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Preface

The first 26 volumes in FAO's Better Farming Series were based on the Cours d'apprentissage agricole prepared in Cote d'Ivoire by the Institut africain de developpement economique et social for use by extension workers. Later volumes, beginning with No. 27, have been prepared by FAO for use in agricultural development at the farm and family level. The

approach has deliberately been a general one, the intention being to create a basic model that can be modified or expanded according to local conditions of agriculture.

Many of the booklets deal with specific crops and techniques, while others are intended to give farmers more general information that can help them to understand why they do what they do, so that they will be able to do it better.

Adaptations of the series, or individual volumes in it, have been published in Amharic, Arabic, Armenian, Bengali, Creole, Ewe, Gipende, Hindi, Igala, Indonesian, Kiswahili, Malagasy, Malaysian, Nepali, Oriya, SiSwati, Thai, Tschiluba, Turkish, Urdu and Vietnamese.

Requests for permission to issue this booklet in other languages and to adapt it according to local climatic and ecological conditions are welcomed. They should be addressed

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Books to read

Introduction

Straw and stalks are residues from the cultivation of rice and other cereals. They are normally not considered suitable as fodder of good quality for ruminants. However, this booklet presents two different methods for successfully using these residues as feed.

In one method the straw and stalks are treated with a water solution of urea. This method is particularly suitable when the aim is to use rice, wheat, barley or oat straw as feed for cattle and buffaloes.

The other method is suitable when there is an excess of straw and stalk, allowing the animals to select their feed. However, cattle and buffaloes cannot select from among the straw of different small cereals and the method is therefore more

suitable for small ruminants like sheep and goats.

This booklet provides detailed, practical guidelines for both methods. It is written in straightforward language and illustrations are used to support the text. It is possible to enlarge the illustrations and use them as posters or transparencies in extension work.

The booklet contains a final section, addressed to the extension worker, summarizing practical experiences with the two methods from different countries.


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Better Farming Series 43 - Feeding Animals on Straw (FAO, 1995, 30 p.)

Method of treatment
(introduction...)
Straw as animal feed
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Does it pay?
How to treat straw

Better Farming Series 43 - Feeding Animals on Straw (FAO, 1995, 30 p.)

Method of treatment

The cultivation of cereals produces large quantities of residues in the form of straw. These residues are poor feed for cattle and are often wasted. However, straw can be a suitable feed if

it is treated with a water solution of urea.

Straw as animal feed

1. The cultivation of rice or other cereals such as wheat, maize or sorghum often produces large quantities of residues in the form of straw and stalks. These residues are poor feed for cattle. buffaloes. sheer and goats and are often wasted. They may serve as maintenance fodder, but animals that are fed straw alone will probably lose weight for the following reasons:

- It is difficult for the animals to eat very much, as they have problems digesting the straw.
- Straw has a poor nutritional value.

2. However, straw can be a suitable feed if it is treated with a water solution of urea. The treatment enables the animals to improve their digestion of the straw, which permits them to

eat more of it.

3. It has been demonstrated that even if as little as one third of the straw is treated, the animals will be stimulated to eat more of the untreated straw.

4. The differences between untreated and treated straw are as follows:

Untreated straw	**Treated straw**
- Poor-quality feed	- Reasonable-quality feed
- Unpalatable, so animals eat little	- Palatable so animals eat more
- Animals lose weight	- Animals gain weight
- Animals produce more milk	

Treatment of straw

5. This section explains how cereal residues such as straw and stalks can be treated to become a suitable fodder for milk production and fattening. The method is simple:

A water solution containing 5 percent urea is applied to the straw.

- The straw is kept airtight for one to three weeks. It is then ready to use as feed.

6. Treatment is preferable where straw constitutes over half of the diet because other feeds are scarce and where higher levels of production are aimed at.

7. The method needs some planning, but it is not difficult. Straw, urea and water have to be mixed in the right proportion and correctly stored. This is explained later

To treat or not to treat

8. The decision to treat or not to treat is the farmer's. Farmers will be most interested in feeding treated straw to milking and fattening animals, which give an immediate monetary return.

9. Feeding with treated straw costs money daily, but this cost can be balanced by a regular income from the sale of milk.

