by the absence of agricultural activities as these are more aligned to the rural forms of settlement (Mbiba 1995).

Urban farming activities in Zimbabwe broadly fall into two categories: intra-urban farming activities and peri-urban farming activities carried out on the outskirts of the urban environment. Whilst all farming activities are of great concern to local urban planning authorities, the off-plot mode of intra-urban agricultural production is the most contentious and problematic in urban planning practice, and officially illegal.

The uncontrolled encroachment of 'traditional' cultivation practices upon environmentally sensitive land, and the ill-advised use of chemicals in vegetable and crop production are often put forward as reasons why urban agriculture should never be considered as a serious urban land-use option. Urban planners are thereby caught up in a jigsaw puzzle in which, on one hand, they are expected to address the current needs of the urban citizenry, whilst on the other hand, protecting and preserving the urban ecological and physical environments in tandem with prescribed notions of urban management. In most instances, matters pertaining to the livelihood systems of the urban populace, mostly the poor, have often taken second fiddle to inflexible environmental planning considerations.

Food produced within the urban environment is primarily consumed by producing households, whereas the surplus is sold to the urban market. Next to production-related problems, planners have to grapple with marketing aspects of agricultural produce. In the cities of Harare and Gweru, local authorities have been engaged in incessant conflicts with fruit, vegetable and crop vendors who sell their products in undesignated areas often in conflict with other urban land uses. Urban land and water resources are critical in the development and practice of urban agriculture. Accessibility of such resources to the urban poor farmers is curtailed by intense competition from other urban land uses such as housing and industrial developments. Planners in most Zimbabwean urban centres view urban open space cultivation as standing in the way of urban development.

Furthermore, the promotion of free market operations in the distribution of urban land entails the poor and powerless being completely pushed out of the urban economic operations.

One would expect the role of the planner to be an advocacy role, by deliberately setting aside land for agricultural production by the poor, but the institutional environment in which the urban planner operates is a major obstacle to responsive and innovative planning.

INSTITUTIONAL PROCESSES AND URBAN LAND-USE PLANNING

Historically, urban planning in Zimbabwe has been guided by rigid Master and Local Plans, which tended to stifle relevant adaptations to emerging and unforeseen urban socio-economic needs, while the urban planner is also faced with political pressures that tend to be concerned with short-term political gains.

Local authorities have been engaged in incessant conflicts

A review of local authority response to urban planning would show that political forces have been at the forefront in determining the course of urban agriculture.

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REFERENCES
- Chaipa I. 2001. Institutional Bottlenecks in Urban Poverty Alleviation: The case of urban food production by the poor and the local governance system in the City of Gweru. Draft MPhil Thesis, University of Zimbabwe.
- ENDA-Zimbabwe. 1994. Urban Agriculture in Harare. Harare: ENDA-Zimbabwe.
- Mbiba B. 1995. Urban Agriculture in Zimbabwe: Implications for Urban Management and Poverty. Avebury: Ashgate Publishing Limited.

For instance, the City of Harare promoted urban farming 'cooperatives' as far back as 1985 following a directive from the Minister of Local Government and Town Planning. These farming 'cooperatives' never functioned as cooperatives in the true sense of the word, but more as groupings for the purposes of acquiring land. The farming 'cooperatives' were more of a manifestation of the ruling party's experimentation with socialist ideologies, than a deliberate and carefully thought out planning intervention to address the needs of the citizens. Similarly, toleration of urban agriculture in other urban centres such as Gweru, could be seen as being more politically motivated than as a conscious planning intervention. In election years for local government, councillors and Members of Parliament, even the worst environmentally damaging practices of urban agriculture have been permitted to continue.

The urban planner operates in an institutional environment that is at the centre of diverse political interests. The fact that urban planning officials are accountable to politically elected councillors, most of whom have no relevant urban planning and management expertise restricts development of innovative ways for integrating agricultural activities into the urban land-use system. Consequently, most practising planners are content with observing the status quo by implementing development control according to laid down procedures and standards and provisions of enabling legislation such as the Urban Councils Act. A further critical shortage of skilled planners also hampers innovative and responsive planning.

The successful and sustainable integration of urban agriculture into urban land-use systems in Zimbabwe is a complex task requiring a multi-stakeholder approach with the urban professional planners taking a leading role and providing a conducive operational environment. This requires intensive public and political awareness-raising and strict observance of ethics of good urban governance.

The Women and Land Lobby Group in Zimbabwe

Urban agriculture is an important social and economic activity providing nutritious food, employment and income to a large number of people in urban areas, especially women. This importance has increased as a result of Economic Structural Adjustment Programmes (ESAP) initiated in Zimbabwe since the 1990s, because of the sharp rise in the cost of living due to the removal of subsidies on basic commodities. This period also saw an increase in urban agriculture and the commercialisation of the activity. Research has shown that, in Zimbabwe, the majority (90 %) of urban cultivators is women who are engaging in urban agriculture as a strategy for poverty alleviation. Households save money by consuming their own produce rather than by purchasing it. As in many other developing countries, urban agriculture is a necessity as it is practised to supplement household food supplies, unlike in developed countries where it is practised as a leisure activity.

Beacon Mbiba

Vegetable production in Mbare high density area

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Urban agriculture has only recently been identified as an activity area for the Women and Land Lobby Group, in which the focus is more on the poor sector of the community because these are the people who practise the activity out of need. Also, these people live in the high-density suburbs, and as a result, most of their activities are carried out on municipal, state or privately owned land that is vacant. This land is not designated for agriculture, and agricultural activities are therefore considered to be illegal.

URBAN AGRICULTURE STRATEGY

Several problems are associated with urban agriculture in Zimbabwe, related to policy and land-ownership issues, production techniques, marketing and the negative environmental impacts. The Women and Land Lobby Group has a two-stage strategy to bring attention to the need for a relevant policy. The first stage relates to lobbying for the legalisation of urban agriculture through stakeholder workshops, to highlight its importance and to map out strategies to have it legalised. The key targets in this regard are the parliamentarians, the municipal government, city council officials, urban council associations, relevant NGOs and the urban cultivators themselves. Once a policy framework governing urban agriculture is put in place and when legalisation is expected, the Women and Land Lobby Group will carry on to the second stage of its strategy. In partnership with other organisations such as the Farmers' Development Trust, the Extension Service and Compassionate Ministries, they will assist cultivators to undertake urban agriculture in a sustainable and viable manner.

Female farmers will be assisted through the provision of agricultural training in farming techniques and management practices, and by offering low-interest loans (from the Farmer Development Trust Input Loan Scheme).

The ultimate goal is to have urban agriculture included in urban land-use planning in Zimbabwe's urban areas and to have the activity realise its full potential in terms of food security for the urban population.

The mandate of the Women and Land Lobby Group is to advocate and lobby for gender-sensitive land policies and promote women's economic empowerment through the equitable access to and control of land. The organisation is concerned with ensuring that policies affecting women's access to land are effectively translated into practice and implementation.

Fruit market in Harare

Beacon Mbiba

The Marginalisation of Urban Agriculture in Lusaka

In 1987, Sanyal suggested that Lusaka, Zambia, was the capital city of urban agriculture (UA) in Africa. This was at the peak of Zambia's economic crisis when residents took up UA as a form of employment and to improve their nutritional status. Travelling in the region today, one will easily agree that Harare, Zimbabwe, has taken over as the capital of urban agriculture and that the activity may not be as widespread in Lusaka as observed by Sanyal in the 1980s.

There is no longer abundant maize growing outside the boundary fence of the elegantly designed Hotel International. In addition, there is little integration into planning. In fact, urban and peri-urban agriculture has been marginalised out of planning; it is not considered a priority by the city authorities and is being gradually squeezed out by residents seeking lodgings to rent, as well as developers. Under these circumstances, a recurring question is 'what factors determine the integration (or otherwise) of urban agriculture into city planning'?

The integration of UA into planning is determined not only by the character of planning and planning institutions in a given place but also by socio-political dynamics relating to access and control of land resources. In Lusaka, it can be observed that the local planning institutions are weak; the planning department lacks the capacity to plan and most of the current strategic planning is carried out by donor agencies and their externally appointed consultancy firms (especially from South Africa)[1].

The combined effect of these determinants in Lusaka is to marginalise agriculture in the planning processes (institutional marginalisation) while also pushing it towards the periphery of the city: peri-urban agriculture (spatial marginalisation).

SOCIO-ECONOMIC SETTINGS AND LUSAKA'S STRATEGIC PLANNING

Lusaka's current population is about two million people, over half of whom reside in peripheral 'compounds', largely unplanned previously informal or squatter settlements. Reports suggest that 70% of the city's population resides on 20% of the land, thus pointing to a dual city comprising of extremely high density areas co-existing with spacious low population density zones (Muwowo 2000, Lusaka City Council 2000). Planning for Lusaka since the 1970s has largely revolved around programmes to upgrade the 'compounds' in terms of provision of improved housing, roads, social services, water and sanitation infrastructure. This is a domain in which large multinational donors and local NGOs play a significant role (see for example, Agyemang *et al.*1997, Lusaka City Council 1999, Nippon Koei Co. Ltd. 1999).

The spatial growth of the city to date was supposed to be guided by the 1975 'Greater Lusaka Development Plan' whose full implementation was however constrained by limited capacity and financial resources, due to a shrinking economy since the late 1970s. Recently, signs of economic stability and recovery have emerged, buttressed by donor funding. A new strategic plan for the city has been identified as necessary to guide these new developments. Whereas, the legal requirement is that the master plan be reviewed every five years, this has never been undertaken for the 1975 Development Plan. Thus over the years, land use has developed in unforeseen directions hence the need for a new

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The result is that UA is pushed out of the more central areas

strategic plan. However, despite all these obvious reasons, local actors in Lusaka allege that the impetus for this plan came from the World Bank which provided the financial resources and appointed a team of South African consultants to prepare it[2]. A draft strategic plan was then submitted in June 2000 and was still awaiting ministerial approval as of March 2001.

THE NEGLECT OF URBAN AGRICULTURE IN THE STRATEGIC PLAN

Generally, little direct mention is made in the plan, on urban and peri-urban agriculture. It appears that there was no attempt to conduct a detailed primary survey of the activity, though the report by Agyemang *et al.* (1997) which included

Beacon Mbiba

Roasted Maize cobs sold along the major roads in Harare

a small section on UA was used. Even in terms of secondary data, the plan did not draw on the large literature base that exists on the topic for the city of Lusaka.

Urban agriculture was discussed in the context of open space management and the need for sustainable environmental development. In section 1.8.4.3, the plan recognises the presence of open spaces and agricultural land amounting to 400,000 hectares in the form of agricultural smallholdings at the periphery and kitchen gardens, where a variety of crops such as potatoes, cassava, maize and vegetables are grown. Aspects of livestock production and commercial horticulture were also identified. The latter is largely found in areas outside the Lusaka District boundary, where close to 90% of the actors are possibly foreign business people[3]. The plan supports a vigorous environmental approach to management of these activities.

However, other than the environmental view of these activities, the study to the plan did not capture the political and economic dimensions of UA and its poverty alleviation potential. It seems to have been influenced by a modernisation philosophy leading to a strategic perspective that fails to draw out employment potentials in the sector as initially identified in another section of the plan. This issue could be gleaned in section 3 where it is stated that:

Agriculture is a major employer in the Lusaka economy. However, as Lusaka is a built up urban area and more and more agriculturally productive land is taken up for urban purposes, it is ***not believed that there is any scope for long term growth*** in this sector.

The plan thus fails to interrogate the issue further. Yet maps produced show that a lot of open spaces exist which could be comprehensively used for agriculture, to boost growth and employment. Secondly, no synthesis and strategy to protect agriculturally productive land from being replaced by building development sites is given. Lusaka still has untapped potential for upward growth, an approach that would draw away pressure from existing open spaces.

THE "COMPACT CITY" PERSPECTIVE AND IMPLICATIONS FOR URBAN AGRICULTURE

Urban agriculture in Lusaka will also be affected by the "compact city perspective" adopted in the strategic plan (also seen in Nairobi and Harare) and described as part of the '*new urbanism*' (Mbiba 2001). Section 2 of the Lusaka Integrated Development Plan captures this as follows: "Before Lusaka expands outside the current district boundary, it is imperative that infilling of residential and commercial areas takes place." This implies that all vacant land within residential areas should be used for building development sites before further expansion outwards. The rationale is that such open spaces are better serviced (with water, roads and sewer lines) relative to more peripheral sites and therefore cheaper to develop.

The result is that agriculture is pushed out of the more central areas towards the periphery of the city; these sites demand longer travel times not available to poor urban residents. This peripheral future of urban agriculture was endorsed in an interview with Councillor Judith Simusya of *Lubwa* Ward 29 who indicated that:

"As council, we have not tackled UA. We do not have a strategy as such.... For us, we provide UA on smallholdings 5 km away from the city... that we promote. On open spaces within the city, we discourage it but do not slash crops". (Interview 08/03/2001)

However, even in the smallholdings, the council does not provide any material support. Instead, this support comes

REFERENCES

- Agyemang OA (Kofi), Chirwa B and Muya M. 1997. Managing the Sustainable Growth and Development of Lusaka: An Environmental Profile of the Greater Lusaka Area. Report prepared for Lusaka City Council, UNDP, UNCHS and Government of the Republic of Zambia. Lusaka.
- Government of Zambia. 1975. Land (Conversion of Titles) Laws of Zambia. Chapter 289. Lusaka: Government Printer.
- Lusaka City Council. 1999. Annual Report of the Housing and Social Services Department, Lusaka City Council. Lusaka.
- Lusaka City Council. 2000. Lusaka Integrated Development Plan 1999 (Final Draft, June 2000). Prepared by V3 Consulting Engineers. Lusaka City Council Lusaka.
- Lusaka City Council. 2000/2001. Report of the Adhoc Committee on Improper Land Allocation in Lusaka. Lusaka City Council. Unpublished Report.
- Mbiba B. 2001. The Political Economy of Urban and Peri-Urban Agriculture in Southern and Eastern Africa: Overview, Settings and Research Agenda. Presentation for the MDP/ESA workshop, 'The Political Economy of Urban and Peri-Urban Agriculture in East & Southern Africa' in Harare, Feb.-March 2001.
- Muwowo P. 2000. Environmental Problems and Gardening in Urban and Peri-urban Areas of Lusaka, Zambia. *Insight (Incorporating Lusaka City News)* 9 (December): 7. Lusaka: Sustainable Lusaka Programme.
- Nippon Koei Co. Ltd. 1999. The Study on Environmental Improvements of Unplanned Urban Settlements in Lusaka: Inception Report. Lusaka: Japan International Co-operation Agency (JICA) and Ministry of Local Government and Housing.
- Sanyal B. 1987. Urban Cultivation Amidst Modernisation: How Should we interpret it? *Journal of Planning Education and Research 6 (3): 187- 207.*

-The Times of Zambia. 1999. Illegal Plot Developers Given Ultimatum (14 October).
- *-The Times Zambia.* 1999. Chainama Land Row Brewing (21 September).
-The Sunday Times. 1999. Comment: Land Issue A Serious Business (7 November).

-The Times. 2000. Illegal Settlers Invade Kanakantapa (11 July).
-The Times. 2000. Illegal Occupations: Police Evict Squatters (6 July).

Urban Vegetable Promotion Project

Crop production along the road in Dar Es Salaam

The rental income option appears more attractive than the benefits derived from UA

from NGOs who work with cultivators and community groups.

SOCIO-POLITICAL CONTEXTS AND LAND DIMENSIONS

The view by councillor Simusya that "urban agriculture is an issue of land' is shared by many in Southern and Eastern Africa (see Mbiba 2001). The urban land on which agriculture does or can take place could be used for many other purposes. Ownership, access and perceptions of good use of land are all socially contested matters that do not favour it. Prevailing processes in Lusaka seem to confirm this view.

As from 1975, land ownership and access in Zambia was governed by the Land (Conversion of Titles) Act (Chapter 289) which abolished land sales, transfers, alienation of land for value and restricted agricultural landholdings. This act was repealed in 1995 restoring value to undeveloped land. As a result of these statutory changes, public perceptions changed on how to use land, as well as on the importance of ownership, control and access to land sites for building development. A real estate market emerged and is now growing steadily with an emphasis on building site development and not on urban agriculture. Key processes observed are:
(a) Open spaces are used for prestigious commercial and residential developments with involvement of international capital such as at Manda Hill Out of Town Shopping Centre, the upcoming OAU Complex in Long-acres, housing developments in the Ibex area, the Chinese Trade/Cultural Centre near Kalingalinga residential area, and so on.
(b) Investments and investors take land from the poor or get preferential treatment *vis à vis* the poor and UA.
(c) Land is being sold illegally by officials and politicians.
(d) Conflicts between different groups and competing claims on the same piece of land occur.
(e) Illegal development of houses for rent is taking place.
(f) There are rising levels of land disputes.

The *Times of Zambia* has reported on many of these processes while the City Council in 2000 set up a Committee to investigate the 'rampant' illegal land dealings by its officials and councillors (Lusaka City Council, 2000-2001). The *Times of Zambia* reported on July 6th 2000: "Police in Lusaka Yesterday evicted over 500 squatters who invaded 40 acres of University of Zambia land and demarcated it into residential plots on the border with Kalingalinga Township." At the time, the land being reserved for future expansion of the university was being used for agricultural production by some residents.

But this article clearly shows that the 'residential movement' and demand for houses by the poor seem to be stronger than that for agriculture. Other press articles and the Lusaka (2000/2001) report suggest that powerful local politicians and patrons use the poor to invade urban open spaces not only for political patronage but also as a way to access sites on which to built structures from which to generate rental incomes. The rental income option appears more attractive than the benefits derived from agricultural activities.

CONCLUSION

Grey literature and anecdotal interview evidence from Lusaka highlight that among other things, the conduct and content of current strategic planning efforts coupled with formal and informal land market dynamics reinforce the exclusion of agriculture rather than its integration into urban planning and development. Current efforts at strategic planning in Lusaka are largely managed by external agencies driven by a western modernist view of the city. These have tended to ignore the urban agriculture reality. Although these efforts have strong concerns for 'environmental biodiversity', they have missed opportunities to explore and develop urban agriculture as a sector within which to tackle issues of urban economy and poverty alleviation. The plans and planning exclude rather than integrate urban agriculture.

Urban agriculture is further excluded by ongoing social and political processes around issues of control and access to land in the city. The priority seems to be to focus on the conversion of undeveloped sites (both formally and informally) for building site development and away from UA. Given these processes and the context, it seems that Lusaka's agriculture will become more active at the periphery (peri-urban agriculture) than in other city open spaces. Consequently, there is a need for a formal process to explore and put in place a peri-urban agriculture review programme as an extension or complement to the just completed Lusaka Integrated Development Plan.

NOTES

(1) A view expressed by officers in the City Council and confirmed by a cursory review of planning and programme documents for the city.
(2) A view expressed by Mr F Mwale, former mayor of Lusaka City (Interview discussion, March 2001).
(3) The team of consultants comprised of V3 Consulting Engineers, LASCO Engineers, Urban Dynamics and Urban Econ.

Integration of Agriculture in City Development in Dar Es Salaam

A number of forces have driven the mushrooming of urban farming and livestock keeping. In Dar Es Salaam. They include poverty; decreasing formal employment; proximity to markets; availability of services; government policy; culture (like livestock keeping as part of the culture) and non-enforcement of laws, regulations and by-laws.

Urban Vegetable Promotion Project

Cropproduction in a valley in Dar Es Salaam

In the Tanzanian context urban agriculture is commonly referred to as "farming activities in the built-up areas where open spaces are available as well as livestock keeping in the built-up and peri-urban areas". Farming and livestock keeping in the city of Dar Es Salaam is undertaken either in the backyard, near homes, in vacant lots around the city, and in the peri-urban areas. Substantial farming takes place in the many valleys and swampy areas. Size of the plots increase as one moves away from the centre to the periphery, while intensification moves in the opposite direction. Crops include vegetables (spinach, cabbages, tomatoes etc.); fruits (papaya, oranges, quaver); paddy; maize; cassava; sweet potatoes; and bananas. Table 1 below shows the growth in animals kept in the city.

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Despite substantial growth, urban agriculture received very limited recognition from the authorities in the past ten years. Of late, professionals and politicians have realised that if urban agriculture is taken seriously and properly organised, it can be effective land management. The city of Dar Es Salaam further recognises the need to develop strategies that can enhance urban agriculture in order to ensure sustainable human development, in support of the Local Agenda 21 and the Habitat Agenda.

INTEGRATION OF URBAN AGRICULTURE INTO URBAN PLANNING

In 1992 the city of Dar Es Salaam adopted the Environmental Planning and Management (EPM) Approach in the City Consultation. This new approach has been the engine of change in many aspects amongst others related to urban agriculture. Environmental Planning and Management advocates dialogue and participatory city planning. Under this new approach the city held a mini-consultation in 1993 to deliberate on agriculture. In the consultation, stakeholders agreed that agriculture in the city contributed substantially (almost 30%) in household food supplies and that is had become integral part of urban livelihood strategies. A Working Group was formed to work out strategies for putting urban agriculture on the city agenda.

The National Human Settlements Policy states that; The Government Shall:

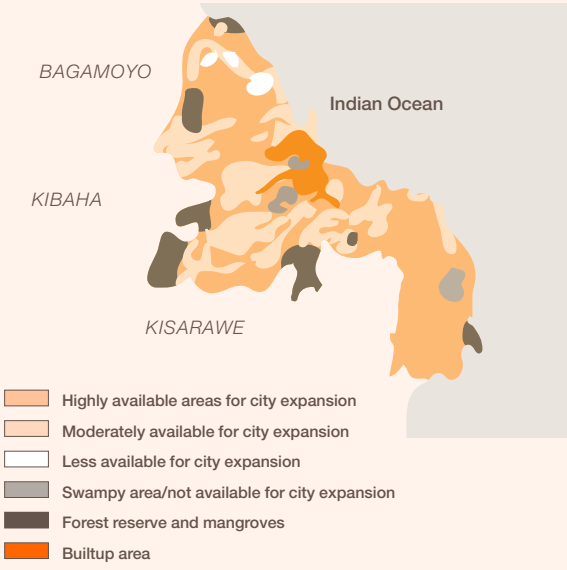
- ❖ Designate Special areas within planning areas whereby people will be granted legal rights to engage themselves in agricultural activities;
- ❖ Continue to regulate and research on the urban agriculture and will ensure that it does not disrupt planned urban development;
- ❖ Review existing laws to facilitate planned agriculture e in the city;
- ❖ Facilitate the construction of appropriate infrastructure to mitigate/prevent land degradation, water pollution and health and safety hazards in areas whereby agriculture is permitted.

The Working Group included representatives from various segments of urban dwellers (the urban poor, men, youth and women groups); Village governments (especially in the peri-urban areas); various government ministries; institutions of higher learning; the Dar Es Salaam City Council Popular sector groups; NGOs and CBOs (both, within the city and active in urban villages). The size of the group depended on the issue being addressed. The Dar Es Salaam City Council was the co-ordinating institution and guided the operations in the urban context. Other members provided information and ideas from their respective localities. Conflicts of interest were minimum. The members knew failure to address interests of a section of city residents would be detrimental. Differences in opinion were managed in a participatory way.

The results of the whole process, from action plan preparation, implementation of demonstration projects and further integration of agriculture in the cities urban zonification was good. One of the successful demonstrations is the Mbutu Agricultural project. Findings of the working group included results of these projects and were a basis of deciding where and to what extent agriculture can be practised in the city as reflected in the *Strategic Urban Development Plan (SUDP).* In this plan, special land zones have been designated for agriculture (See ***Map***) Ideas necessary for revising municipal by-laws and regulations were also worked out and a platform for co-ordination established and enhanced.

In Dar es Salaam UA has received attention on various policy levels and is accepted as a land use in the city. The SUDP also has deliberately set apart several areas to be used for large and medium scale urban agriculture in the future and gives corresponding development conditions. This is contrary to the earlier "zonification" where an area could only be considered for Agricultural activities while it awaited to be assigned other uses like residential or industrial areas. The major difference is that a Master Plan considered UA as a transitional land use whereas the SUDP considers it to be an important activity and has a very important contribution to its citizens.

Strategic Urban Development Plan Framework for Dar Es Salaam



Recognition of urban agriculture has contributed significantly to the quality and quantity of foodstuffs in the city, which in turn lowered prices, thus enhancing the purchasing power of the urban majority. A negative impact though, of agriculture in the city, is the uncontrolled growth, hindering efforts to develop land in a way that could benefit many citizens. With the decreasing number of jobs both in public and private sector, intra-urban and peri-urban agriculture calls for strengthened efforts to organise the activity.

Mrs Mlambo presents findings of the Sustainable Dar Es Salaam Project

Urban Vegetable Promotion Project

Special land zones have been designated for agriculture

Recognition is reflected in several laws and regulations, among them are the Agricultural and Livestock Policy (1997) and the National Human Settlements Development Policy (Jan 2000).

ACCESS TO LAND

Getting land in the city of Dar Es Salaam has always been difficult. The urban poor have consistently sold their land to the rich on the pretext that they do not have sufficient funds to develop it themselves. Through the Environmental Planning and Management Process, communities

The Working Group applied the following steps (as part of the EPM Approach):

- Clarifying the issues to be addressed;
- Involving those whose cooperation is required;
- Setting priorities;
- Agreeing on priority issues
- Initiating and implementing demonstration projects in collaboration with respective institutions.
- Monitoring and evaluating progress and making periodic adjustments to WG proposals; and
- Providing input to the Strategic Urban Development Plan

TABLE 1: Animals reared in Dar es Salaam City

Year	Dairy cattle	Layers	Broilers	Local fowls	Ducks	Pigs	Goats
1985	3,318	221,920	146,205	88,720	4,900	6,795	1,361
1986	4,200	292,000	180,500	93,389	6,800	8,601	2,617
1987	5,278	390,000	194,500	98,304	8,100	10,454	3,820
1988	7,105	445,000	237,000	103,341	10,449	13,383	5,764
1989	8,597	551,800	282,083	108,508	13,479	15,658	8,531
1990	10,402	664,232	335,624	113,933	17,388	18,946	12,626
1991	12,586	824,448	399,393	119,630	22,431	22,925	18,686
1992	15,229	1,027,275	475,276	125,611	28,936	27,739	27,655
1993	18,286	1,225,392	565,579	131,891	37,327	33,564	40,930

are now aware that if they are empowered to better plan and manage their environment in a more coordinated manner, they can contain many of the problems they face.

To improve access to land the city authority is encouraging vertical expansion of buildings, to free some space in the built up areas and in potential areas for city expansion.

CONCLUSION AND RECOMMENDATIONS

There is no one single way of organising urban agriculture, and success very much depends on adaptation to local conditions. In Dar Es Salaam, it is shown, that agriculture can be effectively integrated in Urban Land Use Plans. The city has integrated urban agriculture in urban planning through a bottom-up approach, under the Environment Planning and Management Process. Agriculture in the city is recognised as one of the land uses and an important informal opportunity for the unemployed population.

It is recommended that a thorough study to ascertain the potentials and limitations of urban agriculture be carried out. The results of this survey will be a basis for continued - informed - decision making, and to prevent detrimental effects to the residents and the environment. The shortage of affordable and reliable transport also needs due attention. Efforts to facilitate urban agriculture should incorporate elements to enhance low cost mobility, like bicycles, which will ease the work involved in distribution of the produce.

The approach piloted in the city of Dar Es Salaam has been widely accepted by the Ministry responsible for Land Development. The ongoing process to prepare other Strategic Urban Development Plans in the nine Municipalities with replication of the Environment Planning and Management Process provide evidence of its integration at national policy level. The Strategic Urban Development Plans will give due attention to urban agriculture.

A homegarden

Urban Vegetable Promotion Project

REFERENCES

- Ministry of Lands and Human Settlements Development, Government Notices, Orders, Technical Instructions and Circulars Commonly Referred To in Pursuance of Human Settlements Development – Compiled by Human Settlements Division, Ministry of Lands and Human Settlements Development
- Dongus, Stefan. Vegetable Production on Open Spaces in Dar Es Salaam – Spatial Changes from 1992 to 1999, Albert Lewis University of Freiburg/Germany Institute of Physical Geography Section of Applied Physio-geography in Tropics and Sub-tropics (APT0 with assistance of Ibraham Nyika, Ministry of Agriculture & Cooperatives, Tanzania.
- Sawio, Camilus L. Proposition Paper Managing Urban Agriculture in Dar Es Salaam Department of Geography, University of Dar Es Salaam in Collaboration with SDP Urban Agriculture Working Group.

WORKSHOP ON URBAN AGRICULTURE

Dar es Salaam, 11-13 june 2001.

This workshop, organised by the Urban Vegetable Promotion Project (UVPP) under the Ministry of Agriculture and Food Security and the University of Dar es Salaam, together with the Municipal Development Programme (MDP) based in Zimbabwe, under the RUAF Programme, looked at issues of planning and policy for urban agriculture, existing activities and initiatives as well as the communication, information and training needs of stakeholders. One important aim of the workshop was to close the gap between the policy makers and the practitioners at farm level. Representatives of the most important stakeholders were invited to the workshop, amongst others from the Ministry of Agriculture, the Ministry of Lands, the International Labour Organisation (ILO), UVPP, The University of Dar es Salaam and Sokoine University of Agriculture (SUA) in Morogoro and the University College of Lands & Architectural Studies (UCLAS). Next to presentations and working groups on special subjects mainly pertaining to the question of mainstreaming urban agriculture and the identification of a possible urban agriculture coordinating office, a small market was organised where some farmers displayed their products. One important conclusion was that urban agriculture should be seen as an urban management tool, another was that participatory techniques were necessary for the promotion of sustainable urban agriculture. Further information and the workshop proceedings may be obtained from uvpp@africaonline.co.tz or from ruaf@etcnl.nl .

Incorporating Urban Agriculture

A Case Study Of Glen Valley In Gaborone City Planning

Branko Cavric

Training of urban planners

Today, the scale of urban and peri-urban agriculture (UPA) in Botswana's urban settlements is still very limited when compared to the intensive agricultural practices found in other southern African cities like Nairobi, Dar es Salaam, Lusaka, Harare or Johannesburg. However, in the capital of Gaborone, one of the fastest growing cities in Africa, several agricultural projects have started that are integrated into its urban development. The aim of this article is to provide more details on these new initiatives, using a case study of Glen Valley.

The growth of Botswana's capital, Gaborone, has necessitated encroachment on surrounding farmlands (with land being converted into housing and industrial estates) and the sprawl that has been developing since independence (1966) has resulted in dispersed suburban growth and segregated areas for retail, residential and commercial/ industrial activities. The city is still spreading out, but has now reached its limits in almost every direction. The recent Gaborone City Development Plan (1997) has gone so far as to suggest acquiring even more farmland south and north of the city to accommodate urban development (see the Figure). Of the total area of 19,096 ha of land within the city, agricultural and forested land occupied 2,468.12 ha in 1997, amounting to 17.09 % of the total landmass (DTRP/MLHE 1997: 90).

Gaborone, like many other towns in Botswana has always been reliant for most of its food (even perishable) supplies, on deliveries from outside the city boundaries (Mosha & Cavric 1999). Today, limited agricultural production is taking place within the city boundaries. Most urban commercial farmers are situated in Gaborone North and are either private venturers, or from academic or scientific institutions. Some restricted agricultural activities are going on within the city limits on freehold farms. However, planning authorities have consented to change the two major large-scale freehold farms in Gaborone North, from agricultural use to residential and other land uses (Dithebe 1998), which has caused some land speculation and disputes.

In the southern part of the city, there are a number of small-scale poultry farms. Sanitas plant nursery, also located in this area, is both a commercial nursery and a nucleus of a botanical garden exhibiting exotic plants. In addition, Gaborone City Parks and Gardens Service has a plant nursery in Gaborone West (Ibid 1997).

ENVIRONMENTAL CONSIDERATIONS

A major problem facing the development of urban agriculture is the availability of water as rainfall is erratic and unreliable. The need to make the City of Gaborone self-sufficient in horticultural products was recognised many years ago, but the lack of sufficient water has made this task very difficult.

In August 1997, a new sewage treatment plant was commissioned, with a design capacity of 40,000 cubic metres of effluent

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water per day (Gibb 1993). The proposal for effluent reuse as a source of water for irrigation came as no surprise. This potential water supply brought back the interest to develop small-scale market gardening in and around Gaborone.

Today, about 20,000 cubic metres of effluent is being generated by the City Sewage Works per day, which is at the moment still being discarded as sewage water. It is now under consideration to treat this water to the point that it could be re-utilised as a source for irrigation. Such huge volumes of water in Gaborone

The lack of a clearly defined policy is a limiting factor

with its unreliable water supply, stimulates the idea that Gaborone could become self-sufficient in horticultural production.

It was with this in mind that an irrigated agriculture project, using effluent water from the Gaborone Sewerage Treatment Plant in the Glen Valley Area, was planned.

INSTITUTIONAL AND POLICY CONSIDERATIONS

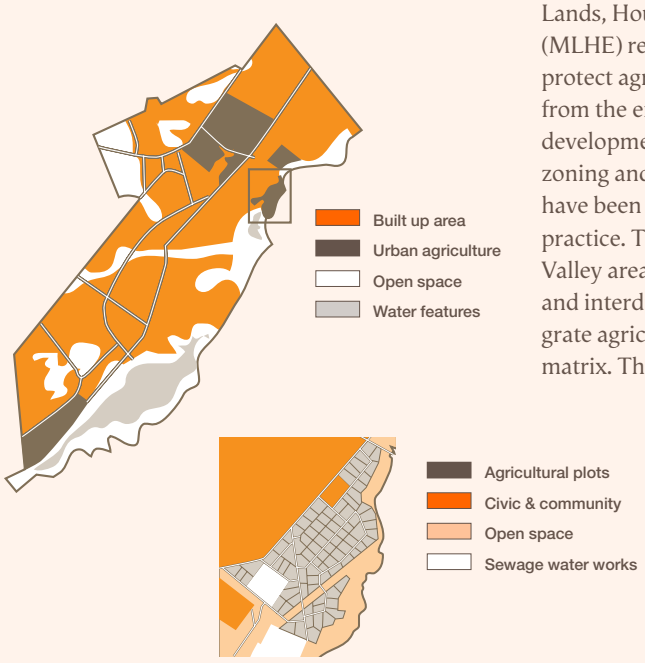
The lack of a clearly defined policy is another limiting factor in the development of agriculture in Gaborone City. There is currently no leading institution working on its integration into urban planning. It has also been said that UA thrives where there is no real effective planning taking place. Indeed, urban planning and land-use controls are very tight, and this may be a further indication as to why UA is so limited (Byerley 1996, Rogerson 1994).

The participation of farmers is strictly up to the individual. Some neighbourhood committees, like in White City and Bontleng, have voiced their displeasure with the development of agriculture on open spaces, alleging that the growing of vegetables and other greens attracts snakes and mosquitoes, reduces playing areas for their children, and utilises pipe water at public stands. Their concerns have been made public in the Ward Development Committee meetings.

Gender is an important issue not only in Gaborone, but in the whole country. Food production is traditionally the responsibility of women, and logically so in female-headed households, which currently make up 36% of households in Gaborone city. Production decisions, providing labour, and financial control over inputs and outputs, are activities predominantly undertaken by women. However, the role women play is insufficiently recognised by society, resulting in the lack of any organised support for female-headed households.

There is no platform for the coordination of urban agriculture activities among Government institutions, who may take uncoordinated initiatives. For example, the Department of Town and Regional Planning (DTRP) of the Ministry of Lands, Housing and the Environment (MLHE) recently launched a campaign to protect agricultural and open spaces from the encroachment of residential developments. Consequently, proper zoning and preparation of physical plans have been very rare in current planning practice. The case study of the Glen Valley area is one of the first systematic and interdisciplinary attempts to integrate agriculture into the existing urban matrix. The 1998 plan tackles adequate access and land-use zoning problems, by involving experts from various professional fields (agriculturists, engineers, planners, environmentalists) and by conducting detailed analyses of the economic components and conditions for attracting investors' attention.

Glen Valley Area



A CASE STUDY OF GLEN VALLEY

Area

Glen Valley is a peri-urban area situated in north-eastern Gaborone. The surrounding areas are primarily residential, recreational or open space. The area is relatively flat and prone to flooding due to the proximity of river channels. Despite its location, which is relatively far from the city centre, the site, consisting of 234 hectares, had been viewed as ideal for agriculture. The soils are suitable and treated wastewater from the nearby treatment plant can be utilised.

Planning and environmental concerns

The intent of the Glen Valley Horticultural Plan was to create a well-designed irrigation project which would cater to small-scale commercial agricultural plots for horticultural purposes with some other activities like flower gardening and perhaps poultry and small stock breeding. The idea was to allocate portions of land to agricultural investors who were conversant with irrigation systems and who would utilise the land to its fullest potential, in order to produce and provide fresh agricultural products to the City of Gaborone and its surrounding areas. Unfortunately, this type of rather intensive production is aimed at those with the necessary resources, and, as seen in other cities like Harare (Mbiba 1995), the poor become excluded.

The plan was approved in September 1998 on condition that an environmental impact assessment be clearly stipulated in the lease contract. The use of the treated water was restricted to specific crops not used for human consumption, such as seedlings, grass, etc. The planning authority stated that close environmental monitoring of the project at the implementation stage was a prerequisite.

Design principles

The size of the Glen valley plots varies from 1.5 to 4 hectares. All plots are back-to-back, and so are easily serviced (see

REFERENCES

- Byerley A. 1996, UA in Botswana - A Minor Field Study, Swedish University of Agricultural Sciences, Working paper 307, Uppsala.
- Cavric B. and Mosha A.C. 2000, State and Perspectives of UA in Botswana, International Symposium UA and Horticulture, The linkage with Urban Planning, Domäne Dahlem Berlin, 7-9 July.
- Dithebe B.T. 1998, The Impact of the Growth and Expansion of Gaborone on the Surrounding Freehold Farms. Unpublished thesis, University of Botswana.
- Gibb Sir Alexander. 1993, Gaborone Effluent Reuse Study, Vol. 1-111 Feasibility Study for the Long-Term Reuse of Effluent.
- GoB. 1997, Gaborone City Development (Draft Final Report), Department of Town and Regional Planning (DTRP), Ministry of Lands, Housing and Environment (MLHE) of the Republic of Botswana, Gaborone.
- GoB. 1998, Glen Valley Detailed Layout, Department of Town and Regional Planning (DTRP), Ministry of Lands, Housing and Environment (MLHE) of the Republic of Botswana, Gaborone.
- Hesselberg J. 1993, Food Security in Botswana. In *Norsk georg.tidsskr.* vol.47, 183-195. Oslo.

Jarlöv L. 2000, UA as a Concept in Urban Planning in South Africa: Example from Port Elizabeth, International Symposium UA and Horticulture, The linkage with Urban Planning, Domäne Dahlem Berlin, 7-9 July.

- Mbiba B. 1995, Urban Agriculture in Zibambwe, Ashgate Publishing Ltd. Averbury, UK.

Mosha A. 1996, Poverty Reduction Initiatives in Gaborone City, Botswana. A Report prepared for the UNCHS, Nairobi, Kenya.

- Mosha A.C. & Cavric. B. 1999, The Practice of UA in Gaborone, Department of Environmental Science, University of Botswana Research project.
- Mougeout L. 2000, UA: Concept and Definition, *UA Magazine*, Volume 1, No. 1.
- Mougeout, L. 1993, Overview- Urban Food Self-Reliance: Significance and Prospects. In *IDRC Reports*, 21, 3: 2-5.
- Pile J. 1999, Farming in the city: Greenhouse Project, The Greehouse Peopleís Environmental Centre, Johannesburg, RSA.
- Rogerson C.M. 1994, Women Urban Farmers in South Africa's Economic Heartland, University of the Witwatersrand.

Figure 1). The requirement from the Ministry of Agriculture is to reduce the buffer zone from the Notwane River and its tributaries, in order to utilise the most fertile soils along the riverbanks. As the site is a floodplain, the investors were warned of the dangers of possible loss of investments and properties. Those areas unsuitable for horticultural purposes (e.g. with soil types susceptible to salinisation) have been planned for other agricultural activities, such as the rearing of small stock, poultry, etc. As a result, 63 plots have been designed on good soil for horticultural purposes and 27 plots for other agricultural uses. No permanent residences are allowed in the project area apart from farm sheds and small quarters to house farm workers.

FUTURE OPPORTUNITIES

Opportunities for the future integration of agriculture into urban planning in Gaborone and the whole of Botswana are still under review. As this article has only scratched the surface of this subject, there are many more questions which need research before the municipal and planning authorities, planning agencies and institutions can capture the full potential of this integration (Mosha & Cavric 1999, Mougeout 2000, Jarlöv 2000). The areas that need attention are listed in the box.

CONCLUSION

Unlike many countries in the subregion, the presence of UA in Gaborone and Botswana at large is still rather low and is not integrated into urban development planning. Due to the fact that more than 40 % of the cityís residents live below the poverty line, UA is rather a spontaneous activity. As in other cities in Africa, as the economy gets worse, incomes are eroded and hence people look for alternative ways to supplement their income just to be able to survive (Mosha 1996, 1999). For quite a number of people, urban agriculture activities help to enhance food security and present an element of self-reliance (Hesselberg 1993, Pile 1999).

In the meantime, planning authorities and agencies are cautiously starting to open their doors and to accept this activity as part of the urban reality. The first steps are now being taken to formalise these activities through the preparation of physical plans. In the current Gaborone City Development Plan (1997), analyses of land-use patterns point out the general changes that can be expected in the next twenty years. Meanwhile, the detailed zoning of certain locations such as the Glen Valley Area indicate that UA can be controlled through proper planning.

A long period of adjustment of interests of various institutions and individuals still lies ahead. Unfortunately, some individuals have neither the time nor the means to wait for the formalising of physical and economic relations as their livelihood depends on the production of vegetables or minor stock breeding. As a result, planning regulations are contravened, particularly by people building all over their plots, in conflict with those who want to cultivate the available land. In view of this, the paper suggests that a minimum set of activities are essential for establishing a balance between the interests of the government, various NGOs and individuals within the framework of the existing urban planning machinery.

CHALLENGES AND PROSPECTS OF URBAN AND PERI-URBAN AGRICULTURE IN BOTSWANA

National Veterinary Laboratory, Sebele, Gaborone,Botswana, May 28-29, 2001

Various stakeholders including central government, local government, parastatal organisations, NGOs, researchers and international organisations like FAO, attended the meeting organised under the RUAF Programme by MDP and MOP. The workshop brought together key stakeholders, facilitated interaction among participants and provided impetus for future collaboration. It was a signal to all stakeholders that UPA is an important, relevant issue in Botswana and action needs to be taken. The government has pledged to come up with a policy on UPA and will strive to mainstream it in the next national plan due in 2003. Contact: MOSHAAC@mopipi.ub.bw

AREAS NEEDING MORE ATTENTION

- ❖ The laws and regulations relating to the planning and use of agricultural land in cities must be brought into concurrence (e.g. Town and Country Planning Act, State and Tribal Land Act, Land Control Act, Agriculture Resources Conservation Act).
- ❖ Government inter-departmental committees and agencies need to be established.
- ❖ Support needs to be provided to all NGOs, associations and individuals involved in UA.
- ❖ UA should be introduced as an aspect of the National Settlement Policy.
- ❖ UA needs to be included in the revised version of the Physical Planning Handbook and the New Physical Planning Manual and Agricultural Manual.
- ❖ A Land-Use and Land-Cover Classification system needs to be developed, and the existing planning DTRP Land Use Code in the section referring to agricultural zoning, improved.
- ❖ A Land-Use Information System to monitor the changes in the use of agricultural land in Botswana urban settlements must be developed.
- ❖ Regular soil-engineering and soil suitability mapping need to occur.
- ❖ Aspects of UA should be integrated into the Terms of References for the preparation of all future settlement development and master plans.
- ❖ An instrument of Agricultural Planning Permits must be introduced, bearing in mind the fragility of the environment in Botswana.
- ❖ UA and Planning should be introduced as a subject in the School of Planning at the University of Botswana, as well as opportunities for continued research in this field.
- ❖ Public information, participation and awareness must continue.

Urban Agriculture **Support Programme**

for Madhyapur Thimi Municipality, Nepal

Traditionally, municipalities in Nepal are defined on the basis of (the accumulation of) non-farm activities with agriculture considered a rural activity. This is one constraint confronted by efforts to promote urban agriculture in Madhyapur Thimi municipality located in the centre of Kathmandu Valley. How this problem was overcome together with issues of land development strategy is narrated below.

Land for urban agriculture is now a significant component of the recently completed 'Development Plans and Building Regulations 2001' of the municipality. The Zoning Plan sets aside just about half of the 11.47 square km area as 'Reserve Zones'. After a two-year planning process, the board of the municipality was convinced of the advantages of an agriculture-based Reserve Zone and accepted the plan, though with great hesitation.

Transporting vegetables to the market

Kai Weise

DEVELOPMENT GUIDELINES AND BUILDING REGULATIONS 2001

The Madhyapur Thimi municipality, with an area of 11.47 km^2 was established in 1997 by consolidating five existing VDCs (Village Development Committees). In recent years, the municipality's population has increased steadily to nearly 40,000, and the adjoining larger municipalities of Kathmandu, Lalitpur and Bhaktapur have exerted mounting pressure as they have also grown at tremendous rates. As a result, a lot of new construction has taken place in Madhyapur Thimi, in a manner inconsistent with traditional settlement structure, and urban sprawl has encroached upon what is actually still primarily agricultural land.

implementation of regulations often appears to be **difficult**

A principal tenet of the Madhyapur Thimi municipality's "Development Guidelines & Building Regulations 2001" is the creation of an Agricultural Reserve Zone. Most non-urban, fertile agricultural land has been placed in this reserve, while existing urban areas will be designated as Development Zones. The regulations mandate the municipality to prevent the development of any kind of urban infrastructure or utilities within the reserve zones. Only the construction of temporary structures will be condoned. The intent behind this regulation is to curb the loss of prime farmland to unplanned urban development.

The implementation of these kinds of regulations often appears to be difficult, especially since in Nepal the courts give greater weight to individual property owners' rights than to the enforcement of municipal regulations. Unfortunately, landowners often interpret this as permission to develop their land in whatever manner they desire, despite the potential degenerative effects this has on the community as a whole. Although a growing percentage of the younger generation has abandoned agriculture, currently 70% of the population still farms. The success of the Reserve Zone policy depends heavily upon the support of the farming community. In recognition of this, the overall municipal planning concept takes the needs of the farmers into serious consideration. The municipality will initiate several support programmes, to increase the profitability of agriculture and to take advantage of presently under-utilised local resources such as nutrient-rich organic waste. These programmes will further focus on integrating agriculture into the overall urban development master plan. Rather than allowing the typical urban/rural dichotomy to create rifts within the community, cooperation and mutual support will be promoted .

THE NEWAR FARMERS

Agriculture has been the primary occupation of the Newars for hundreds of years, deeply influencing both their society and spirituality. Traditionally, Newar communities have lived in compact settlements on elevated ground, surrounded by their agricultural land. The Newars developed an intricate system of land classification, based on soil quality, extent of irrigation, crop type and ownership.

In recent years, farming families have found it increasingly difficult to sustain their previous standard of living through agriculture alone, thus many farmers have taken on secondary occupations, resulting in the slow deterioration of agricultural knowledge and practice in the Kathmandu Valley. Decreasing access to irrigation water has further compromised the economic viability of farming. Whereas 20 to 30 years ago rivers maintained at least a minimal flow year round, now due primarily to an array of detrimental human impacts on the environment of the Kathmandu Valley, rivers are practically dry during the winter season. These are just a few of the many factors which have contributed to an overall decline of agriculture in the Kathmandu Valley.

ZONING

The basis for the new Madhyapur Thimi municipality zoning plan was conceived in a workshop arranged by PAHAR Nepal in

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Potential strategies for integration as identified in the Programme:

- ❖ Create general community support for agriculture.
- ❖ Co-ordinate administrative and management efforts.
- ❖ Facilitate agronomic production.
- ❖ Develop marketing strategies for specialised goods.
- ❖ Promote localised processing and production of agricultural by-products.

June 1999 with financial support from the Swiss Agency for Development and Cooperation and with the participation of the Swiss Federal Institute of Technology.

The members of the workshop sought to determine the factors behind the current explosive expansion trends of the Kathmandu Valley. Traditionally, Newars have constructed their settlements on elevated ground, leaving the fertile lowlands and floodplains almost exclusively for agriculture. However, this pattern has been remarkably altered over the past 30 years. Building has continued as before on elevated areas, but in addition, new construction has also sprung up and burgeoned along roads in the previously undeveloped lowland areas. This indicates that roads act as the primary catalysts for new construction. In acknowledgement of this observation and in an effort to realistically assess potential reserve land, the workshop participants identified the lowland areas with minimal road access as target areas for agricultural zoning.

A group of municipality officials followed up on the workshop over the course of the next few months. The municipality's planning advisor prepared the "Development Guidelines & Building Regulations 2001" in close cooperation with several ward chairmen, the legal advisor and other technical staff. The Reserve Zone was initially conceived of as a conservation area, in which no urban expansion in the future would be possible. Elected municipality officials felt that this was unrealistic for economic and political reasons. Eventually a compromise was reached. The term "Reserve Zone" was adopted, and the municipality was given the authority to incrementally identify and plan out expansion areas within the Reserve Zone and release them for development in the future. As the preservation of agricultural land is one of the driving forces behind the entire concept, a legal mechanism must be set in place to ensure that decision-making remains transparent and responsible. Such a release of protected land would be contingent upon a genuine, documented need and subject to extensive community discussion. On the other hand, this system would also be attuned to economic concerns. Should the disparity between the economic potential of the land in the Development Zones (the existing urban areas) and that in the Reserve Zones grow too large, sufficient political will could set an incremental release of Reserve Zone land into motion. The main attributes of the Reserve Zone remain unchanged. The area may only be developed for agricultural use, with non-permanent, single storey structures. In order to dissuade development, the municipality will not construct roads or provide utilities such as electricity, drinking water, sewage and telephone connections.

THE RESPONSE

The strongest opposition to the Reserve Zone came from those landowners, mostly middle-class government employees, who had moved to the Kathmandu Valley and had intended to build their residences on small plots of land. The municipality is now in the process of allowing the release of one such area for a housing project.

Both the municipal authorities and the farmers are supportive of the concept for urban agriculture. Preliminary studies show that the promotion of localised processing and production of agricultural by-products and developing marketing strategies will be the most essential components of an "Urban Agriculture Support Programme". The advantages for further municipal development of the agriculture-based Reserve Zone are:

- ❖ better allocation of limited financial resources;
- ❖ focus on "new" growth within the existing urban areas, which will promote denser urbanisation and efficient use of space in the Development Zones;
- ❖ proper sewage disposal and management of biodegradable solid waste through compost and manure production methods, enhancing agricultural development. This will turn a potential urban problem into a valuable agricultural resource and promote a community-strengthening interdependency between the agricultural and urban populations; and
- ❖ ensuring that any release of Reserve Zone land be planned and controlled.

Opposition came from **landowners**, who had intended to build their **residences**

Kai Weise

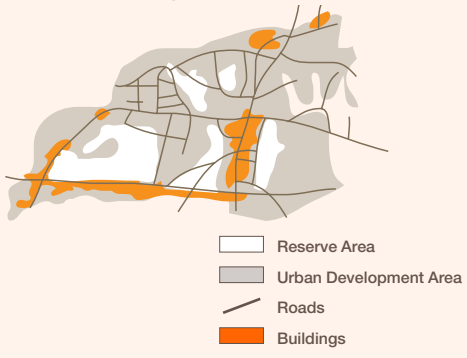
Drying wheat on city square

Madhyapur Thimi has become an example for urban planning in the Kathmandu Valley. Urban planners and government officials of other municipalities and the central government have shown great interest in the experimentation of integrating agriculture into the zoning plan of a municipality.

PROMOTING A SUSTAINABLE MODEL OF DEVELOPMENT

The preservation of agricultural land is vital for the sustainability of urban development in the Kathmandu Valley. The Madhyapur Thimi master plan will serve as a positive example of how urban agriculture can be integrated into the development scheme of a municipality. The reservation of open spaces within urban development areas, combined with the active promotion of agriculture as an economically viable source of income for the farming community and the urban population as a whole, will assist in controlling urban growth. Such a policy will result in higher land values and assure well-rounded family nutrition. Ultimately, the long-term prosperity and liveability of the Madhyapur Thimi municipality will be ensured for many generations to come.

Location of Agricultural reserve Areas



Urban **Farming** and **Land-Use Planning** in the Dominican Republic

The municipality of Santiago de los Caballeros, in the Dominican Republic, aims to promote a more coherent and effective inclusion of urban agriculture citywide through municipal management and planning policies, mechanisms and instruments, with the objective to support local environmental management, and strategies for poverty reduction.

Jacquelyne Acevedo

The mayor of Santiago de los Caballeros, Dr Hector Grullón Moronta, alongside urban agriculture technicians and workers, carries out the first harvest of the horticultural garden developed on the grounds of the Municipal Palace.

In 1991, during a participatory analysis and planning exercise with urban actors (municipal staff, civic organisations and neighbourhood groups), the municipality of Santiago de los Caballeros identified the following principal problems, which are similar to those of many other municipalities in Latin America:

- a significant percentage of urban population live in conditions of poverty and food insecurity (57%);
- a large volume of solid organic waste negatively affects the urban environment, and a lack of resources to collect and dispose of them adequately;
- a large amount of urban and peri-urban plots (both of municipal and private property);
- lack of environmental awareness;
- lack of inter-institutional cooperation and integration to solve the above-mentioned problems; and
- a weak application of existing laws and regulations, and the lack of a land-use plan and operational regulation for poverty alleviation and environmental management.

The **challenge** now lies in the **institutionalisation**

One of the strategies to counteract these problems was the development of a (municipal) urban agriculture programme, which was set up in that same year. This programme would focus on more efficient use of local resources (like organic wastes) based on the existing agricultural culture, and an adequate institutional setting was developed.

The municipality has a specific role to play in this programme: "The municipality will develop urban agriculture as the coordinator, planner and facilitator of actions. It will also implement direct projects in its different zones, with support of the various departments (Public Works, Urban planning, Community Affairs, Cooperation and Development, Environmental Management, Public Relations and Legal Advice), neighbourhoods, the community and in cooperation with other entities (universities, private enterprises, NGOs). It will also guarantee the legal framework that is required for UA development." (Municipal presentation in Havana, Cuba, May 2001).

ACTUAL LAND USE

The city of Santiago de los Caballeros, with its 500,000 inhabitants, is the second city in the Dominican Republic. Land use is rapidly changing from agriculture towards urban construction.

To visualise the extent and type of urban agriculture activities in Santiago, the city was divided into: the *inner city urban* area (34.6 km^2), the *peri-urban* area (29.5 km^2) and the *suburban* area (130 km^2). In the *urban area*, 33% of the vacant or partially constructed areas contain UA activities[1] and another 22% of this land has been classified as suitable for agricultural land use. The total agricultural land-use area counts up to 315 hectares or 9 % of the total inner urban area, including patios, backyard gardens, river- and roadsides and other open spaces.

Due to pressure on the land for housing and the high population

Jacquelyne Acevedo Abinader, *General Coordinator, Municipal Urban agriculture Programme, Santiago de los Caballeros*

density, the presence of agriculture in the poorer neighbourhoods is generally lower than in middle or high-class neighbourhoods. The presence of agricultural land use is relatively high in industrial and institutional areas (especially by schools), and in middle-class neighbourhoods that are generally expanding and include open spaces that are temporarily used for agriculture.

The further away from the functional centre of the city, the higher the presence of urban agriculture. Agriculture is shifting from the centre to other areas, and is characterised by a cycle of location-substitution-relocation. Only in patios and along roads and riversides is agricultural land use of a more permanent character. The main presence of agriculture is on vacant plots and is of a temporary nature.

Most of the *peri-urban* area is subject to a process of urbanisation. Agricultural land use occupies 29 % of the area (ca. 840 hectares) of which 10 % is dedicated to crop cultivation and differs from the inner urban area in that an important part is dedicated to pasture, cattle and pig raising (14 %) and tobacco growing (4 %).

Agriculture thus occupies about 16 % of the total urban (inner and peri-urban) area of Santiago and is the third most important soil use after residential and vacant land use. In this perspective, Santiago is a real agricultural city or modern "agropolis", in which agriculture lives in "conflictual co-existence" with urban construction. Agricultural land use is " on the move" (relocates), but does not disappear with urban growth (del Rosario et al. 1999).

The municipality recognises that agriculture has an important and permanent urban function - food production and income generation - and is embarking on a more systematic inclusion of urban agriculture into urban and land use planning. This function directly responds to the fundamental problem of urban food security.

LAND USE PLANNING: A PROCESS

With the support of a Cuban expert in September 2000, the municipality started to update the classification and identification of non- or partially constructed plots or areas within the urban area, with use of maps, aerial photographs and satellite images. Areas are classified according to their location, land tenure (municipal, institutional or private), characteristics (agronomic, physical and environmental) and potential agricultural land use (agriculture, animal husbandry; temporary versus permanent; monoculture versus mixed land use).

On the basis of this classification, and starting at the end of 2000, agricultural use of land is being stimulated through the dissemination of the objectives of the Municipal Urban Agriculture Programme, by radio, television, journal articles, and through a number of workshops, seminars and meetings. Various demonstration projects (demonstrative gardens, waste recycling and composting, seed and plant nurseries) are also being implemented with the support of different actors.

THE CHALLENGE

The challenge for the municipality now lies in the "institutionalisation" of agricultural land use by either including permanent agricultural land use into zoning plans (see the Box on Havana) and/or stimulating multifunctional and temporary productive use of non-built-up and vacant lands by means of financial or legal incentives (for example tax exemption). This implementation is high on the agenda in 2001. The creation of a municipal department for food security, under which urban agriculture is one component and field of work, also supports a more permanent programme, whose survival does not depend on the interest of only one favourable political administration.

REFERENCES

- Del Rosario Pedro Juan et al. 1999. *Manejo de residuos sólidos y agricultura urbana en la ciudad de Santiago de los Caballeros.* Presented at Centro Internacional de Investigaciones para el desarrollo (CIID), Santiago de los Caballeros, October.

Agricultural Zoning in Havana, Cuba

One way to include urban agriculture into land-use planning is to include it in zoning policies. For the first time, in the "General urban and land-use plan for the city of Havana" (December 2000), urban agriculture is explicitly mentioned and zoned as an "agricultural corridor" around the urbanised area of Havana:

- Goal
  - Create the urban and land-use conditions that contribute to reach the goals set for agricultural production and commercialisation.
- Objectives
  - Develop 101 hectares of agricultural land responding to the demand of international tourism.
  - Optimise use of land for animal production in the corridor around the city.
- Actions
  - Elaborate a partial land-use plan for the southern part of the city where agricultural soils are located.
  - Localise 63 hectares for intensive crop cultivation that will be added to the 38 hectares already in use.
  - Define the perspective of the agro-industrial complex in the city, related to the type of production and the use of industrial installations.
  - Identify the area where the buffalo will be introduced without affecting the aesthetic and environmental values of the south-eastern part of the province.
  - Solve the water supply to animal production systems through alternative solutions that avoid using groundwater of the city.

Source: General urban and land-use plan for the city of Havana
Council for provincial administration, Department of Physical Planning, City of Havana, December 2000

NOTE

(1) Ornamental gardens and non-soil-bound production (hydroponics) were excluded from the survey.

The El Panecillo Pilot Project in Quito, Ecuador

The Municipality of Quito is challenged by demands to eradicate urban poverty, to improve the urban environment and to promote a participatory style of governance. Urban agriculture is a potential source of food, income and employment, and is part of a multifunctional use of land, and therefore has an important and strategic role to play in this development.

By way of a participatory city consultation on urban agriculture, the municipality embarked upon a process of institutionalising urban agriculture. This consultation was followed by the formulation of an action plan, later implemented into a specific action programme which presently forms a pilot project. It is envisaged that this will be implemented throughout the entire Metropolitan District of Quito.

Two systems of urban agriculture (UA) are found in Quito: *intra-urban* agriculture and *peri-urban* agriculture. Intra-urban agriculture is basically a (part-time) family activity, almost entirely aimed at the production of vegetables. The farming technologies are adapted to the distinctive urban conditions (irrigation with drinking water, hydroponics, and intensive production techniques). In the peri-urban system, the entire household is involved in production, with a trend towards exchanging produce, sometimes for cash.

M. Dubbeling

Maize on steep slopes in Quito

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It became apparent during the city consultation that there are no specific regulations concerning urban agriculture in the legal framework of the municipality, in spite of there being laws and regulations concerning issues influencing UA, like land use and water availability. The general action plan includes the following recommendations:

- Urban agriculture is an urban activity and should be recognised, incorporated and regulated under specific municipal policies.
- Credit and incentive programmes for urban agriculture should be developed.
- Technical support systems and programmes for the production, processing and marketing of produce should be developed.
- An urban environmental management system needs to be established.

The decision was made to start implementing the action plan through a pilot programme in the neighbourhood of El Panecillo. El Panecillo is located in the historical centre of Quito, and was selected due to its specific characteristics. It has a large area of protected land unsuitable for construction and already includes a family garden project. This project was initiated in 1994 under a rehabilitation plan with aims to stimulate use of municipal land for UA, avoid illegal occupation of land and improve livelihood conditions for the people.

The community of El Panecillo selected four concrete areas for intervention:

- setting up of composting and vermiculture plants (providing direct employment to 15 youths);
- installation of a community nursery for native ornamental and food production species;
- supporting the existing family gardens for production of vegetables, medicinal plants and small fruits (involving 30 families, and mainly women); and
- construction of two agro-industries for vegetables and medicinal plants (providing direct employment to 23 families).

Through these initiatives, access to capital and knowledge is provided, but central to success and sustainability is the provision of secured access to land. Actors involved in the pilot programme formulated the following land-use regulations:

- use of symbolic rents for municipal lands used for agriculture;
- preferential property taxes for private land areas under agriculture (10% discount); and
- long-term (5-10 years) user-right agreements for municipal lands used for agricultural activities coordinated by producer associations and the agro-industries.

A series of reports have been published with additional information and criteria for the proposed land-use regulations. For instance, the implementation of symbolic rents and preferential property taxes should be principally aimed at the urban poor (presently representing 50 % in El Panecillo). The agricultural production should also be oriented towards organic farming and should incorporate erosion-control techniques to avoid landslides (a general phenomenon in Quito).

To date (May 2001), the programme has facilitated the official recognition of urban agriculture and its integration into the new general Land Use Plan for Quito (2000-2010). The proposals relating to the (regulation of) secure access to lands, transformation and commercialisation are at this point at the Municipal Council and will be legalised shortly. The municipality is also working on the institutionalisation of a municipal urban agriculture programme, that will be hosted under the Department for Social and Economic Development, and will receive a percentage of the municipal budget.

The pilot project started in September 2000. It is financially and technically supported by IPES, the Urban Management Programme for Latin America and the Caribbean (UMP-LAC/UNCH-HABITAT/UNDP) and the International Development Research Centre (IDRC), and is implemented by different governmental and non-governmental actors.

Jacques Schievink

Farming in the Upper Bieslandse Polder

While urban agriculture is considered appropriate for cities in developing countries, the potential for local food production in and around cities in industrialised countries is rarely highlighted. Policy to support its development is even rarer. Post-war European agricultural policy has concentrated on the production of large quantities of cheap food to avoid hunger and to ensure social stability. Economic arguments dictated that such a policy could be best realised through agriculture practised by as few people as necessary on as large a scale as possible in order to reduce costs per unit and maximise output. These policies have led to monocultures in agriculture and ecology in order to maximise scale and efficiency, with land-use planning subsequently separating functions.

Multifunctional Land Use

An Opportunity for Promoting Urban Agriculture in Europe

Food production in and around the city did not fit into this mould. Policy-makers considered it small-scale, and therefore inefficient, not economically beneficial and thus undesirable for society. Social and environmental benefits were ignored.

In Europe, the time now appears ripe for change. At European Union and national state levels, the negative consequences of post-war agricultural policies have been acknowledged, and the prohibitive costs of maintaining such policies in an enlarged European Union are recognised. Many farmers are faced with obligatory diversification of their farms to survive and are seeking a means of combining agriculture with other means of income. At the same time, cities compete with each other to attract investment, and local politicians seek to create high quality, healthy and attractive living environments for their own citizens. There is a growing need to meet a large number of societal needs on scarce urban land.

MULTIFUNCTIONAL LAND USE AS A SOLUTION

Many possible win-win situations exist to meet these challenges as urban planners seek to create attractive land-use combinations and satisfy the many demands placed on scarce land in and around cities. Many of these combinations can be based on urban agriculture, for example:

- agriculture combined with childcare and educational facilities;
- reed production combined with recreation and wastewater treatment;
- aquaculture combined with water storage and recreation;
- production of added-value agricultural products such as cheese, jams and cosmetics, combined with recreation and tourism; or
- urban forestry, which offers health and microclimate benefits, combined with energy crops and recreation.

A good example of combining land use functions in a heavily populated area is the case of the Upper Bieslandse polder in the city of Delft, the Netherlands.

PLANNING IN DELFT

Delft is a city of around 95,000 people in the densely populated province of South Holland. The region is home to approximately 3.4 million inhabitants and population density is 1,179 inhabitants per square kilometre (CBS 2000). As a result, every square metre of land has its designation under the country's planning system that operates at three levels: national, regional and local, which all have roles to play in spatial planning.

In theory, the lower level government should operate within the framework of the objectives set out in the policy of the higher levels. In turn, the policy of the higher levels of government should provide general guidelines within which plans proposed at lower levels can be realised. Of course it is not always possible to accommodate the wishes of all. The plan for mixed use of the Upper Bieslandse polder provides an interesting example of integration of land-use functions and policy objectives.

The plan combined the following land use functions:

- (organic) dairy agriculture;
- recreation;
- nature (re)development;
- (limited) natural water treatment; and
- an important awareness-raising and educational function.

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THE UPPER BIESLANDSE POLDER

The Upper Bieslandse polder lies on the eastern urban fringe of Delft (see Figure 1) and comprises a total of some 35 hectares. Before the realisation of the plan described here, six tenant farmers operated in the area on one-year leases from the municipality of Delft. Longer leases were not granted because the municipality wanted to be able to have access to the land on short notice in case it should decide to develop the area[1]. For the farmers this gave rise to uncertainty and, with six farmers on 35 hectares, use of the land was inefficient in agricultural terms, even though each farmer also worked land elsewhere in the area.

THE PLAN

In 1996 Jan Duijndam, one of the six farmers, who had for some time been considering converting his business into an organic farm, decided to act. Together with a planner from the Delft Initiatives for Nature group (IND), Jacques Schievink, discussions were initiated with the other farmers in the area. Schievink stood at the base of the plan in 1995, when he suggested ecological development and management of the ditches that regulate water levels for farmland in the polder (and got the Delft municipality's environmental prize). Agreement on a plan was eventually reached between the six farmers, including Duijndam's take-over of their tenancy rights.

The Upper Bieslandse polder plan was finalised in March 1997 and, importantly, was adopted in the manifestos of a number of local political parties for the municipal elections of May 1998. Election of a new 'green' administration meant that the plan could go ahead. Work on the ground to implement the plan began in the winter of 1999-2000. Total costs of implementation, excluding maintenance, were around 250,000 Dutch guilders (US$ 100,000).

THE ECONOMICS

Duijndam now has a twelve-year lease of the land from the municipality. He added 30 of the 35 hectares of the Upper Bieslandse polder to the 50 hectares he already farmed organically in the area, to improve economic viability. As for many organic products in Europe, organic milk commands a (slight) premium price in the Netherlands.

The remaining five hectares Duijndam devoted to nature development, setting land aside for traditional Dutch polder landscape features with an ecological function: a water meadow with fluctuating groundwater level, reed bed and marshy woodland. Each gives a habitat to wildlife that is under more and more pressure from rising urbanisation. The nature areas are laid out along the edges of the site to make them visible for visitors making use of the footpaths, cycling and bridle paths constructed as part of the plan. This also means that farming can be carried out more or less unrestricted in the centre of the area (see photo).

Whilst this land does not bring agricultural income, it does generate subsidies from the provincial government for land management that benefits nature development and recreation. In addition, Duijndam receives subsidies from the local water board ('waterschap') for his contribution to their integrated water management strategy. In effect, the farmer carries out the work of the others and gets paid by them for that work. Such subsidies deliver approximately 10% of the farmer's income.

Similar initiatives exist elsewhere in the Netherlands where local authorities have an obligation to provide a certain amount of water storage for water-management reasons. By paying farmers to devote a part of their land to water storage, the municipality 'buys off' its obligation relatively cheaply and, in effect, the farmer gets paid for cultivating water.

REFERENCES

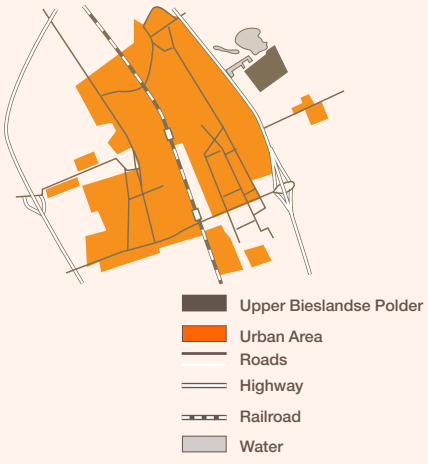
- Centraal Bureau voor de Statistiek (Central Statistics Office). 1999. Jaarboek 2000. Utrecht: CBS. (in Dutch)
- Duijndam J.2001. Personal interview.
- European Commission. 1996. European Sustainable Cities Report. Luxembourg: Office for Official Publications of the European Communities.
- Pederson RM and Robertson A. 2001. Food policies are Essential for Healthy Cities. Urban Agriculture magazine 1 (3) (March): 9-11.
- Schievink J. 2001. Personal interview.

CONCLUSIONS

The case of the Upper Bieslandse polder shows that urban agriculture can offer cities in industrialised countries more than "only" food production. Through a combination of land uses and integration of policies between different organisations at different levels, Delft has obtained a viable organic farm, an attractive recreation area and has restored the opportunities for wildlife in the urban fringe. Combining land use functions can deliver extra income for farmers from unexpected sources. This in turn provides a valuable resource for environmental education in a densely populated urban region. Essential benefits in environmental, health, education, recreation and nature terms are provided to the city and its residents. Combining land use functions can also deliver extra income for farmers from unexpected sources.

Since food production is not an argument for local politicians and planners to allocate scarce urban land to agriculture, these additional benefits of urban agriculture, as 'host' of other land use functions must be made clear. In this sense, interpretation of the term urban agricul-

The Upper Bieslandse Polder



In Europe, almost 80% of the population now lives in urban areas (European Commission 1996). Cities have become largely disconnected from their surrounding countryside. Post World War II agricultural policy in Europe has turned agriculture into a 'food generator' with which city dwellers have little affinity. The one-dimensional role of agriculture is now being challenged by a number of factors: the enormous cost of the European Common Agricultural Policy (CAP), concern amongst consumers about food quality, worries about and the effects of pesticides and other chemicals used in food production on health and the wider environment, genetically modified crops and animal welfare issues (Pederson and Robertson 2001).

There are limits to the powers of planners. For years now, two nesting site poles have stood in the open space, now farmed by Jan Duijndam in the Upper Bieslandse polder. The aim was to attract storks back to the area, a rare bird in The Netherlands nowadays. Finally, this year the stork has returned to nest in Delft, not on one of the poles, but on a high-rise apartment building on the edge of the city 500 metres away!

ture should be broadened to include cultivation of useful products and performance of valuable tasks for society.

The Dutch planning system offers little long-term security (twelve years is not a long lease), but perhaps this is inherent in a situation where so many competing land-use demands exist. Inclusion in local land-use plans would provide urban agriculture with a firmer legal basis.

Urban planners must translate politicians' (still too often) one-dimensional policies into three-dimensional spatial realities on the ground. Realisation of multifunctional land use demands integration of planning between different levels of government. In the highly institutionalised planning systems common to most industrialised countries where national, regional and local plans are drawn up, such an approach even if sometimes difficult, should be possible. This integration should be accompanied by the application of innovative economic instruments, which favour multifunctional land use, such as subsidies or tax breaks where possible. Farmers should be made aware of the possibilities of such support.

Integration of policy *between* different types of organisation is also vital. In the Netherlands, for example, independent water boards have a key role to play in water management. Any decision to combine a productive function of urban agriculture or aquaculture with water storage, recreation or a natural park would require agreement between, amongst others, the water board, the province and the municipality.

The success of the Upper Bieslandse polder can be at least partly attributed to the fact that representatives of three different groups of society – farmer, environmentalist and municipality – realised the benefits of combining multiple land use in the area.

NOTE

(1) For some years rumours had circulated of plans for construction of a high value housing development on the site, even though the regional plan did not permit this.

Spanish edition

The *UA Magazine* has been published in Spanish: *La Revista Agricultura Urbana*, No. 1. Soon No. 2 on livestock and No. 3 on health will also be released in Spanish.
From now on the *UA Magazine* will be released in English, Spanish, and French. Furthermore a more regional focus will be developed, with a focus on Latin America in the Spanish edition and a focus on West and Central Africa in the French edition.

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Planning for Urban Agriculture in Suburban Development in Canada

An examination of suburban development plans and official plan documents revealed that planning for urban agriculture in suburban development planning is non-existent in North American cities. While proponents of urban agriculture seek land for food production on remnants and left-over spaces in the core, built up areas of cities, they ignore the potential to include spaces for urban food production in the settlements of the future, from the outset.

