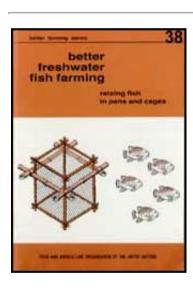




- (introduction...)
- Preface
- Introduction
  - Raising fish in pens and cages
  - The baby fish
- Pens
  - (introduction...)
  - Building a pen
  - Carrying small fish
  - Putting baby fish into your pen
  - Feeding fish in pens
  - Taking care of the fish and pen
  - Harvesting fish in pens
  - Now you must begin again
  - 🖺 Raising your own baby fish in pens
- Cages
  - (introduction...)
  - Building a cage
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- Taking care of the fish and cage
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- Now you must begin again
- Raising your own baby fish in cages





- Better Farming Series 38 Better Freshwater Fish Farming: Raising Fish in Pens and Cages (FAO, 1990, 83 p.)
- **→** (introduction...)
  - Preface
  - ☐ Introduction
  - Pens
  - Cages

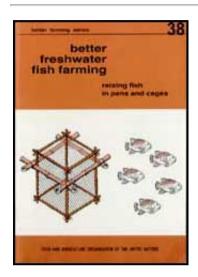
# FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS Rome 1990

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- Better Farming Series 38 Better Freshwater Fish Farming: Raising Fish in Pens and Cages (FAO, 1990, 83 p.)
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#### **Preface**

The first 26 titles in FAO's Better Farming Series were based on the Cours d'apprentissage agricole prepared in Cote d'Ivoire by the Institut africain de dveloppement conomique 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 of individual volumes in it, have been published in Amharic, Arabic, Bengali, Creole, Hindi, Igala, Indonesian, Kiswahili, Malagasy, SiSwati, Thai and Turkish. This volume has been prepared by the Inland Water Resources and Aquaculture Service, Fishery Resources and Environment Division.

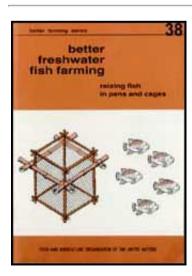
Requests for permission to issue this manual in other languages and to adapt it according to local climatic and ecological conditions are welcomed. They should be addressed to the Director, Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.

Booklets 27 to 38 in the FAO Better Farming Series were written and illustrated by Tom Laughlin, working closely with the technical divisions responsible.









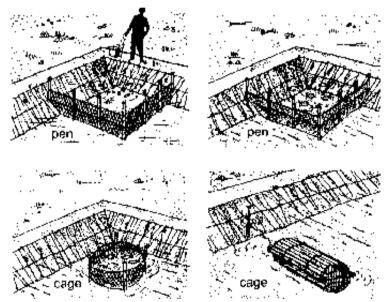
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Better Farming Series 38 - Better Freshwater Fish Farming: Raising Fish in Pens and Cages (FAO, 1990, 83 p.)

#### Introduction

## Raising fish in pens and cages

1. In booklet No. 30, Better freshwater fish farming: the fish you were told that you can put your baby fish in a pen or a cage in one of your fish ponds until you are ready to use them.



Put the baby fish in a pen or a cage

- 2. Pens and cages can also be used for raising fish from the time they are babies until the time they are big enough to eat or sell.
- 3. If you have a stream, over lake or reservoir nearby, you may want to build a

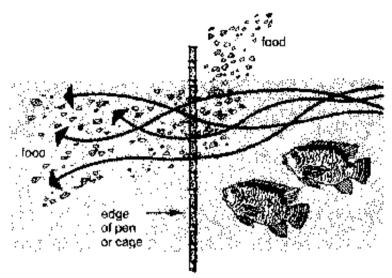
pen or a cage and raise fish there.

- 4. If you already have a fish pond you may want to put in a cage or two so that you can raise more fish than you could in one pond alone.
- 5. Raising fish in pens and cages is somewhat different from raising fish in ponds. Let us begin by looking at some of the differences.

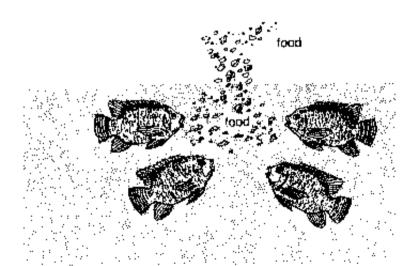
### **Feeding**

- 6. One of the biggest differences, and perhaps the most important, between raising fish in ponds and raising fish in pens and cages is feeding them.
- 7. As you know, with a pond you fertilize the water. That is, you add compost, animal manure or plant materials so that there will be natural food for the fish to eat.
- 8. In addition, fish in ponds must be given other kinds of food each day. This is to make them grow quickly.
- 9. With well-fertilized water and enough of the other kinds of food, the fish can swim about and find food anywhere in the pond.
- 10. However, with a pen or a cage built in a stream, lake or reservoir, there may be little natural food and the movement of water may carry the food that you give the fish outside the pen or cage where the fish cannot get it.
- 11. So, with pens and cages you must take greater care that the fish have enough

to eat, that me food Is very rich and that it does not float away before the fish can eat it.