10. Income from fattening animals is not received until some time later. Fattening therefore requires farmers either to have their own money or to have credit for purchasing urea.

11. Farmers are usually less willing to spend money on better feed for bullocks, dry or sterile cows and young stock. The monetary return from feeding working animals treated straw will come much later, when the crop is sold. The other important point is that bullocks can sometimes do surprisingly well on basal diets of untreated straw.

12. If a sterile or dry cow is used for work, farmers may feed it like a bullock. This is acceptable for the sterile cow, but not the dry cow. If the dry cow is going to calve within two or three months, it must be well to have a healthy calf and more milk during lactation.

13. There are very good reasons to feed treated straw to working and milking cows. It will enable them to maintain their body condition and milk production. There is no doubt that calves and heifers will grow faster if they are fed treated straw. However, this is often a low priority for farmers because of a scarcity of ready money.

14. In all cases to make full use of the treated straw, the animals will require supplementation.

Supplementation

15. The way in which treated straw should be fed to animals depends on the situation. For moderate to high levels of milk production, animals require supplementation, preferably with oilseed cakes, cereal brans or polishings. Fattening animals also require feed supplements. Growing animals older than one year and working bullocks require only small quantities of supplements and, with straw of good quality, these two types of animal may require no supplement at all. However, it is best to feed them as much treated straw as they can eat.

16. Cows and fattening animals are used for work in several countries - at least during the most busy part of the cultivation season. To avoid a reduction in milk production and a reduced liveweight gain, while the animals are working they should be allowed to eat as much treated straw as possible. Supplements must also be added to the treated straw to get the full benefit. Supplements can be:

- cottonseed or other oilseed cakes;
- small quantities of green fodder, preferably from legumes, whether cultivated or from tree leaves;
- bonemeal.

17. It is also important that the animals receive sufficient water to drink.

Does it pay?

18. It costs money and labour to treat straw. Is it profitable? Not always. If animals have access throughout the year to enough grass, other green fodder or hay of good quality, there is no reason to feed them treated straw.

Straw as main feed

19. Where there is a scarcity of grass, green fodder or hay, but where there is plenty of straw, feeding with treated straw

should be considered. In this case, straw is used instead of being wasted.

A larger herd

20. Farmers who want to keep more animals than they can feed with grass or green fodder can do so if they have enough straw of good quality. Here also, straw is put to good use instead of being wasted.

21. Whether it is profitable to feed treated straw will depend on local prices. The price of straw, supplements and urea as well as of milk, meat and labour is an important consideration.

How to treat straw

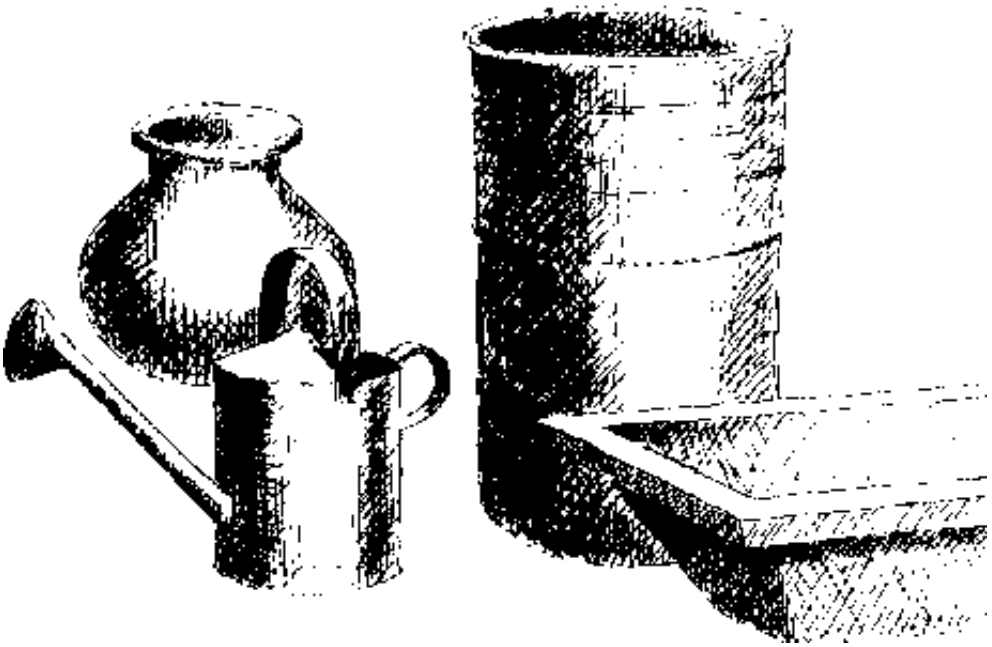
What tools are needed?