Vincenzo Pietropaolo

Sara Kerr, co-founder, Garden of Friends

The Greater Toronto Area (GTA), is the fastest growing city in Canada, adding 100,000 new people a year. Between 1976 and 1996, the GTA lost 62,000 hectares of farmland to development, with another 40,000 hectares designated for development. It is projected that by the year 2026, 40 % of all agricultural land in the GTA will have been lost to development (Toronto Food Policy Council 2000).

TORONTO'S ETHNICALLY DIVERSE SUBURBS

Toronto is often described as one of the most ethnically diverse cities in North America. In 1996, 48 percent of the population of the city of Toronto were immigrants, and one in five residents arrived in Canada after 1991. Growing numbers of these recent immigrants have settled directly in suburban municipalities outside the core areas of the city. They seem to concentrate in particular suburban areas. For instance in Vaughan (north of Toronto) 42 percent of all immigrants are from Italy, while in Markham, one third of the residents claim Chinese as their ethnic origin.

Next to large single family houses with wide green lawns (the stereotype of suburban North America), new suburban housing developments include a wider range of housing types, like single family houses on smaller lots, townhouses, c ondominiums, and multi-unit housing. These new types of housing provide limited or no private outdoor space for gardening and a scarcity of public open space.

This raises questions about suburban development plans taking into account both the ethnic diversity of residents and their traditions of food production against the reduction of both private and public open space. However, little thought has been given to this aspect of land use either by municipal planners or by private land developers.

It is only recently that natural features such as woods or ponds have begun to be viewed by developers as elements of the landscape to be preserved rather than bulldozed. On the outskirts of Toronto, billboards advertise future housing developments with images of nature and names of new housing developments include "forest", "wood", and "lake". These elements of the natural environment contribute to the desirability and marketability of building lots which developers sell at a premium (Marsden 2000). However, site plans for suburban housing developments in the GTA do not include space for community gardens or urban agriculture. Space for growing food is not seen as an environmental amenity that would appeal to new homebuyers, despite the fact that genetically modified foods and food security is the subject of daily media reports, and gardening is the fastest growing recreational activity amongst urban residents.

In a recent study by the author, 30 immigrant gardeners living in the GTA were asked about their gardening histories and practices[1]. While planners and housing developers continue to assume that suburban gardens are primarily ornamental or for recreational use, it was found that immigrant gardeners often put their gardens to productive use for growing ethno-specific vegetables and herbs.

In some Toronto suburbs, social housing units in high-rise apartment buildings, accommodate new immigrants who have no access to private land for growing food. In a neighbourhood near York University, two of my undergraduate students developed a community garden in the vacant lot of a local church. In the Garden of Friends, now in its third year, twenty low-income high-rise residents from diverse parts of the world grow vegetables, which include herbs from Thailand, chillies from Mexico and bitter melon from China. A few blocks away, the African Food Basket,

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an organisation, which provides Afro-Caribbean food to subscribers, is housed in what looks from the street like a typical suburban single family house. The backyard is intensively farmed by a community of gardeners who live in nearby apartment buildings. They experiment with growing foods that are Afro-Caribbean in their origins, including callaloo, okra, and yams. This intensification of low-density suburban open space, which is a recent phenomenon in Toronto, is hampered by suburban developments like smaller housing lots, more multi-units, and more limited private and public open space.

Vincenzo Pietropaolo

Chinese gardener harvesting long squash

An Italian gardener from Calabria who moved to Canada in the 1960s, lives in a single family house with a large backyard. He can grow beans, tomatoes, and other vegetables for his extended family. In contrast, a Chinese gardener (see photo) who immigrated in the 1980s lives in a townhouse with a backyard about one third the size of that of the Italian gardener. She grows Chinese herbs and long squash, which she overwinters in the basement. A recent Punjabi resident has an even smaller backyard, which only allows her to grow Indian herbs and spices in raised beds.

STEPS TO ENCOURAGE URBAN AGRICULTURE IN SUBURBAN DEVELOPMENT

As a first step, urban agriculture and community gardens need to be incorporated into suburban development plans[2] (2), addressing the preservation of prime agricultural land for future generations as community farms or small market farms and demonstration projects. Brian Donahue's recent book, *Reclaiming the Commons* (Donahue 1999), describes a community farm, in a suburb in Massachusetts, which provides training for youth as well as local produce. Some outer London authorities own farms which are run as commercial enterprises next to accommodating school visits (Garnett 2000).

Second, the popularity of condominium developments in North American cities as a form of housing tenure that includes communally owned and managed common spaces, may also provide opportunities to incorporate community farms or gardens. These could become sub-urban-based models for urban agriculture, especially if concerns about food security and access to organic produce intensify.

Third, planners could accommodate the adaptive reuse of existing and mature suburbs. Large backyards could become community gardens, providing space to grow food. Empty lots beside libraries or churches can become community gardens and public parks can provide allotments for growing food. Such changes would require a rethinking of the traditional suburban landscape with private open space that is primarily recreational or ornamental rather than productive.

Finally, incorporating urban agriculture into suburban development requires outreach by advocacy groups to suburban planners, politicians, and especially to housing developers, to educate them about the desirability and long-term feasibility of preserving productive land for growing food within suburban housing developments. Urban-based advocacy groups for urban agriculture and food security must extend their interests into undeveloped and newly developed areas on the urban periphery. This means taking a regional perspective and becoming involved in the development of regional plans, which outline long-term growth patterns and land-use planning objectives. Advocacy groups for urban agriculture must get involved in closely scrutinising development proposals for new suburban developments. Citizens, working in conjunction with municipal planners, can point out the desirability of setting aside land for community gardens as a way to meet public open space requirements and to preserve natural heritage.

(This means that planners must expand their definition of both open space and the preservation of nature: not only playing fields but gardens, and not only woodlots but agricultural land for locally grown vegetables.)

CONCLUSION

In North American cities, including Toronto, food security, urban agriculture, and community gardening advocacy groups have focused primarily on finding land for food production in the central core areas and in established neighbourhoods of the city. Almost no attention has been paid to the new settlements that are being planned on the rural-urban fringe. Yet these are settlements that will absorb population growth and increasingly are the immigrant reception areas for new immigrants.

Paying attention to the potential for urban agriculture in new suburban developments involves taking a long-term view - twenty years into the future - and learning how to use the planning system. It involves working with planners, politicians, developers and local communities to incorporate principles and objectives into official plans, making input to development plans, and creating guidelines, models, and educational tools directed at suburban populations living on the urban fringe. Suburban developments continue to be built at a rapid rate on the edges of our cities. Unless we incorporate urban agriculture and space for community gardens, these residents and their children will not have the opportunities to grow their own food or to achieve any form of food security in the future.

REFERENCES

- Donahue Brian. 2000. Reclaiming the Commons: Community Farms and Forest in a New England Town. New Haven: Yale University Press.
- Garnett Tara. 2000. Urban agriculture in London: rethinking our food economy. In: Bakker et al. (eds), Growing Cities, Growing Food (Feldafing: Deutsche Stiftung für internationale Entwicklung), pp 477-500.
- Marsden Lee. 2000. Developing Environmentally Sensitive Communities. Major Project, Master of Environmental Studies, Faculty of Environmental Studies, York University, Toronto.
- Raja Samina. 2000. Preserving Community Gardens in a Growing Community: A report on the Community Gardens Planning Process in Madison, Wisconsin. Madison Food System Project Working Paper.
- Toronto Food Policy Council. 2000. Food Secure City. Toronto: TFPC, p. 22.

NOTES

1) This research is presented as an exhibit, *Growing Cultures*, at the Royal Ontario Museum, Toronto, May 2000 to January 2002 and is co-produced with photographer Vincenzo Pietropaolo.

2) The city of Seattle approved a resolution in 1992 that community gardens be part of the comprehensive plan of the city, particularly in medium and high density areas. In Austin (Texas), Minneapolis (Minnesota) and Boston (Massacusetts), there are zoning provisions for community gardens (Raja, 2000).

For several years, the Tropical Institute has been surveying intra-urban agriculture, particularly focusing on two categories. Firstly, the home gardens, and secondly the shifting but irresistibly attractive subsistence, mixed and market-oriented gardens

Isabel Madaleno

Cultivator in Prudente

Urban Agriculture **Supportive Policies**

Lisbon (Portugal) and Presidente Prudente (Brazil) from Two Distant Cities

The *home gardens*, which are usually unsponsored, statistically non-existent, but affectionately cared for by families, especially the female members. They are small biodiverse areas surrounding houses or inner and backyards within residential complexes, in which ornamental and fruit trees are combined with vegetable crops, spices, medicinal shrubs and grasses, and sometimes livestock. The *subsistence, mixed and market-oriented gardens*, mainly occupy idle plots in towns. Very often, they are illegally tended by the un- or underemployed using annual crops, as individual efforts of job creation, food provision or simply a way to enhance contact with nature, keep busy, and maintain physical and mental stability. Both types of urban agriculture have not only a social and economic function within city's boundaries, but also remarkable ecological benefits.

Even though urban agriculture has survived, either inside the city or at the outskirts, it is very often forgotten, or worse denied by formal planning, underestimated by urban management policies, and invisible to many researchers. Nevertheless, there are some quite remarkable public programmes, intended not only to teach but also to promote food production, processing and marketing inside towns, cities and metropolitan areas throughout the world.

This is the case with two quite different cities, united only by a common language. Lisbon, the capital of Portugal, and Presidente Prudente, an urban centre in the interior of south-eastern Brazil. While the municipality of Lisbon accounts for 700,000 people, Presidente Prudente has about 170,000. Lisbon has a mild temperate Mediterranean climate, whereas Prudente has a sub-humid tropical one. Per capita income in Brazil is less than half that of Portugal. So it is not surprising that the municipal programmes to promote agriculture within their city boundaries in these two cities have no common goals.

PEDAGOGICAL GARDENS IN THE PORTUGUESE CAPITAL

In the municipality of Lisbon, intra-urban agriculture is a micro-scaled phenomenon but widely practised in inner yards where fruits like oranges (even bananas and avocados) together with subsistence horticulture can be found. In the more peripheral neighbourhoods, scarce vacant plots and small farms (quintas) are used to grow vegetables and raise small livestock (usually consumed by the households). Some of these plots are rented from the municipality for a symbolic value, since Lisbon has one of the most expensive urban soils in Europe.

The problem is that these idle spaces are becoming scarce. Farmers are compelled to sell their farms for urban development. Modern and expensive tertiary buildings are replacing aging property, and consequently, green spaces are shrinking. As Lisbon residents were also aging at an abnormal rate, the municipality began to develop subsidised apartment blocks, much cheaper and accessible to the youngsters, at the expense of the "institutionalised" peripheral agriculture and ecological zones. On the other hand, industrial zones where cleaned and beautified (as happened with the Expo 98 area, which contributed to revitalising the eastern part of the city). However, as the birth rate has been decreasing all over the

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country for years, the schools in most of the older neighbourhoods of Lisbon are starting to become empty.

Strategies for getting children back into these neighbourhoods, such as allowing parents to choose a school near work, creating alternative tasks for teachers as well as attractive activities for pupils, were devised by the municipality together with the Ministry of Education. In the 1990s, "pedagogical farming" was promoted citywide. All newly built preparatory and primary schools were planned to have their own food garden. All the old ones, providing they had some sort of adequate space, were also given the necessary equipment.

Environmental education is not only well accepted by adults, but also a way to engage them further in the business of urban agriculture. Parents contribute inputs for compost and are invited to buy organically grown produce whenever there is surplus available.

Success stories of pedagogic gardens are such that the municipality (the Green Cabinet) developed a City Farm in 1996, where ducks, rabbits, pigs and sheep are raised and can be visited. The families are invited to participate in the preparation of the farm bread, cheese, and cakes. More than 100,000 people explore Lisbon City Farm (Olivais) every year. Additionally, 2001 marked the beginning of a contest sponsored by a public bank in collaboration with the municipality, in which a prize will be extended for the best food garden from the capital city. Eleven schools have applied as have twenty-nine private growers.

These initiatives, both by the municipality and the private sector, are an initial effort to reintegrate anonymous but numerous and increasing gardeners, into urban planning and to revise the municipal regulations to facilitate multiple uses of land in Lisbon.

THE FEED PRUDENTE PROGRAMME

Presidente Prudente is located in the highly industrialised Sao Paulo State, Southeast Brazil. Under the municipal programme, "Feed Prudente", the use of non-built-up plots for vegetable growing by low-income families is stimulated. Local authorities lack the funds to maintain these public areas. As seen in 1999, it is the retired and unemployed, particularly men, who extensively produce sweet potato, cassava and several types of legumes all year round, using organic fertilisers. Extension services provide ploughing machines, water pumps, and supply free seeds for the first crop, and make efforts to prevent cattle raising inside the city (Madaleno 2000).

The initial objectives of the programme were to support community gardening, to ameliorate the quality of nutrition in average households, to provide elders with a sort of occupational therapy, and to create jobs for the needy, thus fighting hunger and unemployment at the same time.

The programme started in 1997, aiming to reach 200 families. Two years later, it had benefited officially only 50, but, as was learnt, many other beneficiaries started with the programme (using the land, technical and financial impetus given by the municipality) after which they continued on their own. In fact, city gardeners tend to only come back for help whenever they want to increase their cultivated area, which varies between 500 to 2,000 m^2. The Secretary of Agriculture further provides free legal advice over contracts with private plot owners.

The cultivator on the photo on page 38 has two plots, both situated close to his house in a peripheral neighbourhood called Garden Itapura, where he grows cassava, sweet potatoes, chicory and other horticultural crops.

Another shift from the initial plan was to give up on community work and cooperative promotion, because the urban agriculture practitioners tend to act on a family unit basis.

The plan was to have about 30,000 m^2 of public land occupied by cassava, followed by several species of beans and corn (each with 10,000 m^2), while sweet potatoes and pumpkins should cover around 5,000 m^2 each. By the end of 1999, 42 officially supported market gardens mixed these planned crops and eight plots were exclusively horticultural. Results from the programme were, apart from irrefutable food and profit provision, a raising of interest in organic agriculture and produce in poorer neighbourhoods, and a decline in the number of complaints about insect and rat proliferation within the city boundaries.

CONCLUSION

Local governmental programmes have been addressing a broad range of problems and difficulties posed by city gardening. In Western Europe, higher per capita income permits less involvement of municipalities in food provision and job creation actions as the poor are usually able to get help from national-level social programmes. Urban agriculture in Lisbon is synonymous with leisure, environmental education, healthy food production and processing, green space and genetic reserve preservation. On the other hand, the main public goals of urban agriculture programmes in Brazil are to increase income, create employment, and improve nutrition and health in the less wealthy sectors. Consequently, the integration of agriculture into urban planning is in both cases as diverse as the cities and citizens themselves.

Composting tank in Lisbon

Isabel Madaleno

REFERENCES

- EFCF. 2000. We are Part of the Earth and the Earth is a Part of Us. European Federation of City Farms.
- Madaleno IM. 2000. City Food and Health in Brazil. Presented in FAO-ETC electronic conference, August 21-September 30. www.fao.org/urbanag or www.ruaf.org
- Smit J. 1998. What Would the World be like in the 21st Century if Cities Were Nutritionally Self-Reliant? Urban Agriculture Notes. Vancouver: City Farmer. www.cityfarmer.org
- Woodsworth A. 2001. Urban Agriculture and Sustainable Cities. Urban Agriculture Notes. Vancouver: City Farmer. http://www.cityfarmer.org/alexandraUA.html

Joseph Batac

MAFESO (NGO) network meeting on urban Agriculture

Planning in a Changing Environment

The Case of Marilao in the Philippines

Marilao is a municipality with approximately 15,000 households located on the fringe of Manila in the Philippines. A few years ago, Marilao's authorities faced a typical peri-urban dilemma. With only 2,625 hectares of land area, just five kilometres from Metro Manila, Marilao's mayor could not find affordable land for a new waste disposal site. There were more than 850 business firms and housing projects that competed for the use of municipal land.

The answers to the challenge "Where do we bring our waste?" posed in 1995 by the mayor, involved complex concepts high in capital investment requirements, but no affordable nor practicable ideas. The precarious situation was emphasised during a series of community planning workshops in 1997, in search of reducing waste by getting all major stakeholders involved. With the gigantic waste problems of Metro Manila in mind, Marilao's authorities decided to go a different way.

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The problem, however, was that the anticipated involvement of the community had to be tested in a country where the style of municipal governance is predominantly administrative-oriented rather than participatory. Planning has purely been a technical matter guided by a corresponding manual. However, the preparation of the development plan as wanted, required interactive consultations with different sectors of the community. Most of the planning officers found it difficult to organise such multi-sectoral consultations. The tools and methodologies required for participatory processes had to be adopted from the NGO community. It was even more challenging to apply them in an environment, which is traditionally managed in a regulatory style. Moreover, experience has shown that a regulatory framework alone is hardly effective, even in the Philippines, which has one of the most stringent environmental laws in Southeast Asia.

Thus, a new style of local governance was required. The basis for this new style was given in 1992, when municipal local government units (MLGUs) were mandated by law to be autonomous with specific powers, functions and revenue. The mandate was anchored in certain principles, among which is the pursuit of ecological balance and participatory processes of managing development. Each of these 1,525 units in the Philippines can have their own interpretation of these two principles, given their actual conditions and management capacity to change them. Within this favourable atmosphere for nearly autonomous local governance, the municipal authority of Marilao together with NGOs, started in 1996 to brainstorm on appropriate solutions, more stakeholder participation and on investment programmes to overcome the waste crisis. It was estimated that the current landfill would be full in about 3-5 years. Another study revealed that almost 50% of the current content was biodegradable waste; 30% could be recycled and only 20% consisted of non-usable materials.

Both the leaders of the municipal local government units and of the NGOs decided to look for ways to recover the major portion of the waste. Four months later, a proposal was finalised for the municipality to establish a composting facility, while the NGO commu-

nity would address the necessary change in behaviour of the main waste generator: each and every household.

To ensure the stable supply of organic household waste, source separation was initiated at the household level in late 1997, followed by different campaigns in the next two years. The activities in these campaigns involved workshops, cross visits, seminars, training, video films (on community cable TV), the playing of jingles during collection, providing the collection crew with a uniform, heralding the message of segregation, printing of calendars and community newsletters, and periodic letters from the mayor. The costs of these activities were shared between the NGOs and the municipality.

In general, principles of marketing were employed for all activities, starting with an analysis of the clientele as to their existing knowledge, attitude and practices (KAP). The ideal profile of potential clients was formulated and its 'appeal' determined. The distribution channels as

Breaking with traditional training habbits

well as the promotional activities were then set up. NGOs drove the process of product development for community change. The process utilised participatory planning techniques that were designed by the NGO. The planning interfaces again involved both the NGO leaders and the municipal staff, and were placed within the Municipal Development Planning Council (MDPC). Each year, a work plan was agreed upon and translated into investment by the municipality. The agreement only takes effect after a series of consultations with community stakeholders and the mapping of internal strengths and weaknesses as well as of external threats and opportunities. Then, the identification of strategies, followed by a consensus on the preferred strategy, the translation of this consensus into activities, and the municipal investments as well as NGO counterpart to implement the strategy. These investments included developing models on urban agriculture and improvements on the collection system for solid waste management. From 1995 to 2000, a total of USD 10,000 was allocated for developing models on urban agriculture. The investment for the collection system reached USD 15,000.

THE NURTURE PLAN

The regular supply of biodegradable waste allowed the municipality to produce compost at a rate of approximately one ton per day using a compost fungus activator to reduce the composting time from three months to one month. The set-up of the technology needs both waste from urban households and agriculture. Initially, the compost was given to urban farmers together with seeds and tools. When the municipalities realised that the compost supply could not cope with the demand, and farmers also asked for application guidelines and related information, the NURTURE plan (*Networking for Urban Renewal Through Urban Ecology)* was established.

The NURTURE plan identified the farmers who practised solid waste segregation and have open spaces within their yards and/or in the contiguous areas. Three strategies were identified on priority crops: (i) food security, (ii) recreation and aesthetics, and (iii) livelihood. The farmers targeted for "food security" are the urban poor who cultivate high nutritive crops that supplement for micronutrient deficiency, especially among children. The target group for "recreation and aesthetics" is middle class households who grow ornamentals and plants with fragrant flowers; and the "livelihood strategy" addresses farmers with growing potted crops/flowers and produce during the off-season.

All three groups encountered the problem of access to land. The NURTURE plan addressed this by developing compact gardens with standard soil composition. At first, the plan targeted appropriate application guidelines, but it had to struggle with large inner-urban variations in soil quality, and some urban areas even had no soil at all but only concrete. Yet they faced a demand from farmers using pots and other containers to grow vegetables or flowers. To address this situation, the municipality carried out a series of practical experiments in 1999, which resulted in a standard substrate with the compost as the predominant material for pot cultures and raised beds with rain shelters.

The farmers were organised under the umbrella of the Marilao Federation of Service Organisation (MAFESO). The MAFESO is a network of 75 community-based housing associations, church/religious groups, sectoral groups like women and transport workers, and civic clubs. In each of these organisations, there are numerous members who have been actively involved in the activities of solid waste and urban agriculture. These members periodically plan and discuss the activities within a working committee under the MAFESO and the Municipal Development Planning Council (MDPC). The members were critical in technology applications and testing, land access arrangements and implementing the investment plan as approved in the MDPC.

THE MESSAGE IS SPREADING

Metro Manila launched a segregation campaign that ended in failure just a few weeks later. After a meeting with Mayor Duran of Marilao, the chairman of the Government of Metro Manila instructed his senior staff to study the Marilao model via one-day cross visits. Several more local governments went to Marilao for a cross visit to learn about the project. In addition, national government as well as

REACHING HOUSEHOLDS AND URBAN FARMERS

Initially, the adoption of the practice of waste segregation was slow but accelerated over time. The municipality offered as incentive a predictable and reliable collection of the *segregated* waste, and a reliable waste collection means a lot in Marilao. Within three weeks, the 500 households in the area adopted the practice, seeing that the waste collection really was predictable and more frequent. After three months, a next area with 400 households decided to adopt the practice. Another 2,000 households from the contiguous area followed six months later, and the municipality had to buy more collection vehicles to keep the promised collection frequency. Today, almost all the 15,000 households of Marilao benefit from the system by providing source separation.

donor agencies published articles on the project, and in April 2000, the wife of Philippine President Estrada visited Marilao to learn about urban agriculture. Officials from the largest NGO in Metro Manila working on solid waste management and recycling accompanied her.

All of these interested groups and institutions had one common question – How did the programme start? The Marilao experience showed that the way to success is a stony one, which challenges old structures and planning habits. The required shift in mindset and style of gov-

Joseph Batac

The compost 'bed'. The bed layers are alternatenaly household waste and agricultural waste

Composting has been promoted by the national government under a specific programme since 1990, but it was more wishful thinking than implementation. Marilao was probably the first municipality actively implementing this policy.

ernance to manage development with community change can only happen when there is a strong political will. This is necessary to motivate the NGO community as well as the households. Once this political will is in place, the technical aspects can be modified with a greater degree of tolerance for correction in the context of improvement. The Marilao experience also showed that Municipal Planning can serve as a focus of development, as long as the commitment of the local government is ascertained, and is characterised by a more managerial style. This commitment then easily translates into investment for community mobilisation and logistics for both short and long term.

PLANNING FOR URBAN AGRICULTURE : A REVIEW OF TOOLS AND STRATEGIES FOR URBAN PLANNERS

Quon Soonya. 1999. CFP Report Series. Report 28, International Development Research Centre (IDRC) Ottawa.

Based on published and "grey" literature and a survey of 26 urban planning professionals from 18 cities around the world, key planning-related constraints facing urban farmers were identified as well as possible responses to these constraints. Land-use issues are of particular concern to urban farmers. These issues are compounded by the urban planning policy context through, amongst others, a lack of formal recognition. Important recommendations cited in literature and from planners are changes to the land-use planning policy level, participation in new multi-disciplinary institutions responsible for all facets of urban agriculture in a community, and establishing records of urban agriculture. It was found that urban planners have opportunities to permit and support urban agriculture, given their position as regards decision-making at the various levels. Planners could use their influence for change, forge alliances and facilitate opportunities for urban farmers.

URBAN LAND TENURE AND PROPERTY RIGHTS IN DEVELOPING COUNTRIES: A REVIEW

Payne G. 1997. London: Intermediate Technology Publications (ITP). ISBN 1_85339_400_9 : GBP 12.95 (pbk).

Payne has provided an annotated and very thorough literature review on a very important aspect of urban agriculture. Indeed, urban land tenure and property rights play an even more vital role than in rural areas. Often, there are frictions between different systems, particularly in urban areas where land is scarce and expensive. Access to credit very much depends on the definition of property rights. Changes in ownership may have very drastic effects on prices of land and, therefore, its use by the urban poor. In this publication, the main tenure types are catalogued and explained: customary tenure, private tenure, public ownership, religious concepts and indigenous vs. imported concepts. The author concludes that careful analysis of the existing systems should be carried out before embarking on major reforms. This is all the more so since tenure measures as a policy tool are rather inflexible in comparison with fiscal and monetary policies. Interestingly, full tenure turns out to be not essential to increasing levels of tenure security. In Botswana and Indonesia, the establishment of a statutory system (i.e., by the state) was firmly grounded on traditional principles. At the end, we find an elaborate, annotated bibliography and a very welcome glossary of terms. There is also a typology of the main categories of land tenure.

AESTHETICS, FUNCTIONALITY AND DESIRABILITY OF THE SUSTAINABLE CITY

Culot Maurice 1997. European Foundation for the Improvement of Living and Working Conditions. Wyattville Road, Loughlinstown, Co. Dublin Ireland. ISBN 9282749231

This publication addresses the renewed focus on the desirability of the city, a phenomenon as essential as ecological perfection and economic health for a city to survive in the long run. The author looks at urban forms placing modern and functional architecture, which breaks with tradition and advocates zoning and separation of functions, against European city-building tradition, with its consistent mix of human activities. The report concludes with recommendations for representatives and officials making a plea for this renewed pluralism. This renewed interest stems from a too-long reign of functionalism that left no space for the human need for buildings that are evidence of an alternative to the destruction and loss of the European city. Briefly put: we should strive again for the 'city of desire'.

Spanish edition

The *UA Magazine* has been published in Spanish: *La Revista Agricultura Urbana*, No. 1. Soon No. 2 on livestock and No. 3 on health will also be released in Spanish. From now on the *UA Magazine* will be released in English, Spanish, and French. Furthermore a more regional focus will be developed, with a focus on Latin America in the Spanish edition and a focus on West and Central Africa in the French edition.

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FURTHER READING ON URBAN AGRICULTURE AND URBAN PLANNING

THE EARTHSCAN READER IN SUSTAINABLE CITIES

Satterthwaite David (ed.). 1999. Earthscan Publications, London, *Stylus Publishing, LLC.*

Satterthwaite provides an introduction to the field of sustainable cities in 20 articles. Part I brings together a wide range of published articles covering the key issues. Furthermore, concepts linking sustainable development and cities (Part II) as well as sectoral programmes contributing to sustainable development in cities (Part III) are discussed. The section on sectoral programmes includes chapters on urban agriculture and planning green cities, waste recycling and building and designing with nature. Part IV provides case studies on innovative action plans (Local Agenda 21) at the city level, from South and North America as well as information systems and urban sustainability indicators. The last part (V) places sustainable city development in a wider regional and global context. (NB)

URBAN AGRICULTURE: CAN PLANNERS MAKE A DIFFERENCE?

Greenhow, Timothy. 1994. CFP Report Series Report 12, International Development Research Centre (IDRC) Ottawa:

Greenhow examines the way city planners look at urban agriculture in three countries: Lesotho, Botswana and Sweden. The basic question is to what extent planning plays a role in influencing the spread of agriculture in urban areas. Gaborone, Greenhow concludes, has neither the subsistence need nor the planning attitude conducive to widespread urban agriculture. In Maseru, inhabitants farm out of necessity and suitable preconditions exist that favour urban agriculture. In Stockholm, policy environment is such that urban agriculture is seen as a valuable component within a new approach to planning, with the environment and the sustainable city in mind. The paper ends with a number of recommendations for urban planners.

SUSTAINING CITIES – ENVIRONMENTAL PLANNING AND MANAGEMENT IN URBAN DESIGN

Leitmann, Josef 1999. McGraw-Hill

A historical transition will take place at the dawn of the new millennium: for the first time in human history, more than half the world's population will be living in cities. These cities currently generate two-thirds of economic wealth and will account for 80% of GDP growth during this decade. Population and economic growth in cities create externalities - more people making more things demand more resources and generate more waste. The resulting set of environmental problems is known as the "Brown Agenda": distressed industrial area; eroding infrastructure; pollution; resource losses; environmental hazards and global environmental issues (taken from J. Leitmannn and editorial comments).

PLACING THE FOOD SYSTEM ON THE URBAN AGENDA : THE ROLE OF MUNICIPAL INSTITUTIONS IN FOOD SYSTEMS PLANNING

Pothukuchi Kameshwari and Kaufman Jerome L. 1999. Agriculture and Human Values 16(2): 213-224. University of Wisconsin.

This article takes a perceptive look at the relationship between city planning and the urban food system in America at the turn of the century. The urban food system is less visible than other such urban systems. The reasons for its low visibility include the historic process by which issues and policies came to be defined as urban; the spread of processing, refrigeration and transportation technology, together with cheap, abundant energy; that rendered invisible the loss of farmland around older cities; as well as the continuing institutional separation between urban and rural policy. Despite its low visibility, the urban food system contributes significantly to community health and welfare and metropolitan economies; connects to other urban systems such as housing, transportation, land use, economic development and impacts upon the urban environment. Existing and potential city institutions that could offer a more comprehensive management of the urban food system are examined. These include the city department of food, the policy council, and the municipal planning department.

ILLEGAL CITIES : LAW AND URBAN CHANGE IN DEVELOPING COUNTRIES.

Fernandes Edésio and Varley Ann (eds). 1998. Estover, Plymouth: Plymbridge Distributors. ISBN 1_85469_550_7 (pbk) : GBP 14.95. 256 pp.

This book provides an important overview of the role played by legislative and legal institutions in the way open spaces are occupied in cities. Much of the content is about how the urban poor gain access to urban land and housing within the margins of the law. Issues addressed are of a wide range: How is illegality perceived? How are property rights and public control of land use defined? How do informal settlements occur and how are they regularised? How does customary law operate? How secure are land-tenure rights in reality? Such questions have often met with uncritical treatment in traditional legal studies. Therefore, this is an important book that brings law and urban change to the attention of a wider audience. After an introductory section setting the framework for urban legal research and the research record thus far, the remainder of the book is devoted to twelve case studies from major cities in Asia, Africa and Latin America.

OPPORTUNITIES AND CONSTRAINTS FOR URBAN AGRICULTURE IN BANDUNG, INDONESIA.

Hietkamp Fern. 1995. AURN working paper no. 7. Asian Urban Research Network (AURN), Centre for Human Settlements, School of Community and Regional Planning, The University of British Colombia, Vancouver, Canada. 36 pp.

Hietkamp has focused on the competition for space between urban agriculture and other activities in Bandung, Indonesia. When the author states that with the current rate of development, much of the land now used for food production within the urban area will disappear in the next 15-20 years, we must realise that this statement was made before the economic crisis hit Indonesia. The author's suggestion that city administrators should include urban farming more systematically in urban planning remains as valid as before, however.

http://www.cipotato.org/SIUPA This is the official website of the Strategic Initiative on Urban and Peri-Urban Agriculture SIUPA. SIUPA was launched in 1999 by the Consultative Group on International Agricultural Research (CGIAR). In collaboration with the many national and international efforts that have started in recent years to address the issue of urban and peri-urban agriculture, SIUPA is establishing, in regional sites, a set of research activities collectively known as Urban Harvest. Summaries of the Regional Stakeholder Workshops in Hanoi and Nairobi, reported on in former issues of the *UA-Magazine* can be found on this site.

http://www.planetizen.com/books/ All-time greatest planning titles by PLANetizen Books Planning professionals may want to go down memory lane to some of the greatest "must-read" titles in urban planning. Visit to see the top twenty greatest as per surveys by PLANetizen Books and see whether you agree with their selection.

http://www.ucl.ac.uk/dpu/pui/ This is the website of the Peri-urban Interface Project: "Strategic Environmental Planning and Management for the Peri-Urban Interface", of the University College London. This research project aims to identify key components and principles of a workable strategic approach to planning and managing environmental dimensions of the rural-urban interface, which will benefit the poor. This website has been designed with the aim to share research findings and the views and other experiences of researchers and practitioners around the world.

http://userpage.fu-berlin.de/~garten/gartenkonferenzEnglisch.html Here you will find information on a conference held in Berlin, in July 21-25, 2000. The title was Gardening-Conference 2000, Perspectives of Small-Scale Farming in urban and rural areas - about the social and ecological necessity of gardens and informal agriculture. It was organised by the working group "Small-Scale Farming and Gardens in urban and rural areas" in co-operation with the working group "Agriculture and Social Ecology" of the Humboldt University Berlin - Faculty for Agriculture and Gardening

http://www.un-urbanwater.net/ Managing Water for African Cities (MAWAC) is a joint initiative of United Nations Environment Programme UNEP and United Nations Centre for Human Settlements UNCHS (Habitat): to build capacity in seven demonstration cities in the water sector to avail information on best practices in urban water management, and to link sector professionals working in the field of water management with each other and with other networks, institutions, governments, municipalities, NGOs and the private sector.

http://metrofarm.com This is a website on farming in the city, focusing on high intensive agriculture in the USA. According to a recent Census of Agriculture, the most productive farmland in the United States is in the Borough of the Bronx, while the second most productive farmland is in the City of San Francisco! One can order books or subscribe to regular radio programmes.

http://www.city.toronto.on.ca/food_hunger/index.htm The Food and Hunger Action Committee was formed in December 1999 to study food security in Toronto and recommend ways to reduce hunger, improve the nutritional health of Torontonians, and support food-based initiatives that benefit Toronto's economy, environment and quality of life.

http://www.ingenta.com Ingenta is a global research gateway serving online information needs of over 1.4 million visitors a month and is one of the UK's top 20 Web services. It provides a free online search service of published content from reliable research sources, information and links to a wealth of other institutions, a broad based article search and delivery service and subject-focused websites, built in conjunction with societies, publishers and university presses.

http://www.ems-sema.org/castellano/proyectos/solidaria/ppp/eng_index.html Information on the project "Study, analysis and proposals to strengthen public-private management programmes in the management of solid waste and environmental sanitation in the metropolitan area of San Salvador" is found on this website of ems-sema. Lots of other information on Latin America also can be found here.

http://www.ecoiq.com/urbangreening The Urban Greening website is for everyone interested in making choices about the green and living environments of communities that are both economically and ecologically intelligent. Of particular interest is the assortment of educational and media resources offered. USA focused.

http://www.ibiblio.org/farming-connection/fffconf/ On this site you will find information about the Summit on "the Future of our Food and Farms", which will be held in Philidelphia, USA. November 29 to 30, 2001. The Summit is creating a place where those interested can come together to share ideas about problems and solutions affecting the farm and food system in the USA.

http://www.sapling.org.uk/ Sapling is a multi disciplinary portal site around the fields of architecture, planning and landscape. Over 400 links are organised into nine key themes - planning, technology, design, housing, heritage, sustainability, construction, transport and regeneration - with additional 'Online Library' (information resources) and 'Web Search' sections.

http://www.nottingham.ac.uk/sbe/planbiblios/ A comprehensive list of bibliographies designed primarily for use by students of the Institute of Urban Planning, School of the Built Environment, University of Nottingham, U.K. The lists cover a very wide, but not comprehensive, range of current planning topics. Most of the bibliographies are regularly updated. The lists particularly focus on items on planning in England. There is a separate list of Planning and Planning-related organisations, contact details and websites.

http://urban.freeservers.com/agri.html This site called: "Urban Issues in Developing Countries", is presented as a portal site with urban agriculture as one of the issues. The site does not give institutional or personal information, and is a work in progress.

http://www.urban.uiuc.edu/faculty/talen/GISweb/main.html This site of the university of Illinois, USA, gives information about a project on the uses of computer-mapping software (geographical information systems) as a tool to survey neighbourhood residents about their local environment.

FORTHCOMING EVENTS

SUSTAINABLE FOOD SECURITY FOR ALL BY 2020: FROM DIALOGUE TO ACTION

International Congress Centre of the Federal Parliament, Bonn, Germany September 4-6, 2001

The International Food Policy Research Institute (IFPRI) in close collaboration with the German Federal Ministry for Economic Cooperation and Development (BMZ) will organise this event. The conference takes stock of the current situation, reviews progress in achieving sustainable food security since the first 2020 Vision conference in 1995, and offers state-of-the-art projections for scenarios in 2020. The meeting will focus on the emerging issues that are most likely to affect the global goal of achieving sustainable food security for all by the year 2020, and to prioritise actions. For more information and registration, you can visit www.ifpri.org/2020conference.

DEVELOPMENT STUDIES ASSOCIATION ANNUAL CONFERENCE 2001 : DIFFERENT POVERTY DIFFERENT POLICIES

Manchester University, Manchester, UK, September 10-12, 2001

The sessions of this conference will include issues of poverty and poverty reduction, agrarian and land reform, urban poverty, livelihood frameworks and poverty analysis, international policy and poverty, e-development and development management. Some of these concepts would be valuable for debates on urban and peri-urban agriculture. For further details, contact the Conference Secretary, Debra Whitehead by e-mail: dsa2001@man.ac.uk or visit http://www.bham.ac.uk/DSA/events.htm.

LOCAL ECONOMIC DEVELOPMENT (LED) POLICY WORKSHOP FOR EASTERN AND SOUTHERN AFRICA

Harare, Zimbabwe, September 10-14, 2001

This workshop, organised by the Municipal Development Programme, is part of its joint programme with the Institute of Social Studies (ISS), the Netherlands, in partnership with the University of Zimbabwe. The workshop is meant to bring all strategic players together to enable them to share experiences and options for sustainable economic development at the local level. The role of urban and peri-urban agriculture in the LED will be part of the workshop module. For details, please contact the Director, George Matovu by e-mail: gmatovu@mdpesa.co.zw.

RAINWATER INTERNATIONAL 2001 AT MANNHEIM, GERMANY 10TH INTERNATIONAL RAINWATER CATCHMENT SYSTEMS CONFERENCE AND INTERNATIONAL RAINWATER FAIR

10-14. September 2001

Rainwater harvesting within an integrated water resources management concept is one important step forwards to a sustainable water future. The conference will reflect on the growing realisation that rainwater harvesting offers great potential in solving domestic and agricultural water problems in humid and semi-arid areas and also many critical urban-related water issues. It will provide a global platform and an exchange forum for technologies and concepts across countries and continents.

More information: http://www.rainwaterconference.org/english/programme.htm

SUSTAINING FOOD SECURITY AND MANAGING NATURAL RESOURCES IN SOUTHEAST ASIA: CHALLENGES FOR THE 21ST CENTURY.

Thailand, January 8-11, 2002

This international symposium will discuss possible approaches and innovations that should contribute to achieving food security, reducing poverty and raising food production under sustainable natural resource management in Southeast Asian countries.

For more information visit: http: //www. uni-hohenheim.de/symposium2002.

THE INTERNATIONAL CONFERENCE "ONE WORLD: RESEARCH FOR A BETTER QUALITY OF LIFE"

Bonn, Germany, October 9-11, 2001

The *Deutsche Tropentag* (DTT) 2001 will be held as a two-day conference on tropical and subtropical agriculture and forestry, organised jointly by the Universities of Bonn, Berlin, Göttingen, Hohenheim and Kassel-Witzenhausen, as well as by the Council for Tropical and Subtropical Agricultural Research (ATSAF e.V.), in cooperation with BEAF/GTZ. One symposium of this conference is planned to deal specifically with urban and peri-urban production systems. More information is available at: http://www.uni-bonn.de/akci/dtt_1.htm

URBAN AREAS - RURAL AREAS AND RECYCLING: THE ORGANIC WAY FORWARD

Royal Veterinary and Agricultural University, Copenhagen, Denmark, August 19 - 21, 2001

This seminar is organised by the working group on Organic Farming of the Danish University Consortium on Sustainable Land Use and Natural Resource Management. After a one-day excursion to an organic farm and an ecological village, a two-day seminar will discuss ecological development of post-industrial societies, focusing on themes such as the consequences of local integration of food production (including urban agriculture); recycling; eco-villages and local self-sufficiency; local collaboration between consumers, processors, distributors and producers; and research needs. More information can be obtained by e-mail: jma@kvl.dk or telephone: +45 3528 3491

IFOAM 2002 ORGANIC WORLD CONGRESS: CULTIVATING COMMUNITIES

Victoria, British Columbia, Canada, August 21-28, 2002

The IFOAM 2002 Organic World Congress "Cultivating Communities" will bring together representatives of the organic movement from around the world, and is open to everyone interested in organic agriculture and sustainable development. The event combines the 14th Organic World Congress, the 4th IFOAM Organic World Exhibition, the 7th International Congress on Viticulture and Wine, and the IFOAM General Assembly.

For more information about Canadian Organic Growers, visit: www.cog.ca.

For more information about IFOAM, visit: www.ifoam.org.

REGIONAL TRAINING COURSE ON URBAN AGRICULTURE

Quito, Ecuador, November 2001

The "Cities Feeding People Programme" of the International Development and Research Centre (IDRC), Canada, is collabo-

rating with UMP-LAC/UNCHS-Habitat and its anchoring institute IPES in the development and implementation of the first regional training course on urban agriculture. Specific support to the project will also be provided by ETC-RUAF, NRI-UK and the FAO. The course will allow twenty (20) municipal staff members, researchers, NGO professionals, and representatives of producer or marketing organisations to discuss and evaluate proposals for action-research and concrete intervention in urban agriculture, in order to influence planning and management of their cities. For more information, contact Marielle Dubbeling, Urban Management Programme for Latin America and the Caribbean (UMP-LAC/IPES) by e-mail: marid@pgu.ecuanex.net.ec

MANAGING BIODIVERSITY IN AGRICULTURAL ECOSYSTEMS

Montreal, Canada, November 8-10, 2001
This meeting is organised by the United Nations University in collaboration with the International Plant Genetic Resources Institute, and the Secretariat of the Convention on Biological Diversity. More information at http://www.biodiv.org/areas/agro/default.asp

REPORTS ON PAST EVENTS

URBAN AGRICULTURE AS PART OF A NEW LANDSCAPE STRATEGY FOR SUSTAINABLE CITIES

University of North London, UK, June 29, 2001
As part of the Architecture Week, organised by the Arts Council, the Low Energy Architecture Research Unit at the University of North London, UK, hosted this conference on Urban Agriculture, which consisted of a series of presentations and short workshop sessions. Contributors explored urban, architectural, environmental, economic and social benefits of Urban Agriculture. The main issues were: "likely strategies for establishing urban agriculture within urban regeneration proposals"; "joining existing research to promote or test the viability of urban agriculture"; financial viability of urban agriculture as a means of local food production.
More information can be obtained from Andre Viljoen, Deputy Director of the Low Energy Architecture Research Unit by e-mail: a.viljoen@unl.ac.uk or at: www.studioBandV.co.uk.

ZIMBABWEAN INITIATIVE, UA STAKEHOLDER FORUM

MDP Offices, Harare June 18, 2001
This meeting made an inventarisation on what has been happening in UA in Zimbabwe. MDP has been asked to further facilitate the process of discussing the subject, which should lead to a policy document on urban agriculture.

NATIONAL NEEDS ANALYSIS ON TRAINING AND COMMUNICATION NEEDS IN SE AFRICA

As part of the RUAF Programme, MDP facilitated National Consultative Workshops in June 2001 on the status of Urban Agriculture in Zimbabwe (as well as Zambia, Botswana, Malawi, Tanzania) and the needs of Information, Training and Communication. Reports on the workshops in Tanzania and Botswana can be found on page 24 and 27. Reports on the other countries will be published in the next issue of the *UA-Magazine*, and on the ruaf website www.ruaf.org

SUBREGIONAL EXPERT CONSULTATION 'URBAN AND PERI-URBAN HORTICULTURE IN SOUTHERN AFRICAN COUNTRIES'

Stellenbosch University, Cape Town, South Africa, January 16-17, 2001
The University of Stellenbosch, South Africa under the auspices of the Food and Agricultural Organisation (FAO) of the United Nations hosted this meeting which focused on the use of low-cost and simple technologies for crop diversification by small- scale farmers in urban and peri-urban areas of Southern Africa. A full report is available on the RUAF www.ruaf.org and FAO www.fao.org websites, or contact Lizl Hobson at LHOB@akad.sun.ac.za.

NON-GOVERNMENTAL ORGANISATIONS COMMITTEE (NGOC) OF THE CGIAR

Durban, South Africa, June, 2001
This workshop was about how NGO and small-farmer organisations could exert more influence on agricultural research for development - not only by the CGIAR centres but also by other research organisations. Urban agriculture was mentioned as one area in which NGOs are involved in research and development. The mid-term meeting of the CGIAR focused on the restructuring of the CGIAR system. If you are interested in further information about regional priority-setting for research in southern Africa - for CGIAR centres and national, subregional and regional research organisations - you might like to get in touch with PELUM (Mutizwa Mukute) - the current NGO contact point for the joint efforts of the CGIAR and the Global Forum on Agricultural Research (GFAR) in this direction. Email: pelum@ecoweb.co.uw.

INTERNATIONAL WORKSHOP: COPING WITH INFORMALITY AND ILLEGALITY IN HUMAN SETTLEMENTS IN DEVELOPING CITIES

Leuven and Brussels, Belgium, May 23-26, 2001
This was the annual event of N-AERUS: Network-Association of European Researchers on Urbanisation in the South. Papers presented had relevance to issues of urban governance and urban agriculture. Further details and papers can be obtained at: http://www.naerus.org.

HABITAT ISTANBUL + 5

New York, USA, June 6, 2001
On June 6 and 8 the Istanbul +5, special session of the General Assembly, took place to evaluate progress five years after the Habitat II. This time it was held in New York and convened by the UN Centre for Human Settlements. More information can be found at http://www.un.org/ga/istanbul+5. Several discussions were organised simultaneously. One of them was the "Food for the Cities: Food Insecurity and Urban Management" organised by UNCHS, IDRC and FAO. This parallel event had the aim of sensitising participants on the issue of urban growth and its impact on urban food security. Presentations were given on food distribution, the role of urban agriculture and cases from Latin America by UMP/LAC. Dialogue was facilitated by a video presentation. More information can be obtained from the respective organisations, or at: http://www.unchs.org/istanbul+5/pel2.htm

THE AGRICULTURE-URBANISATION INTERFACE IN COASTAL LEBANON AND IN THE MIDDLE EAST / NORTH AFRICA

The French Cultural Centre of Beirut, Beirut, Lebanon, June 13-16, 2001

The regional information and training needs assessment under RUAF was jointly organised with a workshop on the results of a four-year running research programme in Lebanon *(see UA Magazine no. 3).*

The programme was meant as a foundation for broader regional exchanges, which would cover neighbouring countries in the southern and eastern Mediterranean basin. The coastal Lebanon programme and the regional needs assessment are coordinated by Joe Nasr, vice-president of The Urban Agriculture Network (TUAN) and researcher at the CERMOC. CERMOC is also the main host. The Lebanon programme is included within the activities of the *CERMOC's Observatoire de recherches sur Beyrouth et la reconstruction.*

For further information, contact: Joe Nasr by e-mail: joenasr@compuserve.com

PARTNERS

URBAN FOOD INSECURITY AND VULNERABILITY MEETING

The FAO Regional Office for East and Southern Africa based in Harare, Zimbabwe is holding periodic meetings on this topic and brings together members from key international development institutions as well as local stakeholders. For further details on these initiatives, contact Farayi Zimudzi or Karori Izumi from the FAO Subregional Office for SE-Africa.

Email: Kaori.Izumi@fao.org

FORMULATION OF URBAN AGRICULTURE POLICY ADVISORY TOOLS FOR LOCAL GOVERNMENTS IN LATIN AMERICA AND THE CARIBBEAN

As part of its "closing the loop" activities, the "Cities Feeding People" programme initiative will collaborate with the Urban Management Programme, Regional Office for Latin America and the Caribbean (UMP-LAC/UNCHS- HABITAT/UNDP) and its anchoring institute IPES to produce a set of seven Policy Briefs known in Spanish as *Directrises o lineamientos de Politica*, intended for local governments in the LAC Region. The general content will include: arguments for better municipal policies on UA, examples of good municipal practice, practical planning and management guidelines, and resources. The purpose of the Briefs is to raise awareness, mobilise support for and strengthen capacities and provide ways for municipal governments to implement urban agriculture programmes and policies. The Briefs will discuss and define strategic approaches for disseminating new knowledge and an agenda for change. Draft Briefs will be validated by the target group, convening the LAC City Working Group on Urban Agriculture and Food Security, and the Latin American Chapter of the International Union of Local Authorities (IULA-LAC), the Federation of Municipalities of Central America (FEMICA) and the Caribbean Local Governments Association (CALGA). The Briefs will be disseminated by sending 20,000 copies (in both Spanish and English) to municipal urban governments throughout the region.

For more information, contact Marielle Dubbeling, Urban Agriculture Adviser, Urban Managment Programme for Latin America and the Caribbean (UMP-LAC/-IPES) by e-mail: marid@pgu.ecuanex.net.ec

NEW EXECUTIVE SECRETARY FOR THE LATIN AMERICAN RESEARCH NETWORK ON URBAN AGRICULTURE: *RED AGUILA*

AGUILA, the network of Latin American and Caribbean institutes and organisations working on urban agriculture (see earlier issues of the *UA Magazine*) is again complete. Since January 2001, the Secretariat of AGUILA has been managed by the Institute for Promotion of Social Economy- IPES, located in Lima, Peru. The new Executive Secretary who recently started in Lima, is Mario González Novo. Together with Gunther Merzthal and Maritza León they form the Aguila Secretariat.

For further information, contact Aguila by e-mail: aguila@ipes.org.pe

AGROPOLIS

Agropolis is the research and training awards programme, coordinated and led by the IDRC on behalf of the Support Group on Urban Agriculture (SGUA). Agropolis supports innovative Masters' and Doctoral research in urban agriculture around the world. Each award covers field research expenses of up to CA$ 20,000 for the research period (between 3 and 12 months).

The deadline for applying for 2002 awards is December 31, 2001.

Agropolis now has its own homepage in three languages. Please link to:
http://www.idrc.ca/cfp/agrhome.html for English
http://www.idrc.ca/cfp/fagrhome.html for French
http://www.idrc.ca/cfp/sagrhome.html for Spanish

Agropolis Award themes

AGROPOLIS International Graduate Research Awards in Urban Agriculture AGROPOLIS . The AGROPOLIS award recipients for 2001 are:

- CHUO, Adamu Nsangu (Mr.) from Cameroon, on "Urban Agriculture and Physical Planning: A Case Study of Zaria Urban Area, Nigeria";
- DANSO, George Kwasi (Mr.) from Ghana on "Perception and willingness to pay for composted municipal waste and night soil by farmers of different urban and peri-urban farming systems in three Ghanaian cities (Kumasi/Tamale/Accra)";
- HOVORKA, Alice (Ms.)from Canada on "Exploring the Effects of Gender on Commercial Urban Agriculture Systems in Gaborone, Botswana";
- ABULO, Grace (Ms.) from Uganda, on "The Assessment of Heavy Metal Pollution To Crops Grown Around Kampala City Kampala, Uganda";
- NGUYEN, Quang Linh (Mr.), from Vietnam, on "The Use of Local Feed Resources to Strengthen Animal Smallholdings and Poverty Alleviation in Urban Hue, Central Vietnam"
- SCHAMI, Danielle J. (Ms.), from Canada, on "Planning for Sustainable Urban Food Systems: From Toronto to Guadalajara"

This site, on Water and Environmental Health, is managed by the London School of Hygiene & Tropical Medicine and the Water, Engineering and Development Centre, Loughborough University, and further supported by a network of collaborating institutions. WELL is a resource centre promoting environmental health and well-being in developing and transitional countries.

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Urban agriculture faces very stiff competition from other urban land uses.

IWMI-Ghana

Availability, Access and Usability of Land for Urban Agriculture

Editorial

Takawira Mubvami, MDP
Shingirayi Mushamba, MDP
René van Veenhuizen, ETC
RUAF

Land is an important resource for urban agriculture. Urban farming requires some land space, irrespective of whether the farming system is soil-based or not. Therefore land is and will remain a resource of particular concern to urban farmers. But land, or rather the adequate use of the land, is of increasing concern also to planners and municipal policymakers who have to consider the various demands on the land and its functions in and around the city.

Urban agriculture has always been part of urban settlements. In the past and even today many urban inhabitants turn to it as part of their livelihood strategy. Although the quantity of food produced by city farming does not match up to that outside the city, its impact is quite considerable. Yet, national and municipal policy do not acknowledge this important role, but consider urban agriculture as something of the past, and one that does not have a place in modern urban design. This poses several key challenges for urban farming: urban land is either not *available* or not *accessible;* and when available, it is most often not *suitable*.

Availability refers to the existence of land that can be utilised for urban agriculture, in the short-, medium- or long-term.

Accessibility refers to the opportunity for actual use of available land by needy households or groups, taking into account administrative procedures and conflict resolution mechanisms. In the past few years, programmes for urban agriculture have emerged, but existing laws have largely ignored the existence of urban agriculture or prevented its official integration into city planning. The ***usability*** of the land for urban agriculture is a function of topography, soil texture and fertility, moisture and other environmental qualities.

Access to suitable and adequate land within a conducive legislative framework will ensure sustainable urban agriculture. The questions we ask and try to get answered in this issue of the *UA-Magazine* are whether suitable land is available and how it is accessed for urban agriculture, especially by the urban resource-poor. In order to further articulate and elaborate on these and other related issues, we have drawn on the rich experiences presented in the recent e-conference reported on page 4.

AVAILABILITY

A city is a dynamic entity that develops continuously; new spatial structures are

created while others go to decay. Consequently, most cities often have a lot of (temporary) vacant open space that could be used for urban agriculture. Urban agriculture takes place *on-plot* and *off-plot,* and in *periurban* areas. Agriculture on-plot is limited by the amount of non-built-up space, and additional space created by rooftops and verandas. The challenge here is to determine suitable plot sizes for various income groups in urban design. Off-plot urban agriculture takes place on road, rail and power-line reservations; land reserved for development; and institutional land reserves. Access to such land is determined by many factors, including informal networks and information. Periurban land is the most freely available category. Here, rules of access are often determined by the land ownership patterns and are subject to a mix of traditional and modern rules.
Yet, in most cities and towns, there is no land zoned specifically for urban farming. Only in a few countries, for example Botswana, urban agriculture has only recently been considered as part of environmental municipal planning. It is crucial to incorporate agriculture in other programmes aimed at poverty reduction, local economic growth, employment, urban youth initiatives, or managing HIV and AIDS at the community level through community gardens.
However, there is high demand for land within urban areas for residential, institutional, commercial and industrial development uses. The cases on Kano, Nigeria; Tanzania; Setif, Algeria and Bamako, Mali show that urban agriculture faces very stiff competition from other 'legal' urban land uses. Therefore, it is not a coincidence that urban farming is being undertaken in marginal areas with fragile ecosystems such as wetlands, hill-slopes, or that it is being pushed to the boundaries of the city, where it is tolerated until other development ventures take over (as is illustrated in the Bamako case). Unfortunately, urban agriculture cannot compete strongly enough against other uses for the land, and often loses out. This calls for policies that do not provide land for urban agriculture on the basis of demand and supply on the open market, but on the important role it plays in sustaining livelihoods, particularly of the urban resource-poor. As mentioned before, the land most often available for

Mario Gonzalez Novo

urban agriculture is open spaces (under council or government) or land earmarked for future development. The duration of its availability is therefore not secure. In many cities, like Accra, Setif and Divo lease for agricultural use of the land is only given for one year. This means that the urban farmer cannot plan for a longer period. It also limits the extent to which services and other resources like finances can be provided.

Initiatives to improve the availability of land for urban agriculture need support and facilitation of the municipality. This is usually hampered by the lack of awareness and adequate information. A good starting point is to make an inventory of available vacant open land in the city (using participatory methods and GIS) and an analysis of its suitability for agricultural use, as is illustrated in the Latin American cases (and several articles published in no.4 of the *UA-Magazine*).

ACCESS

So, there is land available in the city for agricultural use, but this is often not recognised as such, or that access to this land is a problem. The cases in this issue describe many different formal and informal ways to gain access to land. The not-so poor hold land under various forms of title: private ownership, municipal or state land, and institutional land belonging to churches, police, army, etc. Traditional forms of ownership as under customary law also exist (see the cases on Accra, Kano and Divo). Formal and informal access to land by the urban resource-poor includes share cropping, squatting, renting, leasing, inheriting or outright purchase.
The mentioned cases show that despite formal ownership rights becoming dominant over customary mechanisms, informal means of access to land persist. Land ownership, tenure, land transfer, and access and user rights to land are complex and dynamic. There is a mix of both the traditional and the modern systems (see the Ghana case). Claiming formal access appears to be very difficult because of unclear or long procedures, or the reluctance of municipalities to issue long-term leases. The Ghana case points out the complex nature of land transfers, resulting in people opting for other arrangements that are less secure. The role of informal ties, kinship and other social relations are important for such systems of access to work. Among the informal strategies used by farmers to get land for urban cultivation are investment in social relations (marriage), lobbying in groups with caretakers to lease the land, occupying vacant land, etc.

Newcomers (migrants) to the cities often lack the social relations to gain and secure access to land and water. Dominant groups often have a favoured position in regards to land access and prevent migrants from access. In Divo, Ivory Coast, most migrants have been reduced to renting under very insecure tenure arrangements that favour exploitation by the landowners, who use the migrants to clear land for them during the first season and then take over.

Land grabbing and corruption, increasing land rent and increasing contamination of irrigation water and soils are other problems encountered. Such problems often lead to conflicts. The case from Zambia highlights some of the critical problems that may arise in the utilisation of a piece of land between the bona-fide owners and other users. Techniques of conflict resolution are therefore important. These techniques involve bringing the different parties to the

IAGU

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negotiating table and discussing their problems.

There are also differences between men and women in the access to the land. Although it is women who mostly manage the land, it is mainly men who hold the land titles. Women are therefore dependent on the men for arrangements and access to other inputs for agriculture, and if not through their husband or brother, they may find other ways to lease the land. The case of Kampala shows how, as a result, women farm the less suitable areas, sometimes highly contaminated, which could jeopardize the health of family members and customers who consume these products.

USABILITY

Many factors determine the suitability, or usability of land for urban agriculture, such as the size of the plots or soil quality, availability of water, security of tenure, etc. The history or the plots and the proposed urban farming systems may also influence the suitability. The case from Rosario gives an overview of variables selected to define the suitability of the land: environmental quality; potential agronomic use; actual use (and previous use, if the area is currently used as a dump or other hazardous activity); current regulations for land use; planned urban and city projects; water supply; ownership; and population groups interested in agriculture.

The availability and usability of water has been highlighted in the cases of Accra and Hyderabad. Urban farmers very often turn to contaminated water for the irrigation of their crops. In turn, the nutrients contained in the wastewater may replace expensive fertilisers (see also UA Magazine no. 8).

LEGISLATIVE FRAMEWORK

The *legal status* of the land may vary: a significant percentage of the real estate of the city is subject to litigation, while other parcels are public land, or have been sold, leased or assigned to institutions or persons. Duly *regulated* ordinances that foster, promote and formalise the assignment of land for alternative productive enterprises – such as urban agriculture – hardly exist in most cities. Urban agricultural land use is usually seen as an illegal activity that is economically unviable and environmentally disastrous. Until such time that legal frameworks are amended to recognise agriculture in the city, it will be very difficult to legitimise it and attract resources to develop it. The Tanzania case adds to this argument by saying that national polices and laws need to be linked to the municipal by-laws and ordinances.

Recognition and legitimisation of urban agriculture do not remove the reality of competition for resources with other land-uses and activities, but it does level the playing field and provide a framework for officially responding to the resource requirements in an equitable manner. In some countries legislation has emphasised ownership rather than land use (in Kampala for example) to the detriment of agriculture. Most of the by-laws on urban agriculture have tended to control the activity rather than facilitate its development. By-laws and regulations need to be facilitatory rather than being controlling in a negative manner.

IMPROVING ACCESS TO LAND FOR URBAN AGRICULTURE

The general picture may look like a vicious cycle: land is unavailable or access is denied, and if not so, the land is often not usable. This limits the flexibility of the farmer in planning and further impairs his or her ability to mobilise resources, and because it cannot realise its full potential, urban agriculture most often does not compete favourably against other urban land uses. Positive action is needed to break this cycle.

Once the main stakeholders are convinced of the positive impact of urban agriculture, having been informed sufficiently and accurately, a participatory multi- stakeholder process of diagnosis, joint research, planning decision-making and implementation is necessary.

This issue describes various arrangements for improving access to land and other resources. These range from temporary arrangements, for instance in eThekweni in South Africa where community gardens are allowed, to the carefully considered optimisation of the use of open space, in Rosario and Cienfuegos. Another strategy is the creation of (allotment) gardens on privately-owned land leased by associations of the urban poor. Sometimes not all of the land is fully used, but seen as multi-functional and important to all its users (see the London case). The creation of allotment gardens, like in the Philippines underlines the need to have active involvement of the municipality, but also to have good insight into the local social relations.

Most of the cases presented in this issue provide suggestions that could be useful in drawing up successful programmes in urban agriculture. They emphasise the importance of innovative approaches and techniques that facilitate integration of urban agriculture into the city landscape as a permanent feature, thereby ensuring adequate access to land and other resources for the urban poor. Land banks, multi-stake holder participatory urban planning and long-term leasing arrangements are examples of innovative approaches that are already being tried out with success.

Electronic Conference

Optimising Agricultural Land Use in the City Area: Access to land and water, adequate norms and regulations, integration in land use planning

An increasing number of cities and countries are interested in including urban agriculture in their strategies and programmes to reduce urban poverty and enhance urban food security. In order to facilitate that process, from 3 – 26 of November 2003, the Urban Management Programme (UNDP / UN-Habitat), and ETC-RUAF organised an electronic conference on the optimisation of access of the urban poor to land for agricultural activities.

The E-mail discussion originally was supposed to be implemented three weeks, but due to the many enthusiastic contributions it was decided to continue for another week.

SHARING OF EXPERIENCES

In total, 400 participants from 82 countries registered and many more followed the discussions by visiting the RUAF website on the Internet. 36% of the participant was female and 64% male. About 33% of the participants had a background in research institutes and universities, 13% in municipalities and governmental organisations, 26% in NGOs or CBOs, 10,5% were students and 17,5% had another background. The participation from policy-makers and practitioners was higher in this conference than in the earlier E-conferences organised by RUAF. There were more than 450 relevant contributions received for the discussions and some 30 papers were added to the "Background papers" section of the conference website. These are encouraging numbers, indicating a strong interest to share experiences on this topic of relevance for local policy development, urban planning and future projects on urban agriculture.

ACCESS TO LAND BY THE URBAN POOR

The experiences presented in the E-conference illustrated the many ways through which urban poor seek to secure access to land (and water): investments in social relations, development of strategic partnerships between households or by linking up with people with access to land, individual lobbying with caretakers of land or joint lobbying for access to land with private institutional land owners or the local government as well as the occupation of 'vacant' land and the interruption of wastewater disposal lines. The experiences indicate the importance of developing a thorough understanding in the ways people create and secure access to land and how customary and statutory land rights are interacting, before developing any land use regulations and planning.

CONSTRAINTS ENCOUNTERED BY URBAN FARMERS

A number of factors that limit access to urban land for agriculture were discussed. For *actual farmers* in periurban areas a legal position is lacking and under the quest for land by urban estate developers, or migrants and urban poor the social cohesion diminishes. Formal ownership rights become dominant over customary mechanisms. Land grabbing and corruption, increasing land rent and increasing contamination of irrigation water and soils are other problems encountered. The *poor rural and urban newcomers* lack social relations through which access to land and water can be gained and secured. This group further encounters high land prices and lack of resources to lease or buy, while there often is only low quality "vacant" land available. Uncooperative owners of idle land or eviction by local authorities or other threats to this group.

PROVISION OF ACCESS TO PUBLIC LAND

The E-conference showed that various Municipalities, NGO's and other local stakeholders already have a number of promising strategies to enhance access of urban poor to land and water for agriculture. One of the approaches regularly applied, is the provision of vacant public and semi-public land to urban poor for temporal agricultural use. A city is a living mechanism that continuously creates new spatial structures while others are in decay. In most cities there is often a lot of (temporarily) vacant open space that could be used for urban agriculture. A good starting point is to make an *inventory of available vacant open land in the city* (using participatory methods and GIS) and *analysis of its suitability for use for agriculture*. A Municipal Agricultural Land Bank can bring owners in need of temporal or permanent users in contact with those in need of agricultural land. In addition, the *formulation of a City Ordinance* that regulates the (temporal) use of vacant land in the city, is of importance. The *provision of temporal occupancy licenses* to land users farming on land with acceptable suitability is very important since it provides some legality and security to the temporal users. Another lesson learned is *the important*

The objectives of the Electronic Conference were:
1. to share and discuss local experiences on alternative strategies to enhance and secure access of the urban poor to land within the City boundaries for food production;
2. to share and discuss local experiences with the development and application of Municipal bylaws, norms and regulations regarding (access to land for) urban agriculture.

Two main situations or target groups were distinguished:
a. Poor *urban families that already have taken up urban agriculture* as part of their survival strategy.
b. Poor *urban inhabitants without access to land* in need of alternative sources of subsistence and income.

Michael Baumeister
Henk de Zeeuw, ETC-RUAF

role institutional landowners and parastatals can play in leasing out temporarily idle land to urban poor and disadvantaged. Also *the importance of an independent organisation (e.g. NGO) playing a mediating role* to create acceptable win-win situations for both parties. Farmer training on adequate management practices, acceptable for the institutional owner, is crucial.
However, provision of land is not enough: *access to water of acceptable quality* is crucial. Since poor urban farmers in dry regions often rely on urban wastewater, adequate norms and guidelines regarding the safe use of wastewater have to be developed (see an example of such norms and guidelines in UA Magazine no 8, November 2002).

ALLOTMENT GARDENING

Another strategy is the creation of (allotment) gardens on *privately* owned land leased by associations of urban poor. The experiences presented in the E-conference indicate that first of all it is important that there is a *good understanding of the local social relations* before participants are selected and groups are formed. Active involvement of the Municipality is important as well as the availability of an *entity (Municipal department or NGO or project) that plays a facilitating and coordinating role*. It is necessary to define *clear land management conditions* (e.g. crop choice, no building and waste management) and to assist the allotment gardeners in learning and application of the required practices. The increase of Municipal tax on idle urban land or reduction of taxes for landowners could facilitate this.

ZONING FOR URBAN AGRICULTURE

The acceptance of urban agriculture as a permanent land use and its integration in City land use planning was a third strategy discussed. General *restrictive policies regarding Urban and periurban agriculture do not work*: urban agriculture persists under all policy environments. Under restrictive policies, problems associated with urban agriculture stay unattended while its potentials are not fully utilized. So l*egalisation of urban agriculture and demarcation of special zones for urban agriculture* is strongly advocated by many practitioners. Legal protection of urban agriculture – in certain parts of the city- will make it more sustainable and secure maintenance of green zones in the City. However, zoning in itself will not be sufficient: the maintenance strongly depends on the *political will of the local authorities* and the *practical technical and financial capacity of the Municipality*. Another condition is that adequate services are provided to urban farmers preferably through *development of multi-stakeholder support programmes*.

The *integration of urban agriculture into City Land Use Plans* requires an (inter-)active process involving various types of stakeholders with varying interests and perspectives and roles. To enable such process the conformation of a *multi-stakeholder Platform on Urban Agriculture, Food Security and Environment*, including Municipal Departments, NGO's, Farmer Organisations, Universities and other local stakeholders is an important instrument. The *establishment of one central coordinating Municipal Office* has been of great value in various cases as well as the involvement and collaboration of various municipal departments. In addition, the participants in the E-conference have observed the importance of assisting urban and periurban gardeners and farmers to get organised and to voice their interests and to dialogue with other stakeholders. It is crucial to provide more insight to municipal planners on the risks and benefits of each type of urban agriculture as a basis for and the development, with active farmer participation, of *effective guidelines on the management practices to be adopted by* ***each type*** *of urban agriculture and the conditions under which such types of agriculture are acceptable in certain locations.*

GENDER DIFFERENTIATION OF ACCESS TO LAND AND WATER

The topic of gender and access to land aroused quite some discussion and interesting observations. Gender differentiation of access to productive resources and gender division of labour in agriculture have *to be analysed in each city and for each urban farming system*, specifying constraints and opportunities for men, women and children. One has to be careful with transferring knowledge about gender in rural agriculture to urban agriculture, since the urban context and conditions may lead to important changes in the cultural definition of roles, in the division of labour and in access to productive resources. Participants recommended that *urban agriculture projects should specifically target women* in order to overcome present gender differentiation regarding access to land, especially female-headed households. Special attention has to be given to the selling and processing of products and more research has to be taken up on gender differentiation of access to productive resources in urban agriculture.

RUAF E-CONFERENCES
The RUAF electronic conferences are designed to facilitate the exchange of experiences and debate on urban agriculture between a wide group of stakeholders and persons interested in the issue. At www.ruaf.org you can find information on this and the three previously organised electronic conferences:
2003: Agricultural use of Untreated Urban Wastewater in Low Income Countries (with IWMI)
2002: Appropriate Methodologies for Urban Agriculture (with CGIAR-Urban Harvest Programme)
2001: Health, Land-Use Planning and Food Security (with FAO)

PROBLEMS ENCOUNTERED BY THE MUNICIPALITIES

Several problems were mentioned that are encountered by municipalities in the optimisation of agricultural use of urban space. Mentioned above is the lack of *awareness and adequate information* to local policy makers. This is especially true regarding the realistic assessment of the health and environmental risks associated with urban agriculture and available strategies to reduce such risks. The contribution of urban agriculture at *aggregate level* for the realisation of the municipal policy priorities is often not clear.

The development of adequate municipal policies, bylaws, norms and regulations regarding urban agriculture is hampered by the *lack of good examples*. Municipalities sometimes have a *limited capacity* to formulate policies on urban agriculture - and related support programmes- and/or to control and enforce the adopted bylaws and regulations. The integration of urban agriculture in the city development and land use plans is often restricted by the *lack of knowledge* of the existence *of practical methodologies*. Finally, many local governments underestimate the importance of preservation of open green zones in the city.
Several participants also pointed out *the need for adaptations in national laws* in order to enable new developments at local level.
Other themes discussed were the reuse of waste water, the use of compost for urban agriculture, the 'hot' issue of livestock in the city, the innovative urban and periurban systems for land confined conditions, the minimal plot size and the use of GIS for urban agriculture matters.
For a more extensive overview of the discussion, please visit www.ruaf.org/E-conferences.

Cai Gaojian

The houses of migrants will be improved if they stay long enough on the land

Migrants' Access to Land in Periurban Beijing

Farmland in periurban Beijing is owned by local rural collective units (village committees) but is primarily cultivated by migrants without local *hukou* (household registration). This is different from the typical agricultural production in China where farmland is both owned and cultivated by the local rural population. Two case studies (see figure 1) were conducted in Haidian district of the Beijing suburbs to explore how migrants in Beijing gain access to land.

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CONVERSION AND UTILISATION OF FARMLAND

Availability of agriculture land within the borders of Beijing has been declining due to rapid urbanisation and population growth, particularly after 1996. From 1985 to 2002, the area of cultivated land shrank from 421 thousand to 249 thousand hectares, while the total population increased from 9.8 million to 14.23 million. The biggest loss of farmland occurred in the periurban area due to the urban spatial growth pattern, prevalent in Beijing. As a consequence, the majority of land converted from agriculture to other uses in Beijing is concentrated within the near suburbs.

Efforts have been taken by the government to reserve a certain amount of already cultivated land for continued agricultural use in periurban Beijing, in order to maintain a sustainable urban ecological environment and to provide vegetables and food locally. According to the Beijing Master Plan (1993-2010), further urban development should shift to the outer suburbs and remote counties. And according to the "Ordinance for the protection of primary agricultural land in Beijing", which was issued by the Beijing Municipal People's Congress in 1994, "*The requisition and occupation of primary agricultural land should be strictly controlled*" (Article 15); "*All units and individuals are strictly forbidden to leave cultivated land unused or let it lie waste*" (Article 18).

Farmland in Beijing, as in other parts of China, is owned predominantly by the rural collective units, or village committees. According to the "Land Administration Law of PRC" (PRC stands for People's Republic of China), land in rural and suburban areas shall be owned by peasant collectives, except the portions that belong to the State, while urban land shall be owned by the State (Article 8). The total population in Beijing can be divided into 3 categories based on *hukou* status: non-agricultural residents, agricultural residents and migrants without local *hukou*. Of these, only the agricultural residents in village committees can share land use rights on the land they own, while non-agricultural residents and migrants cannot.

The total area of cultivated land in Beijing in 2002 was 249 thousands hectares, accounting for 15% of its total area of land. Out of its total population of 14.23 million, 3.29 million or 23% were agricultural residents; 8.07 million or 57% non-agricultural residents; and 2.87 million or 20% migrants. There are 4,005 village committees in Beijing. The average area of cultivated land occupied by each village committee and each agricultural resident is 62 and 0.076 hectares, respectively. In the two case-study villages, Tujing village and Qinghe village, there are 131 and

67 hectares of cultivated land, and 753 and 1,343 agricultural residents, respectively, in 2002. The average area of cultivated land per agricultural resident is 0.179 and 0.050 hectares respectively.