22. A scale to weigh the straw.

Weigh the straw

A typical basket or bundle of straw should be weighed with a spring balance or similar weighing scale.

23. containing 0.5 kg urea.



A measure

24. A 1 0- litre watering can or bucket.

25. A big barrel or trough which can contain a large quantity of water.

Which types of straw can be treated?

26. Straw from cereals. Straw from all types of cereal and even poor- quality hay - can be used. Rice straw is normally so soft that it can be used as it is. Wheat, barley and oat straw does not need to be chopped if it is compressed during treatment. This can be done by placing a layer of soil on top of the straw.

27. Stalks. Stalks of maize, millet and sorghum can be used but need to be chopped or extremely well compressed during treatment by placing a heavy layer of soil or stones on top of them.

28. Wet straw and stalks. Straw or stalks can become wet from rain but, if they are fresh, there are no problems in treating them. In fact treatment is a way to prevent them from being spoiled. Water can be saved and a stronger urea

solution applied. Because of the high content of water in wet straw and stalks, the quantity of urea should be reduced to half. It is difficult to be completely accurate but the rule is that a 5 percent urea solution should be applied on an air- dried basis.

29. Mouldy or rotten straw and stalks. These must never be used. They will make poor and dangerous feed.

How much straw to treat?

30. Animals have different appetites, but you should use approximately 3 to 3.5 kg of treated straw daily per 100 kg of animal liveweight. Thus, an animal weighing 200 kg will need 3 to 3.5 x 2 = 6 to 7 kg. A young animal weighing 75 kg will only need 3 to 3.5 kg x 0.75 = 2 to 2.5 kg. If you plan to feed the animals as much as they will eat, you can expect them to eat one- third more treated than untreated straw. (See the

following table.)

Untreated and treated straw feed quantities according to liveweight

Animal liveweight	Untreated straw	Treated straw
100 kg	2.0 - 2 5 kg	3.0 - 3.5 kg
200 kg	4.0 - 5.0 kg	6.0 - 7.0 kg
300 kg	6.0 - 7.5 kg	9.0 - 10.5 kg
400 kg	8.0 - 10.0 kg	12.0 - 14.0 kg

The urea solution

31. As an example, if you want to treat 10 kg of air- dried straw (straw that is dry enough for stacking), you need to dissolve 0.5 kg of urea in 5 litres of water. But if you want to treat 100 kg of air- dried straw, you need to dissolve 5 kg of

urea in 50 litres of water. (See the following table.)

Amount of urea solution required

Straw	**Water**	**Urea**
50 kg	25 litres	2.5 kg
100 kg	50 litres	5.0 kg
200 kg	100 litres	10.0 kg

32. and stir until the urea has completely dissolved.

Mix the urea and the water

33. The urea solution should be distributed evenly, using a watering can or something similar.

Storage during treatment

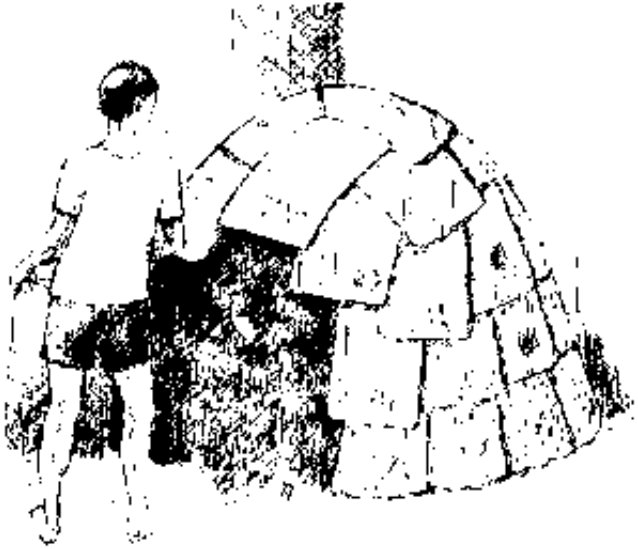
34. There are different ways to store wet straw that is undergoing treatment. The best result is obtained when the straw is kept airtight. This condition can be achieved in several

ways. Following are some examples.

35. Trampling the wet straw carefully before sealing the stack is an important first step.

Trampling the wet straw carefully

36. The straw can be stacked against a wall or in a corner and covered with old bags, banana leaves or bamboo mats and a layer of soil or clay to ensure airtight conditions.
The smaller the quantity of straw, the greater the care needed to make it airtight.

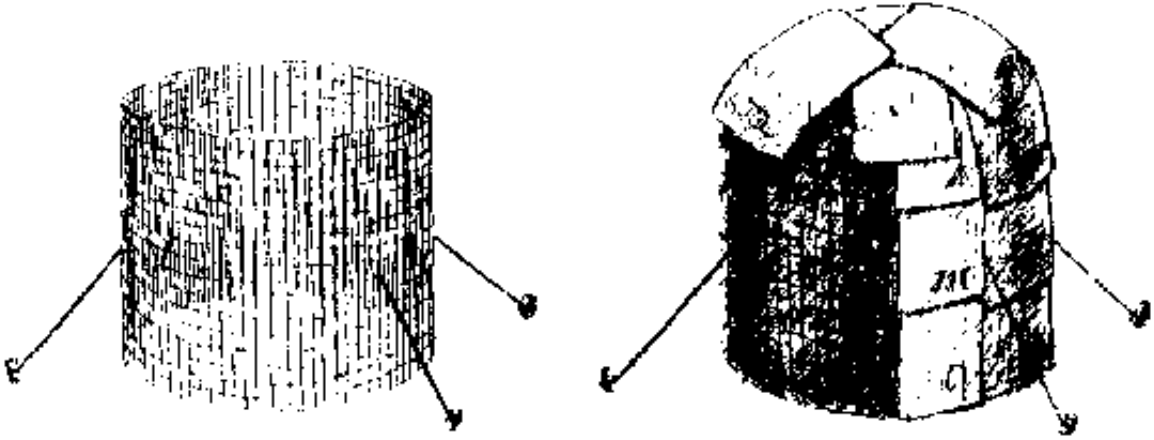


Make it airtight

37. The straw can be stacked in a separate heap and sealed with a mud plaster.

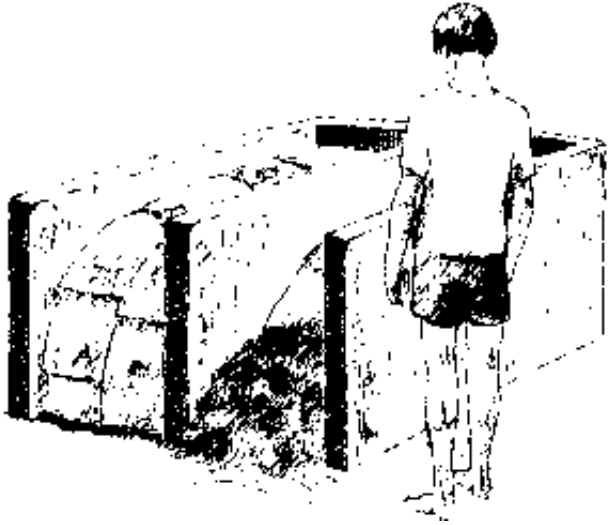
Separate heap

38. Chicken- wire or welded wire mesh can be used to make a stack, lined with used plastic sheets or old fertilizer bags.



Make a stack

39. The straw can be stacked in smaller or bigger clamps made of locally available materials.



Smaller or bigger clamps

40. Depending on the site where treatment is actually taking place there may be other possibilities. The point is that every effort should be made to keep the straw in an airtight condition during treatment.