However, the majority of agricultural residents in periurban Beijing are reluctant to farm. Instead they are engaged in non-agricultural activities, which pay better and provide higher social welfare benefits (as the most dynamic growth area adjacent to the urban core, the periurban region in Beijing provides good job opportunities and social welfare for the local residents). In 2002, total rural employment in Haidian district was 49,726, but only 25% (or 12,627) was engaged in agriculture, forestry, (animal) husbandry or fishing. In our case-study villages, less than 1% of the rural labourers were involved in agricultural production, more than 80% were employed elsewhere, while the other 19% were unemployed. The latter make their living by renting spare rooms to migrants and by social welfare allocated to them by the village committee. In Qinghe village, which is closer to the urban core, the village committee allocates about 30,000 *yuan* (1 US Dollar = 8.3 Chinese Yuan) annually to each of its residents as social benefits. This amount of money is nearly 5 and 12 times of the average annual per capita income of rural households in Beijing (5880 *yuan*) and China (2476 *yuan*) in 2002, respectively. The income of Qinghe village is primarily derived from leasing land and the development of township and village enterprises (TVE). In Tujing village, there are about 5-6 thousands migrants who rent housing. By charging an average annual rent of 1,200 *yuan* per person, local rural households can generate a total revenue of 6 million *yuan* annually or 8,000 *yuan* per person.

The Location of the two Study cases in Beijing

With the increasing costs of local rural labour in periurban Beijing, labour has to be brought in to bridge the labour deficit for agriculture so that the cultivated land is not left unused or wasted (as required by the local laws mentioned earlier).

FEATURES OF MIGRANTS

There were 3.87 million migrants who resided in Beijing for more than one day in November 2002 (according to the National "dynamic monitoring investigation"), while 2.87 million of them resided in Beijing for more than six months. Statistically, they can be regarded as a part of the total population in Beijing. 58 % (or 2.24 million) of these migrants reside in periurban Beijing, 12% in the urban districts and 30 % in the outer suburbs and counties. These migrants are predominantly young and male (80 % in the ages of 15-39 and 62% is male). They are generally better educated than rural residents, but less educated than urban residents in Beijing. Migrants are primarily employed in the "low-end" services and labour-intensive industries: 55% of them are employed in services, such as restaurants, shops, recycling businesses, etc., 35% in manufacturing and construction, 6% as professionals, 2% in agriculture and the rest in other occupations. Although the share in agriculture is quite small, the total number of persons engaged in agriculture is fairly large, up to 62 thousand, which is larger than the total amount of local rural labourers in the near suburbs (55 thousand in 2002).

MIGRANTS' ACCESS TO LAND

The only way for migrants to engage in urban agriculture in Beijing is to rent the land from local village committees or local farmers. Two methods of renting were identified in the two case-study villages. With a higher economic profile, a larger population and lesser farmland, the Qinghe village committee has established a special office for developing most of its cultivated land under greenhouses. Subsequently, these greenhouses are leased under contract to local farmers and migrants to grow popular vegetables, such as tomato, chilli, eggplant, cucumber, etc. These vegetables are sold along the roadsides close to the greenhouse or at large free wholesale markets. The annual rent for such a greenhouse is between 6,000-8,000 *yuan* per *mu*, depending on its quality and available facilities (about 15 *mu* in a hectare). The annual rent for local farmers and migrants is the same, but the former can get back their share of the

The majority of agricultural residents in periurban Beijing are reluctant to farm

Two men who look after the greenhouse harvest cucumbers for sale

Cai Gaojian

Cai Gaojian

Vegetables are sold by the migrants themselves or by road-side vendors

land leasing revenue gained by the village committee annually. In Qinghe village, migrants rent the majority of greenhouses. The basic contract period is one year only, due to the uncertainty about the lease, but can be renewed

Leasing cultivated land to migrants brings many benefits

yearly. Most of these migrants are young couples from the rural areas of Henan province. In order to minimise costs, they usually leave their children in the home village with their grandparents, and build temporary dwellings beside the greenhouses. They can earn an annual net income of 8,000 - 9,000 *yuan* per person, which is 5 times higher than the average income in their home villages. According to the migrants, there are very few violations of contracts in Qinghe village.

New migrants usually build shabby living quarters beside their rented land

Cai Gaojian

The majority of the farmland (about 77%) in Tujing village has been allocated to its local residents, under contract, at the quota of 2 *mu* per person for free use. The rest of the land, equivalent to 450 *mu*, is collectively leased to migrants by the village committee. Those local households who are reluctant to do farming themselves can in turn lease their allocated land to migrants for agriculture use, either collectively through the village committee, or individually. The latter form is less popular and is usually refused by migrants for fear of contractual validity. The price for renting land is generally 800 *yuan* per *mu* per year, much lower than in Qinghe village, where the land is rented with the greenhouses intact. The basic contract period in Tujing is usually 5 years, much longer than that in Qinghe village. This is because most of the tenants (migrants) have to build the greenhouses themselves to enhance productivity of the land. Another reason is that the conversion of land for other uses is less eminent here. Like in Qinghe village, most of the migrants in Tujing village are also young couples from rural areas of Henan province, who leave their children behind and build temporary living quarters on the land they lease. They can also earn an annual income of 8000 - 9000 *yuan* per person. However, there are more cases of contract violations in Tujing village and migrants who rent land here face higher risks.

OBSERVATIONS AND RECOMMENDATIONS

Leasing cultivated land in Beijing to migrants by contract is an arrangement that brings many benefits to the local rural residents, the migrants and the society at large. For local rural residents, it not only generates additional revenue, but also more importantly, relieves their obligation for not letting the farmland stay unused or wasted. It also helps them to move on to higher paid jobs. For migrants, this practice provides a good opportunity to earn more money by using their skills. From society's point of view, the valuable farmland in the periurban area becomes more productive. Furthermore, the improvement of cultivated land slows down the process of urban encroachment in this area.

However, the methods of land leasing and the situation of the migrants should be improved. Generally, migrants feel safer in signing contracts with the local village committees rather than with individual farmers because village committees are the legal owners of land and the basic administrative unit. Further measures should be taken to guarantee the land tenure rights of migrants during the contractual period. The production and living conditions of migrants in agriculture also need to be improved.

Kano is a city with a population of between 2.5 and 3 million, which makes it the largest city in Northern Nigeria. Several studies have shown the significance of urban and periurban agriculture in the area and its contributions to improved nutrition, household food security, employment, etc. of city dwellers.

IWMI-Ghana

Vegetables are grown for the urban market

Optimising Agricultural Land Use in Kano

Urban agriculture is not a new phenomenon in Kano (Olofin et al., 1997). It began long before the 1960s in some parts of the city, and became widespread after the general economic downturn in the late 1980s, when the urban poor struggled to improve their livelihoods. However, despite the obvious gains of this practice, it has not been officially recognised. Rather, it is merely tolerated as a response to the socio-economic conditions faced by many poor individuals (Binns et al., op cit.). Yet, as Lynch et al. (2001) suggest, the promotion of an 'enabling environment' in which agriculture in the city is encouraged and supported remains crucial. Of primary concern in this context is a land tenure arrangement that would encourage full participation of the urban resource poor.

Three sub-systems of field production have always been present in the urban and periurban fringes of Kano: dry season production of market gardening crops, wet season production of staple food crops and permanent fruit orchards. Of these, the permanent orchards usually belong to well-to-do individuals. Also, animal rearing (poultry, fish, cattle etc.) is undertaken by the middle and upper classes of the society who have larger compounds. Thus, dry season horticultural crop production and wet season production of staples, actively pursued by the urban resource poor, are discussed in this article.

This contribution summarises the findings of a sequence of research studies in which the authors have been involved. In particular, the findings consist of the 1996 collaborative research by Natural Resources Institute, Chatham, England, and the Department of Geography, Bayero University, Kano, Nigeria that was commissioned by the DFID (Olofin 1996, and Olofin et al., 1997); the report of three scientists on a re-visit to one site in 2001 (Lynch et al, 2001); the report of three other scientists to more sites in 2002 (Binns et al., 2003) and the author's current (2003) field observations in four sites.

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CROP PRODUCTION

A study by Olofin (1996) established that especially men, between 30 to 70 years of age, undertake urban crop production during both the dry and wet seasons. These men live in simple traditional houses and most have received Islamic instructions. Nearly 98% of the 109 men interviewed during this study were urban resource-poor. Less than 5% are migrants from other parts of Nigeria. The agricultural inputs are rudimentary – hoes, machetes and sickles as implements, and seed from their own stocks or bought on the open market. A few had access to improved seeds, fertilizers and pesticides. Many relied on household refuse, animal droppings and ash for manure.

Vegetable production by irrigation during the dry season is undertaken on flood plains, floodable low terraces and depressed, seasonally flooded upland areas, subject to the availability of water either on the surface or in dug up ditches. Highly polluted urban waste streams are used for irrigation throughout the year in several sites, supplemented by a few tube wells. Flooded low terraces and upland depressions are irrigated with available water usually at the beginning of the dry season. Depending on water availability they may be irrigated towards the end of the dry season, after which the crops are left to mature with the onset of the rains. Otherwise, the plots are left fallow after the first crop for the cultivation of staples during the wet season.

Plot sizes are very small, averaging 0.2 ha per plot in the intra-urban areas and 0.5 ha in suburban areas. However, about half of the respondents had more than one plot. Some of these urban sites are vacant lands belonging to Government. It was clear in 1996 that in five of the seven vegetable production sites investigated the access to land was insecure, and the report

expressed the fear that: "indeed, urban sprawl may soon catch up with the other sites ... if appropriate steps are not taken" (Olofin 1996: 2).

A study of one of the risky sites in 2001 (Lynch, et al., 2001) confirmed that about a quarter to a third of the land that was available for cultivation in 1996 was no longer available for that purpose in 2001. Current observation at that site has shown that more than half of the 1996 space is no longer available for urban cultivation. Indeed, the two most extensive sites at the edge of the urban area where tenure appeared to be private and safe in 1996 are now under great threat. About half of the area at these sites has now gone.

ACCESS TO LAND AND TENURE ARRANGEMENTS

A variety of land tenure arrangements for urban agriculture are common in Kano. These range from individual or family ownership (where tenure is secure) to permitted and illegal squatting (where

More than half of the 1996 space is no longer available for urban cultivation

tenure is insecure). In some locations, farmers utilise open spaces adjacent to government undertakings such as railway lines and offices. Most of the farmers feel that they 'own' their plots in the sense of having user rights over them. This view, one believes, is borrowed from the pre-colonial (and pre-Islamic) times when land tenure in Northern Nigeria was purely communal, and individual community members had the right of use to any land. Thus, once an individual used a particular piece of land, he had the right of occupancy that excluded any other member of the community. The land would revert to the community only when the individual ceased to use it. This is why Ega (1987) argues that the rights to use land at that time was at two levels. The community had rights over all unclaimed land, and the individual had complete control over his holdings. It is also a fact that in this period entitlement to land was exclusively through kinship and membership of the community. This Northern Nigerian land tenure arrangement is what the Land Use Decree (No. 6) of 1978 (enacted into law in 1979), more or less, extended to the whole of Nigeria. By the provisions of this Act, access to land, particularly in the urban area, is vested with the State Governor and the decree makes no provisions for the use of urban land for crop production. Agriculture is associated only with rural land use, and urban land development means the construction of urban structures.

This policy (as presented in the Act) has encouraged governors to deprive urban cultivators of access to land through compulsory acquisition of land and ejection, without compensation (except for mature crops), of urban cultivators from acquired/occupied sites. Indeed, some of these governors have no regard for the many functions of green belts within the urban environment because they allocate them for urban construction.

Unfortunately, the permission given for cultivation of vacant parcels of land that are unsuitable for urban construction (such as in areas of aviation installations, aprons of railway tracks, etc.) is not formal. It has not been written in any legal document, or authorised by any government gazette. But, it was part of a speech that ushered in "Operation Feed the Nation" in 1976 and re-echoed during the launching of the "Green Revolution" in 1980, encouraging Nigerians to cultivate all available land in the cities and in their backyards. Thus, the cultivators of such public vacant lands are mere squatters whose tenure is very insecure. Yet mutual benefits have been established by such use. The cultivators improve their livelihood and the relevant government establishments agree that they have saved money by not having to do periodic clearing. The anxiety that such unused places could become suitable hideouts for criminals and other undesirable elements has also been removed.

ACCESS TO WATER

Both cultural and Islamic beliefs state that water belongs to God. Thus, a man has access to any source of water on the land he cultivates. The problem here is that many sites in Kano depend on urban waste streams for irrigation. The urban resource poor cannot afford to construct tube wells or wash bores to obtain better-quality water. They operate on an individual basis, and the insecure nature of their tenure precludes the formation of cooperative groups that could assist them in obtaining agricultural loans and other inputs from governmental sources.

BETTER ACCESS TO LAND AND SECURED TENURE

The issue of access to and security of cultivated land in an urban environment is controversial. Urban developers would not be pleased to leave large urban spaces vacant while millions of urban dwellers crave for decent shelter. However, it would be useful to identify urban areas that are not suitable for urban construction and reserve such areas for urban cultivation. Flood plains and floodable depressions come first to mind because urban constructions that block natural channels and artificial drains have resulted in devastating floods within urban areas in recent years, particularly in the site re-visited by Lynch et al. (2001).

In view of the mutual benefits cultivators and relevant government establishments have derived from the informal agreement allowing the cultivation of urban public vacant lands, this should be made formal and the occupants assured of their tenure for a reasonable period of time. It is certain that with assured tenure the farmers would be encouraged to form cooperative groups that would qualify them to obtain government assistance, which in turn would give them financial strength to construct tube wells and buy water pumps to source groundwater for their production. They would also use their plots in a more sustainable way.

As things stand in Kano, the urban poor farmer would only become poorer in the near future unless policies and strategies, such as the ones suggested, are put in place to secure better access to land and to assure security of tenure.

REFERENCES

Binns, J.A., Maconachie, R.A., Tanko, A.I. (2003), Water, Land and Health in Urban and Peri-Urban Food production: the case of Kano, Nigeria, *Land Degradation Development 14*, 431-444

Lynch, K.; Binns T. & Olofin, E. (2001) Urban agriculture under threat: the land security question in Kano, Nigeria, *Cities*, Vol. 18, No. 3, 159

Olofin, E. A. (1996) Highlights of the Field Production Survey, Paper presented at the Seminar on Horticultural Activities in Urban and Peri-Urban Kano, Organized by NRI in Kano, 7 pp

Olofin, E.A., Fereday, N., Ibrahm, A.T., Aminu, S.M., Adamu Y. (1997), *Urban and Peri-urban Horticulture in Kano, Nigeria*, Natural Resources Institute: Chatham

Agriculture in Kampala is practised mainly in valley slums where the poor live in informal settlements. Although urban agriculture offers easy access to services and markets, gaining access to land to grow food and rear animals is a challenge for the urban poor.

RUAF Video

Many poor people lack land ownership

Access to Land for Urban Agriculture in Kampala

Urban farming is becoming an ever-present, complex and dynamic feature of the urban landscape and socio-economic reality in Uganda and the rest of Africa. Whereas urban agriculture in some African cities is a matter of a thriving livelihood culture, in Kampala it is an initiative to lessen the growing poverty. However, it is also an activity that puts pressure on resources and the cohabitation of town-dwellers, vegetable growers and livestock farmers can lead to conflict.

THE EMERGENCE OF URBAN FARMING

In Uganda, urban farming started in the early 1970s. Since then the urban population has grown considerably and an increasing number of vulnerable households have turned to urban cultivation as an alternative source of food, as a means of saving on food expenditure, and as a way of generating cash income. Initially urban agriculture was mainly a survival strategy of the poorest of the urban poor, but increasingly farming activities have gained importance among the urban poor, and among a significant proportion of low- and medium-income earners.

Kampala city has a population of about 1.5 million inhabitants, nearly 14% of the total Ugandan population. Of the Kampala inhabitants, 40% consume either a crop or animal product produced in the city, while 70% of all poultry products consumed are produced within the city (Ssebaana 2002). Women and children are primarily involved in urban agriculture in Kampala, which includes farm chores like weeding, planting and harvesting. In contrast, men prefer quick income generating projects. A small proportion of urban agricultural produce is intended for sale, while the majority of it is for home consumption.

Urban migrants often settle in informal, low-income areas with limited opportunities for income generation. Their major cash crop is the cocoyam. Other crops grown include Amaranthus (pigweed), finger millet, cowpea, green pepper, and sugarcane. The urban poor cannot afford fertilisers and resort to other means such as bio-fertilisers (Tithonia diversifolia or Mexican sunflower). In the urban areas, high-value crops such as vegetables are in demand. Selling the surplus vegetables may lead to substantial income savings and subsequently the ability to purchase or rent land.
Often, the poor people form income-generating groups or projects to meet their basic needs and to offer assistance to the community. These groups comprise mainly of women and have cultural names like "*Tweyambe*" meaning "self-help".
Urban farming is a survival strategy for many of the urban poor, yet their farming systems are poorly understood and supported by extension services.

ACCESS TO LAND BY THE URBAN POOR

Land in Kampala is held and administered in a complex web of management regimes, which constrains access and ownership. The British administrators introduced a system of land tenure in 1900, under which land was divided into mailo (from the English word mile) as private land belonging to the Ganda King and chiefs and public (crown) land owned by the Queen of England. Most urban poor settlements and activities are on Mailo, a form of freehold where individuals control access, irrespective of their capacity to develop the land. The majority of the poor, gain their access to land as customary tenants on privately owned land in periurban areas, a form of land tenure unique to Buganda known as *bibanja* (plots) on mailoland.

Annual crops are commonly grown by many poor people as they lack land ownership rights and gain access to land in poor areas like wetlands, road and railway reservations or waste disposal sites. Others utilise their backyards or encroach on undeveloped land left to fallow by landowners. Despite being squatters, the poor have usufruct on the plots they farm. Landlords and city authorities do not allow squatters to grow perennial crops, yet the poor squatters stand to be evicted at any time if the occupied land is going to be "developed". Security personnel, i.e. policemen, claim that crops such as bananas and maize grow tall and create hideouts for thieves. Therefore, Kampala City Council personnel often slash such crops grown by poor people. This means that the poor lose their livelihood, their continued income and food security for their families. Other government authorities such as the Electricity Board often slash crops that are found growing in places where the electricity lines run.

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ACCESS TO LAND FOR URBAN AGRICULTURE

Land for urban agriculture is accessed in many different ways (Nuwagaba et al, 2003): squatting (46%), borrowing (34%), inheriting (11%), renting (5%), co-owning with spouses (4%). Currently in Uganda, the spouse co-ownership of land is a contentious issue particularly among gender activists who contend that women have for long been left out from the benefits of family resources. The majority of urban farmers in Kampala (60%) indicate that they are actively searching for land, and mention to have plans to borrow from government or relatives, or seek funds to buy.

Land in Kampala is administered in a complex web of management regimes

The existing institutional procedures for accessing land in Kampala city are highly bureaucratic, time-consuming and complex. They intimidate urban farmers, who generally lack the knowledge, information and contacts to file an application for acquiring land. Urban farmers in their quest for farming land have often violated and contravened regulatory measures for allocation, utilisation and plot layouts. All this has been attributed to lack of policy responsiveness to the need for planning with urban farming in context.

URBAN POLICIES AND REGULATIONS

Urban farming has been found to function nowadays as a 'double-edged sword' with both nutritional and health as well as economic benefits. Despite this significant contribution, there is no substantive provision in the law that aims at streamlining informal sector activities such as farming in urban areas. Underlying the practice of urban agriculture in Kampala is the fact that it is technically illegal. The by-laws banning the practice are enforced erratically, and have little impact on urban farming.

Urban farming is also prohibited in 'high-density areas'. 'High density' is unrealistically defined as an area with more than two households per acre of land, whereas in most Kampala neighbourhoods there can be as many as 40 households on an acre of land. The 1964 Town Planning Act mandates the Local Urban authorities to enforce regulations for 'development control' in their areas of jurisdiction. In earlier years this Act provided the basis for Kampala City enforcement officials to harass those who carried out urban farming in the city, since the Act views farming as an activity at odds with the urban standards. In Uganda, the Plan for Modernisation of Agriculture (PMA) focuses solely on rural agriculture. However, the government lacks resources to provide enough extension services for this programme.

Although urban agriculture has no legal status in Uganda, city planners and national policy makers have recently recognised the central role of urban agriculture in the wider urban economy. In 1994, a section known as the Urban Agriculture Unit was established within Kampala City Council's (KCC) Production and Marketing Department. Formerly, before decentralisation of Kampala District, it was directly under the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). The broad objective of this Unit is to support and guide the communities in urban agriculture and to ensure household nutrition and food security. A number of achievements have been made, like training of farmers in various crop and animal husbandry skills, and in domestic garbage management and re-use in urban agriculture. Financial support to this Unit by KCC is still relatively small.

Since November 2000, Kampala city authorities, researchers and donors have been working together to address the challenges of urban agriculture under the Urban Harvest programme, led by the International Institute for Tropical Agriculture (IITA), which investigates urban agriculture in the livelihood strategies of the urban poor. A related Health Impact Assessment of urban agriculture in Kampala has been undertaken by a Health Coordinating Committee (HCC), established in June 2002, with active involvement of Kampala City Council (KCC). There is an active link between research and policy making. KCC has accordingly legislated urban agriculture in Kampala City (Urban Agriculture Ordinance 2001). The ordinance provides for the licensing, control and regulation of crop farming and animal rearing in the city.

SUPPORTING URBAN FARMING

The present legal framework regarding urban farming is still far from supportive. The city authorities have made attempts to recognise urban farming but do not provide for the planning or zoning of such activities. Neither the former "harassment" approach nor the current "permissive" approach functions well. Up to date, the City Council needs to issue a permit for people to engage in urban agriculture. The urban poor are not aware of this, while the City prefers to provide licenses to agro-business entrepreneurs (e.g. large poultry farms). This simply means that urban agriculture is carried out without any regulation or authorisation. However, a specific and clear framework is needed to make urban agriculture sustainable and productive.

RUAF Video

Urban agriculture has no legal status in Uganda

A more pragmatic, multi-sectoral and integrated approach would include building partnerships with farmer organisations and other civil society organisations, capacity building, and the identification of zones where urban farming is permitted. Also linkages with programmes that focus on poverty reduction through urban agriculture including planners, agriculture specialists, environmentalists, and community development specialists are necessary. This approach would transform urban farming from an illicit practice to a much-appreciated and highly beneficial activity.

REFERENCES

Nuwagaba. A, Kyamanywa, C Kiguli, J. Atukunda, G, and Mwesigwa, D. 2003. Report on Improving the urban Poor's Access to Land for Urban Agriculture, funded by IDRC/MISR/MDP.

Ssebaana K. J. 2002 Key food security issues /challenges in Kampala city. World Banks Food Security Initiative on Feeding cities in the Horn of Africa workshop. Addis Ababa Ethiopia

African cities experience uncontrolled development and Bamako, the capital of Mali, is no exception. Its rapid growth catches town planners unawares and exceeds national budgets for support to urbanisation. Urban agriculture is one way to help to meet the increasing demand for food in the city.

IWMI-Ghana

The Land Issue and Urban Agriculture in Bamako

Insecure access to land is one of the threats to farming in the city, mainly due to the conflict between land for construction and land for farming. The former almost always gets the upper hand despite the fact that agriculture and market gardening are included in town planning.

In Mali, land without a (determined) owner belongs to the State, and the State determines land regulations, sharing out, and re-allocation of spaces (even agricultural ones). More than 75% of farmers in Bamako do not own the land they cultivate.

Nowadays, it is very hard to find vacant lands in Bamako. Landowners find it more profitable to transform their farms for construction purposes, and rent the buildings, which is more profitable and less risky than agriculture. However, producers may have access to land through (mostly temporary) loans, renting (which is expensive), or customary estates.

Access to land is further constrained by the attitude of local authorities, governors and officials of the city, who give little care to the development of urban agriculture in the city or even fear it at times. The authorities generally attach greater importance to agriculture in rural areas, and activities relating to the promotion of agriculture in proximity to cities are insignificant and even non-existent.

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URBAN AGRICULTURE IN BAMAKO

Urban agriculture involves market gardening, cereal growing and cattle breeding. These activities take place in the periurban and inter-urban spaces of Bamako, and they expand because of growing urban demand for foodstuff.

In this paper the focus is on land ownership in the district of Bamako, in relation to intra-urban agriculture. The constraints and specific assets of the periurban areas are different from intra-urban agriculture, and need to be analysed separately, to prevent erroneous analysis of the situation, but more importantly, to develop appropriate supportive action.

In the intra-urban area, competition for land is strong. The acreage under agricultural activities is reducing, and production modes with high added value are being intensified. In the periurban area, houses are built far from one another and are separated by non-built areas that are not allotted to?. In Bamako large agricultural areas are hemmed-in in the city, along the river Niger and along the railways. They are surrounded and bound by a dense urban fabric.

Urban agricultural spaces, especially market gardens cover an area of about 600 hectares, which is equivalent to 1.6% of the surface of the District of Bamako. They are unequally distributed over the six communities of the District. Market gardens are decreasing and only represent about 1/5 of their surface in 1960 (see map).

LAND OWNERSHIP

There are two ways of appropriating land in Mali: customary law and Malian common law. Customary law is a legal system based on rights of user and culture. Under this system land belongs collectively to a community. Land management is insured by legitimate and organised customary institutions that apply rules and decisions. Today, customary law is weakened by the social disintegration and the intermixing of populations. Furthermore, social prohibitions and the status of customary chiefs are threatened by the existence of new local authorities.

The rules of customary law are respected by Malian common law. In some cases, the new local authorities first appeal to the customary authorities for support or approval before taking decisions. However, modern management of land ownership has difficulty in departing from customary law. The land and Domain code – CDF (National and Land Code) makes property a basic principle; which is mentioned in other laws and regulations. In fact, the national estate involves areas of the public estate: private ownership issued on behalf of the State; private people or territorial communities; and the State's private estate. The shift of concession right into propriety right is made through the leasing of land ownership on behalf of the State, and through the transfer of the title deed on behalf of the purchaser in return for the payment of a price fixed in accordance with the price list issued by decree.

URBAN STAKEHOLDERS

Decisions are taken at three levels in the District of Bamako: the High Commission of the District of Bamako, town councils and influential persons. Each level represents an essential decision-making power. They do not act separately, each level is important, and all levels are inter-connected. The High Commission is the nerve centre for issues related to land management. The governor delegates a

part of his powers to communities for estate management. The mayor is responsible for defining and applying the district policy when it comes to managing the estate property of his district.

Despite the city authorities' efforts in the field of estate management, influential people still have an important role in the allotment of space. Not only do they decide (even unofficially), but they also contribute, with local authorities, to a prompt hearing of estate cases through landowners.

LAND AND OCCUPANCY STATUS

Market gardens are located primarily on lands under the system of customary law. These are lands granted for customary management by colonial authorities to founder families and influential people in the city, particularly the Niarés and the Tourés. Secondly, market gardens in Bamako are found on State or individual properties. These are the State land reserves (which are not serviced), and the State's public and private estates located in districts, particularly in industrial and residential areas. A third category is spontaneous occupation, which concerns registered or not registered lands that are not presently exploited, such as fringes, areas liable to flooding or on which no building can be erected, mainly located along the valley of the River Niger. Such occupation of lands is not legal.

Land for agriculture can be rented or lent. To "legal owners", the farmer is a mere tenant of the land, bringing capital and labour to the farming lease. Thus, the farmer takes entire advantage of the produce of his land. But this way of access to land goes with land royalties paid to the owner as renting fees. The amount of the royalties, fixed after a general agreement, varies according to the land value of the site and the area of the plot. Parcel lending is the second most popular way of getting access to land. Generally, the reasons for the market gardeners to leave their lands are construction, new employment, and seizing of parcels due to unpaid rent.

PLAN OF ACTION TO PROMOTE URBAN AGRICULTURE

The situation as described for Bamako and other cities is considered to be a major challenge for West African cities. The African Urban Management Institute (IAGU) started a series of consultations and research activities in seven capitals in West Africa (Dakar, Abidjan, Ouagadougou, Niamey, Nouakchott, Cotonou, and Bamako). The programme is aimed at enhancing sustained development of urban agriculture and enabling national committees to carry out a series of activities.

In Mali, one such activity is research on land ownership in urban agriculture, which aims to organise a local consultation in Bamako on the links between the land issue and the development of urban agriculture, and to assist in the development of a municipal plan of action (with different components, one being the organisation of community fora). One of the meetings gathered different stakeholders from the departments of health, environment, estate, and town Planning and decentralisation; market gardeners, exporters of fruits and vegetable; researchers, and NGO executives. This meeting led to setting up of a Malian network for the development of urban agriculture and the Inter-sectoral monitoring committee (CIS) for the sustainable development of urban agriculture in Bamako.

The plan of action highlights management, institutions and regulations, means of production, and socio-economic and environmental aspects, and will enable the Malian political authorities to further enhance the development of urban agriculture.

CONCLUSION

Administrative and municipal decision-makers must develop, with the active involvement of market gardeners, a realistic policy for the management of the unregistered land (under customary law) along the banks of the Niger River. The fluvial area in Bamako is no one's property. The surrounding districts could also expand their agricultural surface. Every district could then carry out its own land management policy, above all in this context of decentralisation.

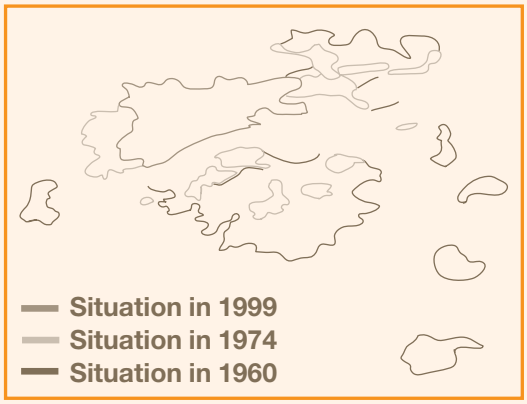

Figure 1
Decreasing market gardens in Bamako

Municipalities (as owner of the lands) should put at the petitioners' disposal parcels of land strictly for market gardening purposes along the river. Access to this area should be subject to royalties. A municipal tax on land could be deducted.

The local authorities are responsible for the preliminary technical planning of the site, like the demarcation of the land, the boring of watering places if need be, and the settling up of water supply utilities.

The government should pass a law restricting the area for cultivation within the valley, or include a policy for zoning. This law can then be used to prohibit the construction of buildings of any kind at a distance of 25 five metres from the upper limit of the waters. The same law must clearly indicate the use of the land.

These areas where market gardening is promoted must be located in or on the fringes of the city, reducing transport costs and assuring fresh vegetables at affordable prices.

The projects and programmes that aim to create and conserve a market gardening belt around the city cannot overlook the problematic subject of land. Both the use of the land as well as the acquisition of land titles must be encouraged, with assistance from the administrative authorities.

REFERENCES

Ministère des Affaires Etrangères – DGCID, 1995 L'Agriculture Urbaine en Afrique de l'Ouest.
M Bertrand, 1994 La question Foncière dans les , Villes du Mali Marché et Patrimoines.
Ministère de l'Urbanisme et de l'Habitat, 1995, Schéma Directeur d'Aménagement et d'Urbanisme de2eme Révision, Bamako et Environs
C. Coulibaly, 1997 Problématique Foncière et Gestion des Conflits en Afrique Noire.
Division de l'Assistance aux Politiques 1996 Analyse de la Sous-Filière Maraîchage péri-urbain.
D. Zalle 1997 Le Maraîchage Intra-Urbain à Bamako

IWMI-Ghana

Access to low-cost water is a key factor affecting farmers

Access to Land and Water for Urban Vegetable Farming in Accra

There are two major categories of urban crop farming in Accra: *household gardening*, which takes place in and around homes, and *open-space farming*, which takes place on lands some distance away from human dwellings, along drains, stream banks, road sides, abandoned waste dumps, around public buildings, wetlands etc.

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Tenure arrangements on urban open spaces vary. In general, no open-space farmer owns the land cultivated, and hardly any of them pays a fee. Most of these lands are owned by the National government, Municipal authorities, or individuals. The situation is different in periurban areas where farmers might own their land or are engaged in 'abusa' and 'abunu' tenancy arrangements (share cropping). In the latter case, farmers give a third and half respectively of the total farm produce to the landowner as payment for the use of the land (Obosu-Mensah, 1999; Asomani-Boateng, 2002).

In urban Accra, farming on open spaces takes place without formal authorisation. Zakaria *et al.* (1998) described the situation as follows: "As the land is not put to any other use, the owners do not bother when farming activities are carried out on such lands until the land is needed to serve some other purpose. Farmers may or may not be given notice to quit the land to make room for any development." Under such insecure tenure conditions, farmers do not invest in farm infrastructure (such as wells or cement ponds), soil conservation or long-term fertility improvement.

ACCESS TO LAND FOR FARMING

There are two main ways by which farmers can gain access to land for farming in both urban and periurban areas of Accra. These are the ***formal*** and ***informal*** access. Though Accra has a formal land delivery system, in the urban areas, this is more or less closed to agricultural uses. In the periurban areas where it is expected to be open to agricultural uses, the procedure is complex, inordinately long, not appropriately efficient or cost effective (Flynn-Dapaah, 2002). In addition, most traditional chiefs in charge of their "stool lands" prefer to sell plots for good prices than to allocate lands for their farming community. For these reasons, farmers in and close to Accra prefer the use of informal arrangements to access land for farming.

A number of informal land arrangements are prominent in Accra. With one arrangement, the land being cultivated is owned or controlled by a government agency that voluntarily gives it out, sometimes through the mediation of a third party, to farmers for temporary use (Obuobie, 2003). In terms of land access from the perspective of property regimes, lands cultivated under such a tenancy arrangement could be called "public, open-space property" (Flynn-Dapaah, 2002) and include undeveloped spaces around public institutions, along drains, banks of streams and rivers, wetlands, etc. Farmers may or may not be given any notice to quit the land to make room for other development.

The benefit to landowners is that continuous cultivation keeps the land clean of weeds and prevents encroachment as well as urban sprawl as the cultivators provide

Several informal land arrangements are prominent in Accra

the "on-site enforcement against unofficial settlement"(Obuobie, 2003; Flynn-Dapaah, 2002). This is mostly practised by open-space farmers in the low-density areas of the city. These farmers are either engaged in seasonal farming (growing crops such as maize, tomatoes, pepper, okra, groundnut etc), relying entirely on rainfall or are engaged in irrigated vegetable farming (growing crops such as lettuce, cabbage, cucumber, spring

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Wastewater can be used for irrigation of the crops

onion, cauliflower, green pepper) when there is a water source nearby.

There exists another similar informal arrangement, only in this case an individual or a private organisation owns the land. Access to land is either through direct negotiation involving the prospective farmer and the landowner or caretaker, or through the mediation of a third party. This arrangement is used both by urban and periurban farmers. Household farmers are normally tenants of the houses and cultivate the land around it and therefore do not pay for such cultivation. Some open-space farmers pay a token depending on the individual landowner. But more often than not individual landowners, like government agencies, view farming on their land as a way of preventing encroachment. Periurban farmers engage in share cropping arrangements with individual landowners as a means of payment for cultivating the land.

Access to land could also be obtained through customary land rights. Contrary to other sub-Saharan African countries, this form of land tenure is legally recognised in Ghana according to the National Land Policy and the Land Title Registration Law (PNDCL 152). Customary land right is mostly found in the Eastern part of Accra, between Labadi, the Ghana International Trade Fair Centre, Burma Camp and Teshie. The owner of the land is the *La stool*, which is one of the customary Ga chieftaincies in Accra (Zakariah *et al.,* 1998). The farmers on the La stool make a customary claim to their holdings which were acquired through inheritance following a construction of social/political history based upon the rights of first occupation or proving kinship to the first occupier (Flynn-Dapaah, 2002).

For sometime now, there have been a series of land conflicts surrounding the ownership and right of access to some of the La stool lands. Although Ga farmers continue to farm on inherited La stool lands behind the trade fair centre and adjacent to the Burma camp military base, much of the lands they claim as their own has been officially earmarked for the military, which has recently revoked its interest in the land (Flynn-Dapaah, 2002). Flynn-Dapaah (2002) reported a representative of the Department of Town and Country Planning indicating that most of the land will be re-zoned for housing, which endangers the farmers' livelihood. The Ga farmers are determined to contest any compulsory claim to the land, since they have never been compensated according to the legal requirements for compulsory acquisition of land. But city officials claim the same land has already been zoned as a green belt (Flynn-Dapaah, 2002; Obuobie, 2003). In fact, parts of the area have a very high groundwater table and are unsuitable for building purposes.

With the exception of farmers cultivating on lands under high-tension electrical cables at Dzorwulu (an open-space farming site), and household farmers who have rented the houses and land on which they cultivate, none of the urban farmers in Accra are known to possess any document supporting arrangements on cultivation of the land. The Accra Metropolitan Assembly (AMA), the city authority, and its municipal Food and Agriculture Directorate, which is part of the decentralised Ministry of Food and Agriculture (MoFA-AMA), are currently developing legislation to create green zones specifically for urban and periurban farming. Building permits can be refused in designated green-belt areas to give existing farmers the land security they need. The success of this initiative will depend largely on the value of the land.

ACCESS TO WATER FOR FARMING

Apart from land, availability and access to low-cost water for farming in the urban and periurban areas of Accra is another key factor affecting farmers. Water access allows vegetable production in and for the lean season and is crucial for profit generation. Household farmers use mainly pipe borne water and *greywater* (water from bathrooms and kitchens); open-space farmers use drain water, streams/rivers, pipe borne water and hand-dug wells, in decreasing order; periurban farmers rely mainly on rainfall and streams/rivers.

There are no formal procedures that farmers follow to get water for farming. Pipe-borne water is perceived to have the best quality,

but is expensive and therefore unaffordable to many. For household farmers, the houses in which they live are usually connected to the city water supply system. Though pipe-borne water supply is meant for drinking, cooking and other domestic or industrial uses, household farmers may extend it to watering of perishable crops and pay for it. Maize and other staples are not irrigated. However, due to the difficulty in meeting the increasing domestic and industrial demand, the Ghana Water Company Limited (GWCL), has cautioned the public to put a stop to the use of treated water for irrigation purposes. The alternative can be *greywater.*

Open-space farmers frequently irrigate their crops with polluted surface water. They locate their farms along major drains and streams to access water for irrigation. Each farmer controls, more or less, the portion of the drain or stream that is within the span of his farm and regularly maintains water drawing points within the drain or stream for fetching water effectively with watering cans. But there could be also two or more farmers drawing water from a given point along the drain. In the wet season when there is enough water in streams/rivers or drains, every farmer is free to fetch water from any point along the drain or stream but there are restrictions in the dry season, which sometimes lead to conflicts. Stream/river and major drains have continuous flow and farmers pay no fee for using the water. Farmers hardly use protective clothing, although some of the drains contain pure and untreated wastewater during the dry season. Due to tenure insecurity farmers show little interest in infrastructure to increase consumers' safety (e.g. via on-farm wastewater treatment ponds).

It is envisaged that as soon as tenure security is achieved, farmers would invest in wells or on-farm wastewater treatment, where through sedimentation or filtration the level of faecal contamination of the water could be reduced (Drechsel et al., 2002).

Concerned with consumer safety and the health of the city dwellers, the city authority, AMA, enacted a by-law: "No crops shall be watered or irrigated by the effluent from a drain from any premises or any surface water from a drain which is fed by water from street drainage" (Local Government Bulletin, 1995). This concerns especially those vegetables and other crops likely to be eaten raw. Compelled largely by lack of affordable and good quality water for irrigation, and sometimes by the nutrient value of wastewater, the farmers continue to grow vegetables with wastewater and the by-laws are not enforced for reasons including lack of sufficient personnel and finance.

Open-space farmers using piped water are in groups and share the bill according to the number of beds each farmer manages. A farmer wanting to join a group has to discuss with the group leader and agree to the approved agreement for sharing water bills. Again, due to increased domestic and industrial demand, the GWCL is in the process of disconnecting farms connected to the pipe-borne water supply system. A personal visit to some urban farming sites (between August and September, 2003) revealed that a number of farmers could cultivate only part of their field mainly due to the lack of sufficient water. In view of the problem of water availability and accessibility for farming, the MoFA-AMA directorate as well as the Council for Scientific and Industrial Research (CSIR) in Ghana suggested exploring the option of ground water use in urban farming.

THE DIMENSION OF GENDER

There are some gender differences in irrigated vegetable farming. It is an established fact that in Accra, and other cities in Ghana, nearly all the farmers are men (Obosu-Mensah, 1999). Women dominate the marketing of the produce with a few men playing the role of wholesalers and very few found as retailers in markets. A focus group discussion and interviews with some key informants (male and female farmers) revealed a number of reasons for this gender division. They include (1) the arduousness of farm work, especially land clearing, land preparation, carrying watering cans for watering and spraying; (2) general lack of interest in farming and (3) cultural definition of gender roles-men do the farming and women do the selling. The study further revealed that, unlike in rural areas, there is no gender bias in term of access to land and water for urban farming.

RECOMMENDATIONS

The majority of urban and periurban farmers in Accra do not own the land on which they cultivate. Access to land is mostly through an informal arrangement.

Open-space farmers often irrigate their crops with polluted surface water

Almost all household and open-space farmers do not pay any fee for cultivating the land but most periurban farmers do, usually through a traditional arrangement. Equally important for cash generation is water access. However, availability and access to low-cost, good quality water for irrigation purposes raises colossal difficulties.

In the light of this difficult and insecure situation it is reasonable to suggest that the agency responsible for agriculture in the Accra Metropolis teams up with farmer groups to seriously address problems of land tenure. Urban authorities could provide protected user rights to cultivators, especially those who guard the city against urban sprawl and encroachment. One major issue would be to agree on a minimum period (in years) a farmer is allowed to cultivate on a piece of land belonging to the municipal government or a public institution. This could be done through dialogue on a multi-stakeholder platform.

REFERENCES

Asomani-Boateng R (2002) Urban Cultivation in Accra: An Examination of the Nature, Practices, Problems, Potential and Urban Planning Implications: in Habitat International Volume 26, Issue 4, December 2002. Pp: 591-607.

Drechsel, P., U.J. Blumenthal and B. Keraita. 2002. Balancing health and livelihoods: Adjusting wastewater irrigation guidelines for resource-poor countries. Urban Agriculture Magazine 8: 7-9

Flynn-Dapaah K (2001) Land Negotiations and Tenure Relationships: Accessing Land for Urban and Periurban Agriculture in Sub-Saharan Africa. Cities Feeding Report Number 36.

Local Government Bulletin, 1995. AMA (growing and sale of crops) Bye-laws, 1st September 1995. Ghana Local Government Bulletin Volume 19, page 190-191

Obosu-Mensah K (1999) Food production in urban areas. A study of urban agriculture in Accra, Ghana. Ashgate, England.

Obuobie E (2003) Institutional Aspects of Urban Agriculture and Wastewater use in Accra, Ghana. Unpublished M.Sc. Thesis submitted to Wageningen University. Wageningen, The Netherlands.

Zakaria S, Lamptey MG and Maxwell D (1998) Urban Agriculture in Accra: A Descriptive Analysis. In: Amar-Klemesu M and Maxwell, D (eds) Urban Agriculture in the Greater Accra Metropolitan Area. Final Report to IDRC.

IWMI-Ghana

Easy access to land means access to food, while limited access often leads to food insecurity, and to a strong sense of anxiety for the future. This article focuses on the differences between locals and migrants in the town of Divo, Côte d'Ivoire, and points out the consequences that access to land has on their lives

People often have small home gardens or have some land just outside the town

The Problem of Access to Land in Divo

The study was carried out in the urban area of Divo, situated in the southern part of Ivory Coast. Divo has a population of about 100,000 and the typical climate of tropical rain forests, with an average annual rainfall of 1950 mm. The vegetation surrounding Divo consists mainly of forest remnants, the shrubs, and coffee, cocoa and palm plantations.

THE URBAN AREA OF DIVO

According to the 1998 general population census of the Ivory Coast (RGPH, 2001), the population is divided into 8 different religious groups and more than 60 indigenous ethnic groups. The predominant ethnic group in Divo and its province is Dida. By origin the Dida are hunters and depositories of land rights. At present there is a variety of other ethnic groups in Divo who have migrated from different parts of Ivory Coast or from bordering countries since 1950.

Although Divo was named "poste administratif" (administrative centre) at the beginning of the 20th century, it began its development only after 1955, when it became the regional capital and an important strategic commercial centre of the entire south of the Ivory Coast. The population density increased from less than 8 inhabitants per square km. in 1955 to 65.9 in 1998. In these years, the town of Divo has witnessed a great transformation. The fast urbanisation of Divo has led to a town, in which the central neighbourhoods are very densely populated, with an increase of green space towards the periphery.

An important reason for the growth of the town is migration. People from different ethnic groups came from Burkina Faso, Mali, Guinea, and from the north-west and centre of the country during the coffee and cocoa plantation boom, and continued even after due to Divo's strategic commercial position, its rich land and Dida hospitality.(Dureau, 1987). The result is a very cosmopolitan town, where the original inhabitants, the Didas, are no more than 15% of the population, a minority in their own land. Although there is no longer a clear-cut division of the town into ethnic groups, a predominance of some ethnic groups in certain neighbourhoods is observed.

Divo has grown substantially and since the 1960s, the municipality has been confiscating land from the villages bordering the town, dividing it into modular parcels of land, and subsequently selling the plots as building blocks..

Most of the people in Divo have at least one urban farmer in their family. Peripheral neighbourhoods have a low population density and land is often utilised by people to grow food crops. In central neighbourhoods people often have small home gardens or have some land just outside the town. Commonly produced crops are starches, such as yams, cassava, taro, rice, maize, plantains; and vegetables such as aubergines, tomatoes, chilli peppers, okra. Fruit trees such as mango and papaya grow spontaneously.

ACCESS TO LAND

Access to land is the main discriminating factor between migrants and locals, with high implications for the life of individual town dwellers. Didas are landowners and depositories of land rights, and migrants are not: they predominantly rent the land. Besides the chief of the village, there is a "chef de terre" (chief of the land), responsible for all land issues, who divides and distributes the land among the villagers. When the migrants arrived in Divo in the 1950s, they asked the "chef de terre" for some land, and obtained it very easily, because plenty of land was available. At present, land is scarce and the Didas are less welcoming. Now migrants mainly rent parcels of land from the local landowners and have to agree to their conditions. Those migrants who have arrived in the last five years have the most difficulty. They are obliged by the landowners to change their plot every 3, 4, 6 or 12 months, depending on the crop.

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In fact, landowners normally rent the land for only one harvest. Many migrants complain about the sudden termination of renting agreements immediately after the cleaning of virgin land. It is more and more common that owners do not rent the land at all because of the increasing land scarcity, and a "fear of the outsider". This situation has led to much instability in the lives of migrants.

Migrants do not have any decision-making power regarding cultivation of the rented land. They are not allowed to grow crops that are considered land-degrading and too nutrient-demanding and therefore food traditions cannot be followed. One informant stated: "I eat rice every day. I look at it only as something that fills my stomach, but nothing else".

The space surrounding the house is used differently by migrants and locals. The land-owning locals tend to fill the space around their house with flowers and ornamental banana trees. Migrants grow food crops instead so that they do not have to spend energy or money in getting to the field, and because they can choose to grow whatever they like without asking for permission from the landlords.

A detailed analysis was carried out to get a deeper understanding of how limited access to land affects the lives of the people of Divo. The analysis looked at the local policies regarding urban agriculture, the actors involved and motivating factors in the choice of crops.

LOCAL POLICIES

No clear planning or policy guidelines exist in relation to urban agriculture, and none of the officials interviewed seemed to be aware of the concept. They knew what a home garden and a small food crop field were (probably some even had access to this type of land, but none of them had a perception on the role of such gardens. Urban agriculture in Divo is neither discouraged nor promoted; it is not considered a formal activity.

The lack of a facilitative policy on urban agriculture is illustrated by the following facts. Firstly, urban plots are exclusively destined for house building. If nothing has been built on a plot within a period of three months the municipality can take it back. This means that there are many incomplete houses, or just foundations, plots, which are often used to grow crops. It is very common to see maize plants growing inside the shell of incomplete houses. Secondly, urban land (the plots where cultivation is not allowed) is much more expensive than rural land. Thirdly, the border between rural and urban land is where the customary and the official land rights meet. The "not well-defined" rights of the farmers in this "no man's land" often leads to conflicts, where the migrant (especially if not Ivorian) is very often penalised.

An attempt to draw up an inventory of land tenure rights was made in 1998. The new law, adopted on 23 December 1998, defines rural land (Stamm, 2000), but does not mention the boundaries of rural and urban land. The clarification regarding this border should probably be the first step towards recognising the role of Urban Agriculture in the general economy of the town.

ACTORS INVOLVED

Local urban farmers are mostly women. According to established gender roles, women are responsible for feeding the family. They grow their staple crops and vegetables, and buy fish and meat on the market. Their husbands very often are landowners, so most women use some of their husbands' land. **Migrant** urban farmers are both women and men. They practise urban agriculture as a means to survive. Urban agriculture is very often the second most important activity, as the salary from their main activity is not sufficient to cover all expenses. Many municipal workers, as well as shopkeepers, artisans (tailors, hairdressers, etc.) have a small plot and cultivate a staple crop, such as maize (which doesn't need daily work). Urban agriculture can be the migrants' main activity when they have not found a "formal" job. In this case, migrants grow crops such as rice, which requires more work, but has a higher market demand, while the type of land used is usually very cheap.

Access to land is the main discriminating factor between migrants and locals

Most urban farmers grow crops for family consumption. A very common answer to the question "Do you eat or sell the crop you grow?" was "I grow these crops to eat, but if it is a good harvest I sell a part to the market". This also means that people tend to grow what they need for their traditional meal, which differs per region.

Motivating factors for the choice of crops

While the local farmers may cultivate the crops needed for their traditional meal, the migrants' choice is often a consequence of practical reasons, related neither to their taste nor their eating habits. As landowners (or landowners' wives) the locals have the power of

IWMI-Ghana

Access to land is a constraining factor for migrants

Paola Iaccarino Idelson

It is very common to see maize plants growing inside the shell of incomplete houses

choosing what they prefer according to their taste and traditions. All the informants grew plantains and cassava, essential for their traditional daily meal, the "foutou". Migrants' choices, instead, are influenced by the landowners and it is very rare that these landowners allow their tenants to grow what they need for their traditional meal (peanuts for the people from the north; yam for people from the centre), as the owners consider these crops land-degrading.

urban farmers are mostly women

The crop choice criteria of the migrants are:

- crops that are easy and fast to grow;
- crops that have a big market demand;
- crops that can be easily stored and preserved, and thus used to feed the whole family for a long period;
- crops that can grow well on the land in question.

Maize is an example of the easy and fast growing crops. It is grown by many different types of people. In fact, maize does not require much work, and has a short harvest cycle of three to four months. Rice is considered as a source of money, because it can easily be sold at a relatively high price. It also represents a source of "food security", because it can be easily stored and eaten every day. It is often grown by low-income migrants, because of the low price of the "wet land" (bas-fond) used to cultivate this crop. Wet land, in fact, is not suitable for building purposes and is very often dangerous to walk on. Therefore, it is usually given away for free, or for a very low price. Moreover, hard work is necessary to cultivate rice, therefore migrants often cannot do parallel activities in order to improve their economic conditions.

Paola Iaccarino Idelson

Dida woman cultivating taro and yam for her "foutu"

DISCUSSION

This study shows how access to land is a constraining factor for migrants in Divo, and how it influences their lives. To the question, "What is the main constraint to your urban agriculture activities?", the majority of urban farmers replied, "The difficulty of finding land to rent", "The short renting agreements", or "Problems with the landowner". The implications of considerable importance are food insecurity, economic instability, impossibility to plan the future, and the need to change food habits.

Access to land can be a constraining factor for migrants and the development of social connections is essential for an easier access to land (Scott, 1993). The situation in Divo and the rest of Côte d'Ivoire could become even worse, as the growing sense of "ivoirité" (a sense of national belonging), that the new regime has been instilling for several years, is making things more and more difficult for migrants (Chauveau, 2000).

Yet, Divo's urban agriculture has remarkable potential. The large amount of land that is still free from buildings (especially in the peripheral neighbourhoods) and the high fertility of the land make the town of Divo an important source of food. All the people interviewed considered it advantageous to be able to grow food crops, even though often without proper management, and in a spontaneous and sometimes very precarious way. The less fortunate (for example recent migrants) manage to feed their family, despite not having enough money for fertilisers or pesticides and not being able to rent the plots for any length of time. The more fortunate, on the other hand, can even sell part of the produce, and, in this way, contribute to the well-being of their families.

In order to improve the potential of urban agriculture, formal recognition of the practice on the part of local policy is not only necessary, but essential. The policy framework should take the conditions of migrants into account and consider the possibility of differentiating the prices of land within the urban area. These two basic steps can make the already existent practice of urban agriculture more profitable for all categories of people in the town of Divo and for the town itself.

REFERENCES

Chauveau, J.P. (2000). *The land question in Côte d'Ivoire: A lesson in history*. Issue paper n. 95. iied, Drylands Programme, London.

Dureau, F. (1987). *Migration et Urbanisation. Le cas de la Côte D'Ivoire*. Edition de l'Orstom, Paris.

Mwamfupe, DG. (1994). Changes in agricultural land use in the peri-urban zone of Dar es Salaam, Tanzania. PhD thesis, University of Glasgow

RGPH, (2001). Recensement Géneral de la population et de l'Habitation, premiers resultats definitifs du RGPH -98. 2nd ed. Institut National de la Statistique, Abidjan.

Sanyal, B. (1985). Urban agriculture: Who cultivates and why? A case study of Lusaka, Zambia. In *Nutrition and Urban Agriculture*. United Nations University' s programme. www.unu.edu/unupress/food.

Scott, J. (1993). Urban agriculture: A response to the impact of structural adjustment measures. In Goodland A. et al. (eds) *Feeding Urban Africa*. Wye College Press, London.

Stamm, V. (2000). *The Rural Land Plan: An innovative approach from Côte d'Iviore*. Issue paper n. 91, iied, Drylands Programme, London.

Urban and Periurban Agriculture in Setif

In Algeria, periurban agriculture as such is not recognised. For a long time State policy considered only one form of agriculture, strictly controlled, regionally specialised and operating at the level of the national market. Thus small-scale agriculture around a city like Setif has not been differentiated from the larger-scale cultivation of cereal in the rural regions of its wilaya (governorate). With the liberalisation of economic policy since 1987, farmers have greater freedom in the orientation of their agricultural operations.

Abdelmalek Boudjenouia

Periurban agriculture delivers a growing portion of the city's supply of perishable goods

Setif is the main town of the wilaya, located within the central zone, and has a population of around 260,000 (DPAT, 2002). Urbanisation is nearly always at the expense of agricultural space. This article seeks to answer two questions: How does farming adapt to liberalisation and urban development? To what extent can periurban agriculture in Setif be considered *urban agriculture*?

Various transformations in Setif's agriculture are indicative of a passage from an agriculture that is planned at the national scale to one that has a local focus and is more responsive to the market. Periurban farmers are reorganising their operations to take advantage of the urban proximity.

SETIF'S AGRICULTURE: A LAND TENURE CRISIS

In the zones of Setif designated to agriculture, 92.6% is actually used for the purpose (9098 ha). Farming is highly diverse, both in its legal categories and in the combination of activities. Land tenure is the principal criterion for designating land for agricultural purposes.

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The State owns three quarters of agricultural land as a result of the confiscation of properties after the country's colonisation. Starting in 1987, the State land was restructured, either as individual agricultural operations (IAO), or as collective agricultural operations (CAO). The IAOs have an average area of 13.4 ha., while the CAOs average 201 ha. (about 31 ha. per individual farmer). Private property makes up the remaining 23.4% of the agricultural land around Setif. While farming activities on private lands are small (averaging 6.8 ha), they represent 87.7% of the legal operations and 57.7% of the farmers. Their number appears to have increased by one fifth according to the latest census, through the subdivision of existing operations; similarly, the number of CAOs have risen as a result of informal splitting of units among farmers with usufruct (According to the Agricultural Census of 2001).

The status of land held as IAO or CAO poses a serious political problem. While farmers would like to appropriate these properties the State wishes to maintain title to the lands (under the 1987 and 1992 reorganisation of the agricultural sector, Law 87-19, they fall under private rights and can be transferred). The main challenge for these farmers is to have full land ownership rights, just like private farmers, to freely sell the land or leave it to their heirs.

In terms of production, cereal production is dominant with its share of total crops increasing from 75.6 % in 1985 to 93.2 % in 2001. A significant growth in market gardening crops (particularly potatoes) has also been observed, particularly between 1993 and 1998, when it rose from 2.3 % to 8.0 %. The share of fodder has plummeted from 22 % to 5.4 %, while leguminous grains have disappeared altogether. Meanwhile, nurseries have started to appear in intra-urban communally- held vacant spaces. Animal husbandry occupies itself mainly with cattle, sheep and goats and poultry.

EMERGENCE OF A CITY-ORIENTED AGRICULTURE IN SETIF

Many families not included in the government's agricultural classification have traditionally maintained their gardens at the urban periphery for domestic production of vegetables or livestock (poultry, small herds grazing around the neighbourhood). While most of the products are consumed by the household, a portion is often sold nearby, on the roadside, or at the market. Income from agriculture is only part of the household income, as some family members also work in other sectors (trade, administration, education, etc.). Yet, agricultural operations play an essential economic role within families.

Periurban, and to a certain extent intra-urban, agriculture delivers a growing portion of the city's supply of perishable goods. This is the result of expanded, small-scale private agriculture: household gardening and animal husbandry, small-scale market gardening close to water sources (like oued (valley) Boussellam, and

the waste treatment plant), as well as dairy production (cattle and sheep). Apiculture, aviculture ornamental horticulture and nurseries are also spreading in response to increasing demand from urban residents for eggs, white meat, honey, plants for landscaping and house interiors, flowers, etc.

The waste treatment plant, put into operation in 1996, is interested to supply urban agriculture with its by-products, both treated water and the composted sludge (about 27 000 m^3/year). The water is still discharged into a oued, from which it is pumped to neighbouring farms. A distribution system is under construction, which would allow the irrigation of 800 ha of land for market gardening and fodder cultivation (and ultimately orchards). This would consist of 13 CAOs on 707 ha, one IAO on 43 ha, and 14 private farmers on 50 ha (ENPHE, 1995).

Although some farmers, notably market gardeners in the vicinity and tobacco growers further away, are starting to use the sludge for soil fertility management (averaging 40 users), this activity is still rather disorganised and barely promoted. Research is expected to clarify the specific risks (in transportation, spreading) of sludge and the proper conditions for its use.

Livestock waste is used for soil replenishment in cereal production. Other wastes such as by-products of poultry slaughterhouses crushed into meal by the Regional Avicultural Office of the East, or mouldy bread, gathered by children door-to-door and resold at the weekly markets, is used as feed for animals.

Urban agriculture delivers a growing portion of the city's supply of perishable goods

Essentially, the traditional agricultural systems in Setif remain and become integrated into the regional, or even national, economy. The private home gardens and micro-herds belong to the more customary forms of urban agriculture, and make use of smaller vacant spaces. Yet new production systems that build on new opportunities such as waste reuse, growing local markets for fresh produce, and the designation of greenbelts for agriculture (Fleury, Donadieu, 1997) are coming up.

The Setif master plan of 1997 classifies certain green wedges as agricultural spaces (oued Boussellam, and an area south of the city). This already points to a change of mind regarding agriculture in the city.

POLICIES TO ENHANCE THE DEVELOPMENT OF URBAN AGRICULTURE

The built-up area in Setif grew from 313 hectares in 1966, to 646 in 1974, 1780 in 1987, and will grow further by 1600 ha in the following 25 years, of which at least 60

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Traditional agricultural systems become integrated into the regional economy

% will be at the expense of agricultural space (DUC, 1995). The location chosen for this growth are those locations where the State is weaker in defending its domain. Although Algeria is encountering serious food supply difficulties, the fertility of the lands is not a criteria for urbanisation or not.

Urban expansion takes place through the creation of residential clusters and zones of non-agricultural economic activities on the urban periphery. Whether urban planning exists is questionable given the overbearing control exercised by State and elected officials in land-related decisions. Financial compensation for land as fixed by the State is considered inadequate by the landowners, which leads to legal conflicts and delays. The change in land classification from agriculture to urban is not well defined and control over property is weak, which makes it easy to divert lands to other uses. For example, the forests of Zenadia and Boussellam are used and recognised by local residents as green spaces. Even the recent designation of these areas as agricultural zones may not be sustained, as these spaces are still officially land reserved for development.

Agricultural use is further hindered by theft of crops, vandalism and trampling of fields.

ACCESS TO LAND

Despite the strong demographic growth in Setif, the food situation does not require spontaneous appropriation of lands for the establishment of household gardens. However, it is striking to observe new houses standing in the middle of empty fields in peripheral municipal areas, illustrating the need by many households to grow food.
After the restructuring of the agricultural sector in 1987, access to land has become difficult, particularly on government-owned lands. Instead, new forms of land tenure are emerging: ceding of inherited land to relatives; leasing of land, even among IAOs and CAOs; and annual partnerships between landowners and investors in crops such as potatoes.

CONCLUSION

Although periurban agriculture in Setif plays a modest, but growing, role in the city, it officially exists principally at the regional or national scales. Poverty as encountered in many African cities, which urges for subsistence urban agriculture to emerge, does not prevail in Setif. However, it would be interesting to further investigate the potential for a public policy that promotes household gardens in periurban popular housing areas, to meet food as well as recreational functions, spatial control and environmental functions. However, the proper integration of agriculture in urban planning requires recognition, specification of, among others, the role of agricultural spaces and activities in the urban system of Setif, and institutional strengthening. Such policies cannot emerge unless the current instability of real estate due to inappropriate laws, lethargy of the State, and superposition of local power is tackled.

REFERENCES

DPAT. 2002. *La wilaya de Sétif par les chiffres*. Direction de la Planification et de l'Aménagement du Territoire de la Wilaya de Sétif.
DUC. 1995. «Modèle de développement des villes de Sétif, El Eulma et Ain Arnat». Direction de l'Urbanisme et de la Construction de Sétif (Algérie).
Constantine (Algérie).
Fleury A., Donadieu P. 1997. De l'agriculture périurbaine à l'agriculture urbaine. *Courrier de l'Environnement*, n° 31.
General Agricultural Census of 2001 (not-yet-published).

UMP-LAC

Urban farmer drawing her plot diagrams in Governador Valadares

Optimisation of the Use of Vacant Land in Rosario

The project "Optimisation of use of vacant land in the Municipality of Rosario" forms part of the Municipal Urban Agriculture Programme, started in September 2002. Currently, 10,000 families are involved in this programme, and occupy more than 60 ha of private, institutional and municipal land.

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The project is implemented by the Secretariat for Social Promotion of the Municipality of Rosario, the National University of Rosario [1] and community-based institutions and NGOs [2]. The project has led to the formulation and institutionalisation of an enabling regulatory and legal framework, facilitating access to land for urban agriculture.

CONTEXT

The city of Rosario with 17,869 ha lies in the heart of Argentina's metropolitan area. According to the National Population Census of 2001, the city has a population of 1,164,800 inhabitants. During the last 30 years, the systematic enforcement of neo-liberal policies and the opening up of markets has led to the economic failure of most of the industries located in the area, as well as to the disappearance of a large number of small and medium enterprises, which have been historically important sources of employment. Over time, the area around Rosario has grown to accommodate irregular settlements, mostly inhabited by groups of poor families, as a result of the unemployment in the region and a high rural and urban migration from provinces in the north of the country.

Unemployment and the lack of social welfare coverage for growing groups of the population has driven NGOs to progressively assume a greater role in social development programmes, with urban agriculture as a significant part of their work. On its part, the municipality has gradually transformed its development activities into social programmes and policies aimed at tackling the situation of those groups excluded from the formal labour market. A major strength the city has in terms of the development of urban productive activities is the existence of numerous public and private vacant lots that can be converted into production areas for groups of poor families. Within this framework, facilitating land access and tenure of these productive spaces to low-income groups is a key to achieving their social inclusion in society.

This case and the one on Cienfuegos, Cuba (on page 26), are two experiences under the project "*Optimisation of Use of Vacant Land for Urban Agriculture*" promoted by the Urban Management Program for Latin America and the Caribbean (UMP- LAC). The project is simultaneously being carried out in these two cities and also in Governador Valadares in Brazil (see box). The project is part of the United Nations Program for Human Settlements UN-HABITAT and the United Nations Development Program (UNDP), the International Development Research Center (IDRC) of Canada and IPES – Promotion of Sustainable Development (Peru).

VACANT LAND AND ITS PRODUCTIVE USE

The city has a large amount of vacant or partially vacant land (in total 35% of the municipal area), much of which has potential for use in urban agriculture given its proximity to marginal settlements and existing housing projects. In fact, a high percentage of urban gardens –voluntary initiatives or fostered by the municipal Urban Agriculture Programme – are located in these areas and are managed by the people living in irregular settlements or shantytowns.

Most of the parcels currently used for

agriculture were "taken" without force by the people, or obtained from public entities or the municipality under an ordinance that promotes the temporary assignment of public and private land for community and productive use (3). The ordinance allows for establishment of community gardens on public and privately owned land. For public land, temporary user permits may be obtained from the relevant authorities. The owners of private land are invited to give their lands free of charge to the Municipality of Rosario for temporary use for a period of two years. During this period the private owner is exempted from paying property taxes for the land.

However, many of these vacant lots may not be suitable for agriculture, being degraded due to numerous urban activities, or being located in a place that makes productive use of the land not feasible–at least in the short term. It is therefore important to analyse the situation of vacant urban and periurban land and determine its potential for agricultural use.

In order for new and vacant areas to become urban productive spaces, reliable and up-to-date information is necessary. Such information facilitates consensual decision-making on the type of land to be used, and how and for how long it can be designated to urban agriculture within the

Mario Gonzalez Novo

Organoponics can be used on land unsuitable for open cultivation

framework of the present urban policy model. Participatory baseline studies makes it possible to determine the situation of urban agriculture in the city, and to study the potential of using non-built up land to sustain such activities.

DIAGNOSIS AND PLANNING OF LAND USE

During the first phase of the project, participatory baseline studies produced information on which an action plan was developed, outlining strategies for the optimisation of agricultural land use. The theoretical and methodological concepts "Suitability" and "Accessibility" were discussed and agreed upon during workshops with gardeners and municipal officials.

The following variables were selected to define "suitability" of the land: environmental quality; potential agronomic use; actual use (and previous use, if the area is used as a dump or for other hazardous activities); current regulations for land use; urban and city projects planned; water supply; and ownership.

The variables considered for the definition of "accessibility" of the land for urban agriculture were: legal status; current regulations of access and tenure; fiscal debt; public policies; and value of land.

The *legal status* of the parcels may vary: a significant percentage of the real estate of the city is under litigation (bankruptcy, unknown owner, etc.); other parcels are part of public land (donations, expropriations), or have been sold, leased or assigned to other institutions or persons. The existence and scope of duly *regulated* ordinances that foster, promote and formalise the assignment of land for alternative productive enterprises– such as urban agriculture - is another significant factor for the determination of accessibility.

Within the framework of *public policies*, it is important to determine the validity of or changes in projects included in the Master Plan, in the Public Housing Service, in Public Works, etc.; whether there are building spaces and areas designated for projected green areas or other specific uses. With respect to land policies, it is important to look at the location and status of land to be protected from illegal occupation.

The *value of land*, besides being an indicator of how attractive the vacant land is on the real estate market, has to be identified to enable all the planning areas to propose possible expropriations of land potentially useful for setting up strategic socio-productive enterprises, such as those related to urban agriculture.

IDENTIFICATION AND CHARACTERISATION OF MUNICIPAL NON-BUILT UP LAND

Non-built up land in Rosario has been classified on the basis of the typology of ownership and vacant

Vacant areas with a potential for urban agricultural were classified using the following typology:

Private spaces	1. Private vacant 2. Private with fiscal debts
Green areas	1. Squares 2. Urban / recreational parks
Institutional spaces	Hospitals, Schools, Jails, Public buildings
Public spaces	Municipal, Provincial and National Public
Areas not suitable for construction	1. railway tracks 2. river/stream banks 3. sidewalks/ roads/ quarries 4. corridors along highways /Beltway 5. Flood prone areas
Ecological reserves/protected areas	1. Ecological Reserves 2. Parks and forests
Treatment areas	1. Sanitary landfills

spaces, each requiring a different policy intervention:

The types of ownership used in the analysis were: Private, Municipal Public, Provincial Public, National Public, Railway company, Road company and others.

The identified lots have 5,000 m? or more in peripheral areas, and 2,500 m? or more in intra-urban areas. The 5,000 m? area is determined by the following calculation: *collectively cultivated area that provides possibilities for commercial agricultural production*. The 2,500 m? area is the total of basic units in intra-urban areas for community gardens (10 families).

The identification of "non-built up" lots was made on the interpretation of *digitised mosaics*. In this way a geo-referenced base map (in a Geographical Information System – GIS) was developed, which is used in the planning and monitoring of urban agriculture in the Municipality of Rosario.

PARTICIPATORY CONSULTATIONS

The diagnostic process combined different participatory approaches related to the search and organisation of basic information. Maps of non-built up land were prepared and the types of more accessible land identified. The main sources of information were:

- Basic information on urban and city planning;
- The Urban Agriculture Programme of Rosario;
- Participatory workshops held with representatives of 70 community gardens located on the flood plains of the Ludueña and Saladillo streams;
- Interviews with technicians, municipal officials and urban producers;
- Meetings with other municipal, institutional and community agencies;
- Consultations with programmes such as Prohuerta (at national level) and Crecer (at municipal level).

Several participatory workshops were held in the process. The first participatory workshop, "Presentation of the optimisation of land use project", was aimed at introducing the contents and purposes of the project, and sharing information on study areas. Maps were prepared to show general information on land use regulations, ownership and use. These maps were also used by the participants to locate their urban gardens and potential vacant land areas for agriculture. The second workshop, "Status of existing gardens", aimed at making an in-depth characterisation of the gardens in operation, the social groups that participate, and the management and working processes developed. It also collected supplementary information to determine the suitability and level of accessibility of identified empty lots. A third participatory workshop, "Development of proposals" went deeper in understanding the problems experienced in gaining secure access to land; defined related conditions and requirements for farmers, and identified commitments to be gained from the municipality.

The proposals made by the community were disseminated among several municipal departments and were analysed during two workshops with their representatives.

The community workshops also led to the identification of the need to improve the suitability of the land for agriculture. Therefore a specific study was undertaken which resulted in a manual of techniques for the management and recovery of several soil types with specific agronomic restrictions.

ACTION PLAN

The Action Plan prepared in Rosario incorporates activities aimed at the design of vacant spaces for productive use, the improvement of the quality of soils to facilitate their agricultural use, and the formulation and institutionalisation of public policies.

In June 2003, *"Comprehensive Design Workshops"* were organised to define programme guidelines for the design of spaces for urban agriculture. These workshops provided a space for debate and for the development of proposals. The workshops resulted in proposed land use maps to serve as useful tools in the planning of land; *design of garden parks in public spaces or along banks of urban streams*; and the design of gardens according to land and soil characteristics.

Several proposals were developed for the gradual inclusion of urban agriculture into Municipal policies. One proposal was the *inclusion of urban agriculture as a strategy into the Master Plan*, which works on two issues. On the one hand, it interprets the processes of change in the physical and spatial aspects of the city, and on the other hand it defines – based on this interpretation – land strategies, spatial and functional policies and programmes, and urban development projects to transform the city.

10,000 families have secured access to land and benefit from improved food security

The exploratory nature of the activities developed by the Master Plan allows for insertion of the urban agriculture programme into the overall urban design, acknowledging the need to include agriculture in urban policies and the public agenda, and the need to generate a regulatory framework and guidelines.

The final objective is to use GIS and community mapping to identify vacant land suitable for urban agriculture and include it permanently in the **Municipal Land Bank of the City of Rosario.**

The management and administration of vacant lots for agricultural use has now been centralised at the Secretariat for Social Promotion (which manages the Municipal Urban Agriculture Programme). The Secretariat co-ordinates its activities with the Cadastre, the Planning Office and the Office for Parks and Promenades. Requests for the (temporary) use of vacant lots will be selected and prioritised by using several criteria defined in the participatory workshops, such as community commitment, the history of the group of gardeners, their management capability, etc.

Presently 10,000 families have secured access to the land through this exercise, and benefit from improved food security, social recognition and income generation.

NOTES

1 Notably the Centre for Agro-ecological Production Studies (CEPAR) and the Centre for Human Environment Studies (CEAH) of the School of Architecture, Planning and Design.
2 The NGO *Nacimiento* has actively participated in the development of the participatory baseline study and consultations, and has also joined this initiative.
3 ORDINANCE N° 4713, Municipal Community Garden Programme (managed by the Secretariat for Social Promotion).

From Empty Lots to Productive Spaces in Cienfuegos

Mario Gonzalez Novo

Irrigation of vegetables on organoponics

Cienfuegos was the last of the main towns founded in the colonial era, but its subsequent development and aesthetic beauty places it among today's finest Cuban cities, and has earned it the name "Pearl of the South."

Governador Valadares, Brazil

Contribution to the Electronic Conference by Ivana Lovo

The multi-stakeholder policy and action planning process in the city of Valadares focuses on the integration of urban agriculture into municipal land use planning. Several municipal offices (planning, environment, agriculture, building) as well as various civil society organisations participate in this process. Studies during the first phase of the project in Valadares indicated that a substantial amount of land (37% of the total city area) with good agricultural potential is available in the City. This includes vacant public land, backyards; public and private institutional compounds, reservation zones of railroad and highways, banks of rivers and creeks; parks and other green areas; lakes/ponds and a natural reservation area. Nearly one third of the urban households are involved in urban agriculture in an informal net of relations (mainly fruits, vegetables and herbs are grown). The total value of intra-, peripheral and rural-urban agriculture equals 3.17% of the city's GDP (gross domestic product), of which 1,17% is generated by households in the informal sector. As a result of this process, a system of tax reduction has been introduced to stimulate the access of interested urban poor to the many vacant private plots. Private land owners can sign an agreement with the municipality or an association of community gardeners giving them temporary user rights to their land. The gardeners have to fulfill certain responsibilities and take good care of the land. The private owners receive a reduction in property tax. Apart from the fiscal incentive, the use of the plot provides the owner a guarantee against illegal squatting. A system of differentiated water tariffs is being developed to promote storage and use of rainwater and grey-water in urban agriculture.

The city is the capital of the province and is located in the south-central part of the island. It has 161,500 inhabitants, who occupy a coastal ecosystem which encompasses a rich variety of flora and fauna, as well as an unique landscape dominated by the green and blue of the sea and sky.

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The "Optimisation of Land Use for Urban Agriculture" project (see also the article on Rosario) aims at building local capacity for the inclusion of urban agriculture as a physical planning tool in optimising the use of land and providing food security. It is linked to the Urban Agriculture Programme in the city of Cienfuegos that aims to initialise and improve the use of vacant parcels of land and thereby to strengthen the options for local production of food in the city and its periphery.

THASES OF THE PROJECT

After an initial analysis of available information, the **first phase** started with a participatory diagnosis in Cienfuegos, using interviews, surveys, a workshop, and capacity-building of the main actors. The data generated during this diagnosis was the basis for developing and subsequent approval of the urban agriculture land use map.

A local team, made up of specialists from different institutions, designed and implemented a Geographical Information System (GIS) which facilitated communication and to give feedback during the fieldwork. The appropriate participatory GIS set-up at the municipal level was studied and further developed throughout the process and adapted to the needs of each phase.

On the basis of this diagnosis, the project areas of the city were selected with the active participation of inhabitants in different neighbourhoods. The work began in four People's Councils (sub-municipal governmental units): Reina, Pueblo Grifo, La Barrera and Tulipán. Maps for current and potential land use were developed in each of these units, and were presented during an extended workshop to the project team and other local stakeholders.

Efficiency indicators were defined for urban land use, based on suitability and accessibility, and further elaborated into an action plan. A last stage in this first phase of the project included a systematisation workshop, to evaluate the experience, to refine the lessons learned and to make recommendations. This information was used in the proposal for the second phase: the optimisation of the use of vacant land for urban agriculture, which would be part of the municipality's strategy against poverty and social exclusion.

The **second phase** of the project - implementation of the Action Plan – included the remaining People Councils with space that could be used: San Lázaro, Buena Vista – La Esperanza, Junco Sur, Pastorita – Obourke. The corresponding land use maps were completed to broaden the knowledge. In addition, this phase included a series of initiatives to communicate the experience gained at local and regional level, like the presentation of the land use maps by the People's Councils, the creation of multimedia materials, a critical reflection on land regulation, use, and conservation written up in the National Urban Agriculture Programme.

FROM EMPTY LOTS TO PRODUCTIVE SPACES

The optimisation of land use is undertaken

as a "process of participatory intervention in which the use of vacant land in a certain territory is planned and defined, based on the level of urbanisation, land tenure, property rights, preconceived uses, socio-economic and cultural aspects, and the physical capacity for the practice of sustainable agriculture". Here, optimisation refers to spatial and temporal use.

This way of "achieving optimal use of vacant land" presupposes improving the quality of life of the population. However, the opportunities differ in most cities of the region, and are the result of a process of differentiated urbanisation and physical planning, which is often incompatible with the fundamental criteria of sustainability.

Another important aspect is that the optimisation of land use is not a passive process of applying geographical and statistical tools, but a very active process. It requires almost an anthropological intervention, which considers a holistic view, characterised by social, economic, environmental, institutional, and political relations. Furthermore, one should be mindful that optimisation could mean that the area in question is not appropriate for agricultural use.

optimisation of land use is not a passive process

Additionally, urban agriculture should be considered under the General Plan of Territory and Urban Regulation (methodologically under physical planning municipality), as a way to achieve food security, a productive opportunity, and an important activity within the urban ecosystem.

FROM MAPS TO ACTION PLANS

The process of reaching consensus (on the land use maps) was undertaken at three levels: 1) Technical compatibility with the Department of Lands of the Ministry of Agriculture; 2) Compliance with the Directive Plan of the Department of Physical Planning, and 3) Alignment of interests with the People's Council. The consensus making process resulted in the prospective use of land for urban and periurban agriculture at the level of each Council and its integration into a city-wide strategy. The GIS maps showed vacant spaces of more than 1,000 m^2. The typology of existing and potential urban spaces is very diverse, and reflects the need for their consideration in planning, as well as tenancy and suitability.

In drawing up the Action Plan, it was necessary to take into account that the National Urban Agriculture Programme has a "sub-programme for the control, use, and conservation of land", which includes elements of agronomy and a multi-dimensional approach to the use of land.

Although an organised and consolidated planning effort exists, and includes urban agriculture, this can be improved. Especially the local governance and the participatory process need strengthening.

The dynamics of local economics and production generate new areas of need for physical planning and regulation. An illustration is the need to convert plots of land that were formed by the restructuring of the sugar industry in the city. There is a legal and policy framework, as well as a structured procedure for land use management, including different organisational forms of agricultural production with respect to different types of tenancy. However, there is no document that could serve as a guide for the use of spaces, with criteria of efficiency and ecological, economic, social, political and institutional sustainability.

The Action Plan developed for the next phase second phase of the intervention project includes scaling up the experience to all People's Councils of the municipality and subsequently to other municipalities in the Province. Integration of the (participatory planning) activity at the different levels of administration is one of the challenges of this process.

One of the priority actions is the approval of a policy document for the use of vacant lands in the municipality, which integrates the land use maps elaborated by the People's Councils. This document should serve as an annexure to the Directive Plan of the Municipality.

Other important activities of the Action Plan include capacity building, dissemination of maps, which at the same time is a validation, launching of agricultural activities on vacant lots by the People's Councils, establishing of municipal facilities to initiate land use projects for each solicited and granted lot, strengthening of the GIS infrastructure in the Provincial Department of Physical and People-Based Planning and strengthening of technical assistance available for the practice of urban agriculture.

Implementation of the Action Plan is now in an advanced phase, as the land use maps have been completed by the People Councils. Potential plots for urban agriculture have been identified within the city and its periphery. In addition, advances have been made in expanding the existing conceptual and methodological framework for the construction of the maps. The GIS is considered as a support tool in the process of land use management and map making: as a basis and a means for communication in the elaboration of the (current and potential) land use maps, and as a tool for constructing the plans needed to conduct the field work.

CONCLUSIONS

As far as territorial administration or management is concerned, the optimisation of land use should depart from the conceptual and methodological assumption of land use according to the land's "vocation," or ideal/best use. Similarly, the Regulatory Land Use Plan should recognise the need to conserve "non-urbanisable" spaces (which are spaces on which cannot be built on) for uses such as urban agriculture. This is fundamental for the inclusion of urban, periurban and rural municipal agriculture in the physical planning process.

This experience has demonstrated the importance of consensus building in land use, not only from the technical point of view or in terms of the use of productive inputs, but also from the ecological, economic, socio-cultural and institutional dimensions. Urban agriculture is an activity, which is guided by the characteristics of a certain agro-ecosystem, but is subject to the complex relationships of urban ecosystems, which can pose problems on its sustainability.

The optimisation of urban land use as a process of participation and multi-sectoral integration provides an opportunity for consensus building and the strengthening of governance.

Community Gardens in eThekweni Municipality in South Africa

The western parts of eThekweni Municipality[1] consists of large tracts of public land, which were zoned for various purposes, but could not be used or developed due to limited finances. In early 1998, the Inner West Council of eThekweni Municipality decided to make urban agriculture a function of the Parks and Recreation Department of the Municipality.

This Municipality is situated within the coastal belt on the south coast of South Africa, and is characterised by high rainfall and an undulating relief. Under the existing health by-laws of the municipality, public lands need to be cut and cleaned of rank grass and undergrowth on a regular basis. Most of

The set-up is believed to be a win-win situation

such land is occupied by previously disadvantaged citizens (of South Africa). Traditionally, these people have been farmers, who now grow food for home consumption, and have been clearing these vacant sites and burning the vegetation found on these properties.

However, since most of these properties were located in the natural drainage lines of this area, it was necessary to ensure that trees and vegetation within the flood line were not removed. Legislation does not permit the removal of vegetation within the flood line. Unfortunately, due to lack of proper guidance or control, valuable trees, vegetation, and subsequently topsoil due to erosion has been lost. This situation called for re-establishing control and training on terracing and working on contours so as to retain the rainfall and prevent soil erosion.

After 1998, the Council permitted the use of the mentioned properties for

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Rachel Slater

Fencing is essential

community gardens, on the condition that the gardeners formed a proper organisation with a chairperson, and complied with the common gardening rules applicable to all gardens in the region. According to this arrangement the Council was required to give timely notice (six months) to the garden organisations and assistance to move to another place, if and when the given property was required for development.

The Council provided funding for the initial development of these gardens in the form of earthworks, fencing, water connection and a secure storage facility, and also undertook to provide compost once a year to each garden until they were self-sufficient in compost. The garden organisations also had to raise funds from their members to meet expenses. For instance, once the municipal water meter was installed the group had to control and pay for their own water use. Lockable taps and lockable tap covers were provided to control the consumption. There was also some financial support provided for fencing, initially, but due to the phenomenal growth of these gardens there wasn't sufficient to go around all the groups, and still there isn't sufficient funding for this activity. Fencing is essential as most of these gardens are situated close to the rural areas where cattle and goats as well as chickens are found grazing around. There is also the usual problem of theft that has to be prevented.

Training in the form of compost making, mulching, and trenching is provided on each garden site, as each site has unique characteristics. This training is provided free of charge and combines current and traditional horticultural principles. A basic barter system is put in place and members swap surplus items amongst each other, to make up a balanced diet. It is also expected that the gardeners will in the future be able to make regular donations of foodstuffs to the local Aids shelters and hospices.

Such a set-up is believed to be a win-win situation for both the community and the Council. The Council provides better services with the money they otherwise would spend on clearing the vacant sites. They save money by having the grass cut on the pavements of the residential areas and delivered to the gardens for local compost making instead of having to truck this to far out refuse sites. The gardeners are able to work in close proximity to their homes, receive training and generate an income. A negative aspect affecting the growth of the gardens is the political interference of certain councillors who attempt to manipulate the people and the situation to meet their own needs.

At the time of writing, plans are being made to set up a community kitchen in each community hall within the different areas. It is proposed that items such as bottled spices and condiments and even jams will be made for sale. Also in the pipeline is the production of dried herbs that can be used for cooking food and for medicinal use by the local people. The plans for the preparation of traditional meals to be frozen and made available for sale to those who return home late from work are well advanced. Additional vacant areas have been identified for community gardens, like undeveloped sports grounds of schools. Applications have been made to the Education authorities to use these areas until such time they come up for development.

NOTE
1 This is the new name for Metropolitan Durban in South Africa

Allotment Gardens for Philippine Cities

Community gardens are defined as gardens where people share the basic resources of land, water, and sunlight. This definition includes both allotment and common gardens. Since March 2002, a project is being implemented in Cagayan de Oro, Southern Philippines, to establish four pilot allotment gardens in different parts of the city with financial assistance from EuropeAid's AsiaUrbs Programme.

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Robert Holmer

Inside the vegetable nursery with some of the gardeners

Allotment gardens are characterised by a concentration in one place of several small land parcels of about 200 to 400 m² that are assigned to individuals or families, usually organised in an association. In allotment gardens the parcels are cultivated individually, while in common gardens the entire area is tended collectively by a group of people (Macnair, 2002). An allotment garden is made legally available by the city authorities to the association to be used exclusively for growing of vegetables, fruits and cut flowers, but not for residential purposes.

HISTORICAL BACKGROUND

The idea of allotment gardening reached its first peak in 1864 when the first Allotment Gardeners' Association was founded in Germany. During the period of industrialisation in Europe, large numbers of workers and their families migrated from rural areas to the cities in search of employment in the factories. Very often, these families lived under extremely poor conditions – a socio-economic situation somewhat similar to the booming development of Philippine cities today. To improve their overall situation, so-called "gardens for the poor" (later termed "allotment gardens") were established; cities, factories and monasteries provided plots for the urban poor, allowing them to grow food for their families and to keep pigs, chicken, and other small domestic animals (Kasch, 2001).

The aspect of food security became even more important in the first half of the 20th century, during World War I and II, when the socio-economic situation was appalling, particularly in terms of people's nutritional status. Many cities were isolated from the hinterlands, and agricultural products from the rural surroundings did not reach the city markets anymore or were sold at very high prices on the black markets. Consequently, food production within the city, especially fruit and vegetable production in homegardens and allotment gardens, became essential for survival. In 1919, one year after the end of World War I, the first legislation for allotment gardening in Germany was

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passed. The so-called "Small Garden and Small-Rent Land Law", provided security in land tenure and fixed leasing fees. In 1983, this law was amended by the "Republic Act for Allotment Gardens" (Gröning & Wolschke-Bulmahn, 1995). The importance of allotment gardening in Germany has shifted over the years. While in times of crisis and widespread poverty (from 1850 to 1950), the main function of allotment gardening was to enhance food security and improve food supply, its present function is in providing recreational areas and locations for social gatherings. What was previously a part-time job is nowadays considered a beloved hobby for millions of practitioners. Frequently, allotment gardens are conceived as part of the public green belt area (Crouch, 2000, Drescher, 2001).

OBJECTIVES AND METHODOLOGY

The main objective of the pilot projects is to serve as a model and learning centre to enable a future extension of allotment gardening in Cagayan de Oro and other Philippine cities.

The pilot areas are in four barangays (the smallest local government unit in the Philippines). The areas in Bugo, Gusa and Lapasan were selected based on the experiences gathered by the city government in a previous project on waste segregation. The allotment gardens here were linked with the biodegradable fraction of the segregated waste by using it as compost in the allotment garden, thus serving as an outlet for this kind of waste. The fourth pilot allotment garden in barangay Canitoan is located close to the city's controlled landfill site, and was selected to be used by the Cagayan de Oro garbage pickers, one of the most socially disadvantaged groups of the city.

The allotment gardens are essential for the success of solid *waste management

The College of Agriculture of Xavier University recommended linking the solid waste management component with the production of vegetables in allotment gardens using compost made from the biodegradable wastes of the surrounding community. Expertise on composting and production of vegetables in an urban setting had been gained through an earlier EU-funded research project (GUANZON & HOLMER, 2003). The German partners Schelklingen and APT of the University of Freiburg agreed to contribute their expertise on the administrative aspects of allotment gardening, particularly on legal aspects and community organisation. The project also has a community-based geographic information system component (GIS) as a tool for integrating allotment gardening into urban planning. This is coordinated by the Belgian partners Dinant City and the Geography Department of the FUNDP University, Namur City.

AREA SELECTION

Suitable areas were identified on the basis of a) accessibility to water and transportation, b) no rent or a reasonable rental cost and c) availability of a contiguous area of at least 3200 m^2 to accommodate eight family units of 400 m^2 each.

Most of the open spaces in Cagayan de Oro are privately owned. Hence it was necessary to advocate and promote the project goals and objectives not only to the respective barangay but also to private landowners. The areas in Bugo and Gusa were identified with assistance of the Allotment Garden Technical Working Group (AGTWG) of the project, the barangay council and the beneficiaries. In both cases the land is owned privately. In Bugo, the landowner did not ask for rental payments but offered her land to be used for community purposes, while in Gusa, the allotment garden area is composed of two adjacent lots, owned by different proprietors. In both cases, the owners agreed to the provisions set out by the project. Land rentals are paid according to the current rates for agricultural land in Cagayan de Oro and the surrounding provinces. The area in Lapasan was identified by use of GIS at the city hall. The AGTWG then made a site inspection and gave its approval. Thereafter, the barangay chairman approached the owner for a leasing agreement without rental payments. In the case of Canitoan, the land is owned by Xavier University who made the land available to the beneficiaries without rental payments. In all cases, memoranda of agreements were issued to all stakeholders, clearly stating the provisions of the project. The memorandum of agreement provides legal security for all parties: for the urban poor the access to land solely for agricultural purposes, and for the landowner the assurance that his property will not be squatted on. As regards the period of tenure, both parties agreed to start with a short-term pilot phase and to evaluate the benefits of the project before going for a long-term agreement. Hence, the memoranda of agreement stipulate a "win-win" situation as a prerequisite for successful implementation of the project activities.

Robert Holmer

Allotment gardens in Germany in 1950

PARTICIPANT SELECTION

The pilot allotment gardeners of the AsiaUrbs project can be categorised into two main groups:

- Those who have already taken up urban agriculture as part of their survival strategy. However, due lack of space, these activities are confined to production of vegetables in containers (such as used cans or plastic bottles) or in tiny patches along the roadside.
- Those who are in need of alternative sources of subsistence and income but have not taken up farming due to lack of access to land (such as the garbage pickers at the landfill site).

Beneficiaries were recruited, based on their income; their willingness to do the

a) The Information & Education Campaign Group (IEC) with assistance of the Allotment Garden Technical Working Group (AGTWG) and a barangay organiser promote the goals and objectives of allotment gardening to all households of the pilot area
b) Interested households submit their application through the project assistant to the AGTWG
c) The AGTWG pre-screens applicants and forwards a list of final candidates to the barangay council for approval. The AGTWG ensures that all major groupings of the community are represented.
d) The barangay council approves/disapproves membership
e) An acceptance ceremony is conducted with a pledge of commitment by the beneficiaries.

actual garden work, to participate and share experiences; their residency near the project site and being residents of the pilot barangay. A Memorandum of agreement was signed with the barangay to support the project activities.
Initially, the identification of allotment garden beneficiaries based on the above-mentioned criteria was left to the communities. This resulted, however, in certain constraints and inequalities that led to the following optimised standard procedure for membership application as agreed upon by the project steering committee:

ALLOTMENT GARDEN SET-UP

The size of each family unit is 20 m x 20 m (400 m^2) consisting of eight beds planted to vegetables of different botanical families (cucurbits, solanaceous crops, legumes, leafy vegetables, etc.). The design of a pilot barangay allotment garden consists of eight individual family units having a net total area of 3,200 m^2 and a gross total area of 4,000 m^2. The area is fenced, and has an entrance, a tool shed, a nursery, and water supply (for which the additional 800 m^2 is used. One important aspect of the allotment garden is the compost heap for the biodegradable household wastes. The compost heap thus links the allotment garden with the integrated solid waste management component of the pilot area. More than 50 % of the household waste in Cagayan de Oro is biodegradable, and its conversion into compost and safe application in the allotment garden significantly reduces the residual waste to be dumped at the controlled city landfill.

As regards the cost of establishing one pilot allotment garden, the project spent approximately 337,640.00 PhP (6,400.00 US $). This includes human resources, capital outlay, consumables, training and overhead costs.

DISCUSSION OF RESULTS

The pilot allotment gardens enabled the urban poor of Cagayan de Oro to have legal access to vacant land in the city for agricultural purposes.
The private landowners who participated in the project are so convinced that they have offered other areas in Cagayan de Oro to be used for allotment gardening. The total area so offered is five hectares of open land. The landowners were particularly convinced that their land will no longer be idle but productive, and that their property is protected from illegal squatting, which is perceived as a constant threat for open spaces.
The allotment garden is essential for the success of the solid waste management programme in the area. The residual waste of the 300 pilot households to be brought to the landfill area could be reduced to 33 %. 55 % of the household waste is biodegradable and went to the compost heap in the allotment garden, while a further 10 % is recyclable and marketed by a garbage pickers' organisation.
The project gets full support of the local government units. A city ordinance on the use of vacant lots in the city is in preparation and will further promote allotment gardening (i.e. tax incentives for landowners that make land available for urban agriculture; requirement to allocate space for allotment gardening in residential areas such as sub-divisions).
Yet, not everything has been smooth. Different perceptions of the community and the of the project itself had to be settled (what technologies to use, how will the project money be spent, misconceptions regarding roles and responsibilities). A good preparation with, and mutual understanding of the project objectives by, all stakeholders is thus a necessity for success.
Also, certain fears and objections within the community had to be overcome. Residents were particularly worried that the compost heap in the allotment garden may be odorous. However, the compost heaps established so far are properly maintained and thus not offensive to the neighbouring community.
The entire project is funded through a grant that is channelled through the barangay. The only direct contribution expected from the beneficiaries is labour to maintain the allotment garden. They are however obliged to contribute towards setting up a fund for the association, which could be used for replacing damaged tools and other equipment, and for obtaining resources (like what?) for new members. And thereby the project is made sustainable.

The importance of allotment gardening in Germany has shifted over the years

RECOMMENDATIONS

Based on the experiences of setting up the first four allotment gardens in Cagayan de Oro, the following is recommended:

- Further advocate and promote project objectives among private landowners, local government officials and the general public in order to extend allotment gardening to other areas of the city
- Include norms and values in training programmes to strengthen the allotment gardeners association
- Consult the city council on strategies to ensure long-term tenure of the allotment gardens (i.e. proposal to purchase land from private landowners)
- Conduct more research, particularly on integrated pest management strategies to reduce dependence on chemical pesticides

Robert Holmer

Allotment gardens Germany in 1920

REFERENCES

Crouch, D. 2000. Reinventing allotments for the twenty-first century: the UK experience. Acta Hort. (ISHS) 523:135-142. http://www.actahort.org/books/523/523_18.htm
Drescher, A. W., 2001. The transferability of the German allotment system to the Southern African Situation. Proceedings of the Expert Meeting on Urban and peri-urban horticulture in Southern Africa, Stellenbosch, January 2001.
Kasch, G., 2001. Deutsches Kleingärtnermuseum in Leipzig: Deutschlands Kleingärtner vom 19. zum 21. Jahrhundert. Band 4, Sächsische Landesstelle für Museumswesen, Chemnitz, Germany.
Gröning, G., Wolschke-Bulmahn, J., 1995. Von Ackermann bis Ziegelhütte. Ein Jahrhundert Kleingartenkultur in Frankfurt am Main. Studien zur Frankfurter Geschichte. and 36, Frankfurt am Main, Germany.
Guanzon, Y. B., Holmer, R.J., 2003. Basic cultural management practices for vegetable production in urban areas of the Philippines. Urban Agriculture Magazine, 10, 14-15, RUAF, Leusden, Netherlands.
MacNair, E., 2002. The Garden City Handbook: How to Create and Protect Community Gardens in Greater Victoria. Polis Project on Ecological Governance. University of Victoria, Victoria BC, Canada
http://www.polisproject.org/polis2/PDFs/the%20garden%20city%20handbook.pdf
Schnitzler, W.H. R.J. Holmer, 2002. Prospective Issues and Challenges of Urban Fringe Agriculture. Report of the APO Seminar on Urban Fringe Agriculture held in Tokyo from 17 to 24 May 2000. Asian Productivity Organization, 2002, S. 53-63.

Urban Agriculture in the London Borough of Bexley

Municipal officials face challenges in making decisions about the future use of urban agriculture. Whereas the financial costs and benefits for alternative land use are clear, they are not so clear for agricultural use. Essentially, technical decisions on the use of land are made with an eye on local politics and pressures from competing constituencies.

Beacon Mbiba

Some members of the Woodlands Farm trust at work

URBAN AGRICULTURE IN LONDON AND THE UNITED KINGDOM

Allotment gardens are probably the most visible and oldest form of urban agriculture in the United Kingdom. They are associated with food growing campaigns during the World Wars (I and II), but their prominence as sources of food has declined since the 1950s. More recently, city farms have emerged as another form of urban agriculture. However, most activities on these farms are not about food production but about social, community and environmental regeneration. There are other spaces like backyard gardens and verandas that are often included in discussions of urban agriculture.

The legal and institutional regimes for land allocation and use are well elaborated and publicised (Garnett, 1996; Crouch et al. 2000; Howe, 2001). In contrast to the developing countries (especially cities in Africa), cultivation in London takes place in designated and planned zones (city farms, allotment gardens). However, despite this 'serene' view, land problems also exist in this context, although they are of a slightly different dimension. The greatest problem is that of unused and under-utilised allotment garden land. Using the case of the London Borough of Bexley this paper seeks to illustrate the difficulties faced by planners and councillors in dealing with land for urban agriculture in a western city since 1999.

ALLOTMENT LAND IN THE LONDON BOROUGH OF BEXLEY

The London Borough of Bexley is an outer London local authority in the South East of the city. It is one of the greenest areas of the city if one considers availability of both passive and active open green spaces. Open lands and allotments are managed in accordance with Agenda 21 principles. Currently, there are close to 36 allotment sites, where each site has plots of various sizes. 'Self-managed tenant committees' under Delegated Management Licences manage about eight of these sites. The rest of the sites are managed by the council and together add up to about 1577 plots. The Bexley Council conducts regular reviews of the status of allotments, and the 2001/2002 review revealed that demand for these plots is declining despite the popularisation of urban farming, food markets, organic food and Agenda 21. Table 1 shows this declining trend in plot occupancy.

This table shows that about 63% of the land is occupied. The level of utilisation has not always been this low. For example, in 1975, Bexley had about the same number of allotment plots (1600) on approximately 99 acres (40 hectares) of land. All were allocated and fully utilised. The demand was high in 1975 as indicated by a waiting list of 740 compared to just 9 at 2002, clearly showing the decline in demand. (Bexley London Borough, 1975: 21-22).

However, the figures in Table 1 hide variations of occupancy by site. Some sites are fully occupied while others are partially occupied. Figure 1 gives a distribution of the sites and levels of occupancy showing that in 2002, six of the sites were fully occupied (i.e. 0% unused land).

Where plots are under-utilised, there is a cost to the council for maintenance. To clear and rotovate a single plot may cost up to £500. The council provides each site with a gravel access road, water, fencing, marking of plots and storage facilities. The estimate for maintenance of all sites in 2002 was given as £240,000. The council is always anxious to reduce these costs and one way to do so is to sell unused sites. Sites that remain under-utilised or unused for years are considered for possible alternative use – usually disposal for building construction.

THE COUNCIL'S INTEREST IN LAND DISPOSAL

Disposal of land offers the council substantial financial benefits through income from land sales and property tax on subsequent developments on the land.

TABLE 1:ALLOTMENT DEMAND IN THE BEXLEY BOROUGH: 1996 – 2002

Year	1996	1997	1998	1999	2000	2001	2002
Total Number of Plots	1710	1728	1360	1339	1341	1370	1384
Total Vacant Plots (Un-occupied)	562	601	337	312	296	331	389
% Vacant Plots	33	35	25	23	22	24	28

Bexley Council, 2002

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Generation of additional income is a priority for the council given the need to provide and fund efficient services in the borough. Funds are needed for education, health and other capital-intensive developments.

Of the several sites not fully utilised, a few have already been sold to real-estate developers, including the Thistlefield Allotment Gardens site sometime between 1997 and 1999 to Croudace Ltd., a housing development company. Following the regular property reviews and consultations with key stakeholders (Bexley Federation of Allotment and Leisure Gardeners) the 2.5 acre site was sold by tender for a capital sum of £1.5 million. Croudace Ltd. Built 30 houses that were sold in 2002 at prices ranging from £190,000 to 250,000 and the company was 'eyeing other sites in the borough'. A property tax of about £110 per month is levied on each of these properties.

According to the councillors who participated in the decision making process, funds earned from the sale were used to improve schools in the borough and for debt redemption. "Anybody wanting allotments in the borough can get them...there is no shortage of land for those wanting to do gardening" (Councillors - Tandy, Campbell and Downing, 21/09/2002).

PEOPLE'S RESPONSES TO THE DISPOSAL

The classification of under-utilised land as surplus land to be disposed has often made headlines in the local press. The Bexley Express (5th March 2003:6) reported that gardeners and the area's 'green fingered community' were alarmed and angry at the idea of further land disposals. The press reports reveal the following about the users and the use of the allotments:

- Largely elderly members of the community who devote time and energy to cultivate the plots
- Some cultivators virtually live on the allotment produce
- Allotments also offer recreational environments and biodiversity in the city.

Discussions of allotment gardening have been outlined elsewhere though, all in all, quantification of these benefits is not as explicit as that for land disposals. This puts pressure on the local authority to dispose of under-utilised land.

However, the concept of under-utilisation can be challenged by saying that what may appear as a surplus today will be in short supply a few years in the future. There could be other factors that lead to reduced demand, that if addressed would lead to a shortage of allotment land. There are alternative ways of using the land that may mean changing the existing or introducing something new. A good challenge to the notion of under-utilisation was given by farmer John Johnson who retorted:

> ... The council says that the open space is underutilised, but 63% of it is used. Only 30% of the people turned up for local elections but councillors don't see themselves as underutilised!. (Bexley Express, 5th March, 2003: 6).

GOOD PRACTICE AND THE FUTURE OF ALLOTMENTS IN BEXLEY

Bexley Council (planners, councillors, executives) has to balance a range of concerns, and respond to the needs of diverse stakeholders. Although final decisions may not be in everybody's favour, the processes and procedures leading to these decisions need to be clear, transparent and inclusive. Crucially, the local authority should not be seen as violating its own rules and regulations. In the case of Bexley, reviews of the land needs are done regularly as part of the council's asset management strategy.

- Consultations are widely done with representatives of user groups. In this case, the council is reviewing its allotment strategy and consulting with the Allotment Federation and the public. A report that was to come out in summer 2003 is now expected in early 2004 (1).
- Gardeners and members of the public can lobby their councillors and members of parliament to ensure that their views are included in the decision-making process.
- Where a site is to be disposed for real-estate development, as was the case at Thistlefield, comprehensive social, archaeological, environmental, design and traffic assessments are conducted. Reasonable and valid concerns are incorporated in the development plan and often set as conditions to be dealt with by the developer.

At the Thistlefield Allotment site, the

gardeners and the area's 'green fingered community' were alarmed and angry

public consultation process generated heated submissions with one group of 48 residents signing a single petition. However, few of these submissions were about keeping the land for urban agriculture. Instead, there were concerns about what housing development would do to the neighbourhood with regards to extra demand for places in schools, extra traffic burdens and pollution, loss of greenery, noise from construction works, parking problems and increased demand for medical services. Traffic objections appeared to be the most dominant. The most valid objection was the one relating to the nearby Audiology Clinic, which requires a tranquil environment for its activities, and was now going to be adversely affected by the introduction of a residential complex in close proximity.

All these concerns were included in the design and orientation of the scheme. A last crucial point in terms of community participation, in general, and urban farming in particular, is that all these activities are publicised with the outcomes documented.It is possible to track back and identify where things went wrong and where they could be done better – this is a good practice. The processes of consultation and documentation can be long-drawn-out and confusing – planners are often accused of delaying development – planners never win!

NOTE

1) The urban allotments strategy currently in preparation will be of interest to many readers and ways to make the final report available for discussion under the RUAF framework will be explored.

REFERENCES

Bexley Council (2000) *Murchison Avenue Allotments Planning Brief, Thistlefield. Murchison Avenue.* Bexley Council, Kent.

Bexley Council (2002) Property Strategy Review. Council Cabinet Meeting 17th December, 2002 Agenda Item 7, Decision Ref: CAB 26/02.

Bexley London Borough (1975) *Open Lands: An Interim Policy.* Town Planning Division, Sidcup, Kent.

Crouch, D., Stempik, J. and Wiltshire, R. (2000) Growing in the community: a good practice guide for the management of allotments. London: Local Government association.

Garnett, T. (1996) Growing Food in Cities: A report to highlight and promote the benefits of urban agriculture in the UK. London: Safe Alliance.

Howe, J. (2001) Nourishing the City. *Town and Country Planning*, pages 29-31.

Facilitating Land Access for the Copperbelt's Periurban Farmers[1]

Lack of secure access to land is a significant constraint for periurban residents in Zambia's Copperbelt Province to realise the potential of urban agriculture as a livelihood strategy. This paper explores the role of the Copperbelt Urban Livelihoods Project (CULP)[2] in facilitating the resolution of land disputes affecting poor periurban residents using an "interest-based negotiations" approach.

IWMI-Ghana

Participation of women in the negotiation of land should be ensured

By helping farmers to organise into associations with a legitimate, credible voice, CULP made a real negotiation process possible. As a third party, the project then facilitated negotiations, based on identifying common interests and potential for mutual gain.

BACKGROUND

Zambia is one of the most urbanised countries in sub-Saharan Africa. As a result of the formerly vibrant mining sector, the Copperbelt is Zambia's most urbanised province. However, since the late 1980s, employment in the mining sector has declined dramatically. Repeated rounds of "retrenchment" have left more Copperbelt households reliant on the informal sector for their income and food production with each passing year.

CULP was started in 1997 to help alleviate the growing poverty in these periurban areas. The strategic aim of CULP's activities is to promote the empowerment of individuals and organisations by assisting them in enhancing their capacity to secure their livelihood and to improve their environment. To achieve these ends, the project implements a set of inter-linked community- and household-based strategies.

CULP's baseline study, conducted in January 1997, found that agricultural production made a significant contribution to household economies, both in terms of generating cash income, and in providing subsistence food. The poorest households reported spending as much as 90% of their income on food. This suggests that household food production was and is a very important strategy for improving food security.

Figure 1: Zambia's Copperbelt Area where CULP has been active

Periurban farmers in the Copperbelt are men and women with low incomes, who grow food largely for consumption, on small plots, which they do not own, with little if any support or protection. Attempts by poor urban residents to gain access to land are often fraught with conflict. Some Copperbelt farmers have secured access to land through informal agreements with local chiefs or private landowners. In other cases, they have "squatted" on land belonging to state or parastatal agencies over many years. However, these arrangements are highly vulnerable to changing circumstances.

The Land Tenure (1998) and the Agricultural baseline (April/May 1999) surveys commissioned by Oxfam Zambia in selected settlements in three urban centres on the Copperbelt highlighted that many urban and periurban dwellers in the area see small-scale farming as a means of survival, and with more and more people being retrenched from formal employment, the problem of land access is getting worse. The surveys also pointed to two aspects of the problem: land tenure insecurity for those who have

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land, and the lack of access to land for those who want it. Many people do not have a clear idea of the land acquisition or de- gazetting process. The number of periurban residents who have actually secured a title to their land is less than 5% in most settlements – (Hansungule et al. 1998).

ENTRENCHED POSITIONS: LAND-OWNERS VERSUS PERIURBAN "FARMERS"

One of the priorities identified during participatory needs assessment exercises was to gain more secure access to land, through lease-hold or other agreements, or through actual issuance of a title. Although most of the farmers with whom CULP was working were farming land that was outside the direct control of municipal authorities, CULP's approach to facilitating more secure land access included involving municipal, parastatal and other actors in an open negotiation process.

The parties involved had strong positions. The farmers claimed their basic human right to have access to adequate food. Historically, the mining sector in the Copperbelt had attracted them to give up life in the rural areas for life in the (periphery of the) city. Now that the mines could no longer support them, and the ties with the rural areas were broken, they were doing what they needed to survive. It was difficult for them to negotiate, since the cost of losing all access to the land was so high.
The landowners' position was equally strong, and was founded more on economic rights. In their view, the other side had no rights. Patterns of fear and mistrust had evolved over the years, and little effort had been made to negotiate with the other side.
Shortly before CULP became involved, incidents that verged on violence had occurred at the Farm College, and MEF had hired armed guards to protect their land. CULP helped the farmers in Chibote to establish Farmers' Associations - with a legal status, leadership and organisational credibility, and thereby a legitimate voice - with which MEF could negotiate.

FACILITATING INTEREST-BASED NEGOTIATIONS

Following the approach described by Fisher and Ury (*Getting to Yes* (1991)), described as "principled negotiation", the Mindolo case is analysed following the suggested key steps. This analysis is useful both to replicate and strengthen the approach, and to train CBOs and other partners in its use.

Separate the People from the Problem
As a neutral third party, CARE was able to bring the sides together ensuring that each side learned more about the other's needs, and developed a shared ownership of the problem. The MEF management was initially not inclined to take the needs of the farmers seriously. However, it became increasingly difficult for them to maintain their position once they knew the families who would be affected. The idea of land that could be used to grow food and provide an income for the farmers and their families lying idle became a problem for them.
Separating the people from the problem is crucial, but another important role of NG0s in land disputes may be - as in this case – using a third party to bring the *right* people together. Emotions were high and were blocking the process in Chibote. If CARE had not taken steps to involve MEF and the Kalulushi Municipal Council in open negotiations, and had merely worked with the community members and facilitators, it could have been perceived as taking sides and lost its ability to facilitate the negotiations. However, by facilitating open discussions, CARE was able to help the people involved deal with the *problem*, rather than with the people.

Focus on Interests, Not Positions
CULP helped the different sides understand **why** the other seemed to be so adamant about its position. Making the different **interests** explicit is a crucial part of the process. Although the Mindolo management knew that many people had been farming the land for years, it did not understand the importance of this activity for meeting the basic needs of very poor and vulnerable households. Once this was understood, the interests of the farmers became part of the problem that needed to be resolved.

By talking about interests, and by presenting the fact that farmers were now organised and had a leadership that was representative and accountable, the negotiation process began **looking at new possibilities**. Previously, Mindolo's position had been reinforced by their bad past experiences (uncontrolled use of land); and by perceptions (farmers never do what they say they will do; if we grant access to some, what next?). CARE helped the parties to begin looking ahead at what could be accomplished with mutual interests in mind, and by assessing alternatives. The alternative of negotiating with an organised group that claimed they could and would adhere to certain

KEY STEPS OF PRINCIPLED NEGOTIATION
-Separate the people from the problem.
-Focus on interests, not positions.
-Invent options for mutual gain.
-Insist on using objective criteria.

MINDOLO FARM COLLEGE
In the settlement of Chibote, agriculture is a particularly important livelihood strategy. Most of those who were practising agriculture at the time of the CULP baseline survey in 1997 were doing so on land belonging to the Ministry of Agriculture, Food and Fisheries (MAFF), at the Mindolo Farm College. This land had been expropriated in 1981 from the Mindolo Ecumenical Foundation (MEF). After nationalisation, much of this land was under utilised by the Farm College. Throughout the period of nationalisation, Chibote residents farmed on the Mindolo farmland with no opposition as the government was not utilising all the land (4000 hectares).

In 1997, after sixteen years of legal disputes, MEF once more took over ownership of the Farm College. The MEF farm manager held a meeting with the Chibote community and advised them to stop farming on the land belonging to MEF. The community did not resist but tried to persuade the farm management to give them some time. After a protracted debate with the community, the institution proposed to get armed security guards to stop the people from trespassing on the farm. Continued meetings with the farm management revealed that they intended to intensify production and land use on the farm ("to become the bread basket of the Copperbelt"). This intensification plan left no room for further encroachments by the farmers. At this point the community vowed never to leave the farmland, but to try to co-exist with MEF.
CARE started to facilitate discussions between the two parties, proposing some kind of partnership for co-existence. The proposal was to allow farmers a small portion of land in exchange for labour, given that the management had no intentions of mechanising the operations. Unfortunately, the proposal was turned down and security was tightened instead.

Organised and accountable farmers associations can negotiate successfully

conditions was clearly preferable to the status quo.

Invent Options for Mutual Gain
Mutual gain follows from an understanding of each others' interests, and by looking forward at possible new solutions. Any agreement that would allow the farmers secure land access for a definite period was preferable to the prevailing situation. The farmers' associations could in return offer protection of the land from encroachment, and care for the land.
Convincing the landowners that mutual gain was possible was one of the key steps in this process. It looked they were having the power, being the owners of the land. Once the farmers were part of an organised association with credible leadership, they had a new and valuable asset: their ability to offer controlled land use and thereby reduce the costs and risks to the landowners. As a third party, CULP worked with the two sides to bring this opportunity for mutual gain to their attention and to convince them that an agreement was a preferred alternative to no agreement. Although it took time, the open negotiation process facilitated by CULP allowed the search for "options for mutual gain" to continue. In 2003, Mindolo entered into discussions with Kalulushi Municipal Council to release 1,300 Ha of land, some of which will benefit the Chibote Cooperative Society Limited (formerly the Farmers' Association). It appears that during more than three years of continued dialogue, the members of the Cooperative Association have been able to convince MEF that controlled, responsible use is preferable to land lying unused or to uncontrolled squatting, which is otherwise bound to happen.

Insist on Using Objective Criteria
In order to ensure that the different interests of the parties are met, it is essential to agree on how to evaluate the agreements. In another case, for instance, in which CULP facilitated agreements between the George Farmers' Association and ZAFFICO (Zambia Forestry and Forest Industries Association), the two parties agreed on clear indicators to assess whether, and to what extent, farmers were living up to their agreement to protect trees on ZAFFICO property that they were farming. According to the agreement, farmers could only grow specified crops (legumes, green manure, maize) and were not supposed to damage trees by using defective tools.

CONCLUSION

Organised and accountable farmers associations can negotiate successfully to secure land access, which is a key constraint to the viability of periurban agriculture as a livelihood strategy.

CULP has demonstrated that NG0s can play an important role in improving security of land tenure for periurban farmers, by facilitating interest-based negotiations between landowners and aspiring farmers.
At least three components were crucial to the success of this process: Organisation of farmers into groups; willingness and ability of the farmers to adopt appropriate land-use practices; and credibility of the NGO or other third-party facilitator.
At the same time, other related aspects should be addressed explicitly, to ensure that the process is successful and replicable. Firstly, *full participation of women* - in the farmers' associations, in the negotiation of land access, and in securing access to land titles – should be ensured. Typically, women are even less able than men to negotiate the legal hurdles associated with gaining secure land access or titles. Secondly, CB0s and other interested parties should develop the *capacity for interest-based negotiation skills* themselves. There is not always a third party able or willing to facilitate the process when CB0s lobby for their interests and rights. Developing this capacity is crucial to ensuring the ability to maintain ongoing negotiations and dialogue.
Thirdly, Municipal Councils in both Ndola and Kalulushi have seen the potential benefits of organised urban agriculture, and have started to identify and allocate plots to Farmers' Associations. However, this is being done without an *official policy or plan*. CULP and others NGOs or urban policy institutes could play an important role in *further legitimising* urban agriculture in Zambia by assisting Councils to develop such plans and policies. Finally, one should take greater advantage of "backyard gardening" opportunities. While land access is a key constraint to extensive agricultural production, most periurban settlements in the Copperbelt do provide adequate space for rainfed backyard gardening. Most residents grow small patches of maize and vegetables in close proximity to their homes. A change in council policies to permit growing of maize and technical training would further increase the existing production.

CARE Zambia
Farmers could only grow specified crops

CARE Zambia
Mutual gain was possible

REFERENCES
CARE Zambia. *CULP Baseline Study*. January, 1997. Ndola, Zambia (unpublished).
Fisher, Robert, Ury, William and Patton, Bruce. 1991. Getting to Yes: Negotiating Agreement Without Giving In. 2nd ed. New York, New York: Houghton Mifflin.
Hansungule, Michelo, Feeney, Patricia and Palmer, Robin. *Report on Land Tenure Insecurity on the Zambian Copperbelt*. November 1998. Oxfam GB in Zambia.

NOTES
1) Paper, slightly edited by RUAF, October 2003 for the Electronic Conference. Original paper presented at the Urban Poverty Conference of CARE International / Urban Insaka, February 2001.

2) CULP is funded by the Royal Netherlands Embassy, Lusaka, and implemented by CARE Zambia and its community and Municipal Council partners.

This article is based on a research project commissioned by IWMI-India, Hyderabad, regarding legal and institutional issues with regard to industrial wastewater management in Hyderabad Urban Area.

WMI-India

A farmer covered by freshly cut para grass

The right to Suitable Water for Agriculture; *an Interpretation of the Constitution of India*

It is not unusual for urban and periurban farmers to use wastewater for agriculture. In some cases, they do not have any alternative: clean water is just not available. In other cases, they want to benefit from the sometimes high content of valuable nutrients in the wastewater

According to Indian law it could be argued that wastewater farmers are entitled to such water, while the government has the obligation to ensure the suitability of the water. In order to make the government comply with this obligation, farmers can turn to the court. As often, there is a huge gap between the theory and practice of the law. There seems to be little awareness among wastewater users, grassroots-level NGOs, and the local authorities on the legal possibilities and constraints. This article aims at making a small step in creating legal awareness by offering a constitutional view on the right of access to water suitable for agriculture.

THE FUNDAMENTAL RIGHT TO LIFE

Like in the constitutions of other democratic countries, the Constitution of India contains a catalogue of fundamental rights. These rights together form the boundaries of India's legal framework: all other laws and regulations as well as all activities of the government at any level have to be in accordance with this framework.

Article 21 of the Constitution guarantees the *right to life*: "No person shall be deprived of his life or personal liberty except according to procedure established by law". Although this article does not seem to have anything to do with water, the Supreme Court of India, the highest judicial authority of the country, has given a series of decisions in which it interpreted Article 21 to encompass the right to a healthy environment:

"Enjoyment of life (...) including [the right to live] with human dignity encompasses within its ambit, the protection and preservation of environment, ecological balance free from pollution of air and water, sanitation, without which life cannot be enjoyed. Any contra acts or actions would cause environmental pollution. Environmental, ecological, air, water pollution, etc. should be regarded as amounting to violation of Article 21. Therefore, hygienic environment is an integral facet of right to a healthy life and it would be impossible to live with human dignity without a human and healthy environment" [(1)].

This excerpt is regarded as an example of how the Supreme Court extended the scope of the right to life also to the environment: a healthy environment is required not only to enjoy the constitutional right to life; it is also an essential prerequisite to be able to live with human dignity. Furthermore, this decision made clear that a "healthy environment" includes the absence of water pollution.

Translating this passage to the context of wastewater agriculture, it could be argued that people who are largely dependent on wastewater, and who, as a consequence, are often prone to wastewater-borne diseases caused by both biological pathogens (mainly originating from domestic wastewater) and/or chemical

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CD-ROM VIDEO
Making a Living along the Musi River: Wastewater Users in and around Hyderabad City, India
Directed by: Stephanie Buechler, Gayathri Devi and Rama Devi

The city of Hyderabad, with its surrounding nine municipalities is one of the fastest growing Indian cities. The Musi river, which runs through Hyderabad, is dry upstream of the city (except during the monsoons), but domestic, hospital and industrial wastewater released from the twin cities of Hyderabad and Secunderabad converts it into a perennial river. In the urban and periurban areas, drainage water from both domestic and industrial sources, is channelled to several contiguous plots of land. Wastewater agriculture all along the Musi river provides livelihoods to a diverse group of women, men and children from different caste groups and represents a broad spectrum of social classes. This highly interesting documentary is produced by IWMI, supported by RUAF and DFID. Copies could be requested through ETC – RUAF.

substances (mainly from industrial wastewater), are being deprived of their right to live (and work) with human dignity in a healthy environment.

According to the Supreme Court, the right to life of Article 21 also includes the *right not to be deprived of one's livelihood*, except according to a just and fair procedure established by law. The case that led to this decision was about pavement dwellers in Mumbai who had been deported from the slums and pavements on which they depended for their livelihood[2]. The Supreme Court ruled that depriving a person of his livelihood, deprives him of his life. Since the deportation of the pavement dwellers from their slums and pavement dwellings would deprive them of their livelihood, deportation would amount to depriving them of their life. Although this case did not have anything to do with water or environmental issues, the general wording in which the relevant observations were made suggests that the deprivation of livelihood as a consequence of environmental degradation may also be considered as a violation of the right to life of Article 21.

In the context of wastewater agriculture, this interpretation of the right to life leads to the following conclusion. If due to, for example, rapid urbanisation and/or industrialisation the water of the streams that have been used for generations by farming communities has become unsuitable for agriculture – either because of its impact on human health, its strong negative effects on crop yields and/or the health and yields of livestock – these farmers will find themselves deprived of their livelihood.

DIRECTIVE PRINCIPLES OF STATE POLICY

To protect and improve the environment
The Constitution of India also contains a set of so-called *directive principles of state policy*. According to Article 48A, the government "shall endeavour to protect and improve the environment". This principle is fundamental in the governance of the country; it has to be applied in making laws and policies. Improvement of the environment includes the improvement of water quality, and one way to improve the quality of surface water, or at least to prevent deterioration, is to treat wastewater before discharging it into surface water. To this end, the government – local authorities in particular – need to have adequate treatment plants and make sure that no discharge of untreated wastewater takes place. Taken together, the Articles 21 and 48A entitle farmers to be protected from the negative impacts of wastewater use; at the same time they obligate the local authorities to safeguard the water quality.

Treatment or Nutrients
A fully-fledged treatment plant will, most likely, not only remove any elements that are harmful to human beings and the environment, but also the beneficial nutrients the wastewater contained before entering the plant. Thus, the outflow of such a treatment plant, although relatively clean and in accordance with the right to unpolluted water, would perhaps lead to a lower crop yield than if the water would still have contained the nutrients. To a certain extent, the farmers would be deprived of a part of their livelihood. It is unlikely, however, that such a partial deprivation would entitle the farmers to legal action, demanding for water that is free of harmful pollutants, but still containing useful nutrients. The wording of the pavement dwellers' judgement suggests that only full deprivation of one's livelihood amounts to a violation of the right to life. Yet, this does not mean that the farmers would have to accept a situation in which they do not benefit anymore from the nutritional value of wastewater.

The organisation of agriculture
Article 48 of the Constitution obliges the government "to endeavour to organise agriculture and animal husbandry on modern and scientific lines (...)". Scientific research in various parts of the world,

The government has the obligation to consider the position of the farmers

including India, has shed light on both the negative and positive aspects of the use of wastewater in agriculture. As a consequence of Article 48, it could be argued that the authorities involved in wastewater management are under obligation to consider the outcome of this research seriously, more so in light of the impact untreated wastewater has on a considerable part of agricultural production[3]. It goes beyond the scope of this article to explore the technical (im)possibilities of treating wastewater in such a way, that the negative elements are eliminated while preserving the beneficial ones.

IWMI-India
A farmer with freshly cut para grass

LEGAL ACTION

Wastewater farmers have, like all other citizens of India, a constitutional right to clean water. The government has the obligation to provide clean water. But, if pollution would render the water (almost) useless for agriculture, the wastewater farmers are being deprived of their livelihood. The violation of both the right to clean water and the right not to be deprived of their livelihood entitles the farmers to legal action. With regard to wastewater management, the government authorities have the obligation to take the position of the farmers into consideration. On the basis of scientific evidence that shows the benefits of wastewater use, they should ideally design wastewater management in such a way that the negative side-effects are reduced whilst the beneficial effects are preserved, to the extent technically possible.

Violation of a fundamental right entitles the victim to legal action. According to the Constitution, both the Supreme Court in Delhi and the High Court of the state in which the violation is taking place[4] can be approached. In the first place, courts entertain cases filed by individuals. However, within the Indian legal system various kinds of group or class action have been developed. One of them is the so-called *public interest litigation* (PIL), which contemplates legal proceedings for the "enforcement of fundamental rights of a group of persons or community which are not able to enforce their fundamental rights on account of their incapacity, poverty or ignorance of law"[5] by any member of the public who concerns himself with the situation of the victims. In cases regarding environmental issues PILs have been filed both by individuals and by NGOs.

The PILs have led to a rich library of decisions of both the Supreme Court and the High Courts, including on issues regarding water quality[6]. However, the overall picture of the effectiveness of PILs is mixed. On one hand, they allow a court to step in where the government is failing, ordering almost immediate measures and/or thorough investigation of the alleged violation. Because the courts have the power to summon all stakeholders – such as the authorities and the polluting industries – involved in the case, they are in a position to come to a comprehensive, "holistic" solution; in some cases, quite successfully. On the other hand, such proceedings tend to take a lot of time[7]. Moreover, in some cases, it has proven to be difficult for the victims to have a favourable decision properly implemented. And last, but not least, PIL cases require the assistance of an advocate who is willing to do a lot of work for only a small fee.

IWMI-India

Vegetable plots along the Musi River

MORE AWARENESS FOR ALL STAKEHOLDERS

One of the findings of the research on legal and institutional issues with regard to industrial wastewater management in Hyderabad Urban Area has been that government officials are not always sufficiently knowledgeable about the prevailing legal framework. And also according to environmentalists and social activists, there is very little legal awareness among the people concerned – the wastewater farmers and their representatives such as grassroots-level NGOs.

Nevertheless, India is a democratic society in which the rule of law prevails, and where government policies have to be in accordance with the legal framework, including the provisions of the Constitution. This requires that the authorities are fully aware of the implications of the constitution on their policies. Furthermore, the rule of law requires that people have at least a basic awareness of their legal position. The fact that the Constitution of India, the fundamental law of the country, is supporting their position should strengthen people in their struggle to improve their situation.

This legal analysis does not only offer arguments for taking the position of wastewater farmers into consideration in the policy-making process, it also attempts to stimulate people to continue their struggle for the improvement of their situation, knowing that the law is on their side. Of course, there is a still long way to go before the relevant laws and regulations are fully implemented and enforced. In order to make the law work as it is supposed to, it will be necessary (a) to create basic legal awareness among

REFERENCES

Bakshi, P.M., *The Constitution of India. Selective Comments by P.M. Bakshi.* 5th edition, Delhi: UniversalLaw Publishing Co. Pvt. Ltd., 2002.

Buechler, S. and Devi, G., *Highlighting the user in wastewater use research: a livelihoods approach to the study of wastewater users in Hyderabad, India.* Paper presented at the workshop "Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities", organised by IWMI-India, Hyderabad, 10-11 November, 2002.

Divan, S. and Rosencranz, A., *Environmental Law and Policy in India. Cases, Materials and Statutes.* 2nd edition, New Delhi: Oxford University Press, 2001.

Shastri, S.C., *Environmental Law.* Lucknow: Eastern Book Company, 2002.

wastewater farmers and NGOs working at field level, (b) to discuss the policy implications of the constitutional rights and obligations with local authorities involved in wastewater management, and (c) to do further research on legal issues in order to develop a better understanding of the legal framework regarding the right to clean and/or suitable water.

HYDERABAD

The Hyderabad Metropolitan Water Supply & Sewerage Board (HMWSSB), responsible for both drinking water supply and sewage treatment, is aware of the fact that wastewater is being used for agriculture. As part of the National River Conservation Plan, HMWSSB is at present implementing a plan to increase the sewage treatment facilities. However, HMWSSB does not seem to pay special attention to farmers that use wastewater.

With help from the "Forum for a Better Hyderabad", a local NGO, people from a downstream village filed a PIL against a project for the inter-basin transfer of industrial effluents to – ultimately – the Musi River. The people get their water from this river and were concerned that this project would increase the pollutant load of the river. The Andhra Pradesh High Court ordered a special committee to monitor the implementation of this project. It remains to be seen what the impact of the transfer of effluents will be.

NOTES

1 Excerpt from the 1995 Supreme Court case *Virender Gaur v State of Haryana*. Similar considerations are found in other cases.
2 The 1986 Supreme Court case *Olga Tellis v Bombay Municipal Corporation*.
3 It is estimated that east of Hyderabad, India, some 40,000 hectares of land are under irrigation with water of the Musi River (S. Buechler and G. Devi, 2002). Almost all domestic and industrial wastewater generated in Hyderabad is being discharged into the Musi without proper treatment.
4 India is a federal union, consisting of a number of states with a high level of independence. Every state has its own High Court.
5 The 1991 Supreme Court in the case *Subash Kumar v State of Bihar*.
6 But, as far as the author is aware, not specifically on wastewater quality.
7 A PIL about industrial environmental pollution in Patancheru, Andhra Pradesh, was filed in 1990. Thirteen years and large number of interim decision later, the case is still pending and the pollution problem stays unsolved.

Legal and Policy Aspects of Urban Agriculture in Tanzania

Urban agriculture in Tanzania is practised in a generally favourable political and legal context. During the 1970s and 1980s, the national government, faced with a poor economy, issued policies encouraging people to undertake urban agriculture.

RUAF-Video

The Ministry encourages and supports urban agriculture

These policies were issued to support urban dwellers to attain food self-sufficiency and to grow food to combat fast increasing inflation. Government and political leaders repeatedly urged urban dwellers to raise livestock and produce food in their backyards and other open spaces.

Under these policies, the Ministry of Agriculture and Food Security (MAFS) encourages and supports urban agriculture through its agricultural extension officers who offer non-formal agricultural education to urban dwellers. The government also set up an urban agriculture extension service in the 1970s under the Ministry in a bid to encourage urban dwellers to produce their own food. Currently, MAFS uses its urban-based Agriculture/Livestock Extension Agents (ALEAs) to promote the raising of livestock and growing of crops. ALEAs visit urban dwellers and impart modern skills and knowledge (non-formal education) about agriculture so that they can increase their crop/animal production.

MUNICIPAL BY-LAWS

In the 1980s, at the municipal levels it was found that these national policies of encouraging urban agriculture, especially livestock keeping, also had some negative effect on the physical urban environment and on the operations of most urban councils.
It was time to review the existing municipal by-laws regarding farming in the town.

The first urban by-laws regulating the growing of crops and raising of livestock in urban centres were enacted already by the British colonial authorities in 1928 under Rule 16 CAP. 101 (Bylaws for

The National Policies in Tanzania that supported urban agriculture included:
- *Siasa in Kilimo* (Politics is Agriculture) of 1972
- *Kilimo cha Umwagiliaji* (Irrigated Agriculture) of 1974,
- *Kilimo cha Kufa na Kupona* (Agriculture for Life and Dealth) of 1974/75
- *Mvua za Kwanza ni Zakupandia* (First Rains are for Planting) of 1974/75.
- The National Economic Survival Programme (NESP) of 1981/82
- The National Food Strategy of 1982
- The National Livestock Policy (NLP) of 1983
- The National Agricultural Policy (NAP) of 1983
- The National Economic Recovery Programme (ERP) of 1986-1990.

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THE NATIONAL HUMAN SETTLEMENTS DEVELOPMENT POLICY OF 2000

Urban agriculture exists in most urban areas in both the developed and developing countries. As an economic activity, it provides income and employment opportunities to the urban populations, and a reliable supplementary source of food to urban dwellers at affordable prices. As a form of land use, well-planned urban agriculture creates a pleasant green scene.

Although urban agriculture is considered an important component in sustainable development, improperly practiced urban agriculture conflicts with other urban land uses and leads to land degradation, water pollution, and is a threat to health and safety.

THE GOVERNMENT SHALL

- ➢ Designate special areas within city planning where people will be granted legal rights to engage in agricultural activities;
- ➢ continue to regulate and research urban agriculture and will ensure that it does not disrupt planned urban development;
- ➢ review existing laws to facilitate planned urban agriculture; and
- ➢ facilitate construction of appropriate infrastructure to mitigate/prevent land degradation, water pollution, and health and safety hazards in areas where urban agriculture is permitted (United Republic of Tanzania, 2000).

Regulation of Cultivation and Keeping of Animals in Urban Areas).

These by-laws had three main objectives:
• to prohibit people of African descent from growing crops and raising livestock in urban areas;
• to prevent urban agricultural activities in urban areas, because it was thought to increase the presence of malaria-causing mosquitoes, especially crops taller than one metre; and
• to maintain a cleaner urban environment and sustain urban aesthetics by preventing people of African descent from growing crops in most of the towns' open spaces.

The essence of these by-laws is that growing crops or raising animals is allowed, if it is under certain conditions. After independence in 1961, most of these by-laws became moribund, but it was in the 1980s, that most towns and municipal councils found it necessary to revive these by-laws in order to regulate the growth of urban agriculture.

In Tanzanian towns, by-laws on crop cultivation distinguish between areas where the growing of crops is completely prohibited and areas where it is permitted. Growing crops is not permitted within a distance of 14 metres from road banks. As for river valleys, crop cultivation is not allowed within a distance of 15 metres from the riverbanks. The cultivation of annual crops is not restricted in these areas. For permanent crops, however, written permission from the Municipal Director is needed. Other by-laws regulate the ways in which crops have to be cultivated, including for instance the use of machinery, planting time, use of inputs, weeding, use of certified seeds, planting on slopes, and how to act in case of plant pests or diseases. Yet other by-laws stipulate the penalties for not adhering to these regulations, including fines, imprisonment and destruction of crops.

Although these by-laws exist and clearly stipulate the penalties for defaulters, they are rarely implemented. For instance, it is common to see crops of all varieties planted in all municipal administrative wards, road reserves, riverbanks, public open spaces including children's playgrounds, and surveyed plots, rendering the by-laws 'toothless.'

In towns, by-laws on livestock keeping define "animals" as cattle, donkeys, goats, horses, mules, pigs and sheep. In other words, small livestock like chicken (local and improved varieties), ducks, rabbits and turkeys, very common in urban areas, are left out. Most town Council by-laws stipulate that they have to earmark certain areas as "specified areas" within the urban limits for the purpose of keeping animals or for grazing.The Councils issue special permits in respect of animals that are authorised within the given urban areas.

Yet, the by-laws do not specify the numbers and types of animals that urban dwellers are allowed to raise according to the density of the areas. By-laws forbid keeping animals outside "a building, structure or enclosure"; hence, holding animals in free range conditions is prohibited. Moreover, the by-laws do not allow animals to be kept "in a building or part of such building that is used for human habitation". Yet, people keep chicken, goats, and sheep in their houses. They could argue that chicken is not defined as an animal in the by-laws. Animals can only be moved with special permission from the Council. Most urban dwellers keep animals without a permit. By-laws which require urban dwellers to remove manure (solid and liquid) and other animal waste are never enforced. The fact that there are many senior government and ruling party officials among the livestock keepers who break the by-laws with impunity, is probably the best assurance for most other livestock keepers that they will not be punished for breaking the law.

The legal context of urban farming is confusing for the urban farmers

CONCLUSION

The legal context of urban farming is somewhat confusing for the urban farmers. The national government pursued a generally favourable policy and even tried to encourage people to do urban farming during periods of severe economic recession. Yet, by-laws at the local level pose many restrictions to the practice. Many urban farmers appear not to know what is allowed and what is not. On the other hand, despite these regulations, enforcement is sparingly done and discriminatory in nature (the elite is less affected), councils lack funds and personnel to reach sprawling and sometimes unplanned urban areas.

REFERENCE
United Republic of Tanzania. (2000). *National Human Settlements Development Policy*. Ministry of Lands and Human Settlements Development. Dar es Salaam: Government Printers. p. 48.

Integration of Urban Agriculture into City Planning in Turkey

In Turkey, urban agriculture does not appear in the "land use and possession classification codes" used in urban planning. This classification was developed 25 years ago and is not clear about certain uses, which leaves these to dispute. This classification needs to be updated.

A modern city draws much of its population from the rural areas. As such, the city should be able to integrate this population and the experiences they have, and provide them with sufficient land. The value of the land, defined by its rent, increases under urbanisation, and agricultural fields and public land are predominantly used for industry and housing. It is necessary to re-value the agricultural sector and the agricultural use of land in the city. There is a need to integrate agriculture into the existing functions of the city, and link it to issues such as poverty, famine, food security and social identity. However, the laws governing the city are a result of sudden decisions and pressures in the past, and do not allow for inclusion agriculture.

It is necessary to search for a new way of land classification that is designed for today's requirements and the possibilities of modern cities. A new "Land Usage and Possession Classification" is therefore suggested. This new classification is based upon the classification of the Ministry of Public Works which is widely known and used in development plans in Turkey. Local administrations like municipalities (including metropolitan municipalities), ward managements and central authorities (including provincial and city administrations) seem to be open to the suggested attention to urban agriculture. However, participation of different stakeholders in decision making and training will be required to actually operationalise this change.

URBAN AND PERIURBAN AGRICULTURE UNDER REVISED ARTICLE 8

81. Livestock and Related Services
811. Fold and Crib Livestock Raising and Related Services
812. Apiculture and Related Services
813. Commercial Raising of Rabbits and Related Services
82. Forestry and Related Services
83. Fishery and Related Services
84. Areas Used to Supply Resources for Urban and Periurban Agriculture
841. Solid and Liquid Home Waste Collecting and Recycling Areas
842. Marketing Areas

ADAPTED ARTICLE 9

9. Non-used areas and water sources (Ýplenmeyen arazi ve Su alanlarý)
9.1 Areas which are not used and processed (Ýplenmeyen ve Kullanýlmayan arazi)

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MUNICIPAL INSTITUTIONS AND URBAN AGRICULTURE

Turkey has a modern urban planning approach but, like many developing countries, has suffered from problems in this process. The institutions and persons involved have several and obscure roles. The public administration has developed into a hierarchical structure with an abundance of actors, of local and central public institutions. Local institutions, whose importance is emphasised by the activities of "Agenda 21", should clearly determine their complementary functions. Since their functioning depends on central governance, coordination can only be achieved by the formation of a web among all local and central administrative units.

The central governing body and its local (provincial) actors have an important role in the formation and functioning of cities. Potential agricultural areas in the cities are increasingly being designated for construction based on the urgent priority of settlement, tourism and industry. The existing laws and regulations prompt urban areas to enlarge without any consideration for ecological conditions. The importance of environmental protection and arrangements for agriculture in the cities, which so far only remain in discourse, can only be taken up when the ways to achieve these goals are clear. To start with, agriculture as the main distinguishing criterion between rural and urban areas should be taken out of the laws, after which integration in urban planning can start.

Henk de Zeeuw

It is necessary to re-value agricultural use of land in the city

INTEGRATING URBAN AGRICULTURE INTO CITY PLANNING

In Turkey, the integration of urban agriculture into development plans and its applicability depends on its inclusion into the process of public certification within the context of the Basic Land Usage and Possession Classification. The classification codes used by Ministry of Public Works, which is an important player in the process of planning, appear to be flexible enough. It is also known that Provincial Banks use the same classification outside of central commercial areas.

The proposed adaptation of the codes of the Ministry of Public Works to include urban and periurban agricultural areas, refers to articles 8 and 9. Article 9 refers to non-used areas, from which the issue of forestry should be removed and incorporated into article 8, which details productive purposes. Article 8 needs only a minor adaptation: it is suggested that that the "mining sector" be excluded and given a separate article under its former name "Source Produce and Mining (kaynak üretim ve çýkarýmý)".

The integration of urban and periurban agriculture into the existing urban planning system of Turkey is a relatively easy task; what is required is a reform of the system. This reform will depend on improved integration and interaction between central and local administrative units, notably the coordination between the Ministry of Public Works, the Provincial Director of Public Works, Provincial Administration and Provincial Bank should become more productive.

Books

SEEDS THAT GIVE: PARTICIPATORY PLANT BREEDING

2003. Ronnie Vernooy. IDRC ISBN 1-55250-014-4. paperback 100 pp. Also available in Spanish and French. IDRC, Ottawa, Canada. Tel: (613) 236-6163. Fax: (613) 563-2476. Web: http://www.idrc.ca/seeds

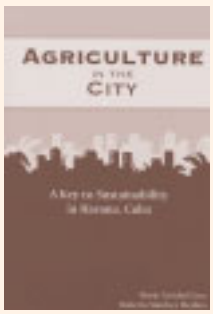
This book, published by IDRC, contributes to the discussion on farmers' experimentation and the important contribution it makes to sustainable development. Local plant breeding is the answer to genetic erosion, and counteracts the increase in vulnerability of crops, for instance, to diseases and climate changes. Today, less than three percent of the 250,000 plant varieties available to agriculture are in use. A mere 12 species provide three-quarters of the world's plant-based food. For many of the small-scale farmers on marginal lands the cost of these high-yielding seeds, the necessary fertiliser, and other inputs is prohibitive. Instead they continue to experiment with local seed varieties, selecting and sharing those that will continue to produce even under adverse conditions, also in urban areas. Seeds that give is part of IDRC's "In Focus" book series. It reviews 10 years of IDRC support for participatory plant breeding research around the world.

Complementing the book are six case studies from the developing world and a thematic web site: www.idrc.ca/seeds.

USE OF WASTEWATER IN IRRIGATED AGRICULTURE.

Country Studies from Bolivia, Ghana and Tunisia. 2003. Wageningen University. The Netherlands.
Bolivia: ISBN 90-6754-705-0; Ghana: ISBN 90-6754-704-2; Tunisia: ISBN 90-6754-703-4.
The research described in these three documents, is part of the Water for Food and Ecosystems Programme, funded by the Netherlands Government. The documents can be downloaded as pdf files from www.dow.wau.nl/iwe; More information: Frans Huibers: frans.huibers@wur.nl

AGRICULTURE IN THE CITY, A KEY TO SUSTAINABILITY IN HAVANA, CUBA.



2003. María Caridad Cruz and Roberto Sánchez Medina. IDRC. Published in 2001 in Spanish and printed in English by Ian Randle Publishers and IDRC.
This book presents the results of a three-year research project on the history and state of urban agriculture in Havana, Cuba, and the long-term potential for urban agriculture in the local economy of two areas in Havana, as part of municipal environmental management. The book will be of interest to a wide audience, including municipal authorities and local action groups.

ACCESS TO LAND BY THE URBAN POOR

2002. Angel, S. et al (seven experts). 48 pages, paperback, US$ 15.00, ISBN 1-55844-152-2. Available at www.lincolninst.edu
Cities in developing nations worldwide face the problems of progress and poverty because of constraints in access to land. Latin American cities offer clear evidence that pervasive and persistent informality in land markets is both an effect of and a major contributing factor to urban poverty. The cost of being informal is often much higher than the cost of being formal, particularly when considering access to serviced land and urban amenities. Seven researchers and consultants experienced with developing and implementing land and housing policies in the third world contributed to this discussion.

LEASING PUBLIC LAND

2003. Bourassa, Steven and Yu-Hung Hong (editors). 2003, 320 pages, paperback, US$ 20.00, ISBN 1-55844-155-7. Available at www.lincolninst.edu
Leasing public land has been advocated as a viable land tenure option for former socialist countries and other transitional economies. However, the debate about land tenure has been influenced more by ideology and preconceptions than by lessons drawn from careful study of existing leasehold systems. This new publication offers a thorough examination of existing public leasehold systems from around the world and presents insightful recommendations for the future role of such systems. Various issues and concepts of public leasehold are introduced and discussed, followed by two groups of case studies of international leasehold systems, organised into a framework for understanding the policy-making implications.

VACANT LAND IN LATIN AMERICAN CITIES

Clichevsky, N. et al (eight experts). 2002, in Spanish, 144 pages, paperback, US$ 15.00 ISBN 1-55844-149-2
Available at www.lincolninst.edu
Vacant urban land is the product of many combined factors, including the functioning of land markets, the actions of private agents and the policies of public agents; and it poses an important challenge for the government and policy makers of Latin America. Vacant lots located on the urban fringes and in central and interstitial areas have been a determining factor in the growth patterns of cities in the region. This book, written in Spanish, identifies the many problems related to vacant urban land in five key cities: Rio de Janeiro, Buenos Aires, Lima, Quito and San Salvador.

FAO OFFERS FREE OR LOW-COST ACCESS TO SCIENTIFIC LITERATURE ONLINE

The Food and Agriculture Organization of the United Nations (FAO) has launched Access to Global Online Research in Agriculture, (AGORA), an online clearinghouse of approximately 400 journals in the fields of agriculture, biology, and related environmental and social sciences. With this website, FAO plans to increase the quality and effectiveness of agricultural education and research by providing wider access to published information. For more information, visit http://www.fao.org/english/newsroom/news/2003/23019-en.html

www.developmentgateway.org
Enter "urban" in the search engine on this site for a wide range of materials on urban agriculture. Every entry is supported by an abstract which summarises the contents and significance of the document or web site presented. Visitors can sign up for updates on new content, access a database containing thousands of projects, peruse a directory of food security practitioners and post resources of your own. The site is run by the not-for-profit Development Gateway Foundation in collaboration with a variety of cooperating organisations, including RUAF.

www.gdnet.org/online_services/toolkits/proposal_writing/
The Global Development Network has developed a toolkit that offers practical tips and suggestions, based on interviews with experienced research fund-raisers from around the world. The reader is offered a checklist of things to consider when writing a proposal, such as style, structure and clarity, putting together a budget to justify the funds, donors to approach and how best to approach them.

www.plos.org/index.html
The Public Library of Science (PLoS) is a non-profit organisation of scientists and physicians committed to making the world's scientific and medical literature a freely-available public resource. PLoS is working with scientists, their societies, funding agencies, and other publishers to pursue the broader goal of ensuring an open-access home for every published article and to develop tools to make the literature useful to scientists and the public.

www.cbnrm.net/
People working on Community-Based Natural Resource Management (CBNRM) throughout the world - as practitioners, managers and researchers - are talking about an urgent need for capabilities that enable direct communication between them. Such CBNRM networking capabilities would make it possible for people to exchange experiences, manage relevant knowledge, and support learning across countries, sectors, cultures, and languages, and in this way achieve better results. *CBNRM Net* is a response to this call. *CBNRM Net*'s web site provides a powerful set of broad, robust and useful networking tools aimed at linking stakeholders.

attra.ncat.org/
ATTRA (Appropriate Technology Transfer for Rural Areas), funded by the US Department of Agriculture, is a national sustainable agriculture information service managed by the National Center for Appropriate Technology. It provides information and technical assistance to farmers, ranchers, extension agents, educators, and others involved in sustainable agriculture in the United States. ATTRA services are also available to farmers, market gardeners, extension agents, researchers, educators, farm organisations, and others, especially those who are economically disadvantaged or belong to traditionally deprived communities.

www.xaia.ca/cityfarmer/
A forum for dynamic discussion on urban agriculture and related issues. Take a look at the urban agriculture forum put on-line a few months ago. Fifty members have already signed up. RUAF members are welcome to set up a discussion area for topics that interest them.

www.aginternetwork.org/en/about.php
Access to Global Online Research in Agriculture (AGORA) is an initiative to provide free or low-cost access to major scientific journals in agriculture and related biological, environmental and social sciences to public institutions in developing countries. Launched in October 2003, AGORA will provide access to over 400 journals from the world's leading academic publishers. Led by the Food and Agriculture Organization of the United Nations, the goal of AGORA is to increase the quality and effectiveness of agricultural research, education and training in low-income countries, and in turn, to improve food security.

www.new-agri.co.uk/03-5/focuson.html
This month's issue of the "New Agriculturalist on-line - reporting agriculture for the 21st century" has a series of articles on urban agriculture from around the world. The full articles can be read on-line.

www.sygw.org/
Seattle Youth Garden Works in the USA empowers underserved youth through garden-based education and employment. It is a market gardening programme for homeless and low-income youth ages 14-22 in the University District and South Park neighbourhoods. Our goals are to connect youth to housing, health care, education, jobs and community. Seattle Youth Garden Works is a programme of the Church Council of Greater Seattle.

www.foodaidmanagement.org/agriculture.htm
Food Aid Management (FAM) was created in 1989 by five U.S. private voluntary organisations (PVOs) to "promote the efficient and effective use of food aid resources to help alleviate hunger and contribute to food security". Under headings such as agriculture, environment, gender and HIV/Aids, the visitor is guided to links that lead to journals, articles, on-line libraries, information networks, etc. The site has a training calendar and events section. Under the heading agriculture, there are sections on nutrition, biotechnology, monitoring and urban Agriculture. Also in Spanish and French.

www.state.fl.us/fdi/fscc/news/state/9902/rt-tm.htm
"Green industry" is the most profitable and least-subsidised sector of US agriculture and is a key to overall community sustainability. The Florida Chapter of the International Society of Arboriculture and the Florida Nurserymen and Growers Association have formally asked the Florida Department of Community Affairs how their groups can work more closely with the Florida Sustainable Communities Network programme as part of their effort to advise public officials on how the "green industry" can help them achieve true sustainability.