Treatment time

41. The straw should now be kept in an airtight condition for one to five weeks before it can be fed to the animals. A short treatment time can be used when it is hot (25 to 30°C) and a long treatment time when it is cold (below 15°C). Urea as a source of ammonia does not work below 5 to 10°C. A way to bypass this problem is to treat large quantities before it gets too cold.

42. Following are the signs of successful treatment:

- The straw has changed colour to dark yellow or brown.
- The straw has a strong ammonia smell.
- The straw is softer than untreated straw.
- The animals - after adapting - eat one- third more treated than untreated straw.

Adapting the animals

43. You can adapt animals to the treated straw over a week or ten days by gradually mixing more and more of the treated straw into the fodder they are used to. Adaptation can be quicker if animals are used to eating straw and if the treated straw is left out in the fresh air for some hours before it is eaten. This practice should only be required during the first week to ten days. It should then be stopped and the straw taken directly from the stack for feeding.

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Excess feeding
(introduction...)

Problems of excess feeding

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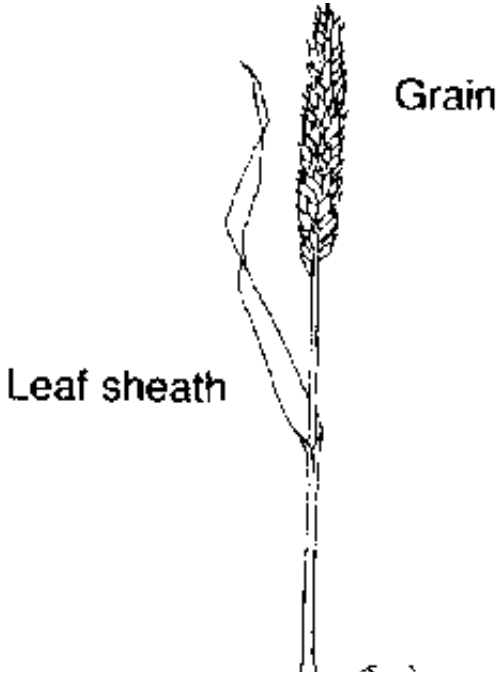
Excess feeding

When animals - particularly goats and sheep - are left to graze, they select the more nourishing parts of the plants. They do the same with straw, if they are fed in excess.

Problems of excess feeding

44. It is well known that cereal straw and stalks are difficult to digest and are of low nutritional value. They are therefore considered a poor feed for ruminants.



Cereal

Leaves are better than stems

45. The various parts of straw differ widely in nutritional value and palatability. In general, the leaves have a higher digestibility than the stems. They are more nutritious and more palatable.

46. This is true for wheat, barley, oats, maize, sorghum and millet. However, rice is an exception: its leaves and stems have the same digestibility but its leaves are more palatable

than its stems.
Permit the animals to select and refuse

47. Straw is normally fed according to the animals' appetite. This means allowing for leftovers of one- tenth to one- fifth of the straw fed.

48. However, to maximize selection, animals should be allowed to refuse half of what they are fed. This way of feeding is correct and it is already practiced by many farmers.

49. When animals - particularly goats and sheep- are left to graze, they select the more nourishing parts of the plants. They do the same with straw if they are fed in excess. They then eat the leaves because they are more digestible and palatable and they can eat more of them.

50. If the animals have access to enough straw and stalks to

be able to select the best parts, they will gain more weight or produce more milk or wool.

Selection is good for small ruminants - but not always for large ruminants

51. For small ruminants, excess feeding works with any type of straw or stalk, but cattle and buffaloes cannot select from straw of small cereals like barley, wheat and rice. To select, cattle and buffaloes need coarser feed such as maize or sorghum stalks or sugar cane tops. The leaves of these feeds are big enough for them to select, even though they have big mouths.

52. In all cases, it is important that the straw and stalks are fed whole and not chopped.

What can the leftovers be used for?

53. When animals are fed excessive quantities, they leave more uneaten. These leftovers must not be wasted. They can be treated with urea and fed to cattle.

Excess feeding and treatment combined

54. Using both the method of excess feeding and the method of residue treatment can be expected to be more effective than using just one or the other.

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Better Farming Series 43 - Feeding Animals on Straw (FAO, 1995, 30 p.)

Practical experiences

(introduction...)