A phytoremediation consulting company, Phytotech, has studied soil lead removal using Indian mustard (Brassica juncea) plants, which are even better at accumulating it than others in the Brassica family. They found that cropping with successive plantings (which were harvested and thrown away) lowered soil lead, with decreasing effectiveness as the lead levels in the soil decreased. This and other work can be found at these sites:
www.epa.gov/region01/leadsafe/
www.bumc.bu.edu/Departments
www.jurban.oupjournals.org/cgi/content/abstract/78/1/199

FIRST GLOBAL WATER, SANITATION AND HYGIENE (WASH) FORUM (DAKAR, SENEGAL)

November / December 2004

The Water Supply and Sanitation Collaborative Council (WSSCC) is organising this event to draw lessons on how successful water, sanitation and hygiene programmes, sector reforms and development partnerships are leading to the eradication of poverty. It also aims at strengthening regional and national partnership initiatives pursuing the goals of the World Summit on Sustainable Development. Web address: http://www.wsscc.org/load.cfm?edit_id=332 Or contact: the forum Manager, at wsscc@who.int

ROLE OF MULTI-PURPOSE AGRICULTURE IN SUSTAINING THE GLOBAL ENVIRONMENT AGRO ENVIRON 2004 (UDINE, ITALY)

October 20-24, 2004

The first Agro-Environ symposium was organised in Faisalabad, Pakistan in 1998. This is the fourth in a series of workshops that aims to be a platform for idea sharing and networking between organisations involved in agro-environmental issues. The theme of the forthcoming Agro Environ is "Sustainable Global Environment and Multi-purpose Agriculture", a theme in which urban agriculture definitely has its place. More information: www.dpvta.uniud.it/~agroenv

UNLOCKING HUMAN POTENTIAL, LINKING THE INFORMAL AND FORMAL SECTORS (HELSINKI, FINLAND)

September 17-18, 2004

The World Institute for Development Economics Research, WIDER, in Helsinki is a research and training centre of the United Nations University. The Expert Group on Development Issues, EGDI, is a policy advisory body linked to the Swedish Ministry for Foreign Affairs. The EGDI-WIDER conference on

Unlocking Human Potential welcomes submissions of papers or abstracts (of 2-3 pages) on the interaction between government legislation and policies with the "informal" efforts and livelihoods of people. The submission deadline is Feb. 1, 2004. For more: www.wider.unu.edu or www.egdi.gov.se, To submit of for further information: unlocking@wider.unu.edu.

WORLD URBAN FORUM 2004 (BARCELONA, SPAIN)

13-17 September 2004

Barcelona is preparing to receive some 2,000 delegates representing governments, local authorities, non-governmental organisations and other experts on urban issues from around the world for the second gathering of UN-HABITAT's World Urban Forum. This forum is held every two years and is a key global event to address and keep abreast of the main challenge of the new Millennium – our planet's transition to an urban world. The issue of urban agriculture, notably the financing of urban agriculture, will be presented here. For more information: http://www.unhabitat.org/wuf/2004/default.asp

UNLOCKING HUMAN POTENTIAL, LINKING THE INFORMAL AND FORMAL SECTORS (HELSINKI, FINLAND)

September 17-18, 2004

The EGDI-WIDER conference on Unlocking Human Potential welcomes submissions of papers or abstracts (of 2-3 pages) on the interaction between government legislation and policies with the "informal" efforts and livelihoods of people. Main issues are: conceptualizations of the formal and the informal; lessons and experiences of success as well as failure; implications for policy makers; in the context of experiences at different times and in different regions of the world, and across a range of topics such as land titling, common property management, employment, small and medium enterprises, gender relations and women's legal rights. The submission deadline is Feb. 1, 2004. The World Institute for Development Economics Research, WIDER, in Helsinki is a research and training centre of the United Nations University. The Expert Group on Development Issues, EGDI, is a policy advisory body linked to the Swedish Ministry for Foreign Affairs. See for more: www.wider.unu.edu or www.egdi.gov.se, To submit of for further information: unlocking@wider.unu.edu.

CONGRESS ON AGROFORESTRY (ORLANDO, USA)

27 June – 2 July 2004

Agroforestry professionals world-wide, from academic institutions and government organisations, the private sector and voluntary groups, will gather for this 1st World Congress of Agroforestry in Orlando, Florida, USA. The main objective is to share knowledge and develop strategies for research, education and training in agroforestry. Visit the congress web site for further details: http://conference.ifas.ufl.edu/wca

INTERNATIONAL CONFERENCE ON URBAN AGRICULTURE, *URBANAG 2004* (BRISBANE, AUSTRALIA)

Mid-2004

Urbanag 2004 will focus on the city of Brisbane, and its role as global leader in urban agricultural practices, as well as emerging urban agricultural tends in the Western Pacific region. More information: Geoff Wilson. Phone +61 7 3349 1422; fax 61 7 3343 8287; e-mail: fawmpl@powerup.com.au. www.urbanag.info

URBAN WOODS FOR PEOPLE AND THE 7TH IUFRO European Forum on Urban Forestry (Stockholm, Sweden)

May 23 – 27, 2004,

This is the concluding conference for the Life Environment Project "Urban Woods for People", as an integrated part of the annual meetings organised by the International Union of Forest Research Organisations (IUFRO) since 1998, to act as meeting places for urban forestry policymakers, practitioners and scientists. The six previous meetings have provided urban foresters with the opportunity to exchange ideas and experiences on actual topics such as funding, education and partnerships. This 7th meeting is being convened under the title "Working with Woods – developing tools for sound urban forestry". Updated information can also be found at: www.svo.se/urbanwoods and www.efuf.org

COMMUNITY-DRIVEN DEVELOPMENT: THE ASSET-BASED APPROACH (ANTIGONISH, NOVA SCOTIA, CANADA)

May 17-June 4, 2004

The Coady International Institute is organising this 3-week certificate programme that offers senior development workers and policy makers exposure to several practical asset-based tools designed to help community leaders build (or rebuild) a community-driven development process. The course also explores the appropriate role for intermediary organisations in promoting and supporting community development from the inside out. For detailed information, go to the Coady International Institute's website www.stfx.ca/institutes/coady

TRAINING COURSE FOR ANGLOPHONE AFRICA ON URBAN AGRICULTURE (NAIROBI, KENYA)

8 - 26 March, 2004

The Cities Feeding People programme of IDRC, the Urban Management Programme of UN-Habitat, the Municipal Development Partnership (MDP) of Zimbabwe, the Ministry of Planning of the Government of Kenya, the Resource Centre on Urban Agriculture and Food Security (RUAF), the International Water Management Institute (IWMI), and the CGIAR Urban Harvest Programme will hold this three-week regional training course. The course is based on a participatory learning model pioneered in Francophone Africa in 1998 and in Latin America in 2001. Seven training modules on different aspects of urban agriculture will address the contents of proposals developed by teams from different cities or towns in the region. The team members have already been selected, and consist of three members - a researcher, a municipal officer concerned with a locally important aspect of urban agriculture, and an implementer of projects. More information on this course will be published at www.ruaf.org or the partner sites.

CITIES AND LOCAL GOVERNMENTS: THE FUTURE FOR DEVELOPMENT (PARIS, FRANCE)

May 2-5, 2004

This Founding Congress of United Cities and Local Government is an opportunity to bring together city and local government leaders from across the globe with key stakeholders from the international community. It will explore the role of local government in development, exchange experiences and develop strategies for the future. The congress will focus on the following sub-themes: local sustainable development in a globalising world; decentralisation and local democracy; cooperation, partnership and solidarity between local governments for peace and development. Over 2,500 participants are expected to attend the congress. More information can be found through the website of IULA:
http://www.iula-int.org/iula/web/template.asp?L=EN&ID=13

ASSURING FOOD AND NUTRITION SECURITY IN AFRICA BY 2020 (KAMPALA, UGANDA)

1-3 April 2004

Food and nutrition security remain Africa's most fundamental challenge. However, Africa has climbed back on the agenda. There are new political initiatives gaining momentum both inside and outside the continent. This all-Africa conference will bring together the traditional and new actors and stakeholders to deliberate on how to bring about change and action to assure food and nutrition security. The International Food Policy Research Institute, under the auspices of its 2020 Vision Initiative, will facilitate an international conference in Kampala, Uganda, in partnership with the Government of Uganda. For more info:
http://www.ifpri.org/2020AfricaConference/sponsors.asp

INTERNATIONAL WORKSHOP ON SUSTAINABLE PRODUCTION TECHNOLOGIES FOR MEDICINAL PLANTS AND ALTERNATIVE MEDICINE (PINAR DEL RÍO, CUBA)

February, 11 – 13, 2004

This workshop aims to facilitate the exchange of new insights on different aspects on the subject of medicinal plants. The workshop language is Spanish, but contributions in English and Portuguese are accepted. More information can be obtained from Juan Francisco Valdés: valdes@af.upr.edu.cu or valdesjfco@yahoo.es

APPLICATION DEADLINE FOR THE AGROPOLIS INTERNATIONAL GRADUATE RESEARCH AWARDS IN URBAN AGRICULTURE.

January 31, 2004

Information and application forms can be obtained from the Cities Feeding
People website in English:
http://network.idrc.ca/en.php?id=4714, French:
http://network.idrc.ca/fr.php?id=4714 and
Spanish: http://network.idrc.ca/es.php?id=4714

URBAN RESEARCH SYMPOSIUM (WASHINGTON, USA)

15-17 December 2003

In December 2002, individual researchers, representatives of public and private organisations and members of research networks from around the world joined World Bank specialists to review recent and ongoing research on urban poverty. This conference marked the Bank's renewed interest in urban research. The Bank wanted this Symposium to become an annual forum. The second Urban Research Symposium took place at the World Bank Headquarters in Washington, DC and is titled "Urban Development for Economic Growth and Poverty Reduction". Contact: urbansymposium@worldbank.org; telephone: 202-473-0539; fax: 202-522-3232.
http://www.worldbank.org/urban/symposium2003/

AGUILA NETWORK CONVENTION (MEXICO CITY, MEXICO)

November 20 - 22, 2003

The Mexican "Aguila" Network on Urban Agriculture - a sub-division of the
Latin American "Aguila" Network on Urban Agriculture – held its Second National Convention. The central theme was "Urban Agriculture as an Organizational Strategy for Food Security, Family/Community Survival, and Environmental Sustainability". More information: gabaher@prodigy.net.mx or bcanabal@cueyatl.com.mx

ICLEI WORLD CONGRESS 2003, ATHENS, GREECE

November 3-7, 2003

Local governments from around the world gathered for this ICLEI World
Congress, which focused on Local Action 2: Local Governments Implementing Sustainable Development. Over 500 representatives from local governments, international agencies, national governments, and donor agencies came together to exchange ideas and identify opportunities to strengthen and advance the achievements of local governments in the area of sustainable development. Information is available at: www.iclei.org/worldcongress

RECTIFICATION

Our readers have notified us of two wrong e-mail addresses that appeared in UA Magazine no. 10 (July 2003). The first is of Cesar Marulanda, the author of the article on Hydroponics on page 8, given wrongly as: delfin@lamolina.edu.pe; the correct address is cesarmarulanda51@hotmail.com.
The second contact e-mail wrongly published is of Preeti Patil (article on India on page 19). It should be preeti_sunil@hotmail.com, and not sunhil@hotmail.com.

LIVESTOCK IN MYSORE

During the recent electronic conference, Er.V.Jagannatha, coordinator of the People's Science Forum (PSF) in Mysore India, called the attention of the participants to a voluntary initiative of the PSF - a survey of urban livestock to facilitate promotion of the Ecocity concept. This mapping is being undertaken under a state Government Programme for the local authority called "Nirmala Nagara" which runs in 31 towns and cities of Karnataka State, in South India. More info at http://www.psf.4t.com, or contact: "Sahana" 437 A & B Block, Double Road, Kuvempu Nagar, Mysore 570 023 India, Mobile: 9448050595, Fax: +91-821-2544918(pp); e-mail: jags_environs57@yahoo.com

MINISTERS' CONFERENCE ON URBAN AND PERIURBAN AGRICULTURE:

Under the title, "Prospects for Food Security and Growth in Eastern and Southern Africa", a Ministers' Conference was held from 28 and 29 August 2003, in Harare, Zimbabwe. A total of 55 delegates from five countries, namely Kenya, Malawi, Tanzania, Swaziland and Zimbabwe, attended. Among them were the Ministers of Local Government from Swaziland and Zimbabwe and the Deputy Ministers of Local Government from Malawi and Tanzania. The Conference was co-organised by RUAF-MDP and the Municipal Development Partnership for Eastern and Southern Africa, in partnership with The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), and supported by FAO, UNICEF, UNDP and IDRC. The principal objective of the conference was to enable ministers responsible for urban development in eastern and southern Africa to share ideas and experiences on the emerging important sector of urban and periurban agriculture, and to develop a policy agenda for action. The Conference recognised the significant contribution of urban and periurban agriculture to food security of urban households, generation of jobs and income, self-esteem and environmental improvement. The Harare Declaration on Urban Agriculture was a key outcome of this conference. In this declaration, governments of the participating countries commit themselves to integrate urban agriculture into their urban economies and to provide an enabling environment for the sector to grow.
The declaration, a full report of the conference, and the list of participants can be found on the website of RUAF.

URBAN HARVEST

As many of you may already be aware, the Steering Committee of the CGIAR Strategic Initiative on Urban and Periurban Agriculture (SIUPA) recently took a decision to change the name of this system-wide initiative to "Urban Harvest". RUAF in turn has taken the necessary steps to incorporate the change of name into its information material (flyers, brochures, website, and email). Although you can still reach our website through www.cipotato.org/siupa the email contact address has now changed:
urbanharvest@cgiar.org An Urban Harvest-Listserv is being developed.

Cities Feeding People has posted a series of nine urban agriculture policy briefs on both their web site as well as that of RUAF. The policy briefs have been validated by mayors and urban planners from approximately 20 cities for content and use. The briefs have been translated into Spanish and French (with a Portuguese version soon to be complete) and tackle issues related to urban agriculture, including land-use planning, wastewater use and gender equity. The policy briefs are available on http://www.idrc.ca/cfp. You may also wish to refer to our partner in Latin America, the Urban Management Programme (http://www.pgualc.org/), for more information.

CITY FARMER 25 YEARS

Our partners in Canada celebrate 25 years of City Farmer, the largest information and education centre for urban agriculture in Canada. Twenty-five years ago, City Farmer executive director Michael Levenston and fellow environmentalist Bob Woodworth were asked by the then Ministry of Energy and Mining to study ways for city dwellers to conserve energy. Now City Farmer is internationally appreciated for its great website; is the largest information and education centre for urban agriculture in Canada; offers workshops and maintains a demonstration garden, showing urban gardeners how to grow vegetables and fruit organically on a small city lot; and even has a street renamed after it in Vancouver. See www.cityfarmer.org

WWW.WASTE.NL

The APUGEDU project in Bamako, Mali has just been finalised. The International cooperation from the European Union asked WASTE together with other partners to analyse the potentials of development of urban and periurban agriculture with the usage of recycled urban waste. This coincided with a programme issued by the World Bank to develop a waste management plan for the city Bamako. WASTE started with compiling a literature review focussing on experiences in southern countries. At the same time, WASTE analysed the solid waste management system in view of recycling in Bamako. Stakeholders, vegetable gardeners and cereal crop owners were identified. With all this acquired information WASTE prepared a workshop on the composting techniques based on the existing waste streams and assisted in the decision-making process to select the compost techniques to be executed in Bamako. During the implementation period WASTE was active as back stopper. The project has allowed to promote composting activity, compost application and management of natural resources. As a result composting is being developed as a waste treatment activity at transfer sites in several collection zones in Bamako. The scenario that APUGEDU has developed will contribute to the overall World Bank plan for waste management in Bamako.

Forthcoming Issues

THE URBAN AGRICULTURE MAGAZINE IN 2004

We welcome article contributions urban agriculture. We invite articles of up to 2,500 words (three pages), 1,700 words (two pages), or 800 words (one page), preferably accompanied by an abstract, references (maximum of 5), figures and digital images or photographs of good quality. The articles should be written in a manner that is readily understood by a wide variety of stakeholders, all over the world. We also invite information on recent publications, journals, videos, photographs, cartoons, letters, technology descriptions and assessments, workshops, training courses, conferences, networks, web-links, etc.

THE FOLLOWING ISSUES OF THE UA-MAGAZINE ARE PLANNED FOR 2004:

NO. 12 GENDER AND URBAN AGRICULTURE
March 2004

The first deadline for submissions was 1 December, 2003. So far, we have received nine articles, which illustrate the issue of gender in urban agriculture in several countries. More articles are requested, especially those which describe methodologies for gender analysis in urban agriculture, and the mainstreaming of gender issues in urban agriculture-related activities. This issue is due for publication in early March, so you are still welcome to submit articles up to 15 January 15, 2004.

NO. 13 MULTI-FUNCTIONAL URBAN LAND USE
July 2004

Deadline for submissions is 1 April 2004. Growing cities, expanding their borders and absorbing rural areas, have to cope with a diversity of claims of its inhabitants. Urban policy makers and planners in many cities still view the rural areas surrounding cities merely as a reserve for future expansion. But more progressive urban policy makers and planners have begun to realise the importance of open green spaces in and around the city for a variety of urban needs, not only for securing a daily supply of fresh food, but also for creating a better urban living environment, for leisure, and even for letting their children know where the milk comes from. Many cities, in developed countries as well in developing countries, have come to understand the role urban and periurban farmers can play in maintaining green zones in the city, using areas less suitable for building. Likewise, innovative farmers in and around cities are exploring the diverse urban demands and have started offering recreational services to urban tourists, providing food, educational and health services, establishing nurseries and coming up with other creative responses to the urban demands. Consequently, the traditional agricultural function of food production is being combined with other functions of importance to the city and to the city dwellers. Such use of land has been named multi-functional land use (see a/o FAO e-conference Multi-functional land use 2001). We welcome your contributions describing examples of multi-functional land use, innovative planning approaches, financial mechanisms and lessons learned regarding the management of such land use.

NO. 14 URBAN AND PERIURBAN FORESTRY
October 2004

Deadline for submissions is 1 July 2004. This issue will be published in collaboration with the European Urban Forestry Research and Information Centre, the Danish Forest and Landscape Research Institute, and the Forestry Division of FAO. Despite the explicit reference to Forestry in the name RUAF, we have not had a special issue as yet on the topic, since other issues have taken priority. But the call for attention to urban greening, parks, agroforestry, etc. has come from different quarters. This special issue will therefore focus on the relation between urban agriculture and forestry in the city. Contributions are invited that discuss concepts and methodologies; advantages and potential; disadvantages and risks of different types of urban agroforestry, and the influence of site specific conditions therein; the access to and the control over resources such as land, water, and inputs; and legal arrangements.

VIDEO ON URBAN AGRICULTURE ON CD ROM

Enclosed with this issue of the UA-Magazine is the video Urban Agriculture on CD-ROM. The original video was produced in 2001 and has now been re-published on CD-ROM, with financial support of the Swedish International Development Agency (Sida). The video can be used for awareness raising and educational purposes. The accompanying booklet is also available on the CD. This booklet contains an overview of the organisations that supported the production of the video.

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ACCESS, AVAILABILITY AND USABILITY OF LAND FOR URBAN AGRICULTURE

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Balancing Health and Livelihoods

Adjusting Wastewater Irrigation Guidelines for Resource-poor Countries

In many low-income countries, less than 10 percent of the urban wastewater is collected in piped sewerage systems and treated. Usually, large volumes of wastewater end up in gutters and open drains and are heavily polluting streams near the city. Here it has been used for decades for year-round or dry-season irrigation of perishable cash crops, such as vegetables, taking advantage of market proximity. This urban and periurban agriculture is more exposed to environmental pollution, including urban wastewater, compared to other farming systems. Due to the common lack of larger industries in resource-poor countries, health risks for farmers and consumers are mostly related to microbiological water contamination from domestic sources (and not industrial pollution).

Acknowledgements: The authors would like to thank the organisers and participants of the Hyderabad workshop for the opportunity for interchange between those involved in Urban Agriculture and those involve in health aspects of wastewater use. The discussions contributed a lot to this article.

To protect farmers' and consumers' health, the World Health Organisation (WHO) published guidelines for the safe use of wastewater in agriculture (Blumenthal, 1989, WHO, 1989), currently under revision[1]. The purpose of the 1989 guidelines was to guide design engineers and planners in the choice of wastewater-treatment technologies and water-management options. The acceptable levels of microbiological contamination included in the guidelines were derived from the results of the available epidemiological studies related to wastewater exposure, use and treatment. In addition, health-protection measures (mainly risk-management measures) were considered, especially crop selection, wastewater-application measures (e.g. drip irrigation) and human exposure control particularly through protective clothing. Integration of these measures and the adoption of a combination of several protection measures were encouraged (WHO, 1989). Where economic constraints limit the level of wastewater treatment that can be provided, a disease-control approach has been suggested, potentially using less strict microbiological guidelines and more management measures for health protection (Blumenthal, *et al.*, 2000; Peasey, *et al.*, 2000).

APPLICATION OF THE GUIDELINES

The application of the guidelines, however, has been found to be difficult in many field situations, for example in India and West Africa, as recently discussed during an expert meeting in Hyderabad (see page 4). To take into account urban and periurban agriculture, adjustments were suggested, especially in relation to the following three points:

- In many countries, wastewater treatment is not possible due to low municipal/governmental resources, and small, old or non-extendable sewerage systems. As the WHO microbiological guidelines expect certain levels of wastewater treatment, their enforcement in situations without any realistic option for treatment would stop hundreds or thousands of farmers from irrigating along increasingly polluted streams, and put their livelihoods at risk, but would also affect food traders and general market supply.
- Especially in market-oriented urban agriculture[2], it is difficult to apply the recommended additional health-protection measures. Highly specialised farmers use every free space with water access to cultivate cash crops, especially those of a perishable nature. Although their plots are often small, irrigation allows for year-round farming and these farmers are able to escape from the poverty trap (e.g. Danso, *et al.*, 2002a), while a contribution to the overall urban vegetable supply and diversified diets is made as well. The small land sizes and insecure land tenure are however significantly constraining farmers' ability to invest in farm infrastructure, such as drip irrigation or on-farm sedimentation ponds. Crop restriction is also often unrealistic as only cash-crop production corresponding to market demand provides the profit on which farmers' livelihoods are based. Thus a change like from vegetables to tree crops would be unrealistic from the land-tenure perspective and also ignores farmers' livelihood strategies (except where non-vegetable cash crops are suitable, e.g. olive trees in the Middle East). In addition, recommendations to change irrigation systems or cease irrigation before harvest usually do not work out, as products such as lettuce would become damaged within a few days from lack of water. Finally, many field interviews show that farmers do not perceive the need for protective clothing (see page 24). All of these constraints to the application of the current wastewater guidelines are common in urban agriculture and not the exception.
- Finally, the microbiological part of the current WHO guidelines have often been used or cited in isolation from the other protective measures (also pointed out in the Hyderabad workshop). A reason might be that the defined critical

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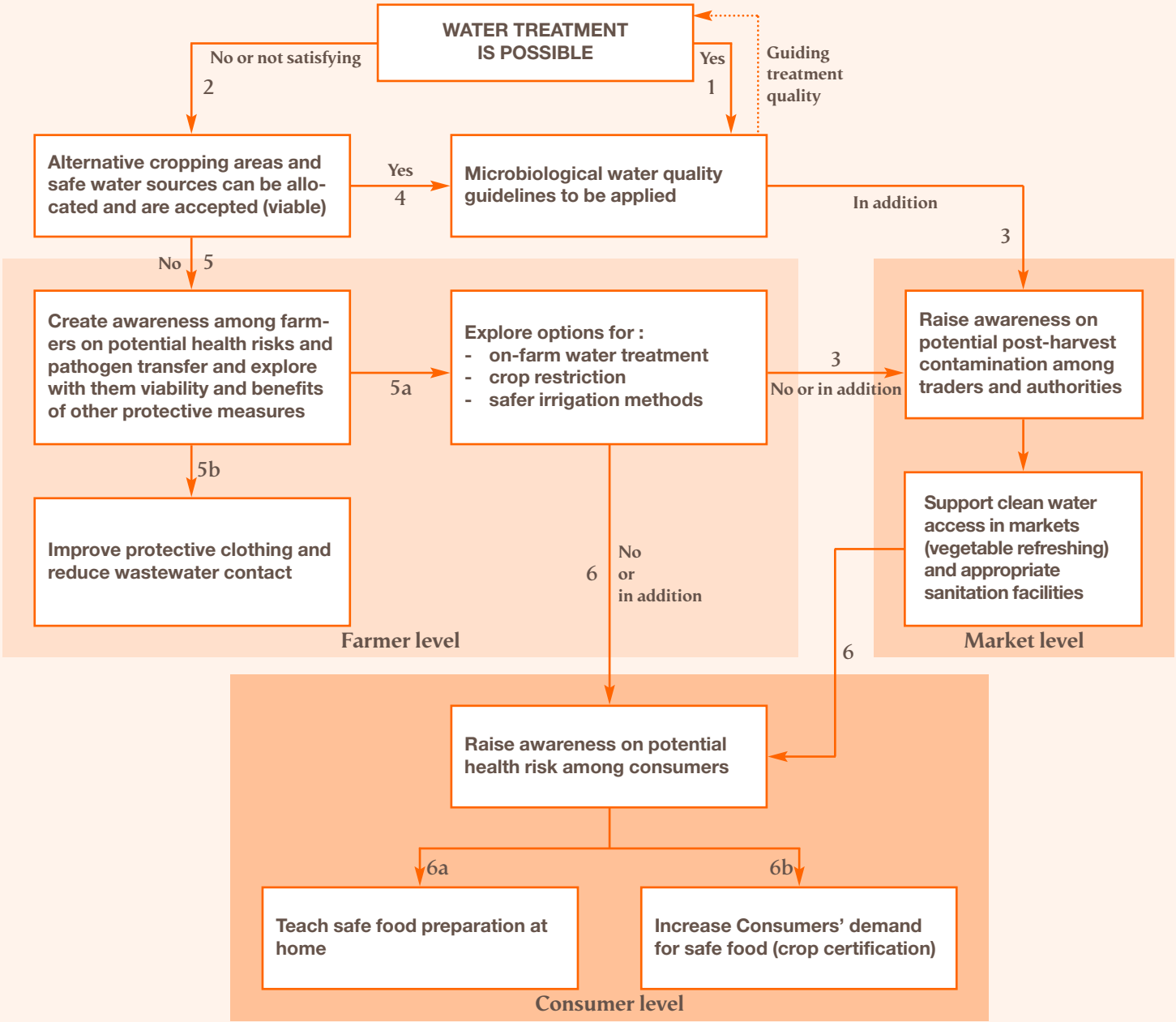


Figure 1: Flow diagram of a decision-making process on locally appropriate health-protection measures

levels appear easier to apply for authorities and institutions than the support of other safety measures for health-risk reduction.

ADJUSTING THE GUIDELINES

With regard to these difficulties, it was suggested that the WHO guidelines need to be adjusted for better application in wastewater exposed urban and periurban agriculture in resource-poor countries. The overall goal should be to find a better balance between safeguarding consumers' (and farmers') health and safeguarding farmers' livelihoods. A stepwise implementation approach for the guidelines (cf. Von Sperling and Fattal, 2001) was thought to be helpful in that it considers different levels of water treatment and recommendations for regions or countries where (improved) treatment is no realistic option. To achieve this, greater emphasis should be placed on further protective measures, which consider the limitations of the current additional measures. This could include other measures on the farm, including better land allocation, but also targeting post-harvest contamination of crops during transport and marketing, which takes place independent of irrigation water quality.

The additional livelihoods perspective can give the health guidelines more dynamism. The Ghana example showed for instance that urban farmers specialised in vegetable irrigation with polluted surface- or wastewater do gain several times more income than their rural colleagues specialising in rainfed agriculture. This allows them to take better advantage of health-care facilities and to pay for medication, which might offset some of the risks through wastewater exposure.

LOCALLY APPROPRIATE HEALTH-PROTECTION MEASURES

A flow diagram of a decision-making process on locally appropriate health-protection measures has been developed (see Figure 1). This process considers experience in Ghana and elsewhere where wastewater is used directly or indirectly for urban and periurban agriculture, and where municipal wastewater treatment is not a realistic option in the short or medium term. The elements of the decision strategy are as follows: (*numbers in the text refer to the diagram*):

- Where monitoring of wastewater treatment is possible from institutional

and financial point of view, the microbiological guidelines for wastewater irrigation should be applied. In this situation **(1)** the guidelines should assist design engineers in setting the standard of the treatment system from the perspective of crop production[3].

❖ Where the establishment or maintenance of a functional wastewater-treatment facility is not a realistic option, the concerned authorities still have different possibilities for reducing health risks to farmers and consumers. First of all, they are asked to explore alternative water sources or cropping areas **(2)** with higher quality water (e.g. groundwater). In Cotonou, for example, the authorities allocated new land for urban farmers with the possibility of groundwater access while in Accra; the Water Research Institute is currently exploring groundwater use in wastewater irrigated urban areas. To be successful, these alternatives have to be explored together with the farmers. Additional measures might be recommended if post-harvest contamination is likely **(3)**.

❖ If alternative land and safe water sources are available and accepted by the farmers, it might be possible to apply the microbiological guidelines **(4)**. If water quality, however, cannot be guaranteed, agricultural engineers should investigate possibilities of **(5a, 5b)**:

a) alternative irrigation technologies and irrigation methods reducing:
   1) farmer's exposure (e.g. during water fetching and application),
   2) crop contact (e.g. surface instead of overhead irrigation), and
   3) microbiological water contamination levels (e.g. through improved and better located shallow wells);
b) crop selection and patterns taking market demand, cultural preferences and gender balance in cultivation/marketing into account;
c) on-farm water treatment options, such as simple sedimentation tanks, taking into account land-tenure arrangements, labour constraints and farmers' interest and ability for on-site investments; and
d) awareness campaigns for irrigating farmers on their own and on consumers' health risks, plus guidance on health protection measures.

In all of these cases, alternative risk reducing approaches have to be technically as well as socio-economically and culturally viable. No implementation should be suggested without consideration of farmers' perceptions, attitudes, suggestions and constraints.

❖ It can also be crucial to focus on post-harvest contamination on markets **(3)**; i.e. on the availability of clean water for vegetable handling, especially crop washing and "freshening up" as well as general hygienic conditions for traders (e.g. availability of sufficient sanitation facilities). This must also be combined with related education and awareness campaigns. Authorities should also consider the well established but often officially ignored informal vegetable markets (e.g. in upper class suburbs), and insist on the availability of clean water. Related costs are likely to be insignificant in comparison with effective wastewater treatment.

❖ Risks to consumers **(6)** should be addressed by sensitising households on the health implications related to polluted irrigation water, **and** to unhygienic produce handling. Recommendations will have to consider local diets and food preparation behaviour and options. Improved vegetable washing and (if possible) cooking can significantly reduce possible health risks through wastewater irrigation or post-harvest contamination **(6a)**. A related (long-term) target is to raise consumers' demand and willingness to pay for safe food **(6b)**. This could catalyse awareness shifts also among traders, farmers and authorities. Crop certification could become an option (Westcot, 1997). However, this transition has still a long way to go in many countries, keeping in mind the dominance of more obvious health risks such as HIV, malaria and lack of drinking water as well as general sanitation facilities (Danso, *et al.*, 2002b). The strategies related to **markets** and especially **consumers** should also receive attention in situations of functional treatment and applied wastewater-irrigation guidelines. The reason is that post-harvest contamination through unhygienic crop handling might take place independently of enforced or non-enforced irrigation guidelines.

CONCLUSIONS

Without question, the enforcement of microbiological guidelines or crop restrictions remains important, but a better balance between safeguarding consumers' (and farmers') health and safeguarding farmers' livelihoods should be made, especially in situations where the required water treatment or agronomic changes are unrealistic. More holistic approaches are required which go beyond the current ones. While in Accra (Ghana), for example, urban farmers using wastewater were arrested, the municipality of Cotonou in Benin provided new land for agriculture where groundwater can be accessed with, for example, treadle pumps. Alternative water sources, other cropping areas or improved irrigation methods are valuable measures for health-risk reduction. However, further research is needed into hygienic food marketing as well as the safe food preparation at home as important options to tackle the wastewater problem in low-income countries. Scientific data on actual risk reduction through the various measures described above are still insufficient. It is finally recommended that the new guidelines be presented in a more integrated way, to avoid the concentration on wastewater treatment to the exclusion of management measures for health protection.

NOTES

(1) A summary of the rationale for the development of the wastewater guidelines, and a brief history of guideline development is given in "Water quality: Guidelines, Standards and Health" published by the WHO, following a meeting of experts in Stockholm, 1999 (Havelaar, *et al.*, 2001).
(2) We refer here to market-oriented open-space vegetable growers, not backyards.
(3) From this perspective, microbiological contamination should receive more attention than, for example, the degradable organic matter content (which can be a valuable source of e.g. nitrogen).

REFERENCES

- Blumenthal, UJ, M Strauss, DD Mara and S Cairncross. 1989. Generalised model of the effect of different control measures in reducing health risks from waste reuse. Water, Science and Technology 21:567-577.
- Blumenthal, UJ, A Peasey, G Ruiz-Palacio and DD Mara. 2000. Guidelines for wastewater reuse in agriculture and aquaculture: recommended revisions based on new research evidence. WELL Study No. 68 part 1, June 2000. http:/www.lboro.ac.uk/well/studies/t68i.pdf
- Danso, G, P Drechsel, T Wiafe-Antwi and L Gyiele. 2002a. Income of farming systems around Kumasi. *Urban Agriculture Magazine* 7 (August): 5-6.
- Danso, G, P Drechsel and SC Fialor. 2002b. Perceptions of organic agriculture by urban vegetable farmers and consumers in Ghana. *Urban Agriculture Magazine* 6 (April): 23-24.
- Havelaar A, UJ Blumenthal, M Strauss, D Kay, J Bartram. 2001. Guidelines: the current position. In: Fewtrell L and Bartram J (eds), Water Quality: Guidelines, Standards and Health: assessment of risk and risk management for water-related infectious disease. *IWA publishing*. 2:
- Peasey, A, UJ Blumenthal, DD Mara and G Ruiz-Palacios. 2000. A review of policy and standards for wastewater reuse in agriculture: a Latin American Perspective. WELL Study No. 68 part 2, June 2000). http:/www.lboro.ac.uk/well/studies/t68i.pdf.
- Von Sperling, M and Fattal, B. 2001. Implementation of guidelines: some practical aspects. In: Fewtrell L and Bartram J (eds), Water Quality: Guidelines, Standards and Health: Assessment of risk and risk management for water-related infectious disease. *IWA publishing*. 2:
- Westcot, D. 1997. Quality control of wastewater for irrigated crop production. FAO Water Report 10, Rome.
- WHO. 1989. Health guidelines for the use of wastewater in agriculture and aquaculture. Report of a WHO Scientific Group. Geneva, World Health Organization, 1989 (WHO Technical Report Series No. 778).

THE CASE STUDY

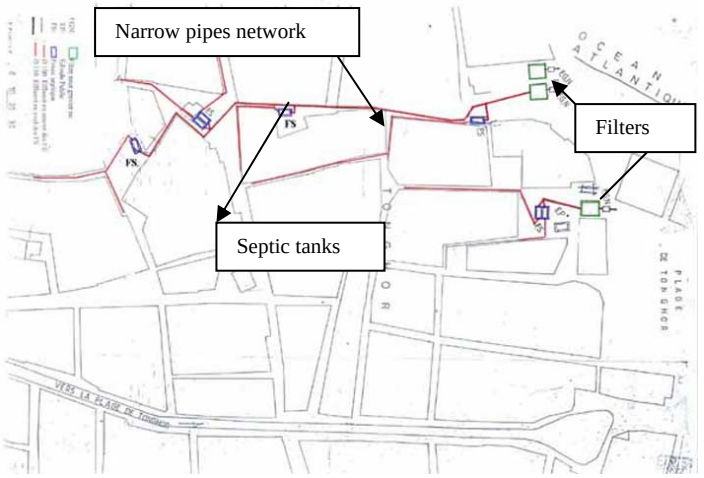
Combined treatment system at YOFF TONGHOR, Dakar, Senegal

Background

According to the framework of the small-scale fishing's sea products harbour management project leaded by the Fishing Ministry of Senegal, a sanitation program has been decided to be set along. As Yoff is one of those localities where a fishing harbour was provided for, the French development cooperation decided to fund the sanitation system. Thus, most of the dwellers of this district did not have sanitation equipment and faeces and garbage were often thrown near the sea.
This sanitation program concerns:

- A low cost and narrow pipe sewage system connected to a collective treatment system with pre-treatment wastewater devices inside households,
- A collecting network for garbage by horse carts associated with a compost area.

The sanitation program proposed by Enda Rup is related to the lesson learned from its experience on sanitation in Rufisque (close to Dakar). The budget for the program is about 50 000 000 CFA (9,700 US $). About 1800 people of 122 households are involved.



Picture 1. General view of the system in the district

Photo 1. General view of the fish harbour

Setting the system

- ✓ **Institutional framework**

The institutional arrangement for the program needed many agreements:

- Between Enda the prime contractor and a Base community association in the district named APECSY who was the delegated contracting authority. According to this agreement, Enda have to elaborate technical files related to system setting, participate in the selection of the company designated to do the work, localise in collaboration with APECSY, the best place to set the treatment system, control the company's work and propose a socio-economical operating system. For APECSY, it is asked to facilitate relationships between Enda and the company who wins the market and the relationships between Enda and the dwellers for the studies provided in the district.
- Between Enda and the Mayor of Yoff, the contracting authority. According to this agreement, The Mayor ensures the technical control of the program. He should commit APECSY (who represents the stakeholders) with the social activities. Enda who should provide the technical option, has to collaborate with ONAS, the National Office of Sanitation for the support of this option.

We have to notice that, to have to work on sanitation issues, Enda already, have agreements with the National Office of sanitation. It just has to discuss every new technology with the experts of the office before settlement.

- ✓ ***Socio-economical data collection***

Yoff Tonghor is located inside a rectangular land between Dakar Airport and the ocean. The population of the district is estimated on about 4 000 habitants. The average number of people by household is 12.6. Differences between social status is very well noticed. Average expenses of 10% of the most rich are 22 times higher than the more poor. 33% of head families are not educated but 15% have university degree. One third of employees work on fishing companies, 20% are workers, farmers or sellers in non-formal business, and 18% are higher officers, teachers and clerks.

About 77% of households have access to tap water at home. 3 % provide themselves from the neighbour's tap water; around 10 to 11% use the public tap water, 8% buy water from the private sellers and one household use a well water (the well is located in the house).

Sanitation issues are very strong in the district. Between 20 to 25 % of households do not have any toilet tools, 40% of households empty their septic tanks each year and one fifth discharge their wastewater in their immediate environment in holes or directly on the ground. But hygiene conditions are different between the three social groups. 93% of the population expressed their willingness to participate in the sanitation program but only 43% agree on financial contribution. The amount proposed by the richer is four times higher than the amount proposed by the more poor.

Lowest level income social groups (35%) use around **40** litres of water per day and person.. They recognize using the sea and other unoccupied lands to throw stools, wastewaters and garbage. Few of them (less than 30%) accept to financially contribute with an average amount of 350 f CFA (0.67 US $) per week.

Meddle level income social groups (35%) use around **70** litres of water per day and person. They have septic tanks and often use workers (7000 f CFA, 13.5 US $) or members of the family to empty their tanks in holes just on the street or inside the house.39% of them accept to contribute financially. The proposed amount is around 700 f CFA (1.35 US $) per week.

Highest level income social groups (30%) use around **130** litres of water per day and person. Specialised companies (with draining cars for 15000 f CFA, 29 US $) empty their septic tank in the sea. Most of them (70%) are willing to pay to improve their sanitation system. Around 1400 f CFA (2.7 US $) the week is the amount proposed by this category.

Generally, population perception on the relationship between sanitation and health care is important to know for the success of sanitation programs. In this district, 46% believe that poor sanitation may cause diseases. They are three times higher in the middle group and two times higher in the poor group than in a rich group. Among the list of diseases we have cholera, malaria and diarrhoea. 56 % believe than the best to avoid diseases is to keep clean, 27 % believe on taking tablets, 11 % think that health education will help and 5 % believe on traditional medicine.

- ✓ ***Financial setting***

Even if the program is already funded, the program's mind is to continue financing sanitation needs after the completion of the first funds by asking people to contribute financially if they want to be connected to the system. Doing that, the first funds will be used to build the big works i.e. the network and the treatment system. We also know from our experience if people have financially contributed, they care more on the efficiency of the system they own and participate more issues of ownerships. Then, to be connected an agreement is set between the National Sanitation Office, the city council, management committee of the district and the owner.

The owner should ask a loan of 200 000 f CFA (387 US $) to the Coordination and Evaluation Committee (CEC). The National Sanitation Office, the city council, APECSY and the management committee compose this committee. The mechanism is based on people solidarity for solving sanitation issues. As people do not often have enough means to pay in one time. They are allowed to pay in 40 month after a first amount of 15000 f CFA to pay at the agreement ratification. They are also invited to pay monthly, after finishing to pay the right to be connected to the system an amount of 1000 f CFA (ca. 2 US $) for the maintenance issues. The CEC is charged to collect the funds and deposit it in the bank.

- ✓ ***Technical feasibility studies***

One of the most important studies to be done for setting a sanitation program concerns the geophysical aspects. This is about type of soil, the level of ground water and the slope.

In this case, the parameters indicate a sandy soil that allows quick infiltration toward the ground water. Which means that latrine systems have to be avoided.

The level of ground water was very shallow that means septic tanks systems and watertight tanks were not advised, if they have to collect both grey and black water, because they may pollute the ground water or may need to be emptied frequently.

The slope was good enough for a narrow pipe network but not ideal for the reuse of treated wastewater in urban agriculture. Thus the slope was directed toward the sea while the land available for agriculture was located at the opposite site.

- ✓ ***Marketing studies on treated wastewater use***

The socio-economical studies have shown 35 farmers. Nine of them work on market gardening, 24 on cereals farming (maize, millet…) and two produce flours. The average surface of their farm varies between 2700 m^2 and 8000 m^2. The study has also shown that 71% of the farmers use fertilizers. 40% among them use chemical fertilizers, 31% use manure.

17% use rough wastewaters to irrigate their crops, 5% use the tap water, the remaining use rainwater or well water. 48% are willing to pay between 100 and 150 f CFA (0.19 to 0.29 US $) per m^3 of treated wastewater to allow them cultivate the all year long.

- ✓ ***Description of the installed system***

The system proposed is an association of pre-treatment devises installed inside the household to prepare the wastewater for discharging in narrow pipes network without creating clogging (photo 4). It is one mouth with a filter, two grease and oil extracting boxes in series. They received wastewater from kitchen and laundries. The effluent from these boxes joins a small settlement-digester tank that received water from bathroom and water cabinet. This last one is dimensioned on a way that the total wastewater coming from the household can stay for 4 hours (retention time) before discharging to the narrow pipe (PVC, 110 mm) network. The role of these infrastructures is to retain grease, sand and various solid matters likely to obstruct the drainage system. The approximate cost is 223 439 f CFA (432 US $).

Then normal big septic tanks (7) were installed outside. Each septic tank is dimensioned to receive wastewater from 10 to 15 households. These infrastructures play the role of secondary treatment. They cost is around 800 000 f CFA (1,547 US $) each one (Photo 2).

Narrow pipes are installed to convey effluent from infrastructures in the household to the septic tanks and from the last ones to the filters (figure 1). The cost of this network is around 3 500 000 f CFA (6,800 US$).

The filters (2) (photo 3) are ponds filled with different layers of various size of gravel. Their role is to improve water quality treatment (tertiary treatment). They cost is around 1 800 000 f CFA (3,500 US $) each one. Then tanks for treated water storage are installed. Those last one cost 750 000 f CFA (1,450 US $) each one. **The only challenge remaining is to study the best way of distributing treated wastewater back to farmers.**

Photo 2. The Collective Septic tank

Photo 3. The treatment system (Filters)

Photo 3. The household sanitation equipment

Photo 4. Details of the household equipment

Setting the sustainability of the program

✓ ***Follow up of treatment efficiency***

To ensure the efficiency of the system some devise have been installed like points of sampling before the entry and at the exit of some septic tanks. Those points are also installed before the entry and at the exit of the treatment system. These devises can also allow measuring flows since the treated wastewater is supposed to supply urban farming.

To follow the efficiency of the system samples have been taken for seven day in four points. One at the entry of a septic tank, one at the exit of this tank, one at the entry of a filter tank and one at its exit. On a mean sample (every two hours from 7 am to 6 pm) taken every day and during a whole week, the following parameters have been analyzed on each sample:

- Flow,
- Feacal coliforms (FC) and parasites,
- Organic matters (BOD_5 and COD),
- Suspended Solids (SS),
- Minerals (nitrogen (N), phosphorus (P)).

Those analyses have to be done at least one time every season at the first year. The first results are shown in table 1 and table 2.

Table1. Wastewater treatment efficiency

Reference	P (mg/l)	N (mg/l)	BOD_5 (mg/l)	SS (mg/l)	COD (mg/l)	FC (N/100ml)
Septic tank inlet	26,1	31,7	883	3400	2000	$1,3\ 10^8$
Septic tank outlet	14,3	6,6	98	64	507	$4,6\ 10^4$
Septic Tank efficiency %	**45**	**79**	**89**	**98**	**75**	**E^4**
Filtration ponds inlet	21	35,4	138	108	843	$9\ 10^5$
Filtration ponds outlet	11,5	30,6	62	37,6	593	$0,7\ 10^4$
Treatment system efficiency %	**56**	**3**	**93**	**99**	**70**	**E^4**
Standards Removal Yields %		**70-80%**	**70-90%**	**90 %**	**75 %**	
Standards			**25**	**125**	**125**	**$1x\ 10^3$**

Table2. Water consumption and wastewater flows

Household	Water bill/liter	Periode of consumption/ number of days	Number of people/household	Consumption/person /day
1	50 000	63	14	56,6
2	13 000	63	8	25,9
3	29 000	63	10	46,0
4	41 000	63	15	43,3
5	47 000	63	16	46,6
6	32 000	63	5	101,5
7	46 000	63	10	73,0
Total	254 000	63	78	392,9
Mean	32 300	4031 litres per day	11	56,1
WWF/ST l/day	**21 689**			
R.T. ST (hrs)	**16**			
WWF/FT l/day	**1490**			
R.T. FT (days)	**20**			
TWWF l/day	**988**			
Water supply ability %	**66**			

WWF: Wastewater flow
ST: Septic tank
FT: Filter tank
RT: Retention time
TWWF: Treated WWF
l: liter

Notes: 1. Only 17 households are already connected to the system. Analysis concerning the septic tank is related to 7 households; those concerning the filtration system are related to the whole connected households.
2. Difference between what arrives at the tanks (21689 l) and what is produced (4031 l) can be explained by additional use of the installed first household wastewater discharge devices by neighbors
3. The data show that between the ST and the FT currently about 20,000 l are lost per day. If here is a calculation error or a physical leakage will be studied

- ✓ ***Follow up of maintenance***

APECSY is responsible for the maintenance issues. The means come from the maintenance fees that every owner has to pay each month. The amount for each owner is fixed at 1000 f CFA (1.9 US $) that are shared as following:

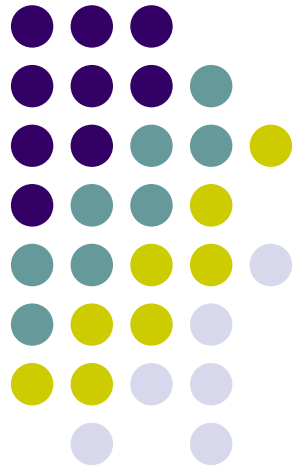
- 350 f CFA (0.67 US $) for a half yearly network maintenance,
- 250 f CFA (0.48 US $) for a prevention stock,
- 400 f CFA (0.77 US $) for future emptying of septic tanks

Challenges ahead:
How to get the treated water back (against the slope) to the urban agricultural sites?
In general, it is common that wastewater treatment sites and farming sites are not in the same area. Also this project was originally designed as a sanitation project. The idea to close the loop and reuse the water came later in.

CASE STUDY

COMMUNITY WASTEWATER TREATMENT SYSTEM SET-UP

Combined Treatment System in YOFF TONGHOR, Dakar, Senegal



1. Background

- Sanitation needs for a fishing harbour community (solid waste and wastewater management)

- 1802 people of 122 households

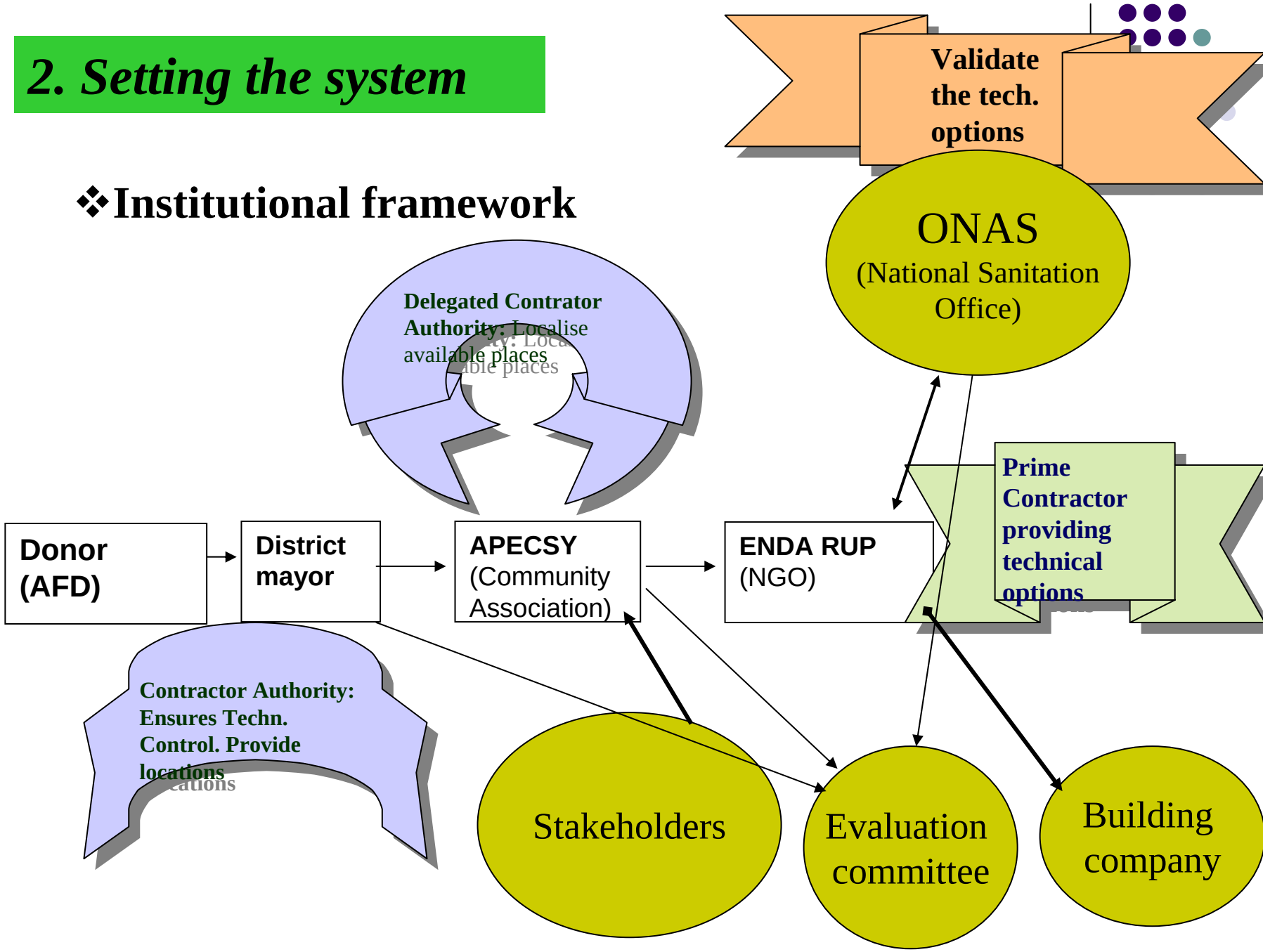
- Population income is more or less low

- Water supply for farming is important

- The funds available are about 10,000 US $

2. Setting the system

❖Institutional framework



❖*Socio-economical data collection*

Population	4000
People per household	12,6
Educational level	33% not educated, 15% university level
Job distribution	20 % workers, farmers, sellers… 18 % high officers, teachers,…
Access to tap water	77 % have access Low level income 40 litre/day/capita Middle level income 70 litre/day/capita High level income 130 litre/day/capita
Sanitation facilities	20-25 % don't have any
Willingness to financially contribute	Low level income: not willing Middle level income: 1.35 US $ per week High level income: 2.7 US $ per week

❖*Financial setting*

The house owner

- Asks the evaluation committee for a loan (390 US $)
- Pays ca. 30 US $ when he signs the agreement
- Pays the remaining over 40 months
- Pays ca. 2 US $ per month for maintenance issues

❖ ***Technical feasibility studies***

Soil	Sandy, good infiltration
Groundwater level	High (2.5 to 6 m)
Slope	Yes, towards the sea

❖*Marketing studies on treated wastewater use*

- 35 farmers (vegetables, cereals,..)
- 17% use rough wastewaters to irrigate their crops
- 48% are willing to pay 0.2 -0.3 US $/ m^3 of treated wastewater

❖***Description of the installed system***

A) pre-treatment device

Cost: ca. 430 US $

B) Sewage system

Use of narrow pipes (PVC, 110mm) about 6,800 US$ for the whole network

C) Treatment system I

Seven septic tanks, each one serving about 10-15 households (about 1,550 US $/tank)

D) Treatment system II

Inside: gravel layers

From the septic tanks the water flows to the filter tanks: Two filters tanks, about 3,500 US $ each one

3. Setting the sustainability of the program

❖ ***Follow up of treatment efficiency***

➢ ***Removal of pollution parameters***

Reference	P total (mg/l)	N total (mg/l)	BOD_5 (mg/l) (biolog. oxygen demand)	SS (mg/l) (susp-ended solids)	COD (mg/l) (chemical oxygen demand)	Faecal coliforms (N/100ml)
Septic tank inlet	26,1	31,7	883	3400	2000	$1,3 \times 10^8$
Septic tank outlet	14,3	6,6	98	64	507	$4,6 \times 10^4$
Septic Tank efficiency %	**45**	**79**	**89**	**98**	**75**	**E^4**
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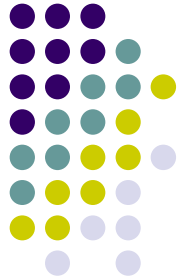
Standards Removal Yields%		**70-80**	**70-90**	**90**	**75**	
Standards			**25**	**125**	**125**	**1×10^3**

Indicators of treatment efficiency



- **BOD_5**: Biological (biochemical) oxygen demand measured over 5 days

- **COD**: Chemical oxygen demand

Indicators of amount of fine organic particles in the water. Chemical or biological breakdown of these particles requires oxygen. For good water treatment oxygen levels must be maintained to catalyze particle breakdown. Without treatment, bacteria will compete e.g. with fish for oxygen.

➢ *Water flow parameters*

Household	Water bill per litre	Periode of consumption (number of days)	Number of people per household	Consumpt. per capita & day
1	50 000	63	14	56,6
2	13 000	63	8	25,9
3	29 000	63	10	46,0
4	41 000	63	15	43,3
5	47 000	63	16	46,6
6	32 000	63	5	101,5
7	46 000	63	10	73,0
Total	254 000	63	78	392,9
Mean	**32 300**	**4031 liters/day**	**11**	**56,1**
WWF/ST l/day	**21 689**			
R.T. ST (hours)	**16**			
WWF/FT l/day	**1490**			
R.T. FT (days)	**20**			
TWWF l/day	**988**			
Water supply ability of FT %	**66**			

WWF: Wastewater flow
ST: Septic tank
RT: Retention time
FT: Filter tank
l: liter
TWWF: Treated Wastewater flow

Notes: 1. Difference between 21689 and produced 4031 l explained by illegal use of household device by neighbors
2. From the ST to the FT currently about 20,000 l are lost which is under study

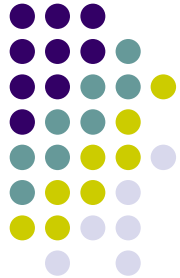
❖*Follow up of maintenance*

APECSY (community) is responsible for the maintenance issues
Maintenance fees (ca. 2 US $) are shared as following

- 0.7 US $ for network maintenance all 6 months,
- 0.5 US $ for a prevention stock,
- 0.8 US $ for future emptying of septic tanks

❖*Challenge*

How to get the treated water back to the urban agricultural sites? It is common that wastewater treatment sites and farming sites are seldom in the same area.



Thanks to Urban Harvest and IDRC for financing the analyses of the Case Study

Ghana fact sheet ….
On urban agriculture with wastewater

IWMI- West Africa Office, Accra, Ghana.

The average urban vegetable farmer in the open-spaces of Ghana

The average Ghanaian urban farmer who is cultivating open spaces is male, and usually cultivates exotic vegetables like cabbage, cucumber, lettuce, onion, cauliflower, and green pepper. He has a plot as small as 0.01 or as large as 0.2 ha. on which he cultivates year-round. He is young to middle-aged, energetic male and used to arduous work which is what vegetable production in open spaces is. His main source of irrigation water is untreated wastewater from open drains or polluted water from streams and rivers and also shallow wells

He is usually a migrant from rural areas with some experience in farming but that is not the reason why he migrated. He is likely to be a Muslim and mostly illiterate though sometimes he has been educated to secondary school level. He is married, sometimes involving his wife in the farming or to market his produce. He has an average family size of 5-6 persons, though sometimes it can be as many as 10. Usually, his dependants are supported solely by income from his farm, but sometime he has a second occupation.

Normally, farming is not his main aim for coming to the city. He gets into farming when he finds out that employment opportunities in the formal sector are not what he expected. But once he starts producing vegetables, he does not want to quit even if he finds regular salaried employment, because he has flexibility in farming and can make a good income specially in the dry season when the city drains provide only a few farmers with a source of water. He needs help in marketing his produce, access to land with secure tenure, facilities for credit, knowledge about pesticide and fertilizer use, good quality seeds, and affordable water which safeguards his health and keeps him out of trouble with authorities.

Urbanization and escalating waste disposal problem

Ghana:
Total population = 19 million
Urban population = 44%
Main urban areas = Accra (also the capital), Kumasi and Tamale
Urban Growth rate = 6% max. (in Kumasi)

Urbanization accompanied by high rural-urban migration and poor urban infrastructure has brought about congestion, put stress on limited resources and facilities, led to problems of food availability, malnutrition, unemployment, poverty and environmental deterioration. Urban expansion has also increased or changed food demand, with the rise in demand for fast food (rice and chicken) as one example, and perishable vegetables as another.

The poor quality and insufficiency of infrastructure is particularly evident in the sanitation and waste-disposal sector. Typically, Ghanaian cities have mainly onsite sanitation facilities for blackwater disposal – bucket and pit latrines, public toilets, open defecation, and <30% of households with water closets. Only 8-10 percent of the municipalities and metropolitan areas are connected to the sewer lines, and many city dwellers (even those dwelling in areas with main sewer lines) cannot afford connections. Greywater from cities are disposed of in storm water drains which also receive overflows from seldom functional onsite systems. Wastewater treatment plants for areas connected to sewer lines are most often not operational. Untreated or partially treated sewage, and greywater in stormdrains, flow through the open storm water drainage networks of cities and find their way into water bodies being used for irrigating vegetables by open-space urban farmers. Industrial wastewater is rarely available or used as most factories are located at the coast.

Profile of Wastewater Irrigation in (peri) urban agriculture

The term "wastewater" in this fact sheet refers to wastewater from municipal sources, which is usually mixed with rainwater, urban run-off or water from stream/river (in the case where the drain is connected to or superimposed on the stream/river). Thus it refers to polluted water with different degrees of dilution. While heavy metal contamination is usually low, pathogen levels are high.

▪ Open-space urban and peri-urban vegetable farming

Profile of farms: In Ghana, wastewater irrigated urban farming takes place in open spaces (especially in lowlands or inland valleys) close to water sources. Though not all the farmers in open-spaces use wastewater for irrigation purposes, it is the most frequently used irrigation water. Open-space urban farming is intensive, all-year-round and market-oriented. Up to about 1500 farmers in Ghana's three main cities of Accra, Kumasi and Tamale are involved in this kind of farming (Table 1).

Table 1. Occurrence of urban farming in selected cities in West Africa

Selected Cities	Number of open-space vegetable farmers in the city or its direct fringes
Lomé	1500
Cotonou	570
Ouagadougou	1100
Accra	**1000**
Kumasi	**200**
Tamale	**150**
Bamako	1980

Cofie *et al*. (2003)

Wastewater irrigators in Ghana cultivate mainly exotic vegetables such as lettuce, cabbage, carrot, cucumber, spring onions and green pepper. The plot size in urban areas range from 0.01-0.2 ha while in the peri-urban areas, it ranges from 0.1 to 0.8 ha. In both the urban and peri-urban areas, the plot sizes are, in general, diminishing as a result of the action of estate developers and dredging of main drains. Declining soil fertility due to lack of fallow periods is another problem. Kumasi has an extensive peri-urban area where besides typical staple crops, over 10,000 farmers are doing open-space irrigated vegetable farming on an estimated area of 11,900 ha only during the dry season (Cornish *et al.,* 2001).

Contribution to city food supply: Though wastewater dominated open-space urban farming *per se* does not contribute much significantly to food security in general in Ghanaian cities, it makes very significant contributions to the supply of specific food items particularly perishables like vegetables, which have now become an important part of urban diet. In Kumasi, 90% of all lettuce and spring onions consumed are produced from open-space vegetable farming in the city (Cofie *et al*., 2001). For Tamale and Accra, about 80% and 10% respectively of cabbage found on the markets are produced from the open-space farming in the cities (IWMI, 2002).

- **Sources and quality of wastewater used by farmers in (peri) urban Ghana**

About 69% of 73 urban and peri-urban open-space vegetable farmers interviewed in Kumasi use rivers and streams polluted with domestic wastewater as the main sources of water for farming (Keraita, 2002). There is extensive use of shallow dug wells (30%) in bottomlands especially in the urban areas. In peri-urban Kumasi, about 50% of 410 farmers interviewed use shallow dug wells (Cornish, 2001). Though water is abundant in Kumasi, the high levels of microbiological pathogens is a health concern in both streams and shallow wells (see Table 2).

Table 2. Quality of water used for irrigation

Sampling site	Distance from city center (Km)	EC μs/cm	N (NH_3+NO_3) mg/l	PO_4-P mg/l	K mg/l	FCx10^6 MPN/100ml
Kaase	4	1203	104.5	11.3	47.9	3595
Asago	9	1336	118.9	51.7	51.7	433
Adwaden	18	931	78.6	75.4	75.4	1
Ofoanse	32	849	78.1	47.7	57.7	35

FC=Faecal Coliform; EC=Electrical Conductivity

Source: Cofie *et al*. (2003)

About half of 138 open-space farmers interviewed in Accra use effluents from open drains as their main source of water for growing vegetables with majority (78%) working without any protective clothing. Though financial constraint is the main reason farmers gave for not using protective clothing, others indicated that the use of boots for instance retards work progress and causes foot-rot. About 12% and 6% of the respondents use wastewater polluted streams and hand-dug wells respectively. Average values of coliforms of irrigation water bodies sampled in Accra show a faecal coliform range of $4.8x10^3$-$2.8x10^6$/100ml for drains and $3.9x10^2$-$3.5x10^5$/100ml for streams (Mensah *et al.*, 2001).

The situation in Tamale is not different. Being further to the north of Ghana, Tamale is a water-scarce area with only temporary streams. Vegetable farmer use any kind of water that comes their way, often drain water. The city has limited supplies of pipe borne water and low groundwater potential. Microbiological analysis carried out during 2000-2001 dry season at six vegetable farming sites within the Tamale metropolis shows faecal coliform levels higher than $2x10^6$/100ml for all sites (Abdul-Ghaniyu *et al.*, 2002).

- **Socoio-economic profile of farmers**

Religion and Age of farmers: Most open-space farmers (wastewater irrigators) in Ghana are Muslims. More than two-thirds of these farmers in Accra and Tamale are Muslims while in Kumasi nearly two-thirds of them are Christians. Tamale is a Muslim dominated city, which explains why majority of the farmers are Muslims and for Accra, many of the farmers hail from the Muslim dominated Northern region of Ghana

Farmers of different ages are involved in urban vegetable farming (Table 3). Most of the farmers are between 20-40 years. This is the working group, most of them have migrated to the urban centres to look for greener pastures.

Table 3. Age distribution of farmers in the cities

Age	Kumasi		Accra		Tamale	
	Frequency	%	Frequency	%	Frequency	%
Below 20	4	4	7	5	1	1
20-30	33	33	45	33	19	25
31-40	35	35	30	21	41	54
Above 40	28	28	56	41	15	20
Total	100	100	138	100	76	100

Gender and Household size: Urban open-space vegetable farming in Ghana is predominantly done by men. On average, less than 10% of the farmers are women who mostly cultivate crops such as spring onions, ayoyo (*Corchorus sp*), alefi (*Amaranths sp*) and other indigenous vegetables, which are less labour intensive and require low initial capital investment.

However, women dominate and play major roles in marketing of vegetables. These market vendors are not necessarily members of the household of vegetable farmers. Infact, majority of them are not related to the farmers. The women control the income they generate from the sales of vegetables and use it mostly to support the family. They spend mainly on food; sometimes on clothing for the children whiles the men spend their income on accommodation, children's school fees, utility bills and other major needs or projects of the family. The women sometimes save part of their income which they use to support their husbands in major projects. Though men and women in a household may not have formally agreed on who spends on what, generally, the Ghanaian culture has already defined who bears what responsibility in the home and this is inherent. Market vendors do not regularly retain portions of exotic vegetables for household consumption, rather traditional vegetables often find their way home for family use. Where farmers grow other crops like maize, they use it to supplement the family food.

The average household sizes of the farmers in Accra (4) and Tamale (5) are comparable with the national average household sizes of 4.5 for Accra and 6.1 for Tamale. Farmers average household size and the national average in Kumasi are 2 and 5.1 respectively.

Farmers' Educational and Economic background: The literacy status of the open-space farmers varies from highly educated ones (tertiary) to illiterates (Table 4). Most farmers in Kumasi have attended primary school while in Tamale, most farmers are illiterate. The illiteracy in Tamale is not only for farmers, but it is a general population issue since the three Northern regions in Ghana have the highest illiteracy rates in Ghana. According to the 2000

population and housing census report, illiterates constitute 79% of the population of the Northern region (Ghana Statistical Service, 2002).

Except for Accra, the educational status of farmers in major Ghanaian cities reflect the situation in the respective regions where the cities are located. Accra is different because most framers hail from the Northern part of Ghana.

Table 4. Educational status of farmers

Educational status	Northern Region (%)		Greater Accra (%)		Ashanti Region (%)	
	Tamale	Region	Accra	Region	Kumasi	Region
Illiterate	79	79	48	29	35	43
Primary	17	15	4	45	51	45
Secondary	3	4	44	18	12	8
Tertiary	1	2	4	8	2	4

Most of the farmers cultivate to generate their major income. Figure 1 shows the main objectives for cultivating vegetables by 138 urban farmers interviewed in Accra. Similar trend exist in Kumasi and Tamale.

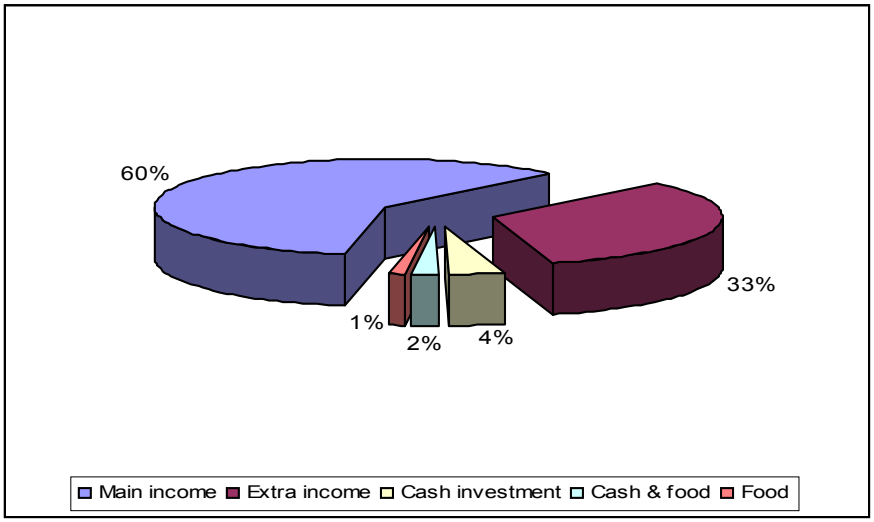


Fig. 1. Main objectives for growing vegetables by urban farmers in Accra

- **Land tenure and security**

Nearly all open-space urban vegetable farmers neither own nor pay for the land they cultivate. Table 5 shows the distribution of land ownership by 150 open-space farmers in Accra. Here, land tenure is insecure, since farmers have no formal permission or supportive document for farming on the land. Under this condition, farmers hardly invest in farm infrastructure (such as wells or cement ponds), soil conservation measures or long-term fertility improvement. However, in the peri-urban areas, 'abusa' and 'abunu' tenancy arrangements (share cropping) is prevalent. In such systems, farmers are required to give a third and half respectively of the total farm produce to the landowner as payment for the use of the land.

Table 5. Typical land ownership by open space farmers in urban Accra

Government/Corporate	Unknown	Own	Private

122	7	4	17

Source: Obosu-Mensah (1999)

- **Irrigation methods and practices of wastewater irrigators**

Wastewater irrigators use watering cans, buckets, and motorized pumps/hose for irrigation. The most common one is the watering can, which has an average volume of 15 litres. The survey of 73 farmers in Kumasi found the use of watering cans to be predominant in urban areas while in peri-urban areas, along river banks, as many as 50% of the farmers were using motorized pumps for irrigation (Keraita, 2002). Three motorized pumps/hoses have been identified at two farm sites in metropolitan Accra, whiles 95% of 138 farmers interviewed in an Accra survey use watering cans. Usually, a farmer carries two watering cans at a go and irrigates, pouring the water directly over the crops. The use of sprinklers is very limited and only found in one or two places in Accra and Kumasi.

Benefits and Risks of wastewater irrigation: Actual benefits derived by wastewater irrigators in Ghana are:

1. Wastewater irrigators find wastewater as a reliable source, which enables majority of the farmers to cultivate even during the dry season (and other people joining) thereby increasing their income and enhancing their livelihoods (Table 6);

Table 6. Revenue generated in different open-space farming systems

Farming system	Net revenue (USD)/ha/year	Net revenue (USD)/farm holding/year
Dry season vegetable irrigation only (garden eggs, pepper, okra, cabbage) in peri-urban areas	300-350	140-170
Dry season, irrigated vegetable and rain fed maize in peri-urban areas	500-700	300-500
All year round irrigated vegetable farming (lettuce, cabbage, spring onions) in urban areas	2000-8000	100-800

Source: Danso *et al*. (2002)

2. Wastewater irrigators do not pay for using the water, hence a reduction in the cost of production; and

3. Some irrigators take advantage of plant nutrients contained in wastewater and apply less manure, although the main purpose for using wastewater is to meet crop water demand. In comparison with common poultry manure and mineral fertilizer application rates, the nutrient value of the wastewater used for farming in Ghana is of little significance (Table 7).

Table 7. Approximate amount of nutrient applied through fertilizer, poultry manure (PM) and irrigation water in and around Kumasi

Nutrient source	Farming type	Nutrient type	Amount nutrient (Kg/ha/yr)	comments
NPK fert. PM	UA UA	N, P & K N P	135 770 350	o Refers to the amount of each nutrient in a 15-15-15 fertilizer o All applications on cabbage of three

		K	420	croppings per year o P and K are expressed in terms of P_2O_5 and K_2O respectively
Irrigation water	*Water application rate varies from 640-1600mm/yr but calculation based on 1000mm/yr. P and K are expressed in terms of* P_2O_5 and K_2O *respectively*			
	UPA	N P K	10-15 7-11 50-80	This is for upstream. Value varies from 100-150 Kg N downstream Kumasi This refers to normal range but could be as high as 700 Kg in few weeks after onset of rains

Source: Cofie *et al*., 2003

From interviews with wastewater dominated open-space vegetable farmers, the following risks have been identified in Ghana as being associated with wastewater irrigation:

1. Breeding of various disease causing parasites (e.g., leech) which causes boils (on hands and feet) after prolong periods of contact with the water;
2. Breeding of mosquitoes from earthen dugouts used by farmers to store water; and
3. Offensive nose odour.

- **Perceptions of key stakeholders**

Perceptions of Officials, Sellers, and Consumers: In 2002, IWMI and its collaborators carried out a survey in Accra, Kumasi and Tamale involving 26 officials, 150 sellers and 1200 consumers to get their perceptions on urban open-space irrigated vegetable farming. Over 70% of respondents in each category mentioned that urban vegetable farming is an important activity in the informal sector with much benefits (e.g., employment and availability of fresh vegetables) and as such should be supported by both the national and local government. However, they raised concern on the health risks that could arise from wastewater irrigation as it could be associated with crop contamination.

- **Institutions**

Urban agriculture in Ghana is "semi-formal" since its formal status is not fully reflected in the land use planning and policies of the various cities. Section 51, subsection 3 of the local government act 462 (1993) generally allows urban farming activities without prior permit from the District (metropolitan) Planning Authority. However, city bye-laws, e.g., the AMA bye-laws (growing and sale of crops) 1995, restricts urban agriculture on land outside one's premises (open-space farming) to a mandatory registration with the metropolitan officer of health with the intension to maintaining good sanitary conditions in the city. Wastewater irrigation is officially unacceptable in Ghana. For instance, in Accra, the practice is banned by the same AMA bye-laws. Farmers are not able to comply with the bye-laws. They cultivate without registering and also with wastewater because of lack of affordable good quality irrigation water. The bye-laws are not enforced due to the lack of human and financial resources.

Development and Research needs

A number of studies on several areas of urban agriculture and wastewater irrigation are ongoing in the three major cities. In collaboration with the Kwame Nkrumah University of Science and Technology, IWMI-Ghana has already started a study meant at evaluating the impact of wastewater irrigation on crops and human health in the context of urban vegetable production in Accra, Kumasi and Tamale and to provide possible intervention packages and

guidelines for farmers, consumers and authorities on the safe production and consumption of wastewater irrigated vegetables. IWMI-Ghana has also started a study on on-farm (waste) water treatment options (sedimentation, filtration, etc.) aimed at reducing crop contaminations at the farm-level.

As a long-term solution, exploring affordable good quality water sources (e.g., groundwater) for urban vegetable production is a possibility but lack of resources makes it unlikely in the near future. With expanding urban populations and food needs, it is likely that the use of poor quality water for food crops may prevail. Guidelines for risk reduction should therefore go beyond calls for improved water treatment. Awareness creation can be attempted at various points, targeting households, farmers, vegetable sellers, consumers and the local authorities. A comprehensive understanding of the situation which includes farmers' level of awareness, technical know-how, livelihood patterns, perception, social constraints, land and water rights etc. are all vital to laying the foundation for practical policy and guideline formulation. Also, quantification of actual and potential benefits and negative effects associated with use of wastewater for urban agriculture is needed to allow for informed decision making.

References

Abdul-Ghaniyu, S., Kranjac-Berisavljevic, G., Yakubu, I.B. and Keraita, B. 2002. Sources and Quality of Water for Urban Vegetable Production (Tamale, Ghana). Urban Agriculture Magazine. No. 8, December 2002. p 10

Armar-Klemesu, M. and Maxwell, D. (eds.). 1998. Urban Agriculture in Greater Accra Metropolitan Area. Final Report to IDRC. Centre file: 003149

Asomani-Boateng R (2002) Urban Cultivation in Accra: An Examination of the Nature, Practices, Problems, Potential and Urban Planning Implications: in Habitat International Volume 26, Issue 4, December 2002. Pp: 591-607.

Cofie, O. P. Drechsel, E. Obuobie, G. Danso and B. Keraita. 2003. Environmental Sanitation and Urban agriculture in Ghana. 29th WEDC (Water, Engineering and development Centre) International Conference. 22nd-29th September 2003. Abuja, Nigeria.

Cofie, O., P. Drechsel, P. Amoah, G. Danso and L. Gyiele. 2001. Improving rural-urban nutrient flows through urban and peri-urban agriculture. Paper prepared for the conference 'Rural-Urban Encounters: Managing the Environment of the Peri-urban Interface', Development Planning Unit, University College London, 9-10 November 2001.

Cornish, G.A. 2001. Informal peri-urban irrigation, Kumasi: Irrigation Practices. Paper presented at the workshop on informal Peri-Urban Irrigation-Opportunities and Constraints. Kumasi, Ghana 7th-9th March 2001.

Cornish, G.A., J.B. Aidoo and I. Ayamba. 2001. Informal irrigation in the peri-urban zone of Kumasi, an analysis of farmer's activity and productivity. Report OD/TN 103 Feb. 1999. UK: HR Wallingford.

Danso, G., Drechsel, P., Wiafe-Antwi, T. and Gyiele, L. 2002. Income of farming systems around Kumasi. Urban Agriculture Magazine 7: p 5-6

IWMI. 2002. Urban food security in Ghana- Food flows and urban food consumption: the cases of Accra, Kumasi, Tamale and Ouagadougou. Consultancy report for IWMI Ghana (unpubl.)

Keraita B (2002) Wastewater use in urban and peri-urban vegetable farming in Kumasi, Ghana. Unpublished MSc. Thesis. Wageningen University, Wageningen, The Netherlands.

Keraita B, Drechsel P, Huibers F and Rascid-Sally, L (2002) Wastewater Use in Informal Irrigation in the Urban and Peri-Urban Areas of Kumasi, Ghana: in Wastewater use for Urban Agriculture. Urban Agriculture Magazine. Number 8, December 2002. p 11-13

Local government (Accra Metropolitan Assembly) Establishment Instrument 1995. L.I. 1615.

Mensah, E., Amoah, P., Abaidoo, R.C. and P. Drechsel. 2001. Environmental concerns of (peri-) urban vegetable production – Case studies from Kumasi and Accra. In: Drechsel, P. and D. Kunze (eds.) Waste Composting for Urban and Peri-urban Agriculture - Closing the rural-urban nutrient cycle in sub-Saharan Africa. IWMI/FAO/CABI: Wallingford, p. 55-68

Obosu-Mensah, K. 1999. Food Production in Urban Areas. A case study of urban agriculture in Accra, Ghana. Ashgate Publishing Limited, Gower House, Croft Road Aldershot, Hampshire GU11 3HR, England.

Obuobie, E. 2003. Institutional Aspects of Urban Agriculture and Wastewater use in Accra, Ghana. Unpublished M.Sc. Thesis. Wageningen University, The Netherlands.

Other Relevant References

Agodzo SK, Huibers FP, Chenini F, van Lier JB, Duran A. Use of wastewater in irrigated agriculture. Country studies from Bolivia, Ghana and Tunisia. Volume 2: Ghana. Wageningen: WUR, 2003. - (W4F-Wastewater). ISBN 90-6754-704-2.

Cornish, G.A. and Aidoo, J.B. 2000. Informal Irrigation in the peri-urban zone of Kumasi, Ghana. Findings from an initial questionnaire survey. Report OD/TN 97 March 2000. HR Wallingford, UK.

Cornish, G.A. and Lawrence, P. 2001. Informal Irrigation in peri-urban areas: A summary of findings and recommendations, Report OD 144HR Wallingford/DFID.

Cornish, G.A., Mensah, E. and Ghesquire, P. 1999. Water quality and peri-urban irrigation. An assessment of surface water quality for irrigation and its implications for human health in the peri-urban zone of Kumasi, Ghana. Report OD/TN 95 September 1999. UK: HR Wallingford.

Drechsel, P., U.J. Blumenthal and B. Keraita. 2002. Balancing Health and Livelihoods: Adjusting Wastewater Irrigation Guidelines for Resource-Poor Countries. Urban Agriculture Magazine. No. 8, December 2002: p 7-9

HR Wallingford/DFID. 2001. Informal Peri-Urban Irrigated Agriculture. Opportunities and Constraints. Proceedings of a workshop held at KNUST, Kumasi, Ghana. 7-9 March 2001.

Keraita, B. 2002. Wastewater irrigation: No water to waste, not even wastewater. Viewpoint; Spore No. 101, Page 16.

Keraita, B., P. Drechsel and L. Raschid-Sally. 2002. Wastewater use in informal irrigation in urban and peri-urban areas of Kumasi, Ghana. CTA/ETC-RUAF/CREPA, Atelier International sur la Réutilisation des Eaux Usées en Agriculture Urbaine. 3-8 Juin 2002, Ouagadougou. Rapport Final, p. 124-141.

McGregor, D., Simon, D. and Thompson, D. 2001. Peri-urban water quality and supply: changing circumstances and practical interventions in Kumasi, Ghana. Centre for Developing Areas Research (CEDAR), Department of Geography, Royal Holloway, University of London.

Obuobie, E., Danso, G. and Drechsel, P. 2003. Access to land and water for urban vegetable farming in Accra. Urban Agriculture Magazine, Number 11: pp 15-17

List of stakeholder institutions involved in urban agriculture/wastewater irrigation in Ghana

1. Authorities

- Metropolitan Directorate of Food and Agriculture
- Metropolitan Health Division,
- Waste Management Department
- Town and Country Planning
- Department of Parks and Gardens
- Ghana Water Company Limited
- Environmental Protection Agency (EPA)
- Ministry of Food and Agriculture (MOFA)
- Ghana Irrigation Development Authority (GIDA)

2. Universities and NARS

- Kwame Nkrumah University of Science and Technology (KNUST)
- Kumasi Centre for Collaborative Research (KCCR) in Tropical Medicine (malaria link)
- University of Ghana
- University of Development Studies (UDS)
- Water Research Institute-WRI/CSIR
- Noguchi Memorial Institute of Medical Research (malaria link)

3. Foreign/International Organization

- International Water Management Institute (IWMI)
- International Development Research Centre (IDRC) with directly commissioned studies
- Resource Centre on Urban Agriculture and Forestry (RUAF) with a focal point in Accra
- Food and Agriculture Organisation (FAO)
- HR Wallingford, UK

- University of Liverpool (malaria link)
- Wageningen University
- IHE-Delft
- Royal Holloway University London
- University of Dortmund (Spring Programme)
- Department for water and sanitation in developing countries (SANDEC) of Swiss Federal Institute of Environmental Science and technology (EAWAG).

4. Others

- Urban and peri-urban farmer groups
- Ghana Organic Agriculture Network (GOAN)
- Enterprise Works
- Centre for the Development of People (CEDEP)

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Domestic wastewater from Korle-Bu Teaching Hospital in Central Accra used directly for vegetable production

IWMI-Ghana

Wastewater Use for Urban Agriculture

Increasing volumes of domestic, hospital and industrial wastewater are being produced in rapidly growing cities around the world. Wastewater treatment is costly and even in those cities that are able to procure funding to build treatment plants, only a small percentage of the total wastewater volume is treated and the rest is left to flow into natural water bodies. Most of the water only receives primary treatment. Many treatment plants in cities in the South go into disuse after a short period of time due to insufficient funds for operation and maintenance.

Editorial

Stephanie Buechler, *IWMI*
Wilfrid Hertog, *RUAF*
René van Veenhuizen, *RUAF*

Part of this untreated wastewater is used by urban, periurban and rural men, women and children from different caste and class groups who practice urban agriculture or related activities such as dairy production, agroforestry, orchards, toddy tapping, teak or other wood harvesting, floriculture or aquaculture (see the article on Hyderabad on page 13, the Dakar case on page 35, Hubli Dharwad on page 31 and Kolkata on 29).

This wide variety of users has a variety of motives for using untreated or partly treated wastewater. In semi-arid and arid areas it is often the only source of water available and it is available year-round. It is also an inexpensive source, not just of water but also of nutrients. In fact, farmers often need less or no additional fertilisers. It can be easily channelled from city drains or from a river to the fields or carried in watering cans. Using this water is also attractive as these fields are often conveniently located near city markets where the produce is sold, or are near urban-based buyers who go directly to the (peri)urban plots.

WASTEWATER SOURCES

The sources of wastewater include rivers, city drainage canals, spouts from city sewage and drainage channels that drain onto the fields below, ponds and tanks, shallow wells, house drainage spouts and channels, etc. The composition of the wastewater also varies according to its origin. There is storm water and other urban run-off, grey water (domestic water that is wastewater without urine and faeces) or black water (domestic wastewater with urine and faeces) as well as industrial wastewater, hospital and other institutional and commercial establishment wastewater and combinations of all of these (each with varying concentrations). Industrial wastewater may contain a wide range of pollutants, heavy metals being the most well-known example, some of which are not acutely toxic either for the crop, the soil or for the consumer but over time may be damaging to either or all of these (see Senegal case on page 35).

THE NEED FOR TYPOLOGIES

Typologies of wastewater use are currently being developed and adapted (e.g. by IWMI and HR Wallingford) for the purpose of standardising categories

employed to define and describe this use in local and national level studies. These typologies will serve as tools for undertaking assessments of the extent of wastewater use in certain key countries around the world. The results of these assessments can then serve to better inform policy-makers at various levels.

Van der Hoek (forthcoming) with IWMI differentiates between direct and indirect use of wastewater according to whether the wastewater is undiluted (direct use from a sewer, e.g.) or diluted with natural surface water such as a river before use. It also categorises the water by the relative strength of the different types of wastewater in a given urban area, the extent (amount of type of treatment) of wastewater treatment, and the use of wastewater in formal (via irrigation infrastructure with a level of permission and control by state agencies) or informal (at many, scattered points) irrigation schemes. Cornish facilitated the revision of this typology at the Hyderabad experts' meeting (see page 4) and suggests the following diagram (Cornish, forthcoming).

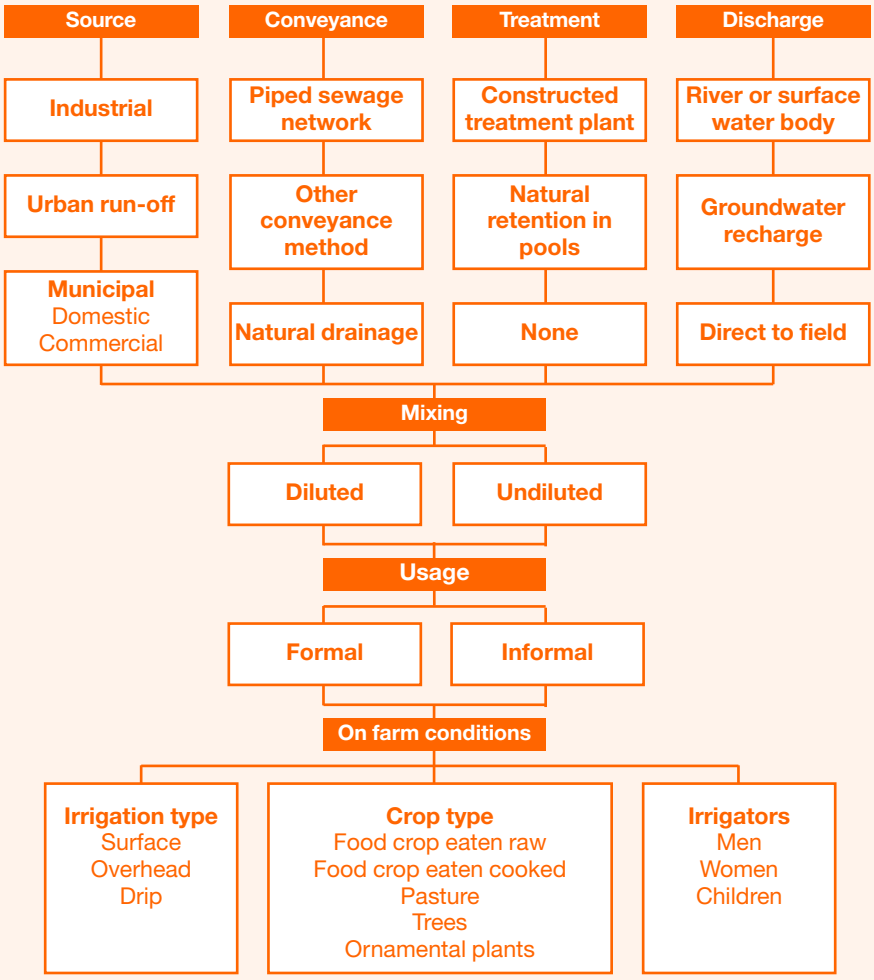

Figure 1 Typology of wastewater irrigation (see page 47 for definitions)

HEALTH-RELATED ASPECTS

Farmers use wastewater out of necessity and it is a reality that cannot be denied or effectively banned. However, wastewater use for urban agriculture is often negatively perceived by the public and by government officials. However, wastewater use for urban agriculture is negatively perceived by the public and government officials, and this contributes to the negative image of urban agriculture.

A major obstacle in the process of minimising the risks of wastewater use lies in the non-recognition of urban agriculture as an urban livelihood strategy. The adoption of any measure or policy therefore depends upon whether the authorities and policy-makers take the activity of urban agriculture itself seriously (see also the Ouagadougou Study visit summary on page 13).

The main risk for the public arises when vegetable or salad crops, grown with untreated wastewater, are consumed raw. This practice can be linked to cholera and typhoid as well as faecal bacterial diseases, bacterial diarrhoea and dysentery for the consumers of wastewater-irrigated produce. There is further evidence that agricultural workers in wastewater-irrigated fields and consumers of wastewater-irrigated produce are more likely to get intestinal helminths infections. These infections are due to *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), *Ancylostoma duodenale* and *Nector americanus* (hookworms) (see Faruqui on page 19 or the discussion on Guidelines on page 7).

There are, however, also cases that show that contamination of products also takes place between the field and actual consumption, e.g. in the market or even in the home of the consumer e.g. through unhygienic handling. There is a need for

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Harvested Para grass along the Musi River in Hyderabad (page 14)

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rigorous (epidemiological) research to determine the type and degree of health risk, the paths of contamination and the likelihood of infection. This is to determine the real risks that may be attributed to wastewater irrigation and other wastewater-dependent activities such as livestock rearing (see the reference to a programme on page 42) and aquaculture (see the case of Kolkata on page 29) in a particular geographical area. The risks should be assessed according to the type of activities for which the wastewater is being used, the type of irrigation method (see the case on Kumasi on page 11) and the type of user group that has the most direct contact with the water. Such studies will increase the understanding of wastewater use and perhaps dispel its pejorative image. This qualitative and quantitative research and

IWMI-Ghana

analysis should include recommendations on appropriate follow-up measures, regulations and policies.

LOW-COST TREATMENT TECHNOLOGIES

Next to a lack of recognition of the issue by governments, an often-mentioned problem is the funding of wastewater treatment infrastructures and the maintenance of these. Low-cost, appropriate, and decentralised treatment technologies can be developed, with the particular users involved. Examples are tanks in which organic matter and suspended solids settle if the user allows sufficient time before irrigating. CEPIS (see page 18) is promoting the integration of treatment systems and agricultural use in Latin America. However, integrated planning between treatment authorities and agriculture is not a common phenomenon (see the Mexico case on page 33).

Decentralised small-scale community operated systems and stabilisation tanks have also been built for successful use for fisheries (see the Dakar and Kolkata experiences on page 35 and 29). The Middle East and Near Africa (MENA) countries have very scarce water supplies, but also have greater economic resources to treat water. Some countries in this region have established integrated plans to use treated wastewater for agriculture (page 20). The other option for providing cleaner water to farmers is through source reduction. The degree of faecal contamination of water can be reduced through the use of environmental sanitation technologies (see the Peru and Mexico experiences on page 37 and 39) and with domestic filtering of soapy water for gardens.

Industrial pollution of surface water bodies should also be reduced by, for example, proper zoning, registration and monitoring of industries and financial and technical incentives for waste minimisation (as suggested by Odurukwe for Abe in Nigeria, page 40).

GUIDELINES

The WHO's recommendations of wastewater treatment and crop restrictions introduced in 1989 are considered by many governments as the legal framework, even though they are not intended for absolute and direct application in every country. The present WHO guidelines, almost exclusively promoting wastewater treatment and crop restrictions, do not take the reasons for wastewater use (such as the lack of treatment possibilities) and the positive impact into consideration (this issue and the discussion on page 7). The revised guidelines (to be published by the WHO in 2003), will be part of a first volume and a second volume will contain case studies of wastewater use and users to provide evidence concerning some of the ways in which wastewater benefits low-income households.

USERS' NEEDS AND PERCEPTIONS

The farmers perception of wastewater quality, economic value and health issues needs careful attention to better inform planning initiatives of the policy-makers and the urban authorities (see the Ouagadougou case on page 24 and the Hyderabad case on page 14). Farmers using wastewater in different locations (urban, periurban or rural; high or low rainfall areas; wealthier or poorer regions, e.g.) have different needs. Other factors that vary across locations are: the source of the wastewater; land-tenure issues; land values and land taxes; infrastructure, like the availability of electrical power; and the legal framework. Flexible "response scenarios" could be developed for each of these specific locations or for similar localities to identify appropriate risk reducing strategies that are technically, economically, socio-culturally and politically compatible (see the discussion on page 7).

INSTITUTIONS

Various governmental agencies are involved in shaping the policy framework in which wastewater-related activities are inserted. Often, there is little convergence between the laws and policies that these different institutions uphold related to urban and periurban agriculture and

wastewater use. There is a need for researchers studying these issues, NGOs and farmers to engage with policy-makers at various levels to encourage a well-integrated, supportive policy environment. There is also a need for strengthening institutions, to fund sewage-collection systems and other improvements in sanitary conditions, and to enact by-laws that can enhance urban safe vegetable production (see the Kumasi case on page 11) as well as the production of other agricultural and aquaculture produce.

EDUCATION, INFORMATION AND AWARENESS-RAISING

Raising awareness among farmers, policy-makers, polluters, marketers, consumers and others is seen by many as the immediate and most important strategy to reduce the health risks in most low-income countries (see the summary of the IWMI-RUAF wastewater E-conference held in 2002 on page 4 and the Ouagadougou Study visit organised by RUAF and CREPA on page 13).

Education and information-sharing need to be tailored to each type of group that engages in wastewater dependent activities, as the use patterns of each set of actors is very different. Consumers are also a heterogeneous group, using different types of wastewater-produced items. Producers, workers and consumers need to be included in information campaigns, training and information-sharing fora, so that hygiene can be improved and associated diseases prevented. Municipal authorities often do not include urban farmers as "real" "irrigation farmers" and therefore do not provide any extension (see the Tamale and Kumasi cases on page 10 and 11). Awareness raising could diminish risks related to wastewater irrigation and possibly have a wider impact in combating hygiene-related diseases in general.

As the Hyderabad Declaration states wastewater use for livelihood activities in urban and periurban areas is a reality that planners and policy-makers must face. Financial resources should be made available for these institutions to implement appropriate measures to protect and support these livelihoods as well as to improve the health of the environment, the users and the consumers.

The Hyderabad Declaration

The International Water Management Institute (IWMI) in collaboration with the International Development Research Centre (IDRC) convened a meeting of minds through an international workshop entitled *Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities,* which was held in Hyderabad, India from 11-14 November 2002. The workshop objective was to critically review experiences with the widespread use of untreated wastewater in agriculture focusing on the livelihoods of the poor, and health and environmental risks. Participants were diverse with a presence of 47 groups of researchers and practitioners from 27 national and international institutions.

The livelihood implications of wastewater irrigation as well as the human health and environmental impacts are clear. Management options identified with partners and stakeholders consider the common situation of wastewater use without options for treatment and include improved health safeguards, awareness raising, cropping restrictions, appropriate techniques, low-cost alternatives (also on-farm), and pollutant-source management. However, many involved in wastewater-treatment, agriculture, sanitation and urban planning have ignored the practice and its implications.

A number of case studies covering different regions of the world, and comprising applications of wastewater ranging from the treated to the untreated were extensively discussed and debated. Three workgroups addressed issues of assessing the global use of wastewater, the health and environmental implications and related guidelines, and institutions and future research directions. Two major breakthroughs were:

(1) a common vision and agenda for the future contained in the Hyderabad Declaration which follows below; and
(2) the discussion with the World Health Organisation (WHO) to take into account the realities in reviewing the guidelines for wastewater use in agriculture.

The Hyderabad Declaration on Wastewater Use in Agriculture

1. Rapid urbanisation places immense pressure on the world's fragile and dwindling fresh water resources and over-burdened sanitation systems, leading to environmental degradation. We as water, health, environment, agriculture, and aquaculture researchers and practitioners from 27 international and national institutions, representing experiences in wastewater management from 18 countries, recognise that:

1.1 Wastewater (raw, diluted or treated) is a resource of increasing global importance, particularly in urban and periurban agriculture.
1.2 With proper management, wastewater use contributes significantly to sustaining livelihoods, food security and the quality of the environment
1.3 Without proper management, wastewater use possesses serious risks to human health and the environment.

2. We declare that in order to enhance the positive outcomes while minimising the risks of wastewater use, there exist feasible and sound measures that need to be applied. These measures include:

2.1 Cost-effective and appropriate treatments suited to the end use of wastewater, supplemented by guidelines and their application.
2.2 Certain activities to take place where wastewater is insufficiently treated, and until treatment becomes feasible:
  (a) development and application of guidelines for untreated wastewater use that safeguard livelihoods, public health and the environment;
  (b) application of appropriate irrigation, agricultural, post-harvest, and public health practices that limit risks to farming communities, vendors, and consumers; and
  (c) education and awareness programmes for all stakeholders, including the public at large, to disseminate these measures.
2.3 Health, agriculture and environmental quality guidelines that are linked and implemented in a step-wise approach.
2.4 Reduction of toxic contaminants in wastewater, at source and by improved management.

3. We also declare that:

3.1 Knowledge needs should be addressed through research to support the measures outlined above.
3.2 Institutional coordination and integration together with increased financial allocations are required.

4. Therefore, we strongly urge policy-makers and authorities in the fields of water, agriculture, aquaculture, health, environment and urban planning, as well as donors and the private sector to:

Safeguard and strengthen livelihoods and food security, mitigate health and environmental risks and conserve water resources by confronting the realities of wastewater use in agriculture, through the adoption of appropriate policies and the commitment of financial resources for policy implementation

14 November 2002, Hyderabad, India

The Hyderabad Declaration

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14 November 2002, Hyderabad, India

Electronic Conference

Agricultural Use of Untreated Urban Wastewater in Low Income Countries

Kranjac-Berisavljevic

The main drain in Tamale, Ghana

From 24 June to 5 July 2002, IWMI and ETC-RUAF organised an electronic conference on strategies that may be applied to reduce the health risks associated with the use of untreated, partially treated or diluted wastewater in agriculture, whilst maintaining or enhancing the social and economic benefits for the poor urban citizens involved in irrigated production.

The use of urban wastewater in agriculture is a widely established practice. Institutions and individuals who lead wastewater treatment and sanitation initiatives globally have largely ignored this practice and its implications. The conference attempted to bridge this gap by setting up a focused discussion based on the experiences of a wide range of participants from the field of water resources, agriculture, human health and ecological impacts. Rather than focusing on (end-of-pipe) treatment of wastewater, the emphasis of the discussion was on:

a. Strategies to ensure proper health-risk management by the users of the untreated or partially treated wastewater; and
b. Strategies to prevent and reduce chemical pollution by industries of domestic sewage water and rivers that are used for irrigation.

The conference itself was divided into two sessions. During the ***first week*** of the conference, the focus in both topics was on the ***analysis*** of the actual situation and trends, and the analysis of the effectiveness of certain strategies. During the ***second week*** of the conference, the discussion put more emphasis on the ***formulation of recommendations*** for policy development and action planning. The discussion in reality did not adhere to this rigidly, nor did it adhere rigidly to the two topics outlined – with some of the topic 2 issues being discussed in topic 1 and *vice versa*.

Summarised by **Judith Kaspersma**, *(RUAF)*

In total, 333 participants from 72 countries registered and many more followed the discussions by visiting the RUAF website on the Internet. About 54% of the participants had a background in research institutes and universities, 3% in municipalities, 25% in NGOs or CBOs, 9% in governmental organisations, and 5% were students. There were 143 contributions received for the discussions and some 21 papers were added to the "Background papers" section of the conference website. These are encouraging numbers, indicating a strong interest to gain access to and discuss alternative approaches and methods, which can be applied in on-going or future projects. The following key issues were discussed:

TOPIC 1: PROPER MANAGEMENT BY FARMERS

SOCIO-ECONOMIC BENEFITS OF WASTEWATER USE

Social benefits of wastewater use have been addressed under the notion of the livelihoods- generation capacity of wastewater agriculture, employment opportunities offered to women through vegetable cultivation thanks to the availability of wastewater, and the different layers of society which benefit from it. In this regard, the potential to reduce urban poverty provided by wastewater agriculture must be understood, and attempts should be made to associate wastewater-use initiatives with poverty-alleviation programmes of donors. Quantification of the economic benefits was discussed for Ghana and Pakistan (also in this *UA Magazine* issue).

PAYMENT FOR TREATMENT

The possibility of **cost sharing** between residential communities and farmers was raised. Residents should pay because they are the generators but because the water has a value for farmers as the users, it was suggested that they contribute to the treatment cost as well. Treatment costs could be reduced substantially through applying cost-effective treatment technology and applying the treated wastewater to commercial crops, which would generate some of the costs of treatment. Alternatively, farmers could treat the wastewater themselves before use for growing vegetables, as shown in a Latin American study, (although this supposes secure land tenure); or let private companies bid for wastewater treatment and resale opportunities.

COSTS OF WASTEWATER USE FROM HEALTH AND ENVIRONMENTAL RISK PERSPECTIVES

Related to the farmer response to *health risks*, it was suggested that observable health risks are better understood than non-observable abstract concepts (such as bacteria, heavy metals, etc.). An idea was emitted that contamination also occurs during transport, processing and sale of consumable products, which might be more important (to tackle) than

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direct contamination.

The studies may not be conclusive. Some participants indicated the need for more research on the actual health impacts of wastewater use on consumers and workers in the production and processing/marketing of products. The exposure of women to the hazards of wastewater poses the additional risk of rapid transmission to family members through contaminating food during preparation on their return from the fields.

The following environmental risks were discussed:

- risk of pollution of groundwater if wastewater flows continuously;
- steady reduction in yields and crop diversity and soil quality (permeability) after initial increases, due to salinisation of the soils;
- reduction in fruit quality;
- increased incidence of weeds;
- heavy metals, especially cadmium; and
- possibly profound effects in arid and semi-arid areas from the introduction of wastewater agriculture, on crop-pest reproduction cycles and populations.

RISK-MANAGEMENT STRATEGIES

Regulation of irrigation water quality and the problems related to standards setting and monitoring Participants called for the adaptation, or development, of new guidelines for untreated or diluted wastewater, which are designed to be flexible so they can be adapted to the local conditions. The approach of "acceptable risk levels" and "response scenarios" were proposed as viable alternatives. Convincing national and municipal authorities of these approaches is seen as important in setting suitable guidelines.

Facilitating change through awareness raising, education and providing relevant and timely information to target groups Many viewed targeted health education as the most realistic, practical and cost-effective measure to reduce health risks. NGOs and the media may have to play a vital role. Target groups are policy-makers, farmers, consumers, micro-enterprises and other tradesmen, and local authorities.

Crop selection and certification of produce (labelling) Crop selection is a suitable strategy given the variation in absorption of certain chemicals by different crops. Labelling and subsequent higher prices if needed, may improve customer confidence.

Improving upon irrigation practices and their limitations Irrigation techniques vary in application of water to roots or leafy parts of crops. Rotation of wastewater application over fields or in time (if possible), are also suggested.

Therapy of affected persons, like deworming campaigns were suggested as cheap(er) alternatives.

Providing alternative sites and sources of water for relocating affected farmers Incorporating urban agriculture in urban planning requires the vision that agriculture and wastewater use are intrinsic parts of a city's processes and recycling efforts.

On-farm complementary treatment Treatment options were suggested in cases where regulation of water quality is possible and where city treatment of wastewater does not achieve the desired standards.

Remediation of heavy metal contamination of soils Heavy metals were seen to cause the highest risk. Several remediation techniques were discussed.

Participation of stakeholders in decisions relating to wastewater use for maximum impact Dialogue and negotiation between citizens and farmers and others will result in applied, practical and implementable solutions. Here the concept of "acceptable risk levels" and "response scenarios" were discussed.

ROLE OF RESEARCHERS IN IMPROVING THE PRACTICE OF WASTEWATER-BASED AGRICULTURE

A more holistic, integrated and multidisciplinary approach to understanding all the implications of wastewater use was called for. The importance of developing a typology of wastewater/farmers, to address issues in a concerted and universal manner was highlighted. The role of scientists and researchers should be to provide knowledge and information on the "current best practices" and to communicate this information in a form that is understandable to the different stakeholder groups. Effective outreach to policy-makers is also a role for the scientific community. Research on wastewater use in urban and periurban agriculture should be better focused, more participatory and action oriented.

TOPIC 2: PREVENTION AND REDUCTION OF INDUSTRIAL CONTAMINATION

Water used for agriculture particularly in the urban and periurban contexts is often polluted by domestic and industrial sources. Often these wastes are combined in the city drainage and sewerage systems, due to lack of awareness, planning or technical means, and together pollute agricultural water sources. Whilst domestic sewage in spite of posing a risk from pathogens, has the advantage of containing nutrients, most industrial wastewater has only the disadvantage of posing a health risk due to chemical contaminants. Limiting the mixing of industrial wastes in domestic sewage is one means of reducing risks from exposure to chemicals.

The discussion centred around the **reasons why domestic sewage is contaminated with industrial wastewater, possible solutions to avoid such contamination, and low-cost options and methods for treatment** of wastewater which may or may not be a mix of domestic sewage and industrial wastewater.

The main impacts of industrially polluted wastewater on urban agriculture sites were from soil salinisation and heavy metal accumulation. These problems could be solved by lime application to acidified soils, restricting the cultivation of crops susceptible to accumulations depending on their physiognomy, and applying other methods like phyto-extraction. In-farm treatment using Kaolin, has been tried on an experimental basis. One possible integrated approach to address the existing situation is to apply waste-management principles at the generation points (households, industries, commercial establishments, hospitals; and the user points (farms); so that overall relative quality improvements are achieved.

LOW-COST OPTIONS AND METHODS FOR TREATMENT OF WASTEWATER

In most developing countries, the lack of financial resources limits the construction of treatment facilities (low cost or otherwise); and even when they do exist, the operation and management of the systems are constrained once more by finances. The solution may be to find treatment alternatives that are robust enough to stay operational at a moderate cost.

Stabilisation ponds still remain the most cost-effective technology while also removing pathogens. In this regard, activated sludge plants require 80% more investment than stabilisation ponds, but are not capable of meeting health guidelines.

Balancing Health and Livelihoods

Adjusting Wastewater Irrigation Guidelines for Resource-poor Countries

In many low-income countries, less than 10 percent of the urban wastewater is collected in piped sewerage systems and treated. Usually, large volumes of wastewater end up in gutters and open drains and are heavily polluting streams near the city. Here it has been used for decades for year-round or dry-season irrigation of perishable cash crops, such as vegetables, taking advantage of market proximity. This urban and periurban agriculture is more exposed to environmental pollution, including urban wastewater, compared to other farming systems. Due to the common lack of larger industries in resource-poor countries, health risks for farmers and consumers are mostly related to microbiological water contamination from domestic sources (and not industrial pollution).

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To protect farmers' and consumers' health, the World Health Organisation (WHO) published guidelines for the safe use of wastewater in agriculture (Blumenthal, 1989, WHO, 1989), currently under revision[1]. The purpose of the 1989 guidelines was to guide design engineers and planners in the choice of wastewater-treatment technologies and water-management options. The acceptable levels of microbiological contamination included in the guidelines were derived from the results of the available epidemiological studies related to wastewater exposure, use and treatment. In addition, health-protection measures (mainly risk-management measures) were considered, especially crop selection, wastewater-application measures (e.g. drip irrigation) and human exposure control particularly through protective clothing. Integration of these measures and the adoption of a combination of several protection measures were encouraged (WHO, 1989). Where economic constraints limit the level of wastewater treatment that can be provided, a disease-control approach has been suggested, potentially using less strict microbiological guidelines and more management measures for health protection (Blumenthal, *et al.*, 2000; Peasey, *et al.*, 2000).

APPLICATION OF THE GUIDELINES

The application of the guidelines, however, has been found to be difficult in many field situations, for example in India and West Africa, as recently discussed during an expert meeting in Hyderabad (see page 4). To take into account urban and periurban agriculture, adjustments were suggested, especially in relation to the following three points:

- In many countries, wastewater treatment is not possible due to low municipal/governmental resources, and small, old or non-extendable sewerage systems. As the WHO microbiological guidelines expect certain levels of wastewater treatment, their enforcement in situations without any realistic option for treatment would stop hundreds or thousands of farmers from irrigating along increasingly polluted streams, and put their livelihoods at risk, but would also affect food traders and general market supply.
- Especially in market-oriented urban agriculture[2], it is difficult to apply the recommended additional health-protection measures. Highly specialised farmers use every free space with water access to cultivate cash crops, especially those of a perishable nature. Although their plots are often small, irrigation allows for year-round farming and these farmers are able to escape from the poverty trap (e.g. Danso, *et al.*, 2002a), while a contribution to the overall urban vegetable supply and diversified diets is made as well. The small land sizes and insecure land tenure are however significantly constraining farmers' ability to invest in farm infrastructure, such as drip irrigation or on-farm sedimentation ponds. Crop restriction is also often unrealistic as only cash-crop production corresponding to market demand provides the profit on which farmers' livelihoods are based. Thus a change like from vegetables to tree crops would be unrealistic from the land-tenure perspective and also ignores farmers' livelihood strategies (except where non-vegetable cash crops are suitable, e.g. olive trees in the Middle East). In addition, recommendations to change irrigation systems or cease irrigation before harvest usually do not work out, as products such as lettuce would become damaged within a few days from lack of water. Finally, many field interviews show that farmers do not perceive the need for protective clothing (see page 24). All of these constraints to the application of the current wastewater guidelines are common in urban agriculture and not the exception.
- Finally, the microbiological part of the current WHO guidelines have often been used or cited in isolation from the other protective measures (also pointed out in the Hyderabad workshop). A reason might be that the defined critical

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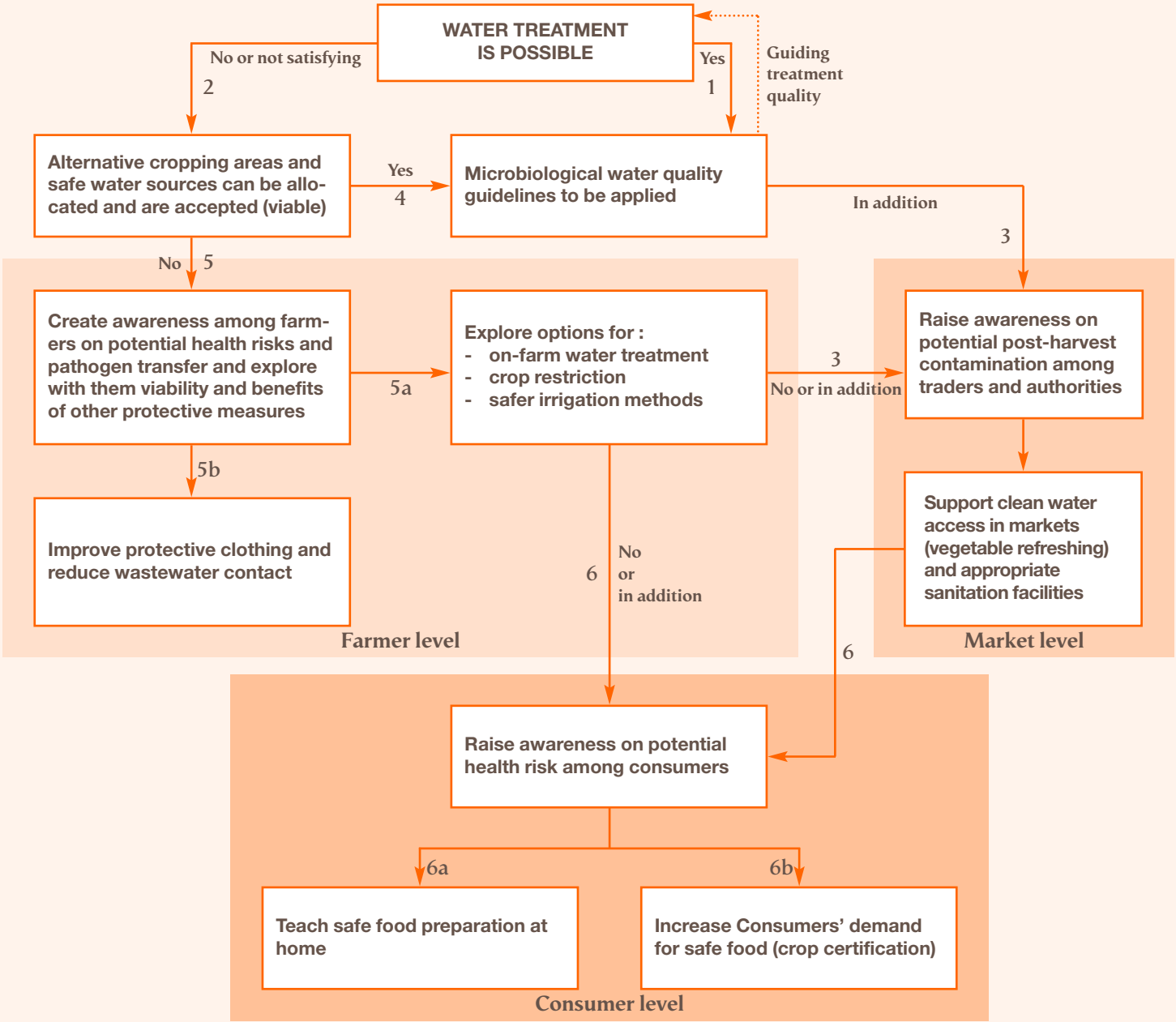

Figure 1: Flow diagram of a decision-making process on locally appropriate health-protection measures

levels appear easier to apply for authorities and institutions than the support of other safety measures for health-risk reduction.

ADJUSTING THE GUIDELINES

With regard to these difficulties, it was suggested that the WHO guidelines need to be adjusted for better application in wastewater exposed urban and periurban agriculture in resource-poor countries. The overall goal should be to find a better balance between safeguarding consumers' (and farmers') health and safeguarding farmers' livelihoods. A stepwise implementation approach for the guidelines (cf. Von Sperling and Fattal, 2001) was thought to be helpful in that it considers different levels of water treatment and recommendations for regions or countries where (improved) treatment is no realistic option. To achieve this, greater emphasis should be placed on further protective measures, which consider the limitations of the current additional measures. This could include other measures on the farm, including better land allocation, but also targeting post-harvest contamination of crops during transport and marketing, which takes place independent of irrigation water quality.

The additional livelihoods perspective can give the health guidelines more dynamism. The Ghana example showed for instance that urban farmers specialised in vegetable irrigation with polluted surface- or wastewater do gain several times more income than their rural colleagues specialising in rainfed agriculture. This allows them to take better advantage of health-care facilities and to pay for medication, which might offset some of the risks through wastewater exposure.

LOCALLY APPROPRIATE HEALTH-PROTECTION MEASURES

A flow diagram of a decision-making process on locally appropriate health-protection measures has been developed (see Figure 1). This process considers experience in Ghana and elsewhere where wastewater is used directly or indirectly for urban and periurban agriculture, and where municipal wastewater treatment is not a realistic option in the short or medium term. The elements of the decision strategy are as follows: (*numbers in the text refer to the diagram*):

- Where monitoring of wastewater treatment is possible from institutional

and financial point of view, the microbiological guidelines for wastewater irrigation should be applied. In this situation **(1)** the guidelines should assist design engineers in setting the standard of the treatment system from the perspective of crop production[3].

❖ Where the establishment or maintenance of a functional wastewater-treatment facility is not a realistic option, the concerned authorities still have different possibilities for reducing health risks to farmers and consumers. First of all, they are asked to explore alternative water sources or cropping areas **(2)** with higher quality water (e.g. groundwater). In Cotonou, for example, the authorities allocated new land for urban farmers with the possibility of groundwater access while in Accra; the Water Research Institute is currently exploring groundwater use in wastewater irrigated urban areas. To be successful, these alternatives have to be explored together with the farmers. Additional measures might be recommended if post-harvest contamination is likely **(3)**.

❖ If alternative land and safe water sources are available and accepted by the farmers, it might be possible to apply the microbiological guidelines **(4)**. If water quality, however, cannot be guaranteed, agricultural engineers should investigate possibilities of **(5a, 5b)**:

a) alternative irrigation technologies and irrigation methods reducing:
   1) farmer's exposure (e.g. during water fetching and application),
   2) crop contact (e.g. surface instead of overhead irrigation), and
   3) microbiological water contamination levels (e.g. through improved and better located shallow wells);
b) crop selection and patterns taking market demand, cultural preferences and gender balance in cultivation/marketing into account;
c) on-farm water treatment options, such as simple sedimentation tanks, taking into account land-tenure arrangements, labour constraints and farmers' interest and ability for on-site investments; and
d) awareness campaigns for irrigating farmers on their own and on consumers' health risks, plus guidance on health protection measures.

In all of these cases, alternative risk reducing approaches have to be technically as well as socio-economically and culturally viable. No implementation should be suggested without consideration of farmers' perceptions, attitudes, suggestions and constraints.

❖ It can also be crucial to focus on post-harvest contamination on markets **(3)**; i.e. on the availability of clean water for vegetable handling, especially crop washing and "freshening up" as well as general hygienic conditions for traders (e.g. availability of sufficient sanitation facilities). This must also be combined with related education and awareness campaigns. Authorities should also consider the well established but often officially ignored informal vegetable markets (e.g. in upper class suburbs), and insist on the availability of clean water. Related costs are likely to be insignificant in comparison with effective wastewater treatment.

❖ Risks to consumers **(6)** should be addressed by sensitising households on the health implications related to polluted irrigation water, **and** to unhygienic produce handling. Recommendations will have to consider local diets and food preparation behaviour and options. Improved vegetable washing and (if possible) cooking can significantly reduce possible health risks through wastewater irrigation or post-harvest contamination **(6a)**. A related (long-term) target is to raise consumers' demand and willingness to pay for safe food **(6b)**. This could catalyse awareness shifts also among traders, farmers and authorities. Crop certification could become an option (Westcot, 1997). However, this transition has still a long way to go in many countries, keeping in mind the dominance of more obvious health risks such as HIV, malaria and lack of drinking water as well as general sanitation facilities (Danso, *et al.*, 2002b). The strategies related to **markets** and especially **consumers** should also receive attention in situations of functional treatment and applied wastewater-irrigation guidelines. The reason is that post-harvest contamination through unhygienic crop handling might take place independently of enforced or non-enforced irrigation guidelines.

CONCLUSIONS

Without question, the enforcement of microbiological guidelines or crop restrictions remains important, but a better balance between safeguarding consumers' (and farmers') health and safeguarding farmers' livelihoods should be made, especially in situations where the required water treatment or agronomic changes are unrealistic. More holistic approaches are required which go beyond the current ones. While in Accra (Ghana), for example, urban farmers using wastewater were arrested, the municipality of Cotonou in Benin provided new land for agriculture where groundwater can be accessed with, for example, treadle pumps. Alternative water sources, other cropping areas or improved irrigation methods are valuable measures for health-risk reduction. However, further research is needed into hygienic food marketing as well as the safe food preparation at home as important options to tackle the wastewater problem in low-income countries. Scientific data on actual risk reduction through the various measures described above are still insufficient. It is finally recommended that the new guidelines be presented in a more integrated way, to avoid the concentration on wastewater treatment to the exclusion of management measures for health protection.

NOTES

(1) A summary of the rationale for the development of the wastewater guidelines, and a brief history of guideline development is given in "Water quality: Guidelines, Standards and Health" published by the WHO, following a meeting of experts in Stockholm, 1999 (Havelaar, *et al.*, 2001).
(2) We refer here to market-oriented open-space vegetable growers, not backyards.
(3) From this perspective, microbiological contamination should receive more attention than, for example, the degradable organic matter content (which can be a valuable source of e.g. nitrogen).

REFERENCES

- Blumenthal, UJ, M Strauss, DD Mara and S Cairncross. 1989. Generalised model of the effect of different control measures in reducing health risks from waste reuse. Water, Science and Technology 21:567-577.
- Blumenthal, UJ, A Peasey, G Ruiz-Palacio and DD Mara. 2000. Guidelines for wastewater reuse in agriculture and aquaculture: recommended revisions based on new research evidence. WELL Study No. 68 part 1, June 2000. http:/www.lboro.ac.uk/well/studies/t68i.pdf
- Danso, G, P Drechsel, T Wiafe-Antwi and L Gyiele. 2002a. Income of farming systems around Kumasi. *Urban Agriculture Magazine* 7 (August): 5-6.
- Danso, G, P Drechsel and SC Fialor. 2002b. Perceptions of organic agriculture by urban vegetable farmers and consumers in Ghana. *Urban Agriculture Magazine* 6 (April): 23-24.
- Havelaar A, UJ Blumenthal, M Strauss, D Kay, J Bartram. 2001. Guidelines: the current position. In: Fewtrell L and Bartram J (eds), Water Quality: Guidelines, Standards and Health: assessment of risk and risk management for water-related infectious disease. *IWA publishing*. 2:
- Peasey, A, UJ Blumenthal, DD Mara and G Ruiz-Palacios. 2000. A review of policy and standards for wastewater reuse in agriculture: a Latin American Perspective. WELL Study No. 68 part 2, June 2000). http:/www.lboro.ac.uk/well/studies/t68i.pdf.
- Von Sperling, M and Fattal, B. 2001. Implementation of guidelines: some practical aspects. In: Fewtrell L and Bartram J (eds), Water Quality: Guidelines, Standards and Health: Assessment of risk and risk management for water-related infectious disease. *IWA publishing*. 2:
- Westcot, D. 1997. Quality control of wastewater for irrigated crop production. FAO Water Report 10, Rome.
- WHO. 1989. Health guidelines for the use of wastewater in agriculture and aquaculture. Report of a WHO Scientific Group. Geneva, World Health Organization, 1989 (WHO Technical Report Series No. 778).

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Sources and Quality of Water for Urban Vegetable Production

(Tamale, Ghana)

The municipality of Tamale is the most urbanised district in the entire northern part of Ghana. It has 293,879 inhabitants and a population growth rate of about 2.7%, and it serves as an administrative and educational centre. The municipality covers an area of about 922 km².

Tamale also has some industries for primary processing of raw materials such as cotton, shea nut (*Vitelaria paradoxa*) and rice. It lies within the Guinea savannah agro-ecological zone and is characterised by high temperatures averaging 29°C and one rainy season (<1,000mm), falling between April and October. The other months are very dry, leaving domestic and agricultural sectors to struggle for the meagre water resources available from small dams and dugouts. Urban gardening is the important source of vegetables for the urban population. Crops grown in the gardens include maize, cabbage, carrots, local leafy vegetables, tomatoes and many fruit types, such as papaya, banana, etc.

Approximately one third of the population in Tamale is served with potable water, while the rest depends on dams and dugouts that retain runoff from the previous rainy season. Groundwater availability is limited in a few hand-dug wells and boreholes, with depths ranging from 18-122m, depending on the nature of the rock material present beneath the soil horizons. The yield of wells and boreholes in the area is generally poor, and the drilling success rate is also low. Out of 18 boreholes drilled in Tamale Municipality in 1997, only three were successful and these yielded between 12-50 l/s.

This situation makes vegetable gardeners use almost any water that they can lay their hands on, regardless of its source and especially during the dry season. For instance, in Kamina (a study site), farmers use water directly from a broken-down sewage-treatment plant. At six sites, the sources were identified and the water analysed for physiochemical and microbiological parameters during the 2000/2001 dry season to determine its suitability for vegetable production. (The results are given in a table, available on **www.ruaf.org**.)

Thirty farmers and relevant institutions were also interviewed. Most of the respondents mentioned that land acquisition did not represent a problem. Most of the respondents are young men (traditional rules do not allow women to own land), comprising school dropouts, or students who could not continue their education due to financial constraints. Of the respondents, 57% mentioned that vegetable gardening is their part-time occupation, supplementing other sources of income. Constraints include lack of financial resources for good quality inputs such as certified seeds and pesticides. About 23% use only compost on their plots. Most of the farmers indicated that they use both organic and inorganic fertiliser, when the funds are available. Farmers usually apply water to their plots using buckets or watering cans, once or twice daily.

WATER QUALITY

All the water sources (1-6) are routinely used for vegetable production in the municipality. The area cultivated at each site varies between 1-10 ha but the area fluctuates every season depending on the water availability and number of farmers engaged in the work.

The physiochemical parameters are within tolerable limits for irrigation water except the faecal-coliform levels, which were for all sites higher than $2*10^6$ faecal coliforms per 100 ml. Irrigation water standards for vegetables are set at less than 10^3 faecal coliforms per 100 ml. This is a clear indication of improper disposal of faecal waste. The municipal authorities echoed this with observations that there is no functional sewerage system or any specific disposal site.

Interviews with the vegetable farmers show that the availability of water for dry-season gardening is not so much of a problem, especially for those who use drains as their water source. However, the Ghana Irrigation Development Authority, which is the division of the Ministry of Food and Agriculture responsible for the development of irrigation in the country, does not recognise these farmers as "irrigation farmers" and does not provide help or any form of training. The Tamale Municipal Assembly holds the same view. Currently, no NGO or government agency is directly responsible nor interested in providing educational and hygiene-awareness programmes to the vegetable farmers.

RECOMMENDATIONS

It is clear from this initial study that vegetable production using polluted water is a regular practice in Tamale Municipality and a large quantity of local leafy vegetables, cabbage, carrots, tomato and other crops are being produced using this same resource, especially during the long dry season. This is, however, driven by the demand for water more than the nutrients in polluted water. Though the physiochemical parameters are tolerable, the levels of faecal contamination are high, hence risky to the health of both consumers and the general public. As this kind of farming is crucial for the livelihoods of the people in the area and also contributes significantly to urban food security, there is the need to give it recognition. The relevant actors, such as local authorities, government institutions, researchers, etc. should embark on a joint approach to look for better strategies to make the practice less risky as it continues to be an important income generating activity for many people in the area.

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Watering cans are often used for irrigation in Kumasi

Wastewater Use in Informal Irrigation

in Urban and Periurban Areas of Kumasi, Ghana

The use of wastewater for food crops will prevail

Kumasi is the second largest city in Ghana, with a population of 1 million people. The average amount of water used is 72 litres/capita/day for pipe-borne water users. Households are the main source of wastewater in the city. Black water from 64% of the population ends up in septic tanks and public toilets; this wastewater is supposed to be collected by trucks and taken to a faecal treatment plant, but it reached its capacity years ago (Leitzinger and Adwedaa, 1999). Twenty–two percent (22%) of the population use different types of latrines and 6% defecate in the bush. The remaining (i.e. max. 8%) of the population has access to piped sewerage systems (for black and grey water) connected to sewage-treatment plants, which, however, are mostly dysfunctional due to insufficient maintenance and/or too low capacity. Typical examples are the two largest plants at Asafo (serving 1.2% of the population) and the one at Kwame Nkrumah University of Science and Technology (KNUST). While the Asafo plant is usually limited by poor operating conditions, the KNUST plant has been completely out of order for more than ten years now. Raw sewage from the university premises flows to a "wetland" linked to a small stream, which is used for urban vegetable irrigation. Other smaller sewage-treatment plants mainly serve private premises and local institutions.

While this describes mostly the situation of black water, grey water from urban households (not connected to sewerage systems, i.e. from up to 90% of the population) is discharged via storm water drains and gutters into surface streams flowing through Kumasi. The effluents of the faecal and sewage treatment plants are also discharged into these streams. They show pollution levels with faecal coliforms of up to 10^{10}/100ml while the recommended maximum level for vegetable irrigation is 10^{3}/100 ml. As Kumasi is traditionally a commercial and transport centre, with one of the largest markets in West Africa, the industrial sector is not much developed. Hence, industrial wastewater is not significant in quantitative terms and heavy metals are not of concern (Cornish *et al.*, 1999).

IRRIGATION PRACTICES AND HEALTH RISKS

Along all of these streams, irrigated urban and periurban vegetable production is practised. In most cases, manual fetching with watering cans and buckets is dominant, while motorised pumps and hoses are less often used than in neighbouring Lomé and Cotonou. The irrigation method is always similarly independent of crops and water sources, and not appropriate when considering the bad water quality observed. The common method of irrigation with watering cans is likely to result in more produce contamination than when using systems like drip, furrows or bowls where water is applied near the roots of the crop. However, the farmers' decision regarding which type of irrigation method to use is influenced by small farm sizes and land insecurity, especially in urban areas, which result in hesitation to invest in infrastructure.

Irrigation takes place in the morning and evening. Due to the short growing cycle of many vegetables and their fragile nature (loss of attractive appearance), irrigation continues until harvesting day. As most pathogens survive on crops for about 15 days, they are carried to the markets and into consumers' homes. Farmers rarely wear protective clothing or take any protective measures when applying water, or pesticides for that matter. Some are aware of such measures but cannot afford them or give them little priority.

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No extension services are offered to farmers on irrigation practices, related protection, etc.

SOCIO-ECONOMIC BENEFITS

About 500 urban farmers are involved in bottomland vegetable farming throughout the year, with up to 15,000 farmers cultivating in the periurban areas during the dry season. While most farmers, especially in urban Kumasi, are men, women dominate the marketing. With an estimated area of 11,900 ha under dry-season vegetable farming around Kumasi, revenue generation from irrigation has been estimated from farm surveys to be as high as US $6 million (US $500/ha/yr) with profits of at least US $4 million (Cornish, *et al.*, 2001). A significant part of this is derived from irrigation using polluted stream water, especially downstream of Kumasi. Thus "wastewater irrigation" not only supports urban diets but also gives employment to producers and sellers and contributes to Kumasi's economy. As a comparison, the whole area under "formal" irrigation in Ghana (irrigation schemes with a dam) currently covers less than 9,000 ha.

In urban areas, farmers grow non-traditional vegetables like lettuce, cabbage and spring onions on open spaces, with water access throughout the year. They rely on this as their major source of income. The kind of vegetables grown depends mostly on actual market demand, water availability and farmers' specialisation and experience with certain crops. Many farmers combine two to three crops in a growing season and report many harvests per year especially for lettuce. This high production level makes Kumasi independent of, for example, lettuce and spring onion production from outside the city. Periurban farmers prefer maize, yam or cassava cultivation during the wet season, for both marketing and subsistence purposes. However, more and more farmers with access to water in addition cultivate vegetables such as okra, garden eggs and tomatoes in the dry season. This can double their farm income (Danso, *et al.*, 2002).

Besides the health risks, wastewater irrigation also does provide benefits to the society. For instance, a large amount of nutrients are not wasted, but retained for crop production. The nutrient contribution of wastewater used for irrigation is shown in Table 1. Farmers are generally aware of the general nutrient value of the wastewater, but are not using the wastewater for fertilisation, but rather as a source of water. In addition, they apply poultry manure in large amounts and high frequency to match nutrient leaching from irrigation (Drechsel, *et al.*, 2000).

INSTITUTIONAL ASPECTS

The Kumasi Metropolitan Assembly (KMA) has by-laws addressing environmental sanitation. Liquid-waste collection and treatment by service providers is governed by regulations. Any treatment plant that is constructed must be certified by the KMA and the Environmental Protection Agency (EPA). This certification addresses the issue of city drainage and pollution control, among other things. There is no specific clause regulating irrigated vegetable farming in the city; the closest one is the national land policy, which stipulates that no activity including agriculture is supposed to be done within 100m of water bodies. However, while this should protect water bodies in rural areas from e.g. pollution, it is supposed to strengthen their capacity for flood prevention in urban areas. Here, illegal construction of houses and shops is a major concern of city authorities, and urban farming is often tolerated as it prevents other types of encroachment.

The Accra Metropolitan Assembly (AMA) by-laws on the other hand, address the issue of vegetable cultivation in the city. In 1995, the AMA enacted a law for the "growing and safety of crops". It states that: *"No crops shall be watered by the effluent from a drain from any premises or any surface water from a drain which is fed by water from a street drainage".* The penalty is three months imprisonment or/and a fine not exceeding ¢100,000 (US $50 in 1995 which is US $13 in 2002). This by-law is seldom enforced, but whenever there has been any enforcement, it has been drastic, such as with the arrest of urban farmers. With regard to the bad water quality used for irrigation in parts of Accra, this step appears reasonable; however, it is neither tackling the whole problem nor its roots. The problems are not only that irrigation-water quality is alarming in the cities and for those downstream, and that one hardly finds any vegetables in the markets with coliform counts of less than 1,000 per 100 ml. As arresting all concerned farmers is no meaningful option, the question is how to enforce the by-laws against water pollution. The answer is that these by-laws need amendments that offer viable alternatives to the farmers (see article on Guidelines on page 7). In addition, any individual prosecution would be a farce as government institutions such as hospitals, ministries, learning and research institutions and others contribute to water pollution just like every household not connected to a sewerage system. In fact, the pollution of our streams is facilitated through the continuous construction of storm-water drains along every street. Urban water pollution is not yet a municipal priority topic, but should become one to tackle the wastewater problem at the source.

Table 1: Nutrient application with irrigation water in and around Kumasi, based on analytical data

	Calculation base	Cornish *et al.*, 1999	Data from IWMI Ghana
Area	Periurban	Periurban	Urban
Amount of water applied per year	200 mm	200 mm	1000 mm
Total N (kg/ha)	2-50	8-40	10-200
P2O5 (kg/ha)	170-200	40-240	130-300
K (kg/ha)	-	80-150	240-470

CONCLUSIONS AND RECOMMENDATIONS

Wastewater collection, treatment and/or disposal in Kumasi city is in a deplorable state and lacks necessary infrastructure. This state of affairs also extends to the disposal of solid waste, sludge, etc. As a result, water bodies, especially in and

REFERENCES

- Cornish, GA, E Mensah and P Ghesquire. 1999. Water quality and periurban irrigation. An assessment of surface water quality for irrigation and its implications for human health in the periurban zone of Kumasi, Ghana. Report OD/TN 95 September 1999. HR Wallingford, UK.
- Cornish, GA, JB Aidoo and I Ayamba. 2001. Informal irrigation in the periurban zone of Kumasi, an analysis of farmer's activity and productivity. Report OD/TN 103 Feb. 1999. HR Wallingford, UK.
- Danso, G, P Drechsel, T Wiafe-Antwi and L Gyiele. 2002. Income of farming systems around Kumasi. *Urban Agriculture Magazine* 7: 5-6.
- Drechsel, P, RC Abaidoo, P Amoah and OO Cofie. 2000. Increasing use of poultry manure in Ghana: Is farmers' race consumers' fate?. *Urban Agricultural Magazine* 1(2): 25-27.
- Keraita, B. 2002. Wastewater use in urban and periurban vegetable farming in Kumasi, Ghana. MSc Thesis. Wageningen University, Wageningen, The Netherlands.
- Leitzinger, C and Adwedaa, D. 1999. Field monitoring of the faecal sludge treatment plant in Kaasi, Kumasi Ghana. A practical report. SANDEC/EAWAG, Zurich, Switzerland.

downstream of the city, used for irrigation by urban and periurban farmers, are heavily polluted. The high levels of nutrients can be an advantage to farmers, but on the other hand, the high levels of pathogens require careful wastewater use to avoid health risks for farmers and consumers. As chemical pollutants in the wastewater are within tolerable limits, their impact on the environment and human health seems to be minimal. The informal methods of irrigation used by farmers (watering cans, buckets, water hoses) increase the risk of contamination of crops (contact of water with edible parts) and of farmers (general exposure). But, the current institutional and policy frameworks concerning wastewater use in farming remain a patchwork with related by-laws and other policies that are missing or hardly practicable in developing country contexts and for farmers that depend on wastewater irrigation for their survival.

As a long-term solution, a comprehensive improvement of the urban sanitation infrastructure is required, but lack of resources makes it unlikely in the near future. With expanding urban populations and food needs, it is likely that the use of wastewater for food crops will prevail. Raising awareness and education as a means to improve the situation has been suggested by a large number of survey respondents as well as in the wastewater related e-conference. Such awareness creation could target households, farmers, vegetable sellers, consumers and the local authorities, depending on the local situation and the best entry point for risk reduction. In order to devise better irrigation and cropping strategies for using the available water, with its inherent disadvantages and benefits, more research on the subject is needed.

A comprehensive understanding of the situation, which includes farmers' level of awareness, technical know-how, livelihood patterns, perception, social constraints, land and water rights, etc. are vital to laying the foundation for practical policy and guideline formulation. Finally, data on the extent and importance of wastewater use especially in and around cities such as Kumasi is needed for better decision-making, thus avoiding partial and myopic judgments, on which current policies are sometimes based. This will require corresponding institutional strengthening and functional research-policy linkages.

Ouagadougou Study Visit

Wastewater in Urban Agriculture, a Challenge for Municipalities in West Africa

This five-day event took place from 3-7 June 2002, and was organised by ETC-RUAF together with CREPA headquarters in Ouagadougou, Burkina Faso, financed by CTA Netherlands. It consisted of a combination of paper presentations, working group discussions and site visits. There were 29 participants.

WORKSHOPS

Three thematic papers and seven case studies were presented. The seven cases focused on cities in Benin, Burkina Faso, Cameroon, Ghana, Mali, Mauritania and Senegal. Although wastewater use is common in all but Benin, the sources and conditions differ more than one might expect. This gave a lively discussion and exchange of views.

SITE VISITS

Different sites in and around Ouagadougou were visited where a number of farmers were available to answer questions or discuss certain issues. The first site, **Kossodo**, is a large farming area that uses untreated wastewater from an industrial zone, with most water coming from a brewery and a leather tannery. The farmers, of which many are women, apply a number of strategies to avoid using the worst quality water. **Paspanga** is situated in between the artificial lake and a busy part of town. An open wastewater sewage channel separates the town from the plots. This channel carries wastewater from several industries as well as some domestic wastewater. The farmers were both men and women, each with their own plots. The farmers were organised and presented a paper with the four main problems, all concerning lack of inputs. The insufficient amount of water available was named as the number one problem. Water from the sewer is only used when wells run dry. **Kamboinse** is on the shore of an artificial lake. There are vegetable plots fed by water from channels dug from the lake into the fields. The water was very low in the lake and no crops were grown at the time of the visit. The only disease mentioned here is Bilharzia. **Boulmiougou** is another gardening site next to an artificial lake. A large number of farmers was present. Strawberries are a speciality from this site. All of the water (including drinking water) comes from wells although cleaner water is available by pumping from a deep borehole.

In all of the cases, water *quantity* and not water *quality* was seen as a regular problem. Moreover, health was not (admitted to be) a special problem (see also page 24).

RECOMMENDATIONS

The recommendations of the workshop (see **www.ruaf.org** for the full text of the Ouagadougou Declaration in French) focused on Socio-Economic Aspects; Institutional Aspects; and Health and Environmental Aspects, and are directed at farmers, farmer organisations and NGOs, municipalities, government and researchers.

IWMI-Ghana

A river polluted with wastewater in Ghana

What could be seen as a general and important conclusion is that urban agriculture itself is not taken sufficiently serious by authorities although studies are available in nearly all countries in which its importance is qualified and even quantified. This underestimation leads to insufficient consideration in town policy and planning, inadequate laws and by-laws and other texts, insufficient consideration and use of its potential in waste management and perhaps above all, insufficient consideration in the allocation of resources. The discussions on hygiene and behaviour provoked interesting debates on cause and effect, and transmission routes: producers, sellers and consumers; in all three stages, contamination as well as prevention may take place. Noteworthy are those recommendations that speak of the need of extension work to urban producers and consumers on the subject of health, hygiene and risky behaviour. Epidemiological studies are needed to review and adapt the current guidelines, to discover and quantify actual risks and to describe realistic paths of contamination.

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The city of Hyderabad, with its surrounding nine municipalities, had a population of 6 million in 2001 in 500 sq. km and is one of the fastest growing Indian cities[1]. The Musi river which runs through Hyderabad is dry upstream of the city except for four months during the monsoons when it receives 700-800 mm of rainfall. However, domestic, hospital and industrial wastewater released from the twin cities of Hyderabad and Secunderabad converts it into a perennial river.

IWMI-India

Urban vegetable plots along the Musi River, Hyderabad

Livelihoods and Wastewater Irrigated Agriculture

Musi River in Hyderabad City, Andhra Pradesh, India

In the urban areas, water from the drains empty from spouts in the walls along the city roads into the fields below along the Musi. This drainage water, which is from both domestic and industrial sources, is channelled to several contiguous plots of land. It is sometimes supplemented by water pumped from the river or, less commonly, from shallow wells along the riverbanks. It is used by approximately 250 households for agriculture on a total of about 100 ha of land in the urban area along the Musi river. Most of the urban agriculture is practised along a 5 km-stretch of the river in the city from the Purana pul bridge to the Amberpet bridge (see Figure 1). It is a green area within a busy area of the Old City and helps to improve air quality.

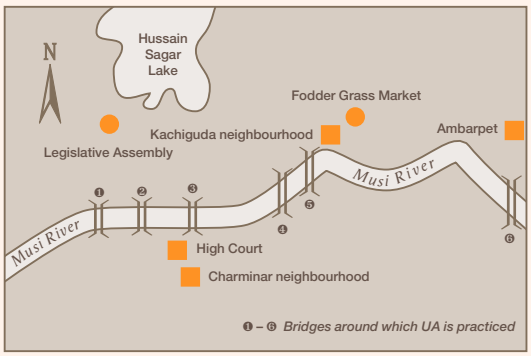

Figure 1: Urban Research Sites

SAMPLING AND DATA COLLECTION

Household interviews were conducted to collect information on types of livelihood activities based on wastewater. In the urban areas, 50 female and male respondents were interviewed from a random sample of 33 households. The respondents were classified according to their respective roles as beneficiaries: Landowners , 50%; Renters, 16; Casual labourers, 12; Permanent labourers, 10; Caretakers, 8; Grass market vendors, 4. These percentages reflect total numbers in the urban area. Government officials were interviewed for information on the sanitation infrastructure and the legal and institutional environment of urban agriculture.

Water quality samples were taken at several points. In the urban area water quality was checked at the Chaderghat Bridge (4), where a sample was tested. More frequent monitoring needs to be conducted to get a better indication of water quality in each season.

SANITATION AND WATER QUALITY

The sewerage network covers only sixty-two per cent of the city. There is only one sewage treatment plant (STP) with primary and secondary treatment capabilities and a second STP with primary treatment capabilities only. In total, these plants treat 133 million litres per day (MLDs) of water. This treated sewage, and the untreated sewage estimated at 327 MLDs, is diverted to the Musi River. Plans for new and upgraded existing plants aim to treat 630 MLDs by 2006.

There are 12 industrial areas within 30 km of Hyderabad city which include electro-plating, lead extraction/battery units, pharmaceutical and jewelry industries. The Common Effluent Treatment Plants (CETPs) are not able to treat the varied effluents adequately. The CETP and industries that do not bring their effluents to the CETP discharge their effluents into the Musi and other water bodies.

The BOD and COD values are quite low in Hyderabad (see Table 2). MPN values indicate high levels of faecal contamination, which increases the health risks of the wastewater to farmers and agricultural labourers in direct contact with it. The risk to the consumer is expected to be lower since none of

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the vegetables grown are consumed raw. However, no quality-assurance tests were done on the vegetables. The EC and TDS values are higher than those recommended by the FAO guidelines. However, since the major crop is para grass which is able to withstand higher salinity conditions, this water may not have a detrimental effect. Total Nitrogen is higher than FAO guidelines but all heavy metals are within safe limits.

Wastewater UA provides livelihoods to the lowest income groups

TYPES OF CROPS GROWN

A variety of crops are grown in this area. The predominant crop is para grass, which is used for fodder, amounting to 65%. Green leafy vegetables are grown on small sections for subsistence and for sale. Other crops that make up only 1% include fruit trees as well as crosandra and jasmine flowers. These products are mainly used by household members.

LAND TENURE

In almost all urban locations surveyed, the land is owned by a single caste community of Hindus belonging to the *kachi* community now included in the category of Backward Caste (BC). This is in contrast to the periurban and rural areas where landowners belong to a multiplicity of caste groups.[2] The average landholding here is 0.4 ha of irrigated land. In the Indian context, these farmers are therefore categorised as small farmers.