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- Practical advice for extension workers and farmers
- Alternative uses of straw
- Operation plan for the year
- Feed resources
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Better Farming Series 43 - Feeding Animals on Straw (FAO, 1995, 30 p.)

Practical experiences

Introducing a new technology is a question of creating a new consensus, and it is not enough to demonstrate it to one or two farmers.

Rate of adoption in different countries

At the moment of writing, the treatment of straw using urea as a source of ammonia has been tried in several countries, but it has not been applied on a large scale in very many. However, there are interesting developments in countries such as China, India and the Niger where on- farm application now seems to be moving ahead. In other countries, such as Bangladesh, many attempts have been made but without any great success at the farmer's level.

The following sections attempt to analyse some of the

important factors to be considered for the successful implementation of straw treatment.

Practical advice for extension workers and farmers

The availability of straw must be seen from the farmer's perspective. This cannot be expressed too strongly.

It is particularly important to find out whether - from the farmer's viewpoint - straw is plentiful or scarce. It is not enough to do this on a national, regional or village level. The estimate has to be made on the farm.

Factors contributing to the quantity of straw available for feeding include farm size, the present use of straw and possible alternatives, the season, the cropping pattern and the number of animals.

If the price allows it, a farmer may of course consider buying

straw from farmers or regions with a surplus.

Alternative uses of straw

Straw can be used as fuel, building or roofing material, as a mulch to contain soil moisture for other crops or it can be dumped in the compost pit. It may also be wasted in the field, for instance during rainy weather.

If straw is used for purposes other than feed, its quantity may not be increased very easily in the short term. The provision of alternative fuel sources may take time if it involves planting trees. The same can be said of other options such as building and roofing materials.

However, if there is a risk of wastage as a result of rain, the urea ammoniation technique can be used to preserve the wet straw. The procedure is the same as the one already described

for treatment, with the difference that water may not need to be added because the straw is already wet. What is important is to keep the ammoniated straw in a relatively airtight condition until it is fed out or until dry weather conditions allow the straw to dry.

Operation plan for the year

The seasonal dimensions of feeding deserve more attention than they have had so far. The objective is clearly to avoid big fluctuations in animal liveweight or milk production, as this can lead to a waste of feed and loss of income for farmers. While much more research is needed in this respect, some general comments can be made. Many factors must be considered to allocate a farm's feed resources efficiently over a year. Regarding the animals, factors such as calving, ploughing and fattening seasons must be considered. Fattening may be for the market or for a religious festival.

However, these seasons may not coincide with the time of generous feed supply so some planning may be worthwhile.

If there is a good market for milk, it pays to conserve straw to ensure that enough is at hand to feed cows well after calving.

A working animal should be in a good condition, but not excessively fat, when cultivation starts. Ad lib feeding of treated straw may therefore not be required, but a supplement of it will help. In Thailand, experience has shown that, in the four- month dry season, feeding working animals a small, fixed amount in the morning before grazing leads to improved work and a higher safes' price when the cultivation season is over.

Annual feed calendar

Feed item	**Month**

	J	F	M	A	M	J	J	A	S	O	N	D
Oilseed cake												
Bran												
Leaves												
Weeds												
Legumes												
Wheat straw												
Millet straw												
Sorghum straw												
Rice straw												
Grazing												
- stubble												
- commons												
- bunds												

Other											

Note: In many situations the treatment of straw will be relevant in particular seasons but not throughout the year. There may be times when there is an abundance of other feeds to use. The above teed calendar is included to help the extension worker establish an overview of the annual feed situation. Such an overview is important because treated straw cannot be ted From one day to the next. The treatment time is approximately three weeks depending on the climate In a particular place. By marking an "X" against a feed item and month, the extension worker can use this calendar to establish a picture of the annual feed situation and plan straw treatment well in time.

Feed resources

Feed production on a farm where the treated straw or straw excess feeding systems are applied will follow the farm's cropping pattern very closely.

Harvest

In normal years, after harvest there will be an abundance of straw. However, it is important to find out whether this is also the right time to feed in excess. Perhaps the stubble remaining in the field can be grazed, making it more important to wait until the rains start to feed the harvested straw. At that time, fields may not be available for grazing for two reasons: with the early rains, farmers may start to plough or the fields may be flooded. In either case, stored straw becomes important as a feed for the animals.