Laws Affecting Urban Farmers

- In 1986, the Andhra Pradesh Government banned wet cultivation in city premises and the power (electricity) supply to the farmers for irrigation was cut off.
- The value of the land in the Musi bed for compensation for the construction of bridges or other government project or activity has been declared as Rs. 800 per sq yard but according to one of our respondents, the actual value of the land should be Rs. 10,000 per sq yard.
- Before 1976, the loss of vegetables after flooding was being compensated (Rs.1,000 to 800) but after 1976 this compensation was terminated.
- Until 1995, a land tax was being collected (Rs. 480 per acre/year) considering all the land on the Musi bed as agricultural land. But after 1995, the Town Survey declared the land as Commercial land and is asking the farmers to pay a commercial tax on that land.
- The land cannot be legally sold.
- No person can build anything on this land.
- There is no legal procedure with the Town Survey regarding the transfer of ownership rights or title of the land.
- The width of the river channel is 100 meters and the rest of the land is supposed to be private, titled land (personal communication, Secretary to the Chief Commissioner of Land Administration).

LABOUR MARKET AND ROLES OF MEN AND OF WOMEN

Men and women involved in wastewater agriculture play different roles in urban agriculture depending on the beneficiary category they belong to. Only landowners who have sufficient household labour cultivate vegetables, since labour is expensive. Most household labour for vegetable production is female. Female landowners carry out almost all of the fieldwork, including irrigation. The women who grow vegetables reserve a portion for household consumption and a portion for sale (see Table 3 for income data). Amongst the dairy producers, the men in the family usually do the fieldwork. Men and women tend and milk the buffaloes and sell the milk or yoghurt. They keep the livestock next to their houses in the city.

The casual labourers are male or female migrants from a drought-prone district. Some were squatters on the banks of the Musi and were relocated to an urban resettlement area. Most are BCs. Permanent labourers work year-round on one plot and are from drought-prone states. They get lodging with the landowner, and salary of approximately € 33/month [3].

The caretakers are men or women who live with their families on the land in small huts or tents. They are either *lambadis* (ST) or from the BC. They sell the various tree leaves to customers who come to the plot. Some also work the land for pay equal to casual labour.

INCOME FROM WASTEWATER USE

Urban agriculture with wastewater benefits the landowners from crop income, from fodder grass for livestock, from rental income and from crops used by household members. For one hectare of land, the annual income is approximately € 2,812 for 1 ha of para grass, € 833 for 1 ha of leafy green vegetables, € 470 for one hundred banana plants, € 33 for 20 coconut palm trees, and € 625/ha/year in rental income from para grass. Table 3 summarizes the average annual incomes for the different crops grown.

Wages for casual and permanent labourers in urban areas are slightly higher than in the periurban and rural areas. There is, however, a wide wage gap

Table 1: Results of Water Sample in Urban Area (Chaderghat Bridge)

Parameter	Concentration	Irrigation water quality standard
BOD (mg/l)	105	-
COD (mg/l)	352	-
MPN (total coliform)	4.6 x 10 10	-
TN (mg/l)	25	5.0
EC (ds/m)	2.1	0.7
TDS	1012	450
Zn (ppm)	0.32	2.00
Cu (ppm)	0.13	0.2
Chloride (mg/l)	151	-
Cr (ppm)	0.04	0.1
Pb (ppm)	0.07	5.00

Table 2: Costs of production and income generated from main wastewater dependent activities [3]

Activity	Cost of production per hectare (Rs. and €)	Income (Rs. and €)	Average annual income (Rs. and €)
Leafy vegetables (Rs/ha/month)	Rs. 3,750/€ 78 per month	Rs.5,000/€ 104 per month	Rs. 40,000/€ 833 per year
Banana (for 100 plants)	Rs. 7,200/€ 150 per year	Rs. 22,500/€ 470 per year	Rs. 22,500/€ 470 per year
Coconut (for 100 palms)	Rs.7,200/€ 150 per year	Rs. 10,000/€ 208 per year	Rs. 10,000/€ 208 per year
Para grass per ha	Rs. 45,000/€ 937 per year	Rs. 90,000-180,000/€ 1,875-3,750 per year	Rs. 135,000/ € 2,812 per year
Para grass (rent collected Rs/ha/month)	NA	Rs. 2,500/€ 52 per month	Rs. 30,000/€ 625 per year
One milch buffalo	Rs. 500/€ 10.40 per month	Rs. 2,000/€ 42 per month	Rs. 16,000/€ 333 per year

between women and men. However, women find employment for more days per year than men in the urban areas (30 days versus 10 labour days for men).

In the case of casual and permanent labourers, additional income is gained through other activities. Females tend to work as housemaids for several houses, earning approximately € 9.40 per month and also work as construction workers where they earn € 1.25 per day. Men, on the other hand, tend to work mainly as construction workers and earn € 1.67 per day.

WASTEWATER FODDER GRASS MARKET AS AN ECONOMIC HUB

From Figure 2 it is clear that fodder grass cultivation is a very important activity in the area. It provides an economic hub around which a number of dependent beneficiaries revolve.

Much of the land dedicated to fodder production is rented to dairy producers. A few own the land. They save by cultivating much of the feed for their livestock. The renters with livestock do the cutting of the grass themselves. Buffaloes are the preferred consumers of this fodder because they provide more milk with a higher fat content, which receives a higher price than cow's milk. Household members also consume this milk, thus saving on this expenditure.

The fodder grass market is located within 10 minutes of where most urban agriculture is practised. Approximately 50% of the fodder grass grown is sold in the market. The other half is used directly by farmers who produce it for their own livestock. The important role it plays economically is symbolised by the promise made recently by the home minister to donate 2,000 square yards of land for a new grass market, in the Kachiguda neighbourhood of the city where most of the urban farmer/landowners and livestock keepers live and keep their animals.

This informal market operates through four salesmen who get a commission of 5% for each grass bundle. Daily, thirty mid-sized vehicles carrying 5 tonnes each transport the grass to the market. These vehicles when fully loaded, generate employment for 40 casual labourers as well as for one truck cleaner and one truck driver. Preliminary estimates indicate that 1,260 casual labourers, fodder-grass salesmen, truck drivers and truck cleaners are employed per day by the landowners and renters.

USERS' PERCEPTIONS ON HEALTH ISSUES AND WASTEWATER USE

The informants had mixed reactions on the health risks associated with using wastewater. Urban and periurban farmers are less exposed to wastewater than are rural farmers who grow paddy and therefore spend long hours standing in the wastewater during puddling, transplanting, weeding and harvesting.

There were mixed perceptions as to the health impacts. One 40 year-old female urban farmer told us: "I never had any health problems due to the use of this wastewater for irrigation". However, in general, urban, periurban, as well as rural farmers complained of rashes and skin irritation when exposed to wastewater for long periods of time. The response of this 68 year-old permanent labourer in Hyderabad city was typical:

I irrigate the field and am exposed to this water all the time. Skin irritations are a common problem with constant itching of the skin on the legs and arms. Mosquito bites and bites of other small insects in the water are also common. I get a fever at least once a month which I think is due to all of these insect bites. But I never had any major health problems due to this water.

This aspect has not been studied in depth and further reasearch will have to be conducted to shed more light on these issues.

SELECTED REFERENCES

- Buechler, Stephanie J, Gayathri Devi M and Uma Maheshwar Reddy. 2002. In-depth interviews of landowners, renters, labourers (casual and permanent) and caretakers Hyderabad, Andhra Pradesh, India (May-October).
- Buechler, Stephanie J. 2001. Interview with M.G. Gopal, Director of Metro Water, Hyderabad (November) and 2001 and 2002. Interview with Waghray KC, Director of Sewage Treatment Plant at Public Gardens, Hyderabad.
- Gisele, Yasmeen. 2001. Urban Agriculture in India: A Survey of Expertise, Capacities And Recent Experience. Cities Feeding People. CFP Report Series Report 32. IDRC, Ottawa.
- Hyderabad Urban Development Authority. 2002. Draft Proposal of Master plan for population projections of year 2011.
- Reddy, Muthyam Katta. 1997. Predatory Industrialisation and Environmental Degradation: A Case Study of Musi River. In: Telangana Dimensions of Underdevelopment. Center for Telangana Studies, Hyderabad.

IWMI-India

Women transplanting rice along the river

LEGAL-INSTITUTIONAL ENVIRONMENT

Box A explains the institutional and legislative environment. Interestingly, all of the governmental institutions seem to deny that there are any benefits associated with this form of agriculture. Some, like the Department of Urban Agriculture within the Ministry of Agriculture, deny its very existence. The only exception is the urban farmers' association. The laws affecting urban agriculture are described below in Box B. These are not proactive in supporting urban agriculture. The only law that favoured urban agriculture was repealed in 1976.

We are just able to fill our stomachs

The urban farmers' association has worked as a pressure group in the past to stop a project to channel the river in the urban area through a covered canal and to establish parks along its banks. It is highly likely that this group could act as a pressure group that could work towards stimulating recognition by governmental agencies of the existence and of the positive impact of urban agriculture on livelihoods. From this might follow a gradual change towards the adoption of legislation that will support urban agriculture.

CONCLUSIONS

Wastewater agriculture in this urban area along the Musi river, provides livelihoods to a diverse group of people from different caste groups and represents a broad spectrum of social classes, ranging from the lower middle class to very low-income groups of urban dwellers, to temporary and permanent migrants from rural areas. These socio-economic characteristics determine the type of wastewater-related activity in which they will be involved.

The agriculture and livestock activities based mainly on a fodder grass market seem well-suited to the only type of water available (wastewater). While banana and coconut occupy a good proportion of the urban agricultural land area studied, the income from leafy vegetables, which occupy only 1% of the land, exceeds the income from the other two crops. Unlike the other crops, leafy vegetables pose a greater risk to the consumer but conclusive studies have not yet been conducted.

However, even though there is a flourishing business from urban agriculture with wastewater, it continues to be a hidden economy, existing in busy areas of an ever-growing megalopolis that will only produce more wastewater in the future. The agriculture is neither recognised nor supported as of yet by the government. Pressure groups like the urban farmers' association have proven to be powerful in the past and could successfully wage campaigns to safeguard their livelihoods in the future.

NOTES

(1) Handbook of Statistics of Ranga Reddy, 2001:157

(2) The *kachi* community received land in repayment of favours to their rulers, some by late 17th century. The names on the land titles are rarely changed. Land disputes are resolved by a *kachi* association.

(3) 1 Euro (€) = approx. 1 USD

Institutions Regulating Urban Agriculture

- **Bhagya Nagar Kisan Sangh (BNKS)** farmers' association was formed by urban farmers in response to the government initiative to ban cultivation on Musi bed in urban areas. It mainly functions as a platform where farmers gather to exchange information and consult one another on any legal issues related to their land.
- **Revenue Department (Collectorate)** is a government department that collected an annual land tax on all urban property until about 1999.
- **Municipal Corporation of Hyderabad (MCH)** coordinates solid waste collection, transportation and disposal. It does not permit buildings to be constructed in river flood plain (along riverbanks). It removes illegal settlements upon the recommendation of the Revenue Office.
- **Commissioner of Land Administration** enforces the Urban Land Ceiling Act of 1976 limiting urban plot size to 4,000 sq ft (370 m^2) and outlawing sale of land along the Musi river. The main reason that they wish to enforce this Act, according to the Secretary to the Chief Commissioner of Land Administration, is so that farmers do not sell the land and hurt air quality due to loss of the green area (personal communication, August 27, 2002).
- **Hyderabad Urban Development Agency (HUDA)** plans and regulates city space. A master plan drafted for the projected population of 2011 for Hyderabad city covers residential plots, industry, transport, amenities and eco assets but the extent of agricultural land not projected. According to same master plan, sewage load is estimated at about 2560 MLD for the projected pop. for 2011 (ranging from 9.5 to 11.3 million). The master plan also suggests decentralised Sewage Treatment Plants (STP). In one section of draft master plan, this proposed: "in peripheral areas and in the No-Development Zones, urban agriculture should be encouraged."
- **Hyderabad Metropolitan Water Supply and Sewerage Board HMWS & SB** are responsible for the provision of water to the city and for construction and maintenance of dams, pipelines and canals for surface water and wells for groundwater. They are also responsible for operation and maintenance of two STPs and the sewerage system. Three new treatment plants and upgrades of the two existing STPs have been proposed by HMWS & SB.
- **Andhra Pradesh Pollution control Board (APPCB)** assesses the quantity of water consumed by private and public sources and methods for discharging water. They perform regular water-quality tests along Musi.
- **National River Conservation Project** is made up of various institutions (such as HMWS&SB) that are currently planning measures to clean up Musi river.

Reality and **Potential**

Integrated Systems for the Treatment and Recycling of Wastewater in Latin America

The amount of people living in cities has increased to over 360 million by the start of the 21st Century (73.6% of its total population). In many cases, the growing pressure this rising population has exerted on water and land resources has overwhelmed government efforts to achieve planned urban growth and has compelled governments to give priority to potable water and sewerage service systems. This has happened to the neglect of both the treatment of wastewater and the disposal of solid waste.

The Pan-American Health Organisation (PAHO) points out that in 1998 less than 14% of the 600 m^3/s of wastewater in Latin America received some sort of treatment prior to its disposal in rivers or in the sea. Just 6% of this water receives acceptable treatment. In addition, the fact that 40% of the urban population in the region shows an incidence of infectious diseases associated with water means that such drainage constitutes a major means for the transmission of parasites, bacteria and pathogen viruses, and therefore requires urgent attention.

More information on the project is available on the CEPIS website: www.cepis.ops-oms.org/Wastewater/Regional Project

Tabel 1: Water and sanitation conditions in Latin America for 1998

Population with potable water	93%
Population with sanitation	90%
- with sewer systems	63%
- with other systems	27%
Treated waste water	14%
- with secondary treatment	6%

PAHO, 2001

Agricultural activities carried out in the periphery of cities have been severely affected, having to opt for the use of wastewater as their only alternative for survival. This is reflected in the existence of more than 500,000 ha of agricultural land being directly irrigated with untreated wastewater (Bartone, 1990), in addition to an even larger land area irrigated with surface water contaminated by urban sewage that normally exceeds health-quality standards (i.e. regarding faecal coliforms and nematodes) as recommended by the World Health Organisation (WHO, 1989).

In Latin America, a limited amount of separate collectors for domestic wastewater, rainwater and industrial sewage exists. Mixed collection systems result in an increased amount of sewage to be treated and adequately disposed.

The Regional Report on Evaluation 2000 in the Region of the Americas (PAHO, 2001) refers to the limited coverage of sanitation and wastewater treatment in Latin America as an evident failure. This failure is partly blamed on the use of unsuitable technologies (more typical in developed countries) and due to the high amounts of investment required, as well as the high operating costs of these systems.

PROMOTION OF INTEGRATED SYSTEMS FOR THE TREATMENT AND RECYCLING OF WASTEWATER

Twenty-two years ago, PAHO'S Pan-American Center for Sanitary Engineering and Environmental Sciences (CEPIS) started the programme for the Treatment and Recycling of Wastewater, to increase the use of appropriate technologies for domestic wastewater treatment within the region.

In 2000, Canada's International Development Research Centre (IDRC) and PAHO/WHO signed an agreement whereby CEPIS would carry out a research programme on integrated systems for the treatment and recycling of wastewater in Latin America.

The aim was to provide cost-efficient solutions for managing domestic wastewater in agricultural activities within cities, and by reconciling the interests of stakeholders responsible for the treatment of urban wastewater and of farmers using this water for irrigation.

To achieve such a goal, a regional inventory of treatment systems currently in operation is being promoted, as well as of related agricultural activities. Twenty case studies were selected, representing four wastewater management situations (see table).

The Project is financing three stages of collection and analysis of information in these locations. In the first stage, *General Studies*, the more general aspects in 18 cases were considered. In the second stage, *Complementary Studies*, 11 of the 18 cases were selected for an evaluation of technical, environmental, economic, social and cultural aspects, and to prepare a preliminary proposal for the integration of treatment and recycling of wastewater in agriculture. In the third and last stage, *Feasibility Studies*, seven cases out of the previous 11 were selected, to promote the socialisation and development of these proposals among the main local actors. Programme activities also include producing and disseminating documentation, strategies and guidelines on this issue for the region, as well as a series of national seminars and donor tables.

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LESSONS LEARNED

The programme was able to identify the critical aspects to be taken into consideration in the design and management of integrated systems for the treatment and recycling of domestic wastewater.

- The explosive growth of big cities has pressed for a prioritisation in the use of surface water for public supply and electrical generation. As a logical consequence, agricultural activities around and within cities have opted to use wastewater as the only alternative for their survival.
- Institutional and socio-economic requirements are of special relevance. The selection of technological options is done under political and institutional decisions usually made without much coordination.
- Most decisions regarding control parameters for water quality, treatment technology, distribution of associated cost, disposal of wastewater and its use in irrigation, to name just the most important ones, are made unilaterally and with almost no participation of other interested groups.
- There is a need to create mechanisms and spaces for coordination and consensus between those responsible for regulating and managing domestic wastewater, and sewage-user or –affected groups.
- In most countries legislation does not consider the health quality of wastewater in terms of human pathogens. When it does, it is not applied due to a series of restrictions such as a limited or weak monitoring and control capacity and because of the social pressure exerted by users.
- Institutions responsible for domestic wastewater management lack the capacity to assume the investment and operating costs of treatment. This is mostly because cities and city representatives have failed to understand or perform their duty in the treatment of generated wastewater.
- The cost of treatment (if existing) has not yet been incorporated into water and sanitation service rates, except in the special cases of Mendoza, Argentina, and (partially) in Cochabamba, Bolivia.
- The potential of integrating treatment and recycling as a mechanism to reducing investment and operating costs in both activities has still not actually been understood.
- The growing conflict of interests between technology providers from developed countries, public health officials and wastewater-treatment operators is leading to an unsustainable situation. In Cochabamba, Bolivia, one private company that attempted to install an activated mud plant had to leave the country after the violent rejection of the population, of increased rates to finance it.
- In other cases, conflicts have reached different proportions but are similarly worrisome: Mexico, a country where it is estimated that some 350,000 ha are irrigated with untreated wastewater, has established a limit of 5 nematode eggs per liter of water in its legislation as a health-quality parameter for effluents from treatment plants, as none of their activated mud plants can reach the level of less than one nematode egg per litre of water recommended by the WHO.
- Some experiences remarkably resemble this programme's proposal to integrate treatment with agricultural recycling of wastewater. In Mendoza, Argentina, some 2,000 ha of agricultural land are irrigated with effluent treated in 300 ha. of stabilisation lagoons receiving 1,400 l/s from a population of 320,000 inhabitants. Nevertheless, agricultural treatment and recycling fall under the responsibility of entities that carry out their activities without much coordination between them.
- In Colombia, companies responsible for the treatment of domestic wastewater will be subjected to high penalties if they dump effluent containing pollutants that exceed the limits established by legislation. In Ibagué, a city of 430,000 inhabitants, untreated wastewater is dumped in the rivers criss-crossing the city, and this water is later used to grow rice in some 26,000 ha. That city's water company was considering installing an activated mud plant and, under a CEPIS programme initiative, has started negotiating with the rice growers' association on the treatment of the wastewater they use in order to reach the health standards required for affected farmers. In turn, they have offered part of their land area to implement the final stage of the treatment prior to taking the effluent to other farmlands or bodies of water.
- One of the most important aspects still to be developed is the epidemiological follow-up of the different wastewater-treatment systems implemented in the region. There is not enough information regarding the incidence of diseases associated with the handling, growing and consuming of products irrigated with wastewater.

Tabel 2:

Cities	Treated	Untreated
With reuse	Antofagasta (Chile)	Mezquital (Mexico)
	Cochabamba (Bolivia)	San Augustin (Peru)
	Juarez (Mexico)	San Martin (Argentina)
	La Vega (Dominican Rep.)	Santiago (Chile)
	Mendoza (Argentina)	
	Tacna (Peru)	
	Texcoco (Mexico)	
	Villa El Salvador (Peru)	
No reuse	Fortaleza (Brazil)	Ibague (Colombia)
	Maracibo (Venezuela)	Jinotepe (Nicaragua)
	Portoviejo (Ecuador)	Luque (Paraguay)
	Puntarenas (Costa Rica)	Solola (Guatemala)

It is necessary to continue to develop dissemination activities, training and technical assistance for the treatment and sanitary use of domestic wastewater in Latin American countries and in the Caribbean. In addition to these dissemination activities, it is anticipated that the CEPIS programme will support pilot experiences in countries where the agricultural use of wastewater is a little-known alternative, such as in the cases of Fortaleza in Brazil and Liberia in Costa Rica. It is expected that results from these experiences will provide plenty of information for the establishment of strict but at the same time enabling legislation.

In the Middle Eastern and North African countries under MENA[1], water is the key development issue. The average rate of the region's annual population growth is one of the highest in the world (around 2.6 per cent) while the region faces scarce natural water supplies. As a result, average renewable fresh water availability in the region has dropped to about 1,433 m^3 per year, while many countries in the region fall well short of that. For example, in 1999, the annual renewable freshwater available per person in Jordan, Tunisia and Yemen was 148, 434 and 241 m^3, respectively, and these values are projected to drop drastically by 2025 (World Bank, 2001). As well, the available water is of a lower quality because of increasing pollution and over-pumping.

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In Jordan, INWRDAM have trained a plumber who, in turn, is training others to install the systems

Wastewater Treatment and Reuse for Food and Water Security

This situation is compounded by the high urbanisation rate in MENA. It varies from 1.8 per cent in Egypt to 4 per cent in Palestine and 5.3 per cent in Yemen (with an overall rate for MENA of 3.2 per cent, which is higher than the rate for developing countries as a whole). With 79 per cent of the population already living in cities in Jordan, and 88 per cent in Lebanon, the average for the region as a whole is already 53 per cent (United Nations Secretariat, 2002 and Population Reference Bureau, 2002). Within the region, about 80 per cent of fresh water is used for agriculture. Even with low urban tariffs, the value of water is at least 10 times higher in urban areas than it is in agricultural areas (Gibbons, 1986). As a result, water will increasingly be taken out of agriculture and put into urban areas. This means that the region will increasingly suffer from twin and related problems of food and water insecurity.

Wastewater reuse is permissible for all purposes

Many countries wish to increase fresh water supplies to domestic and industrial usage, and at the same time expand irrigated agriculture. For example, Tunisia wishes to increase the area of irrigated agriculture by at least 30,000 hectares (ha), and Egypt, by 880,000 ha (World Bank, 2000). How can these seemingly contradictory objectives be reconciled? The answer is water-demand management; more efficient water use within all sectors. One specific component is to use treated domestic wastewater for industry, for some municipal purposes such as flushing toilets and irrigating green spaces, but, above all, for urban and periurban agriculture (UPA).

BENEFITS

There are several benefits in using treated wastewater. First, it preserves high quality and expensive fresh water for potable use. The cost of secondary-level treatment for domestic wastewater in MENA, an average of US $0.5/$m^3$, is cheaper than developing new drinking water supplies in the region (World Bank, 2000). Second, collecting and treating wastewater protects existing sources of valuable fresh water, the environment, and public health. In fact, wastewater treatment and reuse (WWTR) not only protects valuable freshwater resources, but also can supplement them through aquifer recharge. If the benefits of environmental and public health protection were correctly factored into economic analyses, wastewater collection, treatment and reuse would be among the highest priorities for scarce public and development funds. Third, if managed properly, treated wastewater can sometimes be a superior source for agriculture than fresh water sources. It is a constant water source, and nitrogen and phosphorous in the wastewater may result in higher agricultural yields than freshwater irrigation, negating the need for additional fertiliser application. Research projects in Tunisia and Saudi Arabia have demonstrated that treated effluent had superior

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non-microbiological chemical characteristics than that in groundwater for irrigation. Most importantly, treated wastewater had lower salinity levels (WB, 2000).

CASE STUDIES

The countries in the region that practise wastewater treatment include Kuwait, Saudi Arabia, Oman, Syria, UAE and Egypt. However, only Israel, Tunisia and Jordan practise wastewater treatment and reuse as an integral component of their water management and environmental protection strategies.

PROBLEMS

The main problem with the use of wastewater is the threat to public health, the soil and water if reuse is not done carefully. While the main impact on health from reuse in developing countries is from diseases caused by helminths, such as roundworm, hookworm and guinea worm, microbial pathogens pose the second largest threat. The worst-case situation occurs when untreated wastewater is used to irrigate vegetables or salad crops that are then eaten raw. This practice resulted in the cholera outbreak in Amman, Jordan in 1981. Unfortunately, there are many on-going instances of raw wastewater reuse which, without doubt, result in occasional gastro-intestinal illness, but have the potential for causing widespread illnesses. For example, due to water scarcity, the irrigation of market vegetables such as eggplant and cucumber with raw wastewater flowing in the Kedron Valley, West Bank is common. Components in wastewater that are most toxic to some crops include sodium, chloride and boron.

Raw wastewater can also salinise soils, and the grease in this water can reduce soil permeability and aeration by clogging pores. Both microbial pathogens and nitrates from wastewater can contaminate shallow aquifers.

These obstacles are real, but not insurmountable. In 1989, the World Health Organisation published the *Guidelines for the safe use of wastewater and excreta in agriculture and aquaculture* (WHO, 1989), to protect public health. These guidelines identify necessary treatment levels depending on whether the irrigation will be restricted (e.g. cereal, industrial, fodder crops or pastures and trees), or unrestricted (e.g. irrigation of crops likely to be eaten uncooked, sports fields and public parks). Even the most stringent treatment levels in the WHO guidelines can be met by a series of wastewater-stabilisation ponds. In addition to identifying a combination of treatment and crop restrictions, the WHO guidelines also outline safe waste application methods and control of human exposure, to protect public health.

Grey Water Reuse in Urban Agriculture in Jordan

With its low and rapidly decreasing per capita water availability of 148 m^3/p/y, less fresh water will be available for agriculture in Jordan. One means of addressing this threat to food security is to treat and reuse domestic wastewater in UPA. An IDRC-supported project found that 16 per cent of the households in Amman already practice UPA, mainly for the production of fruits, vegetables and herbs. The annual value of UA in Amman is US $4 million — already 2.5 per cent of the total value of agriculture in Jordan (Government of Jordan, 2002). The problem is that only 40 per cent of wastewater in Jordan is collected and treated. The necessary rehabilitation and expansion of conventional sewerage and wastewater-treatment systems will take time and millions of dollars.

IDRC's research partners have come up with a new approach to combat food insecurity — helping the poor to harvest water at the household level. The systems consist of minor plumbing modifications that divert water from showers and bathroom and kitchen sinks through small-scale, natural filters in each household allowing residents to recycle water for reuse in home gardens. Grey water reuse is much safer than combined wastewater reuse because greywater contains no pathogens from the toilet. Also, because most "wastewater" is simply "grey water," diverting it from the public sewerage system can dramatically reduce the costs required for installing and expanding such systems. In this pilot project, grey water-treatment systems were installed in 25 homes in Ain Al Baida, Jordan, and households members were taught how to set up efficient gardens. Systems were also installed at the main mosque in the community, and at a girl's school.

The project has exceeded expectations. The grey water effluent meets standards for restricted irrigation, and households are using it to irrigate eggplants, herbs and olives. Impact on poverty and water use is still being measured. However, an IDRC study on a previous untreated grey water-reuse project found that the community was able to offset food purchases and generate income by selling surplus production, and by saving or earning an average of 10 per cent of its income. Initial water savings were about 15 per cent. The economic impact of this project is likely to be much higher because the grey water recovered in the first project was only about 30 per cent of domestic water, whereas in the current project it has already reached about 60 per cent. Furthermore, previously overflowing septic tanks, that cost at least US $60/yr to pump out have not been pumped since the project began. Economic benefits certainly have been significant enough to impress the neighbours of the original beneficiaries, they are now installing the systems at their own cost, proving that households recognise that wastewater treatment can save them or make them money. The Inter-Islamic Network on Water Resources Development and Management (INWRDAM), has improved the original design developed in Palestine with innovations making the systems safer and more efficient. The media in the filters is either gravel or pieces of old irrigation piping. A simple bag filter eliminates clogging associated with previous systems. INWRDAM also developed an environmentally friendly dishwashing liquid that prevents soil salinisation arising from grey water reuse, and has begun training workshops on grey water reuse for low-income settlements in Syria and other network countries. The Jordanian Deputy Minister of Social Welfare has visited the Jordan project and is interested in the potential for the systems to alleviate poverty. Also, the Water Authority of Jordan (WAJ), a part of the Ministry of Water, is testing the effluent quality of the systems, at its own cost.

For instance, sprinkler irrigation is discouraged. Also, where fruit trees are irrigated with treated wastewater, irrigation should cease two weeks before fruit is picked, and no fruit should be picked up off the ground. Crops and soil can be protected by readily available information on what types of crops and soil are sensitive to wastewater irrigation. Groundwater and surface water can be protected by mapping sensitive areas, such as shallow aquifers used for drinking, and banning wastewater irrigation in those areas.

Given the emphasis that Islam, like other religions, places on cleanliness, there is also a persistent notion within the region that wastewater reuse is against Islam. However, as noted in *Water Management in Islam*, published jointly by IDRC-UNU Press (2001), wastewater reuse is permissible for all purposes, including *wudu*, provided that the wastewater is treated to the required level of purity for its intended use and does not result in any adverse public health effect. Wastewater reuse is being practised with the accordance of religious authorities in Oman, UAE and Saudi Arabia. The kingdom is currently reusing about 20 per cent of its treated wastewater in refineries and for irrigating forage and landscape crops (Faruqui, *et al.*, 2001).

Another obstacle is that except for some of the richer gulf countries in MENA, mechanical treatment of wastewater has not proven sustainable in periurban areas or in smaller towns or cities, because chemical and energy costs are high and operation and maintenance is frequently not carried out. Within its Cities Feeding People programme, the IDRC is currently developing a network of decentralised, low-cost natural waste-treatment systems for reuse nearby. Pilot projects include trickling filters for grey water reuse in the low-density hilly settlements surrounding Jerusalem, aquatic wetlands using water lettuce or duckweed in the Jordan Valley, and low-mechanical content activated sludge in Egypt. See boxes.

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Grey water collected in piping along exterior walls of households

CREATION OF AN ENABLING ENVIRONMENT

Based on the experiences of countries such as Israel, Tunisia and Jordan, which have successful treatment projects

Duckweed Wastewater Treatment and Reuse for Fodder, West Bank

This project aims to protect the environment and improve food security by pilot-testing the use of duckweed, a floating plant, to treat wastewater in small, decentralised communities in the Jordan Valley, West Bank. In the past five years, there has been a growing recognition of the effectiveness of this tiny aquatic plant to treat wastewater at a much lower cost than mechanical treatment plants. Because duckweed is 40 per cent protein by weight and grows so quickly, it can serve as an excellent feed supplement for poultry, livestock and fish, and can even be served in salads. An integrated system can both treat wastewater and provide income and employment opportunities for local residents who sell the produce raised on duckweed. In addition to reducing biological oxygen demand (BOD) and Total Suspended Solids (TSS) levels, duckweed efficiently reduces nitrogen and phosphorous levels in wastewater. But the operation of duckweed systems is still an art rather than a science, and while plants flourish in some locations, it is difficult to grow them in others.

This project will optimise various operating parameters for an integrated duckweed wastewater-treatment system at the Agricultural Development Society (ADS) training farm outside of Jericho, in the West Bank, a few hundred metres from the Jordan River and the Dead Sea.

Despite the political obstacles that have slowed down the Palestinian research team — their office was blown up, they have been shot at, they have endured long delays at checkpoints, and sometimes cannot reach the project site — it has still made some valuable preliminary findings:

Duckweed thrives between 25-30 degrees Celsius — previous systems in Amman and Hebron did not function because of the cold in winter at these high altitude locations. On the other hand, in the summer, when temperatures exceed 40 degrees Celsius in the Jordan Valley, the duckweed will have to be shaded with trellises. The duckweed is growing well — even in water with salinity as high as 3,000 ppm, and is being harvested twice a week. The effluent from the duckweed pond meets the standard for restricted irrigation. The dried feed has already been tested on chickens as a feed supplement with very good results — the average weight of the chickens fed by duckfeed was 17 per cent higher than for chickens that were not fed fodder. Furthermore, the chickens have whiter meat that increases their marketability for farmers. These factors, plus the savings in fodder cost of about 15 per cent, have led to an enthusiastic response by farmers in the area.

This case indicates that when decentralised wastewater treatment leads to opportunities for periurban farmers to generate income, they are willing to contribute to its costs. The Palestinian Researchers have visited duckweed ponds in Bangladesh, which has resulted in an important south-south transfer of knowledge. The Palestinian Ministry of Agriculture, the National Agriculture Centre, and the Palestinian Agricultural Relief Committee all have visited the project and are following the results closely.

In the coming years, fresh water will have to be preserved solely for drinking

relative to other countries in the region, governments in MENA need to do the following to create an enabling environment to encourage safe wastewater treatment. First, treatment must form part of an integrated water-management strategy at the basin level, with multi-disciplinary linkages between different sectors such as environment, health, industry, agriculture and municipal affairs. For instance, the main producer of wastewater — municipalities — must interact with the main user, urban agriculture. Urban/rural planning must be integrated so that industries are not situated in locations where their effluent, often high in dangerous constituents such as heavy metals, will contaminate water meant for the biggest user, agriculture.

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An average household saves or generates 10 per cent of its income

Second, it is the duty of governments to facilitate the participation of stakeholders in wastewater-treatment projects, including supporting NGOs working in institution building at the local level. Safe and sustainable decentralised projects will never be established without the willing participation of the beneficiaries.

Third, there is a need to disseminate existing knowledge about the danger of raw wastewater reuse, safe reuse guidelines and the position of Islam on wastewater reuse. Knowledge of cost-effective treatment technologies and crop and soil protection must also be disseminated and site-specific research carried out to fill missing gaps. Perhaps most importantly, the economic benefits of successful decentralised wastewater-treatment projects must be disseminated to periurban households and farmers, who will only then be willing to contribute to the costs of WWTR.

Finally, to ensure the protection of public health and the environment, governments must regulate and monitor quality of effluent, reuse practices, public health, crop-water quality, and soil and groundwater quality.

CONCLUSIONS

Domestic wastewater treatment is one tool to address the food and water insecurity facing many countries in MENA. In the coming years, in most MENA countries valuable fresh water will have to be preserved solely for drinking, for high value industrial purposes, and for high value fresh vegetables and salad crops consumed raw. Where feasible, most other crops in arid countries will have to be grown increasingly, and eventually solely, with treated wastewater.

And this wastewater will be reused in urban and periurban city gardens and farms, close to where it is generated. Reuse of wastewater in UPA allows city dwellers, particularly the poor, to produce crops valued in MENA such as onions, eggplants and olives, to generate income and feed themselves. Urban agriculture is growing in MENA — for instance, 16 per cent of the households in Amman already have urban gardens, and annual value of UA in the city is estimated at US $4million, which is already 2.5 per cent of the value of agriculture in Jordan as a whole. IDRC-supported projects in MENA are demonstrating that it is possible to develop decentralised wastewater-treatment systems that meet the standards for restricted irrigation for reuse in urban agriculture. For instance, a grey water reuse project in Jordan allowed a community to offset food purchases and make money by selling surplus production, saving or earning an average of 10 per cent of its income. A project in Palestine has helped periurban farmers save 15 per cent on fodder costs and raise healthier, higher-value chickens, by supplementing their feed with duckweed from a community wastewater treatment plant. Furthermore, in both projects, it is clear that periurban households or farmers are willing to contribute up to the full costs of wastewater treatment if it can be demonstrated that they will generate income or save money as a result.

The economic, social and environmental benefits of WWTR in UA are clear. To help the gradual and coherent introduction of such a policy, which protects the environment and public health, governments shall have to adapt an integrated water-management approach, facilitate public participation, disseminate existing knowledge, generate new knowledge, and monitor and enforce standards.

Note

(1) In this paper, the MENA region includes the following countries where IDRC supports projects: Algeria, Egypt, Jordan, Lebanon, Morocco, Palestine, Sudan, Syria, Tunisia and Yemen.

REFERENCES

- Falkenmark and Lindh. 1974. Can we cope with the water resources situation by the year 2050?. *Ambio* 3 (3-4): 114-122.
- Faruqui, N, AK Biswas and MJ Bino MJ. 2001. Water Management in Islam. UNU Press and IDRC Books, Ottawa, Canada.
- Gibbons, D. 1986. The Economic Value of Water. Resources for the future, Washington, DC.
- Government of Jordan. 2002. Technical Report to the International Development Research Centre. Federal Department of Statistics, Urban Agriculture in Amman Project.
- Population Reference Bureau. 2002. 2002 World Population Data Sheets of the Population Reference Bureau: Demographic data and estimates for the countries and regions of the world. See http://www.prb.org/pdf/WorldPopulationDS02_Eng.pdf. PRB, Washington, DC.
- United Nations Secretariat. 2002. World Urbanization Prospects: The 2001 Revision Data Tables and Highlights. Population Division, Department of Economic and Social Affairs, New York.
- World Bank. 2000. World Bank Development Indicators 2000. World Bank, Washington, DC.
- World Bank. 2002. World Development Indicators. World Bank, Washington, DC.
- World Bank and The Initiative for Collaboration to Control Natural Resource Degradation (Desertification) and Arid Lands in the Middle East. 2000. Wastewater Treatment and Reuse in the Middle East and North Africa Region (MENA). World Bank, Washington, DC.
- World Bank and Swiss Development Cooperation Agency. 2001. Water Reuse in the Middle East and North Africa: Summary report of a workshop hosted by the National Water Research Centre, held in Cairo, Egypt, July 2-5.

Perceptions of Ouagadougou Market Gardeners on Water, Hygiene and Disease

Urban farming – particularly in the form of market gardening[1] – has become part of the environment in African cities. A city like Ouagadougou has 48 market gardening sites dispersed in 14 sectors of the city

IWMI-Ghana

Assessing health risks during a field visit in Ouagadougou

African urban studies address this form of farming from various angles. This study[2] focuses on the issue of health. It has been well established that by reusing wastewater and/or polluted water, urban market gardening constitutes a potential health risk for both producers and consumers (Cissé, 1997).

However, the issue here is to know whether market gardeners, who were born in town or arrived there as a result of rural-urban migration, *perceive* the use of wastewater as risky, particularly with respect to health. Have these farmers incorporated their knowledge of this risk into their transfer from rainfed farming practices to (urban) farming that includes the use of wastewater?

This study (conducted between 1993 and 1998) is based on the following hypotheses.

- The perception of market gardeners regarding water and wastewater encourages practices that increase the risk of contamination.
- Market gardeners' notion of contamination and of the concepts "healthy" and "unhealthy" explains their resistance to the current "medical" notion of hygiene and subsequent exposure to parasitic diseases.
- Gardeners' perception of disease (e.g. diarrhoeic diseases) encourages behaviour that is favourable to parasitic infections.
- These parasitic infections are also linked to gardeners' nutritional behaviour.

PERCEPTIONS OF WATER AND HEALTH RISKS

By asking market gardeners to compare their practices with those of rainfed farming, we sought to measure their degree of awareness of the specific risks related to the use of wastewater and the subsequent consumption of these products. It was found that market gardeners perceive themselves as "farmers" in all respects similar to rainfed agriculturists, except for the way in which they provide water to the plant. Market gardeners summarise this difference as follows: *"here, we are our own rain".* Why do market gardeners only perceive a difference in terms of how water is provided to the plant and not in relation to the quality of the water?

Market gardeners perceive water in several ways. The different representations of water are sometimes contradictory, but never totally rule each other out. One perception associates water with life, regardless of its appearance. Of course, the purest water is that which falls from the sky and the water that comes from wells. But other water, even that which we refrain from drinking, such as wastewater from factories, is not the object of any sort of "hygiene taboo". Direct observations show that the market gardeners do not consider this water as dirty, nor that certain hygienic precautions need to be taken. Women and men soak their hands in this water and then go on to eat, breast feed babies, etc. without washing them.

Paradoxically, wastewater is placed on the same level as "pure water" from the sky or wells. It can still be reduced to its basic state, i.e. that of a liquid substance that is both mythical and vital. Women at Tanghin mentioned: *"We cannot differentiate between potable water and water that is not... Water is water. Water does not cause vomiting."*

If wastewater is considered equivalent to potable water, then how can one establish the link between water and some diseases, and is there a possibility to include water-borne diseases into the gardeners' various representations of water?

The link between water and diseases has never been established directly, through water consumption, or indirectly through the consumption of certain products. Market gardeners categorically reject any possibility of being victims of water-borne diseases and thus contaminating members of their families. They do not have reason to think that water should be considered as a medium through which diseases known to them are transmitted. Market gardeners have translated their own conception of contamination or the absence of contamination by a meaningful proverb: *"When an abscess is on the camel's hump, do not pierce the donkey's back."* This

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means that the source of the diseases should not be sought in water, and moreover that the cause of illnesses suffered by family members should not be found in garden practices, particularly when they do not even come to the site: *"How do you expect my child, for example, to suffer (in my place) from pain because of food that I ate (but which he did not)?".*
There is reason to believe that the water on farmers' own sites is drinkable for them. By "potable water", they mean water that does not cause illness, which is the water they use: "*You can drink water on your own site without falling ill, and then drink water from another site and get ill.*" Another remark follows the same line of thinking: *"Since we are used to drinking water on our site, if we change environments, for example if we go to Côte d'Ivoire or Ghana, the water we drink there may make us fall ill. With time, we will get used to the water in that environment, but when we return we will encounter the same problems again".*

According to the market gardeners, "*habit is a second form of hygiene*"; i.e., direct water consumption in itself does not generate disease. But what about the consumption of their products, such as cabbage, carrots, eggplant and tomatoes?

PERCEPTION OF THE CONTAMINATION OF MARKET GARDENING PRODUCTS

The link between certain diseases and the consumption of market gardening products (including raw food) is even less manifest. Market gardeners emphasise that they consume part of what they produce, whether it is cooked or raw, at home or on the site. In their view, market gardening products, be they raw or cooked, should not be considered to be different from other food. All foods can make one sick, not because of its intrinsic quality, but depending on the "strength of the stomach" that receives it.

This strength of stomach (i.e. the individual's "biological capital") is not the only issue in the manifestation of disease. Market gardeners believe that it depends first on God, and second on bad luck. After citing headaches, stomach ache, malaria, backache and chest pains as the most common illnesses in their environment, they added: "*But there are no diseases specific to market gardeners, we are human beings like you. All diseases come from God and we know of no other origin.*" They also believe that illness is due to bad luck: "*One cannot be in good health eternally. One falls ill at intervals of a month or two.*" *"The human being cannot live eternally in good health, he can often fall ill."* These principles underlie the illnesses affecting adults as well as children. But regarding children, there are other representations of illnesses, particularly diarrhoea.

REPRESENTATIONS OF ILLNESSES AND DIARRHOEA

The market gardeners' view on diseases, in general, and diarrhoea in adults and infants, in particular, is not based on a single unified perception. "*Diarrhoea in adults is an illness like any other; it can be due to the food, if it does not agree well with you. In infants, diarrhoea is frequent, one often sees loose stools, and stools with blood, followed by fever.*"

Market gardeners who hold these views ignore the probable causes of diarrhoea in their children. For those working in Kossodo, only God is responsible for the children's diarrhoea: *"We do not allow our children to eat just anything. We supervise their food. When they fall ill, we cannot know whether it is due to the food, the water or the air. If we know that certain food might cause diarrhoea in children, we avoid giving it to them. Diarrhoea, like all other diseases, come from God".*

Special reasons for diarrhoea in children are provided by market gardeners in Abattoir: "*Diarrhoea in children may be due to the change of season. The cold weather just like the heat modifies the rhythm of blood circulation. As a result, the child has to have diarrhoea to be able to adapt.*" Another reason given is: "*Diarrhoea in children is sometimes due to the fact that men continue to have sexual relations with their wives, who have just delivered.*"

CONCLUSION

Observations at the market gardening sites and in homes confirm the above, namely that the water used by market gardeners is not considered to be polluted nor likely to cause illness through contamination, either on the site where they spend most of their time during the day, or at home where they return in the evening, unconcerned about bringing along any dirt.

In this absence of a perceived link between health risks and the use of wastewater, the perception of water contamination and disease occupy a pivotal place, and are part and parcel of the knowledge and know-how of market gardeners.

The concept of hygiene is a question of experience and how the relationship between water and disease is perceived. From the viewpoint of a "health culture" in which there is no place for the notion of germs, the biomedical categorisation of "health risks" cannot make any sense. Even in the West, prior to the 19th century and before the discovery of bacteria, the link between dirt and disease, hygiene and pathogens was not perceived (Douglas, 1981). This lack of awareness should be taken into consideration in all training programmes aimed at changing the "health culture".

NOTES

(1) Market Gardening, in French *maraîchers*, refers to vegetable and fruit production, predominantly for sale at local markets (this last differentiates it from Kitchen Gardening).

(2) The research project on the use of polluted water in urban market gardening is funded by the Department of Development and Cooperation (DDC) of the Swiss Foreign Affairs Ministry and the National Swiss Fund for Scientific Research (FNRST).

The link between water and disease is not seen

IWMI-Ghana

REFERENCES

- Cissé, G. 1997. *Impact sanitaire de l'utilisation d'eaux polluées en agriculture urbaine. Cas du maraîchage à Ouagadougou (Burkina Faso).* EPFL, Senegal.
- Douglas, M. 1981. *De la souillure. Etudes sur la notion de pollution et de tabou.* Maspero, Paris.

IWMI-Pakistan

Blockage by farmers in Channel 4, Faisalabad

Urban sprawl creates challenges and problems like the inability to provide adequate municipal services, increased demand for food, environmental degradation and unemployment of the newly migrated people from rural areas. Municipal authorities also face problems with solid waste management and wastewater disposal. Urban agriculture can play an important part in addressing these problems. Food is produced and available in the city, environmental quality may be improved, and employment opportunities for poor families provided.

Economic and Institutional Issues

of Wastewater Use in Faisalabad, Pakistan

Despite these benefits, policies to support the development of urban agriculture are still very rare. Urban planners tend to exclude agriculture from their sights. Agriculture is "by definition" not practised in cities, and is often seen as "economically unimportant" or as "a temporary phenomenon" (Dresher *et al.*, 2000). A key factor perpetuating the biases against urban agriculture is the colonial concept of the city which remains embedded in the minds of decision-makers, leading to limited availability of, or poor access to, land and water resources. Consequently, urban farmers have to seek alternate sources of water and land. Unavailability of canal water and brackish groundwater further compel farmers to use untreated wastewater for food and fodder production to sustain their livelihoods.

Wastewater is used because of the bad quality of groundwater

Satiana Road channel ends

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STUDY AREA

This study was conducted in Faisalabad, the third most populated city of Pakistan, with about two million people in its municipal boundary. In spite of its large size (about 122 km^2), the city retains its village character with many pockets of agricultural land within the municipal boundaries and animals kept in most residential colonies (although cattle and buffalo are no longer permitted within the city limits: Water and Sanitation Agency, 1993). The old parts of the city have developed along the concept of mixed residential and commercial areas.

The green areas can be divided into three categories: agricultural, recreational and institutional (see figure 1). Recreational areas include parks, green belts and stadiums while research farms and playgrounds of college, university and research institutes are examples of institutional green areas. Agricultural land is situated towards the periphery of the city, most often waiting for the development of housing schemes. People can use this land for agriculture, but inaccessibility of irrigation water, unawareness and the temporary nature of plots restrict people's using it for agricultural purposes. No planned agricultural land is present in the city for food production. All institutional areas, recreational areas and most of the agricultural areas receive canal water. Agricultural areas that do not receive canal water or an insufficient supply, use sewerage water for irrigation.

The estimated sewerage flow of Faisalabad is 25.55 m^3/s. Untreated wastewater in the east is discharged into the Maduana drain and both treated/untreated sewage drains in the Paharang to the west. These drains discharge into rivers (the Ravi and the Chenab, respectively). The wastewater is led to the drains through five channels. From an irrigation point of view, channels 3 and 4 are the most important, because agricultural land has direct access to these channels. Channel 3 carries predominantly domestic sewage and channel 4 carries wastewater mainly of an industrial origin. See Figure 1 for the city's land-use patterns.

The major crops grown within the municipal boundary are wheat, fodder and vegetables. Wheat is consumed by the

farmers as a staple food, with a little left over as a marketable surplus. Vegetables are offered in the market for sale to the urban population and fodder is produced for animals held in the urban areas for transportation purposes. There are about 20,000 donkeys, 1,000 horses and mules and 300 bulls engaged in transportation business.

SURVEY

In a survey conducted within the municipal boundaries of Faisalabad City, data from primary and secondary sources were collected. Maps showing roads and villages in the periphery of Faisalabad City, the location of areas irrigated with wastewater, and the sewerage network, open channels (sludge carriers) and location of disposal works within the Faisalabad municipal boundary were made. Furthermore, data were collected on the cropped area of villages present in municipal boundaries, on wastewater generation, wastewater quality at different locations, etc. Several visits to the wastewater area further assisted in developing an understanding of the current status and practices of wastewater and the crops grown. Semi-structured interviews were conducted with the following groups: Farmers (five farmers from each wastewater site); "*Numberdars*[1]" (heads) of four villages that receive wastewater; the Sub-Divisional Officer, Irrigation and Power Department (IPD), who supervises the canal's passing through the city; Director of Town Planning, Faisalabad Development Authority (FDA); and the Director of Planning and Development, who is a legal advisor of the Water and Sanitation Agency, WASA.

RESULTS

The unavailability and unreliability of canal water, and the bad quality of groundwater are the main reasons for using wastewater. Agricultural sites using wastewater are located in the city. The water channels leading canal water to these sites are often clogged with city garbage. In those areas where the agricultural fields are higher than the watercourse, water hardly reaches the land. As well, most of the agricultural sites are located at the tail reaches of the irrigation system, so water remains scarce there. Groundwater in Faisalabad generally has a high content of total dissolved solids (TDS), ranging from 350 mg/l near the irrigation canal (due to seepage) to 2,700 mg/l at deeper sources (Water and Sanitation Agency, 1993). In most of the agricultural sites, groundwater is highly unsuitable for irrigation. Therefore, the farmers seek alternative sources of irrigation. Another important reason for farmers to use wastewater is its nutrient value that helps save in fertiliser costs. Farmers do not acknowledge the potential harmful impacts of wastewater on health so they do not hesitate in using wastewater for vegetables or fodder. Farmers mentioned that they want to continue to use wastewater for crop production. However, the main problem is that chemicals and hazardous industrial waste are often mixed with domestic wastewater, and this affects crop growth. Secondly, the lack of a proper legal framework and infrastructure prevents a clear view of the farmers' responsibilities and privileges.

Other problems were more site-specific and are described below.

Figure 1: Land-use pattern in Faisalabad City, Punjab Pakistan

ABBREVIATIONS

NEQ	National Environmental Quality Standard
Rs	Rupees (Pakistani Currency)
FDA	Faisalabad Development Authority
WASA	Water And Sanitation Agency
TMA	Tehsil Municipal Administration (Previously Municipal Corporation)
IPD	Irrigation and Power Department

Site 1

This area receives wastewater from the street drains. Data about the quality of this water are not available. Almost all of the water is used for irrigation purposes. Farmers consider this to be a good source of irrigation, but in the rainy season there are difficulties with drainage. This site is located in the middle of a populated area and the food products from these farms are prone to theft. From the WASA point of view, residents of that area do not dispose of their wastewater in the sewer line (as it could have been sold to farmers at another place), so WASA not only loses sewerage fees but also the wastewater discharge in WASA channels is reduced. At this site, about 20 hectares of land is being cultivated, the major crops being fodder and vegetables. In the winter all of the land is covered with vegetables, but in summer both fodder and vegetables are grown.

Site 2

In this site, farmers receive very little canal water, and are as a result dependent on wastewater, which is mainly of domestic origin, and has a pH of about 7 and a BOD of 300 to 350 mg/l. This area is near the rim of the city and is less developed. Farmers purchase the rights to pump wastewater from the main sewer line (manholes). Farmers have full control over the wastewater because they can pump water according to their own needs. However, the cost of pumping and the water rate paid to WASA do increase the cost of irrigation. Farmers pay about Rs 8,000 (US $ 140)[2] for water rights and spend about Rs 30,000 (US $ 526) for fuel. Farmers who do not have a pump have to purchase water at a rate of Rs 240 for irrigation of all their crops per time per acre (10.4 US $ per ha). This cost is very high compared to canal water, which ranges from Rs 60 (for wheat) to Rs 177 (for sugarcane) per acre for all irrigation events. Due to the current expansion of roads, the manholes have become inaccessible and therefore the farmers must carry water from the stabilisation ponds, which costs about Rs 2,500 (US $ 44) per hour per week for one year.

Site 3

Site three receives wastewater from channel 3 that carries mainly household wastewater, though industrial effluents are also mixed in to some extent, now and then contributing about 5 percent of total flow. Wastewater in this channel has an average BOD of 480 mg/l. WASA auctions the right

to use wastewater of this channel. The highest bidder is responsible for the retailing and distribution of wastewater from this channel. Here, both the farmers and bidder face a problem. Farmers hold the view that wastewater should not be sold because it is "waste". The bidder demands higher prices than that paid for canal water, and therefore the farmers feel that the bidder is getting higher prices, due to his monopoly. The lack of proper infrastructure for conveyance of wastewater aggravates this problem, as farmers near the wastewater channel do not give other farmers access. Non-cooperative behaviour of farmers leads to a limited use of wastewater from channel 3, causing the bidder to not be able to meet his costs and therefore ultimately go out of business.

Site 4

This site does not receive canal water due its topographic position. Firstly, land near the head of the watercourse is lower. Secondly, the overall shortage and frequent breach hardly allows the canal water to reach this site. Groundwater is extremely brackish and unfit for irrigation, so the farmers have to rely completely on the use of wastewater, which is either pumped or diverted by breaking the sidewall of channel 4. Due to the presence of industries alongside this channel, its wastewater is mainly of industrial origin. The quality of this channel has therefore restricted farmers to only growing tolerant crops like wheat and fodder. None of them can grow vegetables here because irrigation this water can burn vegetable crops. In the case of wheat and fodder, this water is furthermore not supplied at the tillering stage, as the plants are at that point too tender and susceptible to toxic elements. The unavailability of other sources of irrigation and the use of industrial wastewater has a negative impact on the livelihoods of these farmers. Farmers grow fodder for their livestock and wheat for household consumption. Their daily business is financed through the selling of milk.

IWMI-Pakistan

Wastewater being pumped out from Channel 4, Faisalabad

DISCUSSION

Pakistan is lacking legislation to effectively manage environmental resources and to control its pollution problem. The first major legislative effort was the environmental protection ordinance of 1983, but this has not yet been implemented (Water and Sanitation Agency, 1993). Another act was passed on September 3 1997 by the national assembly, but the procedural detail and description of the regulatory mechanisms are lacking. This act states that: *"...no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant of noise in an amount, concentration or level which is in excess of the National Environmental Quality Standards.....".*

Farmers don't want to pay too much for 'Waste'water

There is no provision of using untreated or semi-treated wastewater for agricultural purposes. According to the Standards for Municipal and Liquid Industrial Effluents, COD and BOD of wastewater should not exceed 150 mg/l and 80 mg/l respectively (Government of Pakistan, 1993). But WASA does not have enough resources to test and treat all of the wastewater so it has to dispose of it on land or in surface water channels without treatment. WASA's supplying of wastewater for use in agriculture is in fact a violation of the existing environmental regulations. WASA does not have the legal support for the development of infrastructure for untreated wastewater distribution for the use in agriculture. Selling of wastewater for agriculture is on an *ad hoc* basis, keeping in view the urgent need of farmers who are facing acute shortages of canal water and are willing to the face health risks associated with wastewater use.

WASA recovers some of the cost of wastewater collection and disposal by selling wastewater to farmers on an *ad hoc* basis, but due to the lack of by-laws and a legal framework, the allocation, distribution and prices are fixed on the basis of farmers' demand for water, the rates ending up being substantially higher than the canal water rates. Due to higher prices, farmers try to "steal" water from open channels/sludge carriers. In case of a conflict among the farmers, they try to get a stay order from the court against this illegal use of wastewater for agriculture on the basis of NEQs (National Environmental Quality Standard), to damage the interests of others. So, farmers and bidders do not invest in the development of the wastewater-distribution system due to this situation.

Poor quality of wastewater prohibits urban planners from using wastewater in green belts and parks. They think that this practice will firstly reduce the amenity value of parks and recreational sites, and secondly, that it will expose the urban population to health risks. Therefore, the canal water in parks and greenbelts is used, or they are kept vacant without any plantations.

There is a need to define a proper policy framework for the use of wastewater for urban agriculture in a productive and non-hazardous way. It is suggested that WASA consider the following three aspects:

i) by-laws for the use, pricing and distribution of wastewater;
ii) development of infrastructure to convey water to the farm-gate; and
iii) collection of wastewater rates for its use in agriculture, to stop the monopoly position of some farmers with respect to this resource.

NOTES

(1) Usually people call them *Numberdars,* but in official documents the word "*Lamberdar*" is used. *Numberdars* are responsible for collecting the revenues for the Irrigation and Power Department (IPD). A *Numberdar* is not a regular employee of the department, and receives about 6 percent of the revenue as a salary. Socially, a Numberdar is considered to be the village head. This job is transferred to his son after his death.
(2) 1 US Dollar = 57 Pakistan Rupee

REFERENCES

- Drescher, AW, R Nugent and H de Zeeuw. 2000. Final Report on Urban and peri-urban agriculture on the policy agenda, FAO/ETC Joint Electronic Conference August 21- September 30, 2000.
- Water and Sanitation Agency. 1993, Faisalabad Environmental Infrastructure Master Plan, Faisalabad Development Authority, Faisalabad, Pakistan.
- Government of Pakistan. 1993. Environment and Urban Affairs Division, Pakistan Environmental Protection Agency, Islamabad.

Integrated **Resource Recovery** Project

in Kolkata, India

Cities consume resources and produce both liquid and solid waste. The disposal of these wastes is increasingly becoming a problem. However, waste must be regarded as a resource for the sustainable urban development. Agriculture has always been an intrinsic part of Asian cities. In many Asian cities, the composting of separated solid waste and recycling of waste and sewage water used to be a tradition. These conventional methods are being renewed as urban agriculture is found to be providing employment, food and nutrition, land management and environmental improvement.

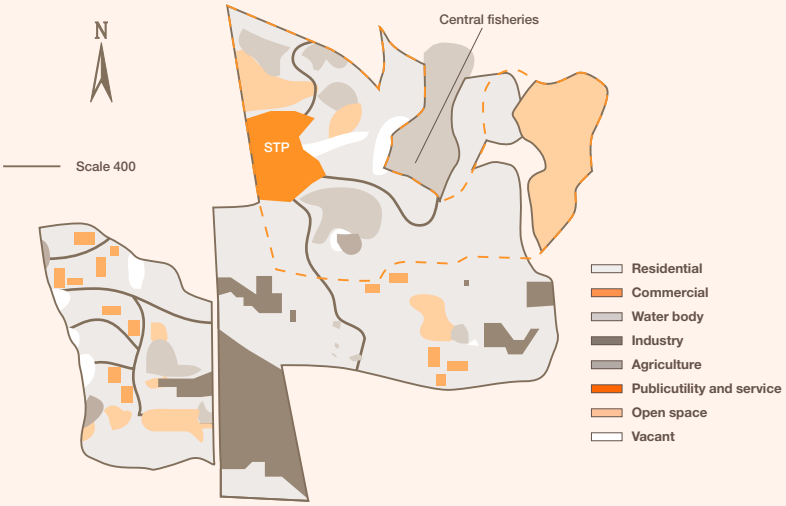

Figure 1: Project area, Integrated Recovery Project, Bandipur

Appropriate legislation needs to be developed

Kolkata (formerly Calcutta) has one of the largest recycling zones in India with age-old practices of fish culture and vegetable production. A large number of sewage-wastewater-fed fisheries have been developed on the wetlands in lagoon types of ponds in which fish are cultivated, and where sunlight, water hyacinths and phytoplankton are used to clean the water.

The urban authorities are encouraging the indigenous system of aquaculture. Three projects in the periurban areas of the Calcutta Metropolitan area have been taken up with the participation of local people, fishermen and the village council/municipal government. The Community Based Wetland Ecosystem (CBWE) was first introduced in 1995 in Titagarh, a northern suburban industrial town within the metropolitan area. The project in Titagarh is presented here and is now known as the Integrated Resource Recovery Project. It is officially recognised by Kolkata Metropolitan Development Authority, and has generated wide interest from the local urban bodies and village councils.

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THE PROJECT AREA

Kolkata produces one third of its requirement of fish in sewage wastewater-fed lagoons and a similar share of its vegetables utilising natural compost and recycled wastewater.

The study area is located on the east bank of the river Hoogly (a tributary of the Ganges), 22 km north of Kolkata within the metropolitan area, with an estimated population of 344,700 in 2001. Most of the people are industrial workers and belong to the economically weaker section. The study area covers Titagarh town, which is basically an industrial town and Bandipur rural land unit (mouza). See Figure 1 for a map of the project area.

THE SYSTEM

Titagarh has an old sewage treatment plant (STP) with a capacity to treat 9.08 million litres of sewage per day (mld). As this plant was found to be inadequate, a new stabilisation tank system was proposed with a capacity of 14.10 mld to bring the total capacity to 23.18 mld. This new stabilisation tank system (STS) has been built in Bandipur, 2 km from Titagarh. The system at Bandipur, which includes wastewater treatment and reuse for aquaculture, is termed as the Resource Efficient Stabilisation Tank System. The system is used for the treatment of raw sewage discharged by the people of Titagarh and parts of Barrackpore municipality, mainly from commercial and domestic sources. The cost of the Bandipur STS is much cheaper than the Titagarh STP, because the latter consumes cost intensive electrical and mechanical energy, whereas the Bandipur STS is based on a natural process.

The Activated Sludge Treatment Plant (ASTP) at Titagarh

A splitter box before the inlet to the primary settling tank allows 4.54 mld of sewage directly into an oxidation pond, while the rest of the 4.5 mld sewage is treated in the activated sludge treatment plant. Here the sewage first enters into a primary sedimentation tank, after which the effluent is sent into three equal capacity aeration tanks for mechanical aeration. After this process of mechanical aeration, the effluent is sent to three secondary settling tanks. The return of the effluent from the secondary settling tanks to the aeration tanks is such that 50% of the sewage flow is returned to the aeration tank. From the settling tanks, the final effluent is led into the storm-water tank, where part of it goes into the river, and the other part is led through two canals, into the adjoining farmland. An area of 23.8 hectares of land is irrigated with treated effluent from the STP, and

5.35 hectares are irrigated with untreated waste lifted from the canal by a portable centrifugal pump.

Resource Efficient Stabilisation Tank System at Bandipur

The process at Bandipur, wastewater treatment and aquaculture, is known as the "resource efficient stabilisation tank system". It is a project based on ten years' of experience with the sewage-fed fisheries in east Kolkata. The system, which was commissioned in 1995 comprises a series of aerobic, facultative and maturation ponds.

The design flow considered 14 mld of raw wastewater (BOD of 200 mg/L and faecal coliform numbering 1 x 10^7 per 100 ml). The retention times at the design flow are 1, 5 and 4 days respectively for aerobic, facultative and maturation ponds. The stabilisation tanks are designed to produce an effluent suitable for aquaculture reuse with a faecal coliform count of under 10^4 per 100 ml.

Fish culture is currently practised in both the facultative and maturation ponds. This is essentially an interim measure, as the wastewater flow is currently around one third of design flow. This method is not only cost effective but also requires less land since the maturation pond is used for fish production. The ponds are simple and cheap to construct. The method does not require skilled operation and is easy to maintain. Properly designed ponds give a consistently good performance. The method is suitable wherever land is cheap and readily available.

The high productivity of these sewage-fed fishponds is due to the high content of nutrients in the wastewater, while the high alkalinity stimulates the production of phytoplankton, a primary product1 in the fish food chain. It also generates an abundant quantity of algal photosynthetic oxygen. Fish yields were recorded to be approximately 7 tonnes per hectare per year. The stabilisation tanks at Bandipur are rented out to a local fish farmer who normally pays Rs 50,000 (1,250 Euros in 2001) p.a. to the local *panchayat* and approx. 2,750 Euro p.a. to the Calcutta Metropolitan Water and Sanitation Authority (CMW&SA), an agency of the metropolitan development authority. This aquaculture enterprise provides employment for 50 people, and produces high quality animal protein for the low-income group of local beneficiaries.

The integrated complex of Bandipur and Titagarh has been leased out to 110 farmers. Around 30 to 32 types of vegetables (exotic and indigenous) are cultivated, depending on the season and the climatic conditions. Some of the more profitable vegetables are spinach, Chinese onion, coriander, cauliflower, kidney beans, lettuce, etc. An estimated quantity of 3,060 tonnes of vegetables is produced by the farmers annually. About 800 persons are engaged.

In Titagarh and Bandipur, the solid and liquid wastes are mostly commercial and domestic in nature. The industrial solid and liquid wastes must be separately treated from domestic waste; otherwise, they can contaminate valuable wastewater resources.

CONCLUSION

The experience and techniques mentioned here could act as an example for other municipalities. With declining employment in the industrial sector and the growth of the informal sector, the urban poor and low-income families are increasingly shifting towards urban agriculture for survival. Urban agriculture should be given more attention for its potential to support a sustainable urban environment, generating employment and reducing (municipal) investment in waste management.

It is of great value that the Metropolitan Development Authority in Kolkata has included wastewater recycling in its urban development programme, but appropriate legislation needs to be developed. Furthermore, wastewater use for urban agriculture does not relieve the planners and policy-makers of their responsibility to further improve the quality of life of urban poor. Social wealth requires synergy and co-ordination between locally rooted innovation and central guidance.

REFERENCES

- Edwards, Peter. 1992. Reuse of Human Waste in Aquaculture. UNDP-World Bank, Washington DC.
- Ghosh, Santosh. 2002. Wastewater Recycling in Urban Aquaculture. Paper presented at the July 2002 International Congress in Irrigation & Drainage, Montreal, Canada.
- Gupta, Sumita. 1995. Land-use planning for urban agriculture. Paper presented at the December 1995 International Workshop on Urban Aagriculture and Sustainable Environment. Centre for Built Environment, Kolkata.
- Kolkata (Calcutta) Metropolitan Development Authority. 2001. Integrated Resource Recovery Project. Titagarh, Bandipur Area, India.
- Rai, SP, AK Roy, *et al.* 1997. Recycling of wastewater in integrating aqua-agri-horti farming. Paper presented at the December 1997 International Workshop on Urban Agriculture and Sustainable Environment. Centre for Built Environment, Kolkata.

Box 1: Methodology used in the Project Area of Titagarh STP

Properties of Waste: An analysis of samples of the primary treated sewage of the Titagarh STP, which was released for agriculture and aquaculture indicated the parametric values of: Ph - 7.5 to 8; Total alkalinity of - 300 to 400 ppm; CO_2 - 30 to 50 ppm; P_2O_5 - 8 to 12 ppm and COD - 150 to 200 ppm. Digested sludge exhibited: Ph - 7.5 to 8; Organic carbon - 3 to 4.2 mg per 100g; Nitrogen – 85 to 98 mg per 100g; and Phosphorous - 15 to 209 mg per 100g of soil.

Soil Bed Preparation The land is prepared by hand with spades and comb-like splitted spades, in July. Compost (of waste) is spread over the land and mixed with the soil, making the level of the land about 5 to 10 cm high, and non-biodegradable elements are removed. Inorganic fertiliser is also spread to quicken the process of decomposition. The term "*Ulti Koop*" refers to turning the (15-20 cm of) soil over by a spade. Plot size and drainage facilities depend upon crop, season and cultivation. After three months of cultivation, compost is added for a second time.

Application of Sludge, Effluent and Compost The effluent from the treatment plant is taken directly to the fields via 600 mm diameter concrete pipes. Sludge, either from the treatment plant or from the oxidation ponds, is periodically removed, dried and applied by farmers as organic manure. Garbage is purchased by the farmers, separated and composted.

Source: *Kolkata (Calcutta) Metropolitan Development Authority, 2001*

Next to the orchards many farmers plant small vegetable plots

A. Bradford

Crop Selection and Wastewater Irrigation

Hubli-Dharwad, India

The twin city of Hubli-Dharwad generates approximately 60 million litres of wastewater per day (Hunshal, et al., 1997), which is discharged untreated from the open city drains (wastewater nallahs) into natural courses that flow into the hinterlands. Along the main wastewater nallahs, three distinct cropping systems are apparent: vegetable production (see Bradford, et al., 2002); field crops with vegetables; and agroforestry.

This article will address the latter cropping system, as out of the three systems, agroforestry has the potential of reducing the high risks that are associated with wastewater irrigation. In addition, the gender implications from wastewater irrigation will be briefly addressed, as will wastewater-irrigated fodder production.

The spatial variation of the cropping systems results from a combination of factors which include labour availability, farm size, market access, village conformity and soil types, with the overriding aspect being the availability of wastewater itself. In the city and suburbs where the wastewater supply is guaranteed, intensive vegetable production occurs. In locations where the supply is erratic and unreliable, field crops and agroforestry predominate. In field crops, such as cotton and wheat, wastewater irrigation is simply used to start the field crop season earlier. This brings added advantages over rainfed agriculture as the crops that are harvested earlier bring higher market prices, as once the market is inundated with produce from rainfed systems, the market price tumbles.

AGROFORESTRY SYSTEMS

In India, wastewater irrigated agroforestry has long been recognised as a strategy to dispose of urban wastewater, while also rehabilitating and greening wastelands (see Das and Kaul, 1992). In the periurban villages of Budarsingi and Katnur on the main Hubli *nallah*, all farmers bordering the *nallah* engage in some kind of wastewater irrigated agroforestry practice. In other locations, only sporadic planting of trees on farm boundaries and the occasional agroforestry practice can be observed. The benefits from agroforestry include reduced irrigation requirements and therefore reduced exposure of farmers to wastewater. During the dry season, vegetable crops are irrigated every two days while tree crops are irrigated every ten days. Furthermore, farmers who have adopted agroforestry systems, have reported a substantial increase in income from the produce as a result.

WASTEWATER IRRIGATED AGROFORESTRY PRACTICES

In Budarsingi and Katnur, the main wastewater irrigated agroforestry practices are "tree predominant" orchard systems and agrosilviculture, consisting of spatially mixed perennial-crop combinations (Young, 1997). The two most important tree species are sapota (*Achras zapota*) and guava (*Psidium guajava*); other common species are coconut (*Cocos nucifera*), mango (*Mangifera indica*), arecanut (*Areca catechu*) and teak (*Tectona grandis*). Species found on farm boundaries include neem (*Azadirachta indica*), tamarind (*Tamarindus indica*), coconut and teak. Other less common species are banana (*Musa paridasiaca*), ramphal (*Annona reticulata*), curry leaf (*Murraya koenigii*), pomegranate (*Punica granatum*), lemon tree (*Citrus limon*), galimara (*Casuarina equisitifolia*) and mulberry (*Morus indica*).

Tree predominant orchard systems are planted as a single crop of either sapota or guava or a mixture of the two, with tree spacing of 6-7 metres. Next to the orchards many farmers plant small vegetable plots which are also irrigated with wastewater. Farmers with larger landholdings also plant additional field crops adopting similar cropping patterns to the field crop systems found on the Dharwad transect. The agrosilviculture systems consist of tree rows containing a mixture of sapota and guava. The trees are spaced along the rows at intervals of 6-7 metres and each row is planted approximately 9 metres apart. The land between each row is used for field crops.

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AGRICULTURAL CONSTRAINTS

Farmers in Budarsingi and Katnur identified rigorous weed growth as the main constraint to agroforestry. Even though fruit pests and disease were evident, the low incidence meant that many farmers took no control measures and as such pesticides were not used on the agroforestry plots. Weeds were identified as problematic, particularly *Parthenium hysterophorus*. Farmers attribute the wide spread of the weed to seeds that are carried in the wastewater and then pumped onto the fields. Farmers reported that even though the *Zygogramma* beetle was established, the beetle (an introduced bio-control agent) could not multiply fast enough to control the increasing weed problem. As a result, removal by hand was the main weed-control measure and consequently most farmers reported labour shortages. Additional crop problems reported by farmers included the early dropping of fruit from trees and the softening of fruit while still growing; farmers identified wastewater irrigation as the causal factor for both of these problems. Indeed, a similar problem was reported with apples irrigated with wastewater which resulted in "detrimental effects on fruit quality by decreasing flesh firmness and increasing incidence of core flush" (Meheriuk and Neilsen, 1991: 1269).

A. Bradford

Innovative farmer standing before a row of sewage-irrigated teak intercropped with Achras zapota and Psidium guajava; the soil in the foreground has been prepared for a kharif crop of sorghum.

GENDER IMPLICATIONS OF WASTEWATER IRRIGATION

The high nutrient loading from wastewater greatly increases the incidences of weeds; the farmers also attribute this to seeds that are carried in the wastewater and then pumped onto the fields. Consequently, as the main weed control method is hand tillage, the weeding accounts for the high labour inputs associated with wastewater irrigated cropping systems. Household members meet these labour-input needs and within the household women normally carry out these tasks; likewise, when farm labourers are hired they are more likely to be women due to the cheaper labour costs. Census data also confirm that a higher proportion of women are engaged in urban agriculture. Budds and Allen (1999) reported that the male population mainly seized the non-farm opportunities, as the wages are higher than in the agricultural sector (for example, building labourers earn 70 rupees per day, as opposed to farm labourers earning 50 rupees). As well as perpetuating their positions as the poorest social group, women's exposure to the hazards of wastewater – pathogens, toxins and organophosphate pesticide residues - is also increased as they spend full days working in the fields. Furthermore, once the day's work is finished, the women return to their households and carry out evening chores, including food preparation and cooking, thereby increasing the risk of pathogen transfer to other family members if basic hygienic standards are not maintained.

FODDER PRODUCTION

An additional wastewater-irrigation system can be found just outside Maradagi village on the Dharwad *nallah*. Since 1995, a small-scale dairy farmer has been irrigating a one-acre plot of Napier grass (*Pennisetum purpureum*) with wastewater and borewell water on an alternating daily basis. The grass is grown throughout the year and used as fodder for eight dairy cows and two bullocks stalled nearby. An additional supplementary feed made from a rice by-product is also fed to the livestock. Changing from dry feed to the Napier grass fodder, the farmer reports a milk yield improvement of from 3-4 litres per day to 8 litres per day, an enterprising twofold increase.

REDUCING RISK

The main reason why farmers do not diversify and adopt more sustainable cropping systems is because "change" is associated with risk and farmers who depend on agriculture for their livelihoods will at all costs mitigate any perceived risks. The farmers who have adopted agroforestry practices have done so because they have either additional income generating opportunities or larger landholdings. This reduces their dependency on a single livelihood or small agricultural plot. Furthermore, farmers with larger landholdings are more likely to experiment with small plots of agroforestry and expand such experiments as they reap the benefits and gain confidence in the new practices. This process is clearly occurring in Budarsingi and Katnur, where wastewater-irrigated agroforestry systems have spread as a direct result of farmers observing the practices, and then adopting them once they are confident they work; in this case "change" is no longer perceived as a risk and thus agroforestry practices are freely adopted.

Adoption of agroforestry systems reduces farmers' direct contact with and exposure to sewage, due to the reduced irrigating requirements of tree crops in comparison to vegetables and field crops. In addition, the use of organo-phosphate pesticides is greatly reduced, as the diverse agroecosystems become more stable and less vulnerable to pest populations. This process could be enhanced through the extension of appropriate IPM strategies using participatory approaches such as farmer-field schools. These empower farmers through education and training which are designed to meet the needs of smallholders and marginalised farmers and to incorporate traditional pest-control methods. Therefore, the development of micro technologies at the farm level to reduce risk is a crucial component within this process. Examples of this process are clearly evident in Hubli-Dharwad, where some innovative farmers have diversified their agroecosystems by incorporating agroforestry practices.

REFERENCES

- Bradford, A, R Brook and C Hunshal. 2002. Risk Reduction in Sewage Irrigated Farming Systems in Hubli-Dharwad, India. *Urban Agriculture Magazine* 6: 40-41.
- Budds, J. and Allen, A. 1999. Peri-Urban Profiles: Hubli-Dharwad, India. Research Paper. Development Planning Unit, University College London, UK.
- Das, DC and Kaul, RN. 1992. Greening Wastelands Through Wastewater. National Wastelands Development Board, Ministry of Environment and Forests, New Delhi, India.
- Hunshal, CS, SR Salakinkop and RM Brook. 1997. Sewage irrigated vegetable production systems around Hubli-Dharwad, Karnataka, India. *Kasetsart Journal (Natural Sciences)* 32 (5): 1-8.
- Meheriuk, M and Neilsen, GH. 1991. Fruit quality of McIntosh apples irrigated with well or municipal waste water. *Canadian Journal of Plant Science* 71: 1267-1269.
- Morgan, RPC. 1995. Soil Erosion and Conservation. *Second Edition*. Longman, Harlow, UK.
- Young, A. 1997. Agroforestry for Soil Management. *Second edition*. ICRAF, Nairobi.

In 1999, IWMI explored the advantages and risks of the use of urban wastewater for crop production along the Guanajuato river. At least 140 hectares of land downstream of the city of Guanajuato[1], farmers in two periurban communities (San Jose de Cervera and Santa Catarina) irrigate with raw wastewater. The benefits from wastewater irrigation include additional water, nutrients and the benefit obtained for the treatment (Scott, et al., 2000).

Paula Silva-Ochoa

An overview of the Treatment Plant in Guanajuato, Mexico

The Impact of a Treatment Plant on Wastewater Irrigation in Mexico

The 1996 Mexican environmental regulation NOM-001-ECOL establishes the maximum amount of contaminants permitted in wastewater discharged into public water bodies or national property. This restriction aims to reduce wastewater disposal into the river and the negative impacts for health and the environment, through a fine of US $0.25 per cubic metre of untreated water that exceeds the permitted limits. However, the regulation also leads to a reduction in the nutrient values and forms a constraint to irrigation by wastewater. In accordance with this regulation, the public water-supply company of Guanajuato city, called SIMAPAG[2] constructed an activated sludge wastewater treatment plant, which started to operate in June 2002. In this article, the plant's benefits are reviewed. The aim is to give some preliminary answers to the research question: *How does the water-treatment plant influence the benefits of the use of wastewater for crop production?*

The need to assess these effects appears essential for future, since current national environmental laws and local policies will increase the volume of treated wastewater and actual will change the conditions of raw wastewater irrigation. In Guanajuato's Hydraulic Plan for 2000-2025, an additional 47% of wastewater is planned to undergo treatment, which together with the 16% of wastewater already treated, makes for a total of 53% of treated wastewater in the near future.

The volume of residual waters generated in the 46 municipalities of Guanajuato total 207.13 million cubic meters per year. If this water could be used directly for agricultural purposes, it could irrigate around 20,500 ha, which is almost 5% of the actual irrigated land in Guanajuato (416,690 ha). There are 16 treatment plants in the urban areas and another 26 wastewater-treatment systems in the rural areas. The lack of technical and administrative capacity prevents the water treatment programmes from being carried out satisfactorily.

SIMAPAG AND THE TREATMENT PLANT PROJECT

Water supply for the city of Guanajuato (with a total population of around 106,000) is provided by SIMAPAG. There are 31 water-supply operator agencies like SIMAPAG in the state of Guanajuato. They act as financially autonomous public utilities with an independent administration. Only ten of these have a healthy financial status, but SIMAPAG had an outstanding performance in terms of financial surplus and overall efficiency (CEAG, 2001). The potable water-supply coverage is 95%, and sewer coverage 82%. Domestic connections represent almost 94% of the total number and there are very few commercial and industrial connections. The average production per connection is 27.7 m^3 and the average fee is US $0.59/$m^3$ (CEAG, 2001).

SIMAPAG constructed an activated sludge with chlorine treatment plant. The federal government contributed 24% of the funds, the local government 40%, and SIMAPAG the remaining 36%. In , the plant treatment design parameters are described. According to the average production per connection, the expected sewage effluent[3] from Guanajuato city is around 0.14 m^3/s, this is a volume of 6.3 million cubic metres. Until the treatment plant started to operate, this effluent was discharged into the Guanajuato River. Nowadays, 70% is treated, while the wastewater produced by the community of Marfil, representing the remaining 30% of untreated wastewater, is seweraged downstream of the treatment plant outlet. Currently, SIMAPAG has to pay annually US $472,500 for this remaining 30% of untreated wastewater.

WATER AND NUTRIENT VALUE

The treatment plant gives SIMAPAG the opportunity to sell the treated water. No commercial transaction has taken place as of yet, but there will be greater competition among the different sectors. Moreover, raw wastewater irrigation will have to compete against the use of treated water, since every cubic meter of untreated wastewater disposed in the Guanajuato River costs SIMAPAG a fine of US $0.25.

Thus the farmers' request to use raw wastewater will only arouse the interest of SIMAPAG if the farmers are willing to pay the fine expenses, which they cannot. The expected water productivity in small-scale irrigation systems is only around

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A diversion point in Guanajuato River for the irrigation canal

REFERENCES

- Aqua Orbi Ingenieros. 2001. *Memorias de cálculo de Proyecto Planta Tratamiento Aguas Residuales Guanajuato, Centro*. Guanajuato, Mexico.
- Comision Estatal de Agua de Guanajuato (CEAG). 2000. *Diagnóstico de los organismos operadores de agua*, 1995 - 2000 and *Plan hidráulico* 2000-2025. CEAG, Guanajuato, Mexico.
- British Geological Survey, Comision Nacional del Agua and UAC. 1995. Effects of wastewater reuse on urban groundwater resources, Leon, Mexico. Final report. BGS Technical Report WD/95/. Keyworth, Nottinghamshire, UK.
- Blumenthal, Ursula J, Anne Peasye, Guellermo Ruiz-Palacios and Duncan D Mara. 2000. Guidelines for wastewater reuse in agriculture and aquaculture: recommended revisions based on new research evidence. Task No: 68 Part 1. London School of Hygiene & Tropical Medicine, WEDC, Loughborough University, UK.
- Sánchez, Jesus de Vicente. 2000. *La utilización de aguas no potables para riego*. Report form the Asociación Española de Parques y Jardines, Spain.
- Scott, Christopher A, J Antonio Zarazúa, and Gilbert Levine. 2000. Urban Wastewater Reuse for Crop Production in the Water-Short Guanajuato River Basin, Mexico. IIMI Research Report 41 International Irrigation Management Institute, Colombo, Sri Lanka.

Table: Plant treatment design parameters

Parameter	Unit	Influent	Effluent
Discharge design	Lps	140	140
Total Suspended Solids (TSS)	Mg/l	217	<60
Total Biological Oxygen Demand (BOD)	Mg/l	337	<60
Total Nitrogen (Kjelndahl)	Mg/l	82	< 35
Faecal coliforms	MPN P/100 ml	6.2 X 10^6	<1000
Total Phosphorous	Mg/l	11	< 20

Source: Aqua Orbi Ingenieros S.A. De C.V, 2001

US $0.15/m^3 (Silva, *et al.*, 2000). A higher productivity could be reached, even up to US $0.50/m^3, if more profitable crops like vegetables are cultivated. But these vegetables are consumed raw, which is restricted under regulation NOM-001-ECOL-1996. The operation cost of one cubic metre of treated water is US $0.11. By means of a 10% charge for sanitation services, SIMAPAG recovers US $0.04/m^3 from the domestic users and US $0.08/m^3 from industrial and commercial users. In order to be profitable, the selling price for the treated wastewater should be at least US $0.07/m^3. Industrial customers could pay up to US $0.50/m^3, which would give a surplus of US $0.43/m^3.

The existing concentration of nitrogen phosphorous in the effluent is enough to meet the nutrient requirements for alfalfa, the most common cultivated crop. Farmers show very little concern regarding the reduction of nutrients due to the water treatment process upstream, since the treated water still has a high content of nutrients. Water users are more afraid about water-level reduction in the river than about nutrient reduction in the river effluent. The sludge would represent another important source of nutrients.

The storage and elimination of this material is one of the major operational problems, while the area that could benefit from the waste-treatment plant is around 20 to 30% of the total study area. Unfortunately for the moment, the solid waste is taken to a landfill.

FOREGONE TREATMENT COST IMPACT

It is obvious that wastewater irrigation was not considered as an alternative method for wastewater treatment. The selection of the water-treatment process was entirely based on environmental regulation NOM-001-1996. The reason behind this is the great percentage of irrigated land without water entitlement. SIMAPAG only recognises the land that has a regular water right. Annually, this is legally granted to 300,000 to 500,000 m^3, which represents just 30 to 50 ha.

Theoretically, the water-treatment plant in Guanajuato city would produce treated water for all types of landscape irrigation, including for example, golf courses and parks (though with higher maximum limits than for agriculture). However, there is presently no reuse process in place except for irrigation for agriculture.

Nevertheless, if the produced treated water is not sold; the capital investment will not be justified. The cost and difficulty in operating and maintaining conventional treatment plants to meet the specified guidelines means that they are not recommended where waste-stabilisation ponds and wastewater storage and treatment reservoirs can be used (Blumenthal, *et al*, 2000).

CONCLUSIONS AND RECOMMENDATIONS

The major potential impact of the water-treatment plant is the possible reduction in wastewater discharge in the river, if the treated water is sold to an industrial consumer outside the Guanajuato River sub-basin. However, this would lead to competition over the water. The position of the farmers is weak because only 30 to 40 ha have proper water entitlement. This impact is not affected yet, because of additional sources of urban wastewater entering into the river downstream of the treatment plant.

Further research is needed to identify conditions under which the substantial benefits of wastewater irrigation can be captured while financial sustainability of the water-supply utilities is maintained. There are several aspects that need to be analysed regarding the relationship of the urban production of treated water and wastewater irrigation such as:

- a water market for treated effluent and its commercial feasibility in irrigation (comparison between the use of treated water and raw wastewater);
- water rights conflicts;
- hydrological impact of selling the treated water outside the sub-basin;
- water-quality assessment at the final use point (e.g., farm level for irrigation); and
- an accounting of nutrients lost from raw wastewater.

Notes

(1) Very often the state and its capital city have the same name in Mexico. Unless it is mentioned, Guanajuato refers to the province of Guanajuato and not to the city.
(2) SIMPAG stands for *Sistema de Agua Potable y Alcantarillado de Guanajuato* in Spanish, or the "Guanajuato Water Supply System".
(3) This figure comes from the assumption that 70% of the total produced water per outlet will be sewerage.

Reuse of **Untreated Wastewater**

in Market Gardens in Dakar, Senegal

In Senegal twenty-six percent of the population lives below the international poverty line of US $1/day. These conditions threaten food security. In order to generate income and feed their families, more and more people are practising urban agriculture. However, they lack safe and affordable irrigation water, and many farmers use untreated water.

RUAF Video

Collecting water from a pond for irrigation of crops

Within Dakar, the most important section of the Niayes[1] in terms of food production is the Niayes de Pikine. In this large area inside the city limits, horticulture is prevalent. The zone is threatened by both urban development and saline intrusion. Over the last 30 years, the portion of the Niayes zone in Dakar has shrunk by 56 ha (10%).

The Senegalese government has recognised the importance of horticulture in this area (including in the urban areas). However, the activity remains firmly lodged in the informal sector. As from 1984, the state formally attempted to incorporate horticulture into its national economic plans and development strategies. In 1994, this effort culminated in the creation of the Department of Horticulture, whose aim is to support small-scale agriculture (plots between 225 and 500 m^2) through credit programmes, training, and access to tools, fertilisers and pesticides. While government support for urban farmers has been negligible to date, it is encouraging that the socio-economic benefits of small-scale urban farming are being recognised.

CHARACTERISTICS AND CONSTRAINTS

About 60% of the vegetables consumed in Dakar are produced within that city. The dominant types of crops grown by urban farmers in the Niayes zone are lettuce, tomatoes, onions and jaxatu (a type of eggplant). The farmers earn a profit of about FCFA 43,000 (US $64)[2] per harvest (based on oral surveys). Using the four most commonly cultivated crops (lettuce, tomato, eggplant and onion) the study found that on average, farmers were able to harvest five crops per year. The net average annual profit for each farmer is then 215,000 FCFA (US $320), or 589 FCFA (US $0.88) per day—less than the international poverty line of US $1/day. While this figure may seem low, the actual amount of profit generated may be less important if the urban farmers were to become completely self-sufficient in vegetables. Considering food purchases of the poor in the urban areas of developing countries can easily amount to 50% - 80% of their income, this is a considerable benefit to the improvement of family wealth. Moreover, these figures probably vastly underestimate the income of the urban farmers: most of the time, farmers do not want to show what they own.

The use of untreated wastewater for irrigation itself could become a constraint to urban gardening in Dakar. Certainly, environmental issues associated with untreated wastewater reuse such as clogging of soil particles and contamination of soil could potentially become a problem if greater quantities of wastewater are reused. Furthermore health effects arising from consumption of contaminated produce could restrict the practice, particularly if serious illness results and the public becomes more aware of the prevalence of wastewater reuse. At least in the short term, a much greater obstacle to urban agriculture in Dakar is the insecurity of land tenure.

FARMERS AND INSTITUTIONS INVOLVED

The majority of the farmers (88%) in Dakar are men, married (80%) and less than 45 years old, with a primary responsibility of feeding their families. However, most of the sellers are women, and help out during the harvests, or act as intermediaries, selling their crops to merchants and market gardens. A slight majority of the urban gardeners (58%) are former farmers who migrated to Dakar from rural areas over the last decades of drought. Other farmers are former artisans (19%),

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fishermen (4%) and business people (2%) who have all fallen on hard times. Some of the farmers have university degrees. For 75% of the farmers, this activity constitutes their main occupation. 38% of the farmers are Wolofs, 23% Toucouleur, and 19% Séréres, but all ethnic groups are represented, and the practice does not appear to be restricted to only the poorest of these. The central local institutions acting on questions of urban agriculture and wastewater use are the GIEs (Groupes d`Intérêts Economiques). GIEs are local economic associations that work to develop local businesses and economic activity. In addition to local representatives, NGOs and the like, they are often made up of urban agriculture groups. Certain groups of urban farmers are particularly dynamic and have developed adaptive approaches to poverty alleviation in their communities. However, the results of their work have been limited and dispersed (Enda/IFAN, 2002). Nevertheless, due to their close proximity to civil society, they remain important actors to be engaged.

RUAF Video

Saturation ponds where grey water from surrounding houses is treated

Officially, the practice of wastewater reuse is banned, however, recognising its prevalence, little is done by authorities to curtail the activity. In response to water scarcity, the *Ministère de Hydraulique* has developed two macro plans that are supposed to improve the effectiveness of management and the quantity of available water. The first programme, the Sectoral Water Project (PSE) was developed in 1996. Its central aim was to increase the amount of available water by drawing on surface water from the lake *Guiers* and extending the water-provision network of Dakar. The second programme is known as the Long-Term Water Project (PLT) and is a five-year plan (2002-2007) that touches on wastewater policy in urban areas. Notably, *Office Nationale de l'Assainissement* (ONAS) has recognised the prevalence of raw wastewater reuse for agriculture and has proposed the decentralisation of wastewater treatment if such technology can be proven effective (Egziabher, *et al.,* 1994). ONAS envisions a decentralised management including the creation of 160 small-scale community operated systems and 60,000 on-site treatment systems. Moreover, they explicitly recognise the value of wastewater reuse under the assumption that it be done with a minimal risk to health wherever possible. The impact of these two programmes on urban water management will be significant. On questions of wastewater, the Ministry of Health and the Ministry of Environment are important actors. Unfortunately, they have not yet been fully engaged in the process of researching the impacts of wastewater reuse. Meanwhile, things are moving on well. Recently, hygiene students presented their graduation work on the use of wastewater in urban agriculture. While the practice of wastewater reuse is prohibited by the Health and Environment ministries, the city authorities are conscious of its existence. In March 2002, the Dakar declaration was signed by seven mayors and city councillors from West Africa, in support of the development of the urban agriculture sector. Moreover, the declaration specifically noted that the reuse of wastewater occurs and poses potential health risks. However, recognition is not yet action and although many mayors are supportive (for example, the mayor of Pikine), they do not yet have the capacity to act.

RECOMMENDATIONS AND POLICY SUGGESTIONS

Recommendations should take into consideration both that the farmers need to earn an income for their families and that public health (including the health of the farmers themselves) needs protection. Attempts to meet the WHO guidelines through various treatment options should be explored while at the same time investing other non-treatment management options, some of which are outlined in the same WHO source.

The first recommendation is of course (to try to assure) treatment of domestic wastewater for unrestricted use. Irrigation methods can be organised into both means of distributing the raw wastewater to the plants to minimise contamination of the plants, and precautions that the farmers can take to protect their own health. The main irrigation method currently practised, use of watering cans, accentuates the risk of contamination of the plants and farmers. In fact, the research project confirmed that lettuce irrigated with watering cans has higher levels of contamination by faecal coliforms and streptococcus than lettuce irrigated by hosing water into the furrow (Enda/IFAN, 2002). Another obvious recommendation is to practise the crop restrictions recommended by the WHO, banning the irrigation of raw salad crops with wastewater except for that which meets the quality outline for unrestricted irrigation. In practice, this may be challenging, as crops such as lettuce and tomatoes are some of the most profitable crops for urban farmers in Dakar. An education programme for farmers, the public, and municipal officials are furthermore essential.

The current research project (supported by the IDRC) has identified the lack of collaboration between important institutions, both non-governmental, such as the farmers themselves, groups representing them (the GIE), and governmental organisations such as the municipalities (the municipality of Dakar), and national-level departments. It is recommended that the development of regional networks be created to facilitate the exchange of information and improve the efficiency of finding appropriate treatment and non-treatment options for wastewater use. It is evident that in Dakar a multi-stakeholder process for the development of appropriate policies as well as appropriate guidelines for the use of wastewater (including water-quality standards) are required.

Notes

(1) A narrow but long fertile zone of land that stretches along the coast of Senegal from Dakar to St. Louis.

(2) onversion based on October 2002, rate of f CFA 667.87 = US $1.

REFERENCES

- Egziabher A G, Maxwell D G, Lee-Smith D, Memon P A, Mougeot L J A, Sawio C J. 1994. Cities Feeding People. An examination of urban agriculture in East Africa. IDRC, Ottawa, Canada.
- Gaye M et Niang S. 2002. Epuration des eaux usées et l'agriculture urbaine. Etudes et recherches, N° 225-226-227, Enda Dakar

There are approximately 6 billion inhabitants in the world. By the end of 2000, 31 countries with an approximate population of 480 million people had a chronic deficit of fresh or potable water. Each year, 54% of the available fresh water is used. If the consumption per person remains the same, we will be using 70% of the total by the year 2025, only as a result of the increase in population. If the per capita consumption of all countries in the world would reach the levels of the more developed countries, this would be 90% of all the available water. Currently, more than 20% of water used for personal consumption is going towards urban irrigation activities. Thus, in the year 2025, it will no longer be possible to irrigate urban green areas with potable water. Peru is among the most affected countries.

"Ecological Park" on San Juan de Lurigancho, Lima

Juan Carlos Calizaya

Prevention Today,

The Case of Lima, Peru

Solutions Tomorrow

In Peru, as in many other Latin American countries, the informal occupation of land in periurban areas like slums results in a scarcity of suitable locations for proper housing, let alone agriculture. Basic water and drainage services are in deficit in the peripheral human settlements of these cities, and this situation will continue in view of the high cost of these facilities and the low income per household.

Located in the central coast of the country and on an extremely arid band of land in South America, Lima is a case that requires urgent attention. While the projected worldwide supply of fresh water in 2025 will be 5,100 m3/inhab/year (now 9,000 m^3), the Peruvian coast on that year we will have only 1,000 m^3/inhab/year of fresh water available. However, Lima has more than 1.1 million residents without this service; only 4% of the sewage in Lima is treated, the rest being dumped into the sea, the rivers or directly on the ground.

Public investment is necessary to provide service coverage to the for whom the number of socially excluded people who lack access to water and sanitation, but economic crisis forces investments to be directed to solve food emergencies, health and domestic production problems. However, the problem of feeding and caring for the health of populations living in extreme poverty will not be solved if people lack potable water and suffer from wastewater pollution. It is time for the state to promote policies focused on greater prevention, to be conscious that fresh water for human consumption is a non-renewable resource, and that this requires the enforcement of three national policies:

- to declare a state of emergency in the Peruvian sanitation sector, and to become aware of the gravity of the problem;
- to establish a campaign to change the attitude of the population regarding the irrational consumption of potable water, especially in the disposal of faeces and in urban irrigation; and finally
- to promote and support local governments in the implementation of systems to recycle treated grey water for urban agriculture.

SAN JUAN DE LURIGANCHO

In 1998, the Urban Development Institute CENCA assumed the challenge of fostering and promoting a sustainable attitude concerning the use of potable water in Peru, with excellent results. The promoted system has become a benchmark for alternative sanitation systems for local entities, and has an application in urban agriculture. Although it is still not consolidated as an explicit policy, the first steps towards acceptance have been taken.

Unfortunately, the prevailing model of water and drainage management is centred on a consumption-intensive, high profitability approach. This has resulted in an irrational exploitation of water, as it encourages consumer attitudes and technologies that are not responsive to the imbalance this could bring as well as the alteration of ecosystems. The described system promises to redu ce pollution, preserve the environment, while improving environmental education and awareness, generating household savings and providing inputs (water and compost) for urban agriculture. It is not exclusively for the poor, as other higher-income population groups can adopt it. At the same time, it takes into account the objective restrictions of access to the conventional system that

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Children in Lima gather around a "small plot" at school

Francisco Arroyo

many settlers will have during a good number of years. This implies that special attention must be given to the cultural aspects of the beneficiaries.

ECODESS

A pilot project is being executed in the district of San Juan de Lurigancho on environmental sanitation, called ECODESS, which stands for Ecology and Development with Sustainable Sanitation. It is a comprehensive micro-system of collection, treatment and recycling of household solid and liquid waste, divided into two sub-systems:

- A household system, which includes a bathroom, a sink and a grey water collection network, which in turn leads to a "grease-trapping chamber" and a phyto-treatment channel for filtration.
- A neighbourhood system that, combined with a second collection network, collects the water coming from all the plots that use the ECODESS system, and conveys it to a phyto-treatment channel, where it is filtered a second time before being stored in a cistern. From there it goes into the underground irrigation network used to keep green areas.

The conventional hydraulic conveyance system used in Peru and especially in Metropolitan Lima is a difficult problem to solve. The sustainability of this project, from a technical point of view, lies in the relative simplicity of its technology in terms of application, use and maintenance. Materials are easy to obtain, as they are available in the areas where the project is to be implemented.

Training by experts further guarantees the continuity of the process. The involvement of the Health Sector in local issues like the follow-up of the system is another element that will contribute to the adequate supervision of the project after the installation is completed. Organisational forms to involve the population in the operation of the system, such as the Environmental Management Committees and the Park Committees, ensure continuity. The raising of ecological awareness among the population as a whole and not only among direct users is important, but it is from the identification and commitment of the members of each household that the system becomes an immediate and long-term daily practice.

The costs are lower than those of the conventional system. This is basically related to the cost for the installation of the external network up to the front of the house, as conventional drainage represents expenses of no less than US $600 per dwelling, while for ECODESS, the expense to be covered by each household for the external installation does not exceed 150 dollars. On the other hand, the system of environmental dry toilets, or eco-toilets, entails significant savings in the household consumption of water, and provides inputs to improve the gardens and arable lots. Currently, more than 100 dwellings in settlements of the district of San Juan de Lurigancho are using this system, and the surface of irrigated land extends over 700m^2. An analysis of costs made by the Municipality of San Juan de Lurigancho reveals that the monthly expenditures made to convey irrigation water to 40% of park areas in the district would serve to set up eight new parks with an area of 400 m^2, complete with irrigation systems using phyto-treated grey water. The local water-recycling system used to irrigate urban green areas and urban agriculture plots is an alternative that can replace oxidation pools in small spaces or slums, as these require large areas and high costs.

The recycling of wastewater favours the state of the urban ecosystem. Furthermore, this intervention generates both temporary and permanent jobs, as well as a local market for inputs and by-products, like a small company that manufactures eco-toilets, phyto-treatment channels, grease-trapping mechanisms, fertilisers like compost, and greenhouses in green areas and for urban agriculture.

FUTURE CHALLENGES

The challenges relate to the implementation of a long-term strategy to consolidate a policy, or rather a discipline, for the consumption of water and its sustainable treatment. This policy must include the fact that Lima is a water-stressed area, and that by the year 2015, expenses to overcome this crisis will be greater.

ECODESS is only one tool in this challenge. There are other tools to assist in this process. However, from the perspective of environmental sanitation and recycling of water for green areas and urban agriculture, the goal of these strategies is to consolidate a policy of sustainable sanitation and rational water use. The institutions involved in ECODESS are committed to carrying out the following actions:

- Establishment of a Group of National Work in Ecological Sanitation; with universities, NGOs, environmental movements, urban agriculture practitioners and local governments. Promoting urban environmental management practices with local perspective, involving local organizations.
- Dissemination of information on the system and its advantages at all levels, social sectors and in both urban and rural areas.
- Technical training of functionaries and technicians in several institutions on water, sanitation, health, urban agricultural production, food security and local management of the urban environment.
- Influencing the development of adequate regulations. Pilot experiences must contribute to generate regulations that give more openness to these systems.
- Environmental education, especially in schools, focusing on changes in the attitude of people should be one of the key elements required to change environmental management practices.

Ecological Sanitation and Urban Agriculture

Local treatment and recycling of sewage (soapy "grey" water) and the reduction or even non-generation of wastewater are viable options that should be considered and supported within a municipal policy of sanitation and sewerage systems, that also takes urban agriculture into the equation.

Such solutions are legitimate, especially since many municipalities lack the capacity to provide costly drainage works and water-treatment plants, even in the more economic and viable versions, such as stabilisation ponds. This is especially true for the urban zones located in steep and/or stony terrains, as well as for those municipalities with problems of water supply. In Latin America and the Caribbean, this counts for 60% of the cities.

The main challenge for this type of solution is the need to provide information, set up demonstration sites with families and/or public institutions, organise meetings and participatory workshops to analyse the problems and their possible solutions, and to establish municipal incentives for those who adopt these technologies, as contributions of building materials and/or rebates in property taxes or water charges.

A CHANGE OF PARADIGM

Ecological sanitation is an alternative to the linear "solutions" to carry waste (excreta, soapy water, industrial water, etc.) to rivers, ponds, underground waters and seas that cause serious problems of pollution and public health. In municipalities with water shortages and a lack of other resources, it is neither viable nor recommended to "use 15,000 litres of treated or potable water per person per annum to evacuate 35 kg of faeces and 500 litres of urine *per capita* each year. In developing countries, more than 90% of the sewage is discharged without treatment" (Esrey, *et al.,* 2001: 13).

Ecological sanitation also forms a viable alternative to "latrines", the conventional solution for poor people in developing countries. This "drop and deposit" model encounters serious problems, especially in densely populated areas where the subsoil is impermeable, aquifers are shallow, or are prone to flooding. There is the risk that groundwater will become contaminated with pathogens like nitrates, leading to the pollution of potable water as well as irrigation water used for urban agriculture.

Ecological sanitation is based on an ecosystems approach. The nutrients and organic matter contained in human excreta must be considered as a resource and properly treated for its contribution to food-production systems. Ecological sanitation further allows for recovering and recycling nutrients in a safe and non-polluting way, with zero discharge. This is especially relevant in its relationship with urban agriculture, as it allows for a closing the cycle of nutrients, facilitating the cultivation of legumes and other vegetables in an ecological way, without agrochemicals (*see Figure 1*). This technology addresses households and requires community involvement. Ecological sanitation further serves to improve the family diet and its economy, as well as the self-esteem of its members. It also strengthens beneficial, responsible and committed community relations.

The proposed techniques include:

- Dry toilets with diversion of urine.
- Gravel, sand and purifying aquatic plant filters.
- Composting, which gives a secondary treatment to solid excreta from dry toilets.
- *Organoponics:* a production system that uses urine as its main source of fertilisers.

The "*Organoponics*" technique developed in Mexico by CEDICAR A.C. (Arroyo, 2000) consists of the production of small gardens in containers using urine as a liquid fertiliser, and soapy water that is filtered domestically to irrigate the gardens.

THE MEXICAN EXPERIENCE

In Mexico, several experiences have been recorded regarding the implementation of ecological sanitation programmes. The more negative experiences result from the implementation of technologies without prior work in the communities. This is often the case with unilateral initiatives by local governments, which although well intentioned, are felt as an imposition. To some extent they are not connected to the expectations of the population and therefore rejected. As a result, many dry toilets, for example, are now used as sheds or small chicken coops.

The more positive experiences mostly coincide with preparatory work having been carried out with user populations, including: demonstration sites in the same community or visits to other communities that have adopted these technologies; community diagnostic workshops with an emphasis on ecological considerations; collective analysis of problems and possible solutions in which the advantages, disadvantages, viability and freedom to adopt the technology and its methods are discussed and decided upon by each household. Although this point is the most important, local governments or other central government units must give additional incentives or assistance in order to build dry toilets, install grey water filters and collectors to catch rainwater.

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REFERENCES
- Arroyo, Francisco. 2000. *Organoponia. Un sistema de producción adecuado a la agricultura urbana.* CEDICAR AC, Mexico.
- Ersey, SA, et al. 2001. *Cerrando el ciclo. Saneamiento ecológico para la seguridad alimentaria.* UNDP, Sida, Mexico.

Aba is a booming commercial city in southeast Nigeria. It covers a surface area of about 40,000 km2 and has a population of more than 1 million people according to the 1991 population census of Nigeria. The city is presently experiencing a quick and unplanned growing spurt due to massive migration. Several large companies present, including Unilever, International Equitable, Coca Cola, Nigerian Breweries, etc., medium-sized paint-manufacturing, beverage and food-processing industries, as well as a huge amount of smaller industries. These companies together generate a large volume of wastewater.

IWMI-India

Upper Anicut, a dam in Musi River, Hyderabad

Wastewater Non-Management

in Aba City, Nigeria

There are many people within the urban and periurban areas of Aba who engage in different forms of crop production, which include arable crops, vegetables and horticulture. Most of these agricultural practices are rainfed because Aba has a regular distribution of rain. But there is also irrigated agriculture especially during the dry season (between the months of October and March). Dry-season vegetable production yields much higher profits. The main sources of irrigation water of agricultural sites in the urban and periurban areas of the city include the Aba River, open drains carrying water from the main roads and household wastewaters. The Aba River accounts for about 90% of the total sources.

RESULTS OF WASTEWATER NON-MANAGEMENT

Due to the poor wastewater-management system in the city, Aba River is heavily polluted with both toxic and heavy metals from industrial wastewater. There is no central sewerage system and there are no septic tanks for domestic wastewater. The sewers for industrial wastewater coming from big industries and the open drains used for the wastewater of medium- and small-scale industries are channelled in such a way that their contents spill into the Aba River.

This pollution of the Aba River is very likely to increase in the next decade. There is inadequate or hardly any treatment of the waste-water carried out by the industries, and no efforts are made to change this situation. Information on basic waste-management techniques is inadequately provided to industry and there are no financial/ technical incentives in place for industries to manage their wastewater.

The locations of the industries are unplanned, and most of the industries are even illegally operating in the city since they are not registered with the relevant body: the Environmental Health Sanitation Authority (EHSA). There is no dialogue between the (financial department of the) municipality and the EHSA towards in granting approval for the establishment of industries. The EHSA is not able to effectively monitor the industry due to the lack of proper legislation, and it faces inadequate capacity in terms of manpower, training and tools.

RECOMMENDATIONS FOR IMPROVEMENT

The following measures, if well implemented, will assist in improving the city's wastewater management:

- Local authorities should review the existing waste-management regulations and adapt or develop them, especially towards making them more stringent to offenders.
- Registration with the EHSA should be mandatory for all industries.
- Effective monitoring of industries should be ensured by employing more people and by providing them with relevant training.
- Provision of (information on) waste-minimisation techniques to industries should be sought.
- Economic incentives should be given to industries that are willing to implement waste-minimisation strategies but lack the required capital.

NGOs can and should contribute to the encouragement of proper wastewater management, for instance by organising workshops and seminars for industry and government on the importance of proper waste management, on technical and/or economic measures, as well as by studying and monitoring the current situation and to inform the public about pollution and about those industries that effectively have implemented waste minimisation.

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Policy Brief

Treatment and Use of Wastewater for Urban Agriculture

THE FORMULATION OF MUNICIPAL POLICIES FOR URBAN AGRICULTURE

Increasingly, municipal governments are interested in urban agriculture for its benefits in the areas of food security, health, environment and employment. This series of guidelines is based on the latest scientific and technological developments and innovative practices experienced in cities throughout the Latin American Region. This is a good source of inspiration to share and improve.

"Using wastewater has become an alternative in view of the lack of access to potable water services in periurban and rural areas. It also responds to the immediate needs of the population". Donatilda Gamarra. Town Councillor and President of the Special Environmental Programme Committee, Municipal District of Villa El Salvador, Peru.

Developing programmes for the treatment and use of wastewater for urban agriculture basically involves managing health risks and facilitating the adoption of adequate technologies at city or neighbourhood level while optimising their benefits. Adopting facilitating policies and defining the financial sustainability of wastewater treatment and use systems is necessary.

TEN ACTIONS IN POLICY FORMULATION

1. Applying risk management strategies

In many cases, wastewater is the only source of water for irrigation. Once this reality is accepted, guidelines and mechanisms must be developed in the first place, in order to decrease the health risks associated with the use of untreated wastewater for agriculture, and then the treatment thereof must be promoted.

2. Educational and political campaigns

Many people think that participatory awareness-raising or information campaigns targeted at several actors are the most realistic, cheap and effective way to facilitate the understanding of existing strategies for the management of health risks. These strategies include monitoring water quality, choosing crops, adequate management of irrigation techniques, and treatment of produce.

3. Monitoring water quality

In San Juan de Lurigancho (in Lima, Peru), the NGO CENCA and the municipal government reached an agreement with the Agrarian University of La Molina for the monitoring of the quality of wastewater used for agriculture in the city.

4. Choice of crops

Choosing crops to grow in relation with the quality of wastewater is a key factor, because there are large variations in the way plants absorb pathogens and heavy metals.

5. Applying adequate irrigation and crop-treatment techniques

Adoption of adequate technologies for the treatment of wastewater is important. The flows of industrial and domestic wastewater must be properly segregated.

6. Choosing a treatment technology

The most interesting treatment options are those that eliminate pathogens but retain the nutrients present in the water. An example of this is found in stabilisation ponds, which are also a good alternative to the treatment and use of water at a city scale. Investment costs are up to 80% lower and operation costs are up to 90% lower than costs associated with more sophisticated technologies, such as aerated or mud-activated plants. However, stabilisation ponds require large areas of urban land. There are other alternative sanitation systems, which have been extensively tested in several cities in the region.

7. Changing policies and establishing a facilitating regulatory framework

The treatment and use of wastewater must be part of a coherent and facilitating legal and regulatory framework, aimed at including it in the physical planning of cities.

8. Incorporating treatment and use into urban planning

In the District of Villa El Salvador (Lima, Peru), the municipal government incorporated the construction of treatment plants and the use of wastewater for irrigation in collective leisure areas, like Parque de la Alameda de la Juventud, into its Urban Development Plan. The local government is currently analysing the possibility of setting aside spaces in the same area for family or community UA plots. However, the use of urban land for this purpose requires careful planning.

9. Determining financial sustainability and calculating costs and benefits

In order to make the implementation of treatment plants economically sustainable, integrated wastewater treatment and use systems must be developed. It is important to calculate all the direct and indirect costs and benefits of the system and to define who should assume the costs of treating and using wastewater.

10. Defining the price for wastewater treatment and use

Applying the "polluter pays" principle must be a priority: both the local industries and the urban population must assume the cost of treating the wastewater they generate. At the same time, farmers must pay for the use of treated water, just like they pay to use fresh or potable water. Only in cases of low-income and marginalised producers, should the cost be assumed by the central or local government as a social inclusion policy.

(Summary by Mariëlle Dubbeling, UMP-LAC)

More Information

This Policy Paper is part of a series of 9 papers on urban agriculture: ❖ Urban Agriculture: an on-going urban activity ❖ Harvesting democracy: local consultative processes in UA ❖ UA, land management and physical planning ❖ The hidden investment: the implementation of micro-credit programmes in UA ❖ Giving use to what is discarded as useless: using organic waste in UA ❖ Treatment and use of wastewater for UA ❖ Urban agriculture: equal opportunities for men and women ❖ UA and urban food security ❖ Strengthening small agribusinesses: processing and commercialisation of UA.

The Series has been validated through Local Multi-stakeholder Consultations carried out in 10 cities in Latin America and the Caribbean and at a Regional Consultation conducted in Lima, Peru (on September 11-13, 2002), where representatives of several local and national governments and civil society were present. The entire series are in Spanish and available on the web page of the Urban Management Programme for Latin America and the Caribbean: www.pgualc.org.

Livestock and **Urban Waste** in East Africa

Rapid urbanisation has not been accompanied by equitable economic growth and has resulted in increased urban poverty. As a result of this worsening of urban poverty, many low-income households suffer from extremely limited livelihood security. Increasing demand for land in cities for housing favours urban livestock keeping, as it requires less or no land and promises higher returns per unit of land utilised.

REFERENCES
- Ishani, Z, PK Gathuru and D Lamba. 2002. Scoping study of Urban and Peri-urban poor livestock keepers in Nairobi, Mazingira Institute, Kenya.
- Ossiya, S, N Ishagi, L Aliguma and C Aisu. 2002. Urban and Peri-urban livestock keeping in Kampala City – a scoping study. Ibaren Konsultants, Kampala, Uganda.

This study was commissioned and financed by DFID's Livestock Production Programme, UK, and is based on five city case studies, which have been conducted by local research teams (for further details please refer to the full document which can be found on: ***www.nida.or.ug***

A workshop on these experiences will be organised by DFID, NRI and the LPP Partners and supported by RUAF in Nairobi, Kenya: January 27-30, 2003.

Compared to urban crop production, livestock can be shifted easily to other urban areas as they become available. The urban poor engage in urban livestock keeping as a response to limited alternative livelihood options and food insecurity, but they often lack control over and access to basic inputs.

LIVESTOCK AND LIVELIHOODS IN EAST AFRICA

With the objectives to understand the current situation of poor urban livestock keepers in East Africa, and to identify areas where future research could make a contribution to the development and promotion of this activity for the poor, five city case studies were selected in Tanzania, Uganda, Kenya and Ethiopia. The cities were Dar es Saalam, Kampala, Kisumu, Nairobi, and Addis Ababa.

The case studies reveal that urban livestock keeping benefits the poor and provides an accessible means of diversifying livelihood activities. Furthermore they show that especially vulnerable groups, such as female-headed households, children, retired people, widows and people with limited formal education are particularly involved in urban livestock keeping as a form of social security strategy (Ossiya et al. 2002). Urban livestock keeping contributes to food security, income and employment generation, savings and insurance systems and social status. It provides easily convertible assets for covering important expenditures (such as school fees, health treatments).

LIVESTOCK AND WASTE

There are also, however, various externalities involved in livestock keeping (e.g. zoonoses, environmental contamination, product safety) which require addressing. There is **strong evidence** from all the case studies **that animal waste disposal causes environmental and public health dangers** (Ishani, *et al.*, 2002). Urban livestock keeping also competes for water resources with human consumption as the demand for water for this activity is not taken into account by the supply services. In many slum areas, municipal water has to be bought and therefore other water sources, which are often contaminated, are accessed for livestock and men.

RECOMMENDATIONS FOR RESEARCH AND POLICY

Research studies are required to assess in more detail the current and potential impact these negative externalities have on urban people and to contribute to the development of strategies to overcome or minimise them.

Livestock waste management

Research is necessary to understand how water and public health problems will develop with increasing livestock numbers and over time. Parallel to understanding the scope and dimensions of this problem, research is required to provide improved waste-management technologies adapted to the specific circumstances of the poor. An important research component would be the potential for the intensification of urban/periurban and rural linkages in terms of nutrient flow.

Water availability

Currently, city planners do not take into account the water demands of urban livestock keepers. This results in competition for resources, overuse and conflicts between neighbours. Studies are needed which quantify the current and future water demand by urban livestock keeping, and to identify potential water management strategies.

Zoonoses

The existing and potential health risks for humans caused by the transmission of diseases from livestock have to be assessed in greater detail. Relevant information is needed to advise policy-makers and city authorities on these issues in order to provide guidance for the formulation of pro-poor urban livestock legislation. Aspects related to zoonoses, which need to be taken into account for the formulation of new legislation is food quality standards and quality control processes.

The study also shows that poor livestock keepers are marginalised from existing knowledge and improved technologies. There is a clear opportunity to improve the current management system through capacity development and information sharing. However, in order to achieve this, organisation and networking among poor livestock keepers is required to improve the access to services, information, technologies and markets.

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Abbreviations and Definitions

- **BOD** Biochemical Oxygen Demand
- **COD** Chemical Oxygen Demand
- **TSS** Total Suspended Solids
- **TDS** Total Dissolved Solids
- **Grey water** (domestic) wastewater from kitchen and bathroom
- **Black water** wastewater with excreta, urine and associated sludge
- **Sludge** is the settled matter after stabilisation of organic matter in wastewater through some process. It may have an offensive odour and a mud-like appearance.
- **Faecal coliforms** are bacteria found in the faeces of warm blooded animals; the numbers found in water indicate the level of faecal or sewage pollution and the numbers found in treated wastewater indicate the effectiveness of wastewater treatment.
- **Intestinal Nematodes** the most common are round worms, hookworms, and whipworms which carry the highest risk of infection.
- **Guideline limits** indicate the maximum level of pollution at which persons would not be at risk of infection. For restricted irrigation, no more than one viable human intestinal nematode egg per litre is permissible, whereas for unrestricted irrigation additionally no more than one thousand faecal coliform bacteria per hundred millilitres are allowed.
- **Wastewater stabilisation ponds** comprise one or more series of anaerobic, facultative and maturation ponds. They consist of shallow, usually rectangular “lakes” into which wastewater continuously flows and from which a stabilised effluent is discharged. Anaerobic and facultative ponds are primarily for the removal of organic matter, although they are very effective in removing intestinal nematode eggs. Maturation ponds are used mainly for the removal of excreted bacteria and viruses.
- **Bioremediaton** is accomplished through the use of plants and trees that uptake water and reduce nitrogen and host microbial organisms and some heavy metals in the water.
- Other **alternative methods** consist of gravel, reeds or vetiver grass which serve as filtration mechanisms as well as to reduce the amount of nitrogen in the water. These are sometimes combined with the use of water hyacinth or duckweed as bioremediators and with solar radiation aquatic ponds that kill pathogens.
- **Restricted irrigation** applies to water used for irrigating a restricted range of crops, for example, cereals, fodder crops, pasture, trees, and crops, which are processed before consumption.
- **Unrestricted irrigation** refers to water that can be used to grow any crops using any irrigation method without health risks including crops that can be eaten raw.
- **Diluted** Effluent mixed with other water before use in irrigation.
- **Undiluted** No significant dilution of the effluent in a river or other water body before use in irrigation.
- **Formal use** Use of wastewater with a certain level of permission or potential control by state agencies (alse suggested are: Authorised and Planned use).
- **Informal use** Use of wastewater without permission and control by state agencies (alse suggested are: Unauthorised and Unplanned use).

WATER MANAGEMENT IN ISLAM.

Faruqui, Naser I, Asit K Biswas and Murad J Bino. 2001. United Nations University Press and International Development Research Centre, Ottawa, Canada.

This volume presents Islamic perspectives on a number of proposed water-management policies, including water-demand management, wastewater reuse, and higher tariffs. The book opens avenues for a wider dialogue amongst researchers working at identifying the most promising water-management policies, adds to our knowledge of some of the influences on formal policy and informal practice, and makes these ideals available to a broader public. *Water Management in Islam* will interest researchers, scholars, and students in natural resource management, Islamic studies, Middle Eastern studies, development studies, and public policy.

VISITE D'ETUDE ET ATELIER INTERNATIONAL SUR LA RÉUTILISATION DES EAUX USÉES EN AGRICULTURE URBAINE: UN DÉFI POUR LES MUNICIPALITÉS EN AFRIQUE DE L'OUEST ET DU CENTRE

2002 CREPA, ETC-RUAF. CTA. (In French: English Title, Study Visit and International Workshop on the Reuse of Wastewater for Urban Agriculture). Proceedings of the study visit cum workshop held in Ouagadougou, Burkina Faso from 3-7 June 2002. This report contains ten papers (three general subjects and seven city case studies) and a detailed description of the workshop and the study visits in and around Ouagadougou. All activities are reported from three angles, which reflect the main themes: socio-economical aspects, health and environmental aspects and institutional, juridical and financial aspects. The working group findings are presented together with a set of recommendations to various groups of stakeholders. The represented cities are Cotonou, Benin; Kumasi, Ghana; Dakar, Senegal; Nouakchott, Mauretania, Bamako, Mali; Yaounde, Cameroon and Ouagadougou, Burkina Faso.

A FRAMEWORK FOR ANALYZING SOCIOECONOMIC, HEALTH AND ENVIRONMENTAL IMPACTS OF WASTEWATER USE IN AGRICULTURE IN DEVELOPING COUNTRIES

Hussain, I, L Raschid, MA Hanjra, F Marikar and W van der Hoek. 2002. IWMI Working Paper 26. International Water Management Institute, Colombo, Sri Lanka.

www.cgiar.org/iwmi/pubs/working/WOR26.pdf

The biggest challenge faced by policy-makers at present, is how best to minimise the negative effects of wastewater use, while at the same time obtain the maximum benefits from this resource. While most of the impacts of wastewater use, both negative as well as positive, are generally known, a comprehensive evaluation of the benefits and costs of these impacts has not as yet been attempted. Conventional cost-benefit analysis is not adequate to evaluate wastewater impact due to its environmental and "public good" nature. To fill this gap in knowledge, this paper attempts to develop a comprehensive assessment framework applying available and tested techniques in environmental economic analysis, for the comprehensive evaluation of the costs and benefits of wastewater. The periurban area of Faisalabad, Pakistan is chosen to represent this context.

GUIDELINES FOR WASTEWATER REUSE IN AGRICULTURE AND AQUACULTURE: RECOMMENDED REVISIONS BASED ON NEW RESEARCH EVIDENCE

Blumenthal, Ursula J, Anne Peasey, Guillermo Ruiz-Palacio and Duncan D Mara. 2000. Report summary of WELL Task No. 68 (Part 1). London School of Hygiene & Tropical Medicine, Loughborough University, UK (67 pp).

www.lboro.ac.uk/well/resources/well-studies/summaries-htm/task0068i.htm

WELL is the **DFID**-funded resource centre promoting environmental health and well-being in developing and transitional countries. WELL is designed to coordinate and provide services for water, sanitation and environmental health programmes to DFID and other agencies. The WELL website is a focal point of information about water and environmental health and related issues in developing and transitional countries. This study reviews the WHO (1989) Guidelines for Wastewater Reuse in Agriculture and Aquaculture in the light of recent epidemiological studies.

ÉPURATION DES EAUX USÉES ET L'AGRICULTURE URBAINE (WASTEWATER TREATMENT AND URBAN AGRICULTURE)

M Gaye and S Niang. 2002. ENDA Tiers Monde, Dakar, Sénégal (354 pp). *(In French)*

This book gives detailed insights into wastewater research and treatment in Senegal. It has three parts: 1) Sanitation policies in Senegal and participation of the inhabitants in the demand management; 2) making use of wastewater for urban agriculture in Dakar; 3) treatment efficiency of wastewater through stabilisation ponds. It gives an overview of water and sanitation in Africa and Senegal in particular: relevant institutions, existing policies and treatment efforts. A project of ENDA Senegal is described in more detail, discussing the revolving fund, the involvement of the population as well as the collection and treatment of domestic wastewater. Part two reviews the use of wastewater in urban agriculture; one source is real wastewater, the other comes from shallow natural wells (*Céans*) from which the water is seen as clean but in fact contains much the same pollutants as wastewater. Part three describes the treatment plants of Castors and Diokoul and their efficiency in removing pollutants and pathogens. Thanks to the details and description of methodologies in this book, it can serve well for anybody wanting to undertake a similar wastewater-treatment *cum* -reuse research in another sub-Saharan country.

THE MANGO CITY: URBAN AGRICULTURE IN BELÉM

Isabel Maria Madaleno. 2002. *In Portuguese: A Cidade das Mangueiras: Agricultura Urbana em Belém do Pará,* which can be purchased through **www.gulbenkian.pt, educa@gulbenkian.pt**, or directly from FUNDAÇÃO CALOUSTE GULBENKIAN – Av. De Berna, 45 A – 1067-001 Lisboa, Portugal.

The wettest city in Brazil, Belém - also known as the "mango city" - has more than one million inhabitants. Its natural environment is dominated by islands, deep rivers and narrow green waterways, and by plain alluvial soils suitable for almost any kind of vegetable crops. This book describes the evolution of the metropolis, explaining how what we see in the very many illustrations is deeply intertwined with the history of the country, about the human occupation and devastation of Amazonia, focusing in particular on Brazilian Pará. It is a tribute paid to a hard-working and ingenious people, who against all odds survive in one of the poorest metropolises in Latin America, frequently complementing

Books

their monthly income with fruits, herbs, spices, medicinal plants, and all sorts of animals.

TIERRA VACANTE EN LAS CIUDADES LATINOAMERICANAS

(Vacant Land in Latin American Cities) Nora Clichevsky (ed.). 2002. (*In Spanish*). Lincoln Institute of Land Policy Information Services, Cambridge, USA (144 pp). US$15.00. ISBN 1-55844-149-2 (Fax: 617-661-7235 or 800-526-3944; e-mail: help@lincolninst.edu; or website: **www.lincolninst.edu**)

This book identifies the many problems related to vacant urban land, as well as the opportunities that it presents. It is the culmination of a research project coordinated by the editor between 1997 and 1999, in which the issues around vacant land in five cities (Buenos Aires, Argentina; Rio de Janeiro, Brazil; Quito, Ecuador; Lima, Peru; and San Salvador, El Salvador) were analysed and compared. A great variety of vacant land situations coexist in Latin American cities, but there are common threads throughout the region. The problems derived from vacant lots include increased costs for the provision of infrastructure in low-density areas, as well as long commutes and high transportation costs related to growth further from the urban centre. The essays suggest that, at this moment when urban planning and management are being refined in many Latin American countries, vacant land could play an important role in the dynamics of cities and metropolitan areas. The creative use of vacant land could be beneficial to all social sectors.

Selected Publications by IWMI

(www.cgiar.org/iwmi/pubs)

- **Urban Wastewater: A Valuable Resource for Agriculture: A Case Study from Haroonabad, Pakistan** Van der Hoek, Wim, Mehmood UlHassan, Jeroen Ensink, Sabiena Feenstra, Liqa Raschid-Sally, Sarfraz Munir, Rizwan Aslam, Nazim Ali, Raheela Hussain and Yutaka Matsuno. Research Report 63. International Water Management Institute.
- **Use of Untreated Wastewater in Periurban Agriculture in Pakistan: Risks and Opportunities** Ensink, HJ Jeroen, Wim van der Hoek, Yutaka Matsuno, Sarfraz Munir and M. Rizwan Aslam. Forthcoming. Research Report 64. International Water Management Institute.
- **Health Risks of Irrigation with Untreated Urban Wastewater in the Southern Punjab, Pakistan** Feenstra, Sabiena, Raheela Hussain and Wim van der Hoek. 2000. The Institute of Public Health, Lahore, Pakistan and Pakistan Program, International Water Management Institute.
- **Urban-Wastewater Reuse for Crop Production in the Water-Short Guanajuato River Basin, Mexico** Scott, C.A., J. Antonio Zarazua and G. Levine. 2000. Research Report no. 41, International Water Management Institute, Colombo, Sri Lanka (34 pp).
- **Wastewater Reuse in Agriculture in Vietnam: Water Management, Environment and Human Health Aspects - Proceedings of a Workshop held in Hanoi, Vietnam, 14 March 2001** Raschid-Sally, Liqa, Wim van der Hoek and Mala Ranawaka (eds). 2001. IWMI Working Paper 30. International Water Management Institute, Colombo, Sri Lanka (48 pp).
- **For us, this Water is Life: Irrigation Under Adverse Conditions in Mexico. In: Buechler, S., Water and Guanajuato's Ejido Agriculture: Resource Access, Exclusion and Multiple Livelihoods** Buechler, Stephanie. 2001. PhD dissertation. Sociology. Binghamton University, Binghamton, New York, USA.
- **Wastewater Use in Agriculture: Review of Impacts and Methodological Issues in Valuing Impacts.** Hussain, Intizar, Liqa Raschid, Munir A Hanjra, Fuard Marikar and Wim van der Hoek. 2002. Working Paper no. 37. International Water Management Institute. Colombo, Sri Lanka.

Websites

www.cgiar.org/iwmi/

A major source of information on the topic of water is the International Water Management Institute, whose mandate is "improving water and land resources management for food, livelihoods and nature. Their site provides a number of updates, policy papers, publications as well as a free subscription to their electronic bulletins.

www.iwapublishing.com/template.cfm?name=water_intelligence_online

International Water Association (IWA-) Publishing provides information services on all aspects of water, wastewater and related environmental fields. It includes *Water21*, the IWA membership magazine, and a broad range of journals, books, scientific & technical reports, manuals, newsletters and electronic services. *Water Intelligence Online* is a new online service providing access to a wide selection of valuable information. Also available are the abstracts of the papers from the Workshop: "Use of Appropriately Treated Domestic Wastewater in Irrigated Agriculture", Wageningen University, The Netherlands (April 24, 2002).

www.cleanh2o.com/ww/

This wastewater engineering virtual library (VL) is part of the VL, which is one of the oldest web-based catalogues. Unlike commercial catalogues, it is run by a loose confederation of volunteers, who compile pages of key links for particular areas in which they have expertise. This part of the VL is focused on the USA.

www.sandec.ch

SANDEC is the Department of Water and Sanitation in Developing Countries at the Swiss Federal Institute for Environmental Science and Technology (EAWAG ***www.eawag.ch/e_welcome.html***) in Duebendorf, Switzerland. Its activities centre on problems of sustainable development in economically less developed countries. Its mandate is to assist in developing appropriate and sustainable water and sanitation concepts and technologies adapted to the different physical and socio-economic conditions prevailing in developing countries. The SANDEC research activities focus on use of waste, wastewater and as a recent topic: urban agriculture.

www.cepis.ops-oms.org

The website of the Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente (the Pan American Centre for Sanitary Engineering and Environmental Sciences) is in Spanish and English and focused on Latin America. It contains a wealth of information on publicationd, events, training materials, etc.

weather.nmsu.edu/hydrology/wastewater/

The *Middle East Wastewater Use Clearinghouse* is a site established to promote knowledge about the use of wastewater on agricultural land to increase the limited water resources available in the Middle East. The project is a cooperative effort of San Diego State University's Middle East Development programme, the Peres Centre for Peace and the International Arid Lands Consortium, and is supported by USAID. The site has information on the project and related issues.

www.ihia.org.uk/

The International Health Impact Assessment Consortium (IMPACT) is a multi-agency partnership formed to help further the research, study and practice of Health Impact Assessments.

EVENTS

METHODOLOGIES FOR RISK ASSESSMENT OF WASTEWATER REUSE ON GROUNDWATER QUALITY (Sapporo, Japan)

30 June – 11 July 2003

This symposium is part of the 33rd General Assembly of the International Union of Geodesy and Geophysics. Subjects include: threshold value of soil degradation under wastewater application, processes in the soil, crop production and quality, risk for human health.
More information: Mr Steenvoorden of ALTERRA, The Netherlands; e-mail: j.h.a.m.steenvoorden@alterra.wag-ur.nl

FIFTH MEETING ON ORGANIC AGRICULTURE (Havana, Cuba)

27-30 May 2003

Organised by the ACTAF (Cuban Association of Agricultural and Forestry Engineers), this conference will discuss new experiences related to integrated systems of natural resource management, appropriate technologies, social and economic aspects, environmental aspects, and the contribution of (organic) urban agriculture to sustainable urban development. The conference language will be Spanish.
More information: Nilda Pérez Consuegra: nilda@isch.edu.cu

COURSE ON URBAN AGRICULTURE AND SUSTAINABLE DEVELOPMENT (Santa Maria, Brazil)

May 2003

This course is being planned by the Research Group on Tourism and Development of Camobi. Email: turodes@ccr.ufsm.br Or by mail: Grupo Turismo e Desenvolvimento; Caixa Postal 5042 – Camobi; CEP 97.111-970 - Santa Maria – RS, Brazil.

2ND INTERNATIONAL SYMPOSIUM ON ECOLOGICAL SANITATION "ECOSAN - CLOSING THE LOOP" (Lübeck, Germany)

7-11 April 2003

Conventional forms of centralised sanitation are coming under increasing criticism. Especially because of the enormous investment involved, the huge operating and maintenance costs, high water consumption and other drawbacks, they are not suitable as a blanket solution for developing countries, particularly in arid climate zones. The GTZ sector project on ecosan has started in May 2001. The objective is to investigate ecosan systems, establish them in national and international guidelines and prepare them for dissemination. During this Symposium a conference on Sustainable Sanitation will be held.
www.gtz.de/ecosan/english/symposium2.htm

WORLD WATER FORUM (Kyoto, Japan)

16-23 March 2003

The Third World Water Forum will be held in Japan (Kyoto, Shiga and Osaka, who share the water resources of the Lake Biwa-Yodo River Basin). The forum is gathering submissions through a range of activities including Regional Conferences on individual themes in various regions around the world and the publishing of the World Water Action Report. The Virtual Water Forum is providing a discussion platform. The session can be accessed at the World Water Forum website www.worldwaterforum.org/for/en/fshow.393 You can enter this session as a guest or register as a participant, in which event the WWF will send you the necessary ID and password. More information: www.worldwaterforum.org

IDRC WATER DEMAND FORUM NO. 4 ON DECENTRALISATION OF WATER MANAGEMENT (Cairo, Egypt)

3-5 February 2003

The International Development Research Centre is supporting the promotion of water-demand management strategies through the WDM Forum. A series of Water Demand Management Forums have been organised. Wastewater Reuse, Water Valuation, Public-Private partnerships and Decentralisation of water management. The Fourth Forum on *Decentralisation of water management* is aimed at decision-makers from the Middle East and North Africa. The First Water Demand Forum was held in **Rabat Morocco, 26-27 March 2002** and focused on Wastewater Reuse. The second forum focused on Valuation and was held in **Beirut Lebanon, 25-27 June 2002**, and the third on Public-Private Partnerships was held in Amman, Jordan 15-17 October. For more information please visit www.idrc.ca/waterdemand/

WATER, POVERTY, AND PRODUCTIVE USES OF WATER AT THE HOUSEHOLD LEVEL (Johannesburg, South Africa)

21-23 January 2003

This International symposium will discuss practical experiences, new research, and policy implications, from innovative approaches to the provision and use of household water supplies. Please contact one of the symposium organisers: IRC International Water and Sanitation Centre, Delft, The Netherlands (Dr PB Moriarty : moriarty@irc.nl); or the Department of Water Affairs and Forestry, South Africa
(B Schreiner or D Versfeld).

WATER AND WASTEWATER: PERSPECTIVES OF DEVELOPING COUNTRIES (New Delhi, India)

11-13 December 2002

This conference aimed to focus on the various inter-linked aspects of water availability to provide a forum for chalking out strategies that may be useful to the developing countries. For information, please contact: Prof. Rema Devi Organising Secretary WAPDEC wapdec2002@yahoo.com Their website is www.iitd.ac.in/wapdec.

ENVIRONMENTAL AND PUBLIC HEALTH RISKS FROM URBAN, INDUSTRIAL AND NATURAL SOURCES IN SOUTH EAST ASIA (Hanoi, Vietnam)

10-12 December 2002

This Seminar is organised jointly by UN-ESCAP, IWMI and the National Institute for Soils and Fertilisers (NISF). More information can be obtained from NISF (ncvinh-nisf@ftp.vn) or UN-ESCAP (wees.unesscap@un.org).

WASTEWATER USE IN IRRIGATED AGRICULTURE: CONFRONTING THE LIVELIHOOD AND ENVIRONMENTAL REALITIES (Hyderabad, India)

11-14 November 2002

See the report as well as the Hyderabad Declaration on page 4.

GREEN CITIES, SUSTAINABLE CITIES CONGRESS (Midrand - Johannesburg, South Africa)

18-21 November 2002

The following subjects were discussed: Sustainable Urban Greening and Sustainable Development; Social Implications; Poverty Alleviation and Economics; Technical Aspects.

For more information, contact the Green Cities Congress Secretariat: Van der Walt & Co, Randburg, South Africa: Tel: +27 11 789-1384; Fax: +27 11 789-1385; e-mail ierm@vdw.co.za; www.ierm.org.za/greencities/

ECOLABELS AND THE GREENING OF THE FOOD MARKET (Boston, Massachusetts, USA)

November 7-9, 2002

This conference, organised by Tufts University and US Department of Agriculture, was a response to the rapidly growing use of ecolabels, which has raised several questions: How credible are they? More information: visit www.nutrition.tufts.edu/conted/ecolabels

EXCHANGE MEETING AND SEMINAR ON URBAN AGRICULTURE (Ath, Belgium)

23-26 September 2002

This seminar was organised by the Haute École Provinciale du Hainaut Occidental (Ath), Institut de la Vie (Bruxelles), PRELUDE international (Bruxelles), Solidarité Socialiste/FCD/DTS (Bruxelles). This seminar brought together about 30 farmers and experts from East, Central and West Africa and from Europe with the intention to share experiences in urban agriculture, visit urban agriculture sites in Belgium and France, to discuss possibilities of promoting urban agriculture, find solutions such as building and consolidating partnerships and networks and to identify relevant research programmes. Case studies from both African and European participants were presented. The event ended with the formulation of recommendations and conclusions and the drafting of a common charter of Urban Agriculture.
For more information (including the results), please contact: Prof Michel Ansay, Institut de la Vie, mansay@ulg.ac.be

WORKSHOP ON URBAN AGRICULTURE (Lima, Peru)

18-20 September 2002

This workshop, organised by the Cities Feeding People (IDRC) Programme and hosted by ITDG, Peru, reviewed results, impacts and lessons learned from a second generation of urban agriculture projects in Latin America and the Caribbean. The proceedings of the workshop will be published in early 2003 and copies will be made available from the Cities Feeding People Programme.

IFOAM ORGANIC WORLD CONGRESS (Victoria, Canada)

August 21st to 28th.

Although it was planned for 800 participants, about 1,300 people from 92 countries participated in this 14th International IFOAM Organic World Congress. See for information: www.cog.ca/ifoam2002/ to order the proceedings.

STUDY VISIT/WORKSHOP: REUSE OF WASTEWATER IN URBAN AGRICULTURE, A CHALLENGE FOR MUNICIPALITIES IN WEST AFRICA (Ouagadougou, Burkina Faso)

3-7 June 2002

Refer to page 13 or visit the RUAF website at www.ruaf.org.

INTERNATIONAL FORUM RETHINKING THE CITY (Montreal, Canada)

27 June 2002

This meeting gathered a large number of high-level policy-makers and business representatives from LAC, Canada and Italy. The event provided a good platform for speakers, mostly local governments and the private sector, to openly express and then illustrate their views regarding local governance, focusing on the interaction of public and private sectors.
More information: www.ems-sema.org/eventos/montreal/index_i.html

URBAN POLICY IMPLICATIONS OF ENHANCING FOOD SECURITY IN AFRICAN CITIES (Nairobi, Kenya)

27-31 May 2002

This workshop was organised by UNHCS in partnership with the FAO, IDRC and SIUPA (CIP-based Strategic Initiative on UPA). The minutes of the workshop are published. Contact: Urban and Regional Economy Unit, Urban Economy and Finance Branch, UNCHS (Habitat), P.O. Box 30030, Nairobi, Kenya.
Tel: +254 2 624521; Fax: +254 2 623080; e-mail: rose.muraya@unchs.org.

FEEDING CITIES IN THE HORN OF AFRICA: DECLARATION OF ADDIS ABABA (Ethiopia)

7-10 May 2002

The report of this three-day workshop "Feeding Cities in the Horn of Africa" is now available on cd-rom. For further information, please contact: Michael Wales, Horn of Africa Food Security Initiative, FAO Investment Centre, Rome; Tel: 0039-06-5705-5432; e-mail: Michael.Wales@FAO.org.

NETWORKING

CITY CONSULTATION ON URBAN AGRICULTURE AND FOOD SECURITY IN QUITO, ECUADOR ON CD-ROM

IPES, the Urban Management Programme - Regional Office for Latin America and the Caribbean (UMP-LAC/HABITAT) and the IDRC have produced a multi-media CD-ROM on the participatory process of dialogue, action planning and municipal intervention on urban agriculture in the city of Quito, Ecuador (from September 1999 until September 2001). The CD-Rom is only available in Spanish and can be ordered for US $15 (excluding costs for postage). Please contact the Urban Management Programme in Quito (e-mail: marid@pgu-ecu.org or Fax at +593.2.2282361 - ext 110-)

URBAN AGRICULTURE POLICY ADVISORY TOOLS FOR LOCAL GOVERNMENTS IN LATIN AMERICA AND THE CARIBBEAN

As part of its "closing the loop" activities, the Cities Feeding People programme initiative of the IDRC collaborates with UMP-LAC/UNCHS- HABITAT/UNDP, and its anchoring institute IPES to produce a set of Policy Briefs (see page 41). These briefs are known in Spanish as "*Directrises o lineamientos de Politica*", and are intended for local governments in the LAC Region. The general content include arguments for better municipal policies on UA, examples of good municipal practice, practical planning and management guidelines, and resources. The Briefs will be disseminated in 20,000 copies (in both Spanish and English) to municipal urban governments throughout the Region.
For more information: Please contact Marielle Dubbeling at the Urban Management Programme in Quito (email: marid@pgu-ecu.org or Fax at +593.2.2282361 - ext 110-)

NETWORKING

AGROPOLIS INTERNATIONAL RESEARCH AWARDS IN URBAN AGRICULTURE

Call for Applications

The AGROPOLIS International Graduate Research Awards Programme was launched by the International Development Research Centre (IDRC) in 1998 to support innovative Master's and Doctoral level research in urban agriculture. To date, the AGROPOLIS programme has helped 27 students carry out field research in developing countries. Their work covers a broad scope, from the impact of wastewater use in urban and periurban agriculture in Ghana, to trials of local feed resources to strengthen animal smallholdings in Vietnam, or an exploration of gender issues in commercial urban agriculture in Botswana. AGROPOLIS awardees are making significant contributions to the advancement of urban agriculture in many parts of the world.

Up to 14 awards will be granted annually, at least 5 of them at the Master's level. AGROPOLIS covers field research expenses up to CA $20,000 a year, for periods ranging from 3 to 12 months. Applicants must be citizens or permanent residents of a developing country or of Canada: at least two-thirds of the awards will be made to researchers from developing countries. All applicants must be registered full-time at a university. Starting this year, the AGROPOLIS Program will also offer up to two post-doctoral awards to promising researchers who have obtained a Ph.D. in urban agriculture or a related field and who wish to specialise further.

The deadline for applications is January 31, 2003.

For more information: AGROPOLIS International Graduate Research Awards in Urban Agriculture, IDRC, PO Box 8500, Ottawa, ON, Canada K1G 3H9, Tel: (613) 236-6163, ext. 2040; Fax: (613) 567-7749. Email: agropolis@idrc.ca Website: www.idrc.ca/cfp.

RUAF USERS SURVEY

In total 53 people responded to the question **"How do you locally apply the information provided by RUAF"**, that was raised by RUAF in an e-mail to all persons in the UA-contacts database having an e-mail address. The responses to our request came from all the corners of the world. The contributions varied in length between a short word of thanks to long essays and suggestions for improvement. The reactions are all very positive showing the wide use of information for inspiration, networking and sharing information, research, training and education or in local policy and programme development. These experiences and suggestions for improvement of the RUAF services will be discussed in the next RUAF partner meeting in February 2003 and will be taken into consideration in future work of RUAF.

On 1 October a random draw from the 53 entries took place and the three lucky winners were: Ysmary Trejo, Habitat from Venezuela, Ken Hargesheimer, Garden/Mini-Farms Network, from the United States and Almitra Patel, from India. The winners have been contacted and were given a choice between two packages of publications on Urban Agriculture. Congratulations to these winners!! RUAF would also like to thank all the other respondents for their contribution.

Abbreviations and Definitions

- **BOD** Biochemical Oxygen Demand
- **COD** Chemical Oxygen Demand
- **TSS** Total Suspended Solids
- **TDS** Total Dissolved Solids
- **Grey water** (domestic) wastewater from kitchen and bathroom
- **Black water** wastewater with excreta, urine and associated sludge
- **Sludge** is the settled matter after stabilisation of organic matter in wastewater through some process. It may have an offensive odour and a mud-like appearance.
- **Faecal coliforms** are bacteria found in the faeces of warm blooded animals; the numbers found in water indicate the level of faecal or sewage pollution and the numbers found in treated wastewater indicate the effectiveness of wastewater treatment.
- **Intestinal Nematodes** the most common are round worms, hookworms, and whipworms which carry the highest risk of infection.
- **Guideline limits** indicate the maximum level of pollution at which persons would not be at risk of infection. For restricted irrigation, no more than one viable human intestinal nematode egg per litre is permissible, whereas for unrestricted irrigation additionally no more than one thousand faecal coliform bacteria per hundred millilitres are allowed.
- **Wastewater stabilisation ponds** comprise one or more series of anaerobic, facultative and maturation ponds. They consist of shallow, usually rectangular "lakes" into which wastewater continuously flows and from which a stabilised effluent is discharged. Anaerobic and facultative ponds are primarily for the removal of organic matter, although they are very effective in removing intestinal nematode eggs. Maturation ponds are used mainly for the removal of excreted bacteria and viruses.
- **Bioremediaton** is accomplished through the use of plants and trees that uptake water and reduce nitrogen and host microbial organisms and some heavy metals in the water.
- Other **alternative methods** consist of gravel, reeds or vetiver grass which serve as filtration mechanisms as well as to reduce the amount of nitrogen in the water. These are sometimes combined with the use of water hyacinth or duckweed as bioremediators and with solar radiation aquatic ponds that kill pathogens.
- **Restricted irrigation** applies to water used for irrigating a restricted range of crops, for example, cereals, fodder crops, pasture, trees, and crops, which are processed before consumption.
- **Unrestricted irrigation** refers to water that can be used to grow any crops using any irrigation method without health risks including crops that can be eaten raw.
- **Diluted** Effluent mixed with other water before use in irrigation.
- **Undiluted** No significant dilution of the effluent in a river or other water body before use in irrigation.
- **Formal use** Use of wastewater with a certain level of permission or potential control by state agencies (alse suggested are: Authorised and Planned use).
- **Informal use** Use of wastewater without permission and control by state agencies (alse suggested are: Unauthorised and Unplanned use).