With a very high cropping intensity - which is often the case in irrigated areas - there may not be any land at all for grazing

and straw may have to be used as the main feed throughout the year. At other times, residues from weeding or other crops such as sugar cane may be available.

Supplementation

Correct supplementation is of great importance for obtaining the full benefits from feeding straw, whether the excess feeding or the treatment approach is applied. This point tends to be neglected while too much importance is given to the effect of treatment per se or - with the excess feeding approach - getting the animals to eat more straw.

This is wrong. Oilseed cakes or oil- meals from seed cotton, soybean or sesame, for instance, are good supplements. Cereal brans and polishings may also be used. They should be used together with a supplement of green fodder, preferably from legumes. Grain from rice, wheat, barley or maize is not a

good supplement and should only be fed in very limited quantities. The oilseed cakes will help the animal make better use of the straw but, as a rule of thumb, if oilseed cakes or grain constitute more than one- fifth of the total feed, the animal will tend to make inefficient use of the straw.

Data from an experiment conducted in China illustrate this general principle. The objective was to discover the effect of using cottonseed cake to supplement fattening animals which had access to all the treated straw they could eat.

Supplementing cottonseed cake

Liveweight gain obtained by supplementing different quantities of ammoniated straw with cottonseed cake is shown in the following table.

Liveweight gained with cottonseed cake supplement

Feed consumed

Cottonseed cake supplement	Ammoniated straw	Daily liveweight gain
0 kg	6.2 kg	250 g
1 kg	6.2 kg	600 g
2 kg	5.4 kg	700 g
3 kg	5.2 kg	840 g
4 kg	3.5 kg	940 g

It can be seen that there is a very good response to the first 1 kg of cottonseed cake, as the animals increase their daily liveweight gain from 250 to 600 9. As 1 kg of cottonseed cake is less than one- fifth of the total quantity eaten (1 kg of cottonseed cake and 6.2 kg of straw) there is no effect on the

quantity of straw consumed, which remains the same at 6.2 kg, with and without cottonseed cake. However, 2 kg of cottonseed cake constitute more than one- fifth of the total diet and the amount of straw eaten is reduced from 6.2 to 5.4 kg, and this tendency continues as the level of cottonseed cake is increased to 3 and 4 kgs. It drops to as little as 3.5 kg of straw with 4 kg cottonseed cake.

It can of course be argued that the animals are increasing their daily weight gain by eating more cottonseed cake. But normally straw is much cheaper than oilseed cake and grains and so it has to be calculated carefully whether, in a particular case, it makes economic sense to go beyond a supplement of 1 or 2 kg. This applies in both the excess feeding and straw treatment approach.

Feeding of treated residues

Type of animal

There has to be a good economic reason for a farmer to feed treated straw. Farmers may keep milking, fattening, working or growing animals, a combination of these or one or two animals, which - according to the needs of the farmer - may serve several purposes.

For farmers who are short of cash, the milking animal is the best to start with. The monetary effect of feeding fattening, working and growing animals better will only be felt later and the farmer must have sufficient cash to buy urea and some oilseed cake for supplementary feeding until the animal is sold or the crop harvested.

The milking animal

The effect on milk production can be quick and an increase in

milk yield may be seen within the first two weeks, even within a couple of days. Provided there is access to a market, this will mean an immediate increase in cash income, a part of which can be spent on urea.

Other effects will be a longer lactation period and a higher conception rate owing to the animals' better condition.

Farmers in many countries have observed that they can save concentrate by feeding treated straw, without any reduction in milk yield.

As a useful starting point, however, a farmer may supplement 0.25 kg of oilseed cake per litre of milk produced by a cow. This may be reduced by feeding more green fodder. At the village level in India, 8 kg of milk have been obtained with a feed of 10 kg of treated straw, 10 kg of fresh green fodder and 0.5 kg of concentrate.

Treated straw usually covers the requirements of low yielding animals producing less than 3 to 4 kg of milk. For higher-yielding animals, supplementation with oilseed cake, brans and some green fodder will be necessary.

The fattening animal

The younger the fattening animal the more important an additional protein supplement will be. Experience shows that, with ad lib feeding of treated straw and supplements of 1.5 to 2 kg of oilseed cake daily, growth rates of 0.5 to 0.6 kg per day can be obtained under village conditions. This has been the experience in China. In a country with smaller cattle, for example Bangladesh, daily growth rates of 0.2 to 0.3 kg may be adequate.

More or less straw

When fed treated straw ad lib, fattening animals will typically increase their dry matter intake by one- third or more. Milking animals may even double their intake.

Countries or regions which have a scarcity of straw (from the farmer's perspective), such as Bangladesh and the high plateau of Bolivia, may not find such a huge increase in intake feasible.

However, theoretically, the animals should also benefit from treatment even if they are not allowed to eat more. Whether the benefit is enough to justify the investment in urea and other inputs is a question which needs to be decided in each particular case. It is important to remember that ad lib feeding is not appropriate in all situations.

Problems in applying technology

It would be too simple to say that the large- scale adoption of straw treatment will occur to the same extent as extension workers include this technology in their programmes for farmers.

In many countries animal husbandry extension services are weak. When they exist as independent units in government livestock services there is often a scarcity of human resources and transport facilities. Whatever human resources there are may be working on imported, exotic animal species or tend to have a veterinary bias. Some countries have adopted the farming systems approach to extension but livestock extension is normally supervised by agricultural departments whose emphasis is almost invariably on crops.

These problems are mentioned because they are important reasons for the low level of adoption not only of the technologies presented in this booklet but of others as well.

They are also mentioned to show that the question is complex and not merely a matter of choosing the right technology. Extension programmes conducted by producer organizations and other non- governmental organizations are interesting possibilities.

For many agencies, a precondition for taking up extension work in animal production would be an exhaustive training of staff in the appropriate principles of animal production applicable to the feed resources available to farmers.

It has taken time to gather the information, but a useful record of experiences has now been accumulated by FAO's Feed Resources Group. It is clear that classical feeding standards are outdated and not useful for treated straw and excess feeding.

Systematic testing - the small pilot project

One critical factor in adoption can be dealt with. That is the grey area between research and large- scale extension, otherwise called the pilot project.

A pilot village trial requires the same systematic testing as research. It is important to be very sensitive to farmers' preferences and be prepared to listen to their ideas even when they go against conventional, professional thinking.

Two examples illustrate this point.

Anhydrous ammonia or urea in China?

In one UNDP/FAO- sponsored project in China, two different ammoniation technologies were tried. One was anhydrous ammonia involving a centralized supply of ammonia. Treatment had to be arranged at a fixed time for all farmers in the village, as it involved somewhat sophisticated and

expensive equipment that was beyond the capacity of individual farmers.

In the other case, urea was used, which individual farmers could buy in the market at their convenience.

An analysis of the two cases over some years clearly revealed a stagnating trend in areas where anhydrous ammonia was used, while the number of farmers treating straw and the quantities they treated continued to expand in areas where urea was used. The use of urea was also very clearly the technology of greatest interest.

Small or big stacks in India?

In India, many on- farm pilot trials have been conducted with treated straw using urea as the source of ammonia. However, in the experience of the National Dairy Development Board, a

breakthrough came only when it was realized that farmers found the treatment of small quantities too demanding in terms of labour. They preferred to treat large quantities - 1 tonne or more at a time - depending on the number of animals there were to feed.

Success in the application of the technologies presented in this booklet will depend to a large extent on the sensitivity of extension workers to farmers' preferences. When a technology has been adjusted to the conditions and satisfaction of some farmers, these farmers can then help explain the technology to their colleagues.

A critical consensus

Villagers in many parts of the world often operate by consensus. Introducing a new technology is therefore a question of creating a new consensus - it is not enough to

demonstrate it to one or two farmers. To swing the consensus in favour of a new technology, a pilot project should arrange for 25 to 50 percent of the farmers to try the new technology successfully. In this manner a critical group of villagers who are confident with the new technology is created.


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Better Farming Series 43 - Feeding Animals on Straw (FAO, 1995, 30 p.)
(introduction...)
Preface
Introduction
Method of treatment

Excess feeding
Practical experiences
Books to read

Books to read

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