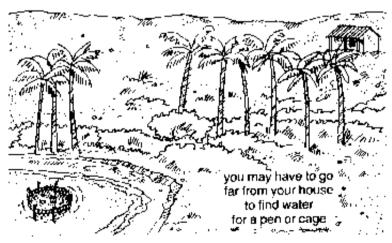


movement of water may carry the food out of a pen or cage before the fish can eat



be sure to feed in such a way that the fish can eat before it floats away

- 12. It is always a good idea to put a fish pond near where you live so that you can easily take care of it and watch that people do not try to steal the fish.
- 13. You can usually find a place near your house with the right kind of soil to build a pond.
- 14. If there is no water there, you can dig a water supply ditch and bring water to the pond.
- 15. However, with a pen or a cage you must find a place where there is water already.
- 16. So, you may have to go quite far from your house to find a stream or a lake which would be good for a pen or a cage.



Find a stream or a lake

17. This may make it hard to take care of the fish and watch that people do not steal them.

18. Remember, it is very easy to steal fish from a cage because all of the fish are in a very small space and they can be taken quickly with a net while you are not watching.

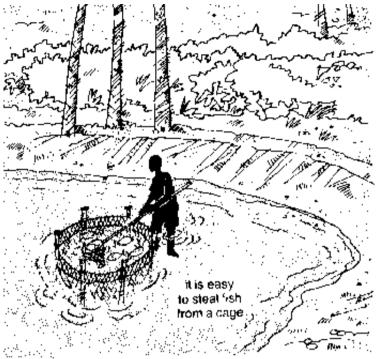
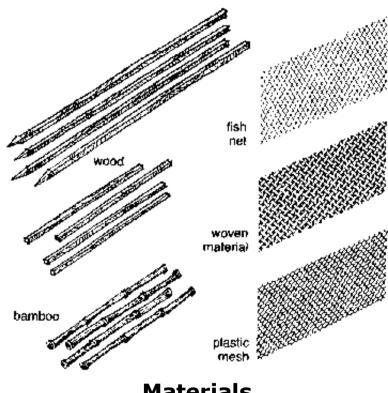


Figure Work, time, materials

- 19. To dig a pond is hard work, and the bigger the pond the longer it takes. If you dig a pond all by yourself it will take a very long time.
- 20. However, to dig a pond you do not have to spend very much money.
- 21. The only building materials that you need for a pond are for the inlet and outlet and for the overflow.

- 22. To build a pen or a cage is less work than digging a pond. It is easier to do by yourself and it takes less time.
- 23. However to build a pen or a cage may cost you more money. Pens and cages are built of bamboo or wood and closed with fish net, woven material or plastic mesh.

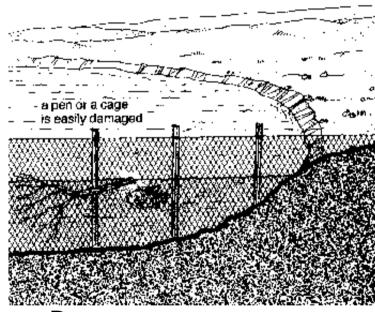


**Materials** 

24. You may have to buy some of these materials if you decide to build a pen or a cage.

#### Loss of fish

- 25. With a pond, if you are careful to cover the outlet and the overflow with screens there is little danger of losing fish.
- 26. However, with a pen or a cage that is covered with fish net, woven material or plastic mesh you must be more careful.
- 27. A pen or a cage can be easily damaged by animals in the water or rubbish such as logs or tree branches. So, there is greater danger of losing fish.

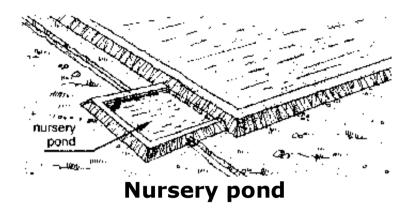


Damage a pen or a cage

# The baby fish

- 28. The first time you stock a pen or a cage you will need some baby fish.
- 29. If you have raised fish in ponds and have built your own nursery pond you may

# already have baby fish.



30. If you do not have your own baby fish perhaps you can get them from another fish farmer or from a fish culture station.

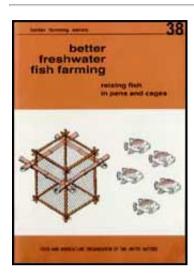


Get baby fish

- 31. After you have built either a pen or a cage you can raise baby fish in it as well. You will learn more about this later in this booklet.
- 32. Now let us begin to learn how to build pens and cages and how to raise fish in them.





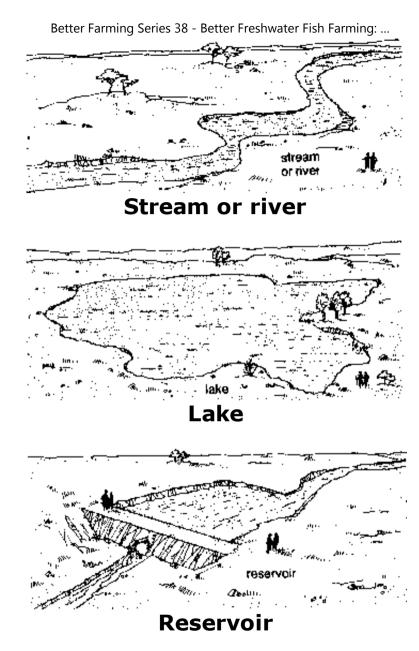


- Better Farming Series 38 Better Freshwater Fish Farming: Raising Fish in Pens and Cages (FAO, 1990, 83 p.)
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  - Now you must begin again
  - Raising your own baby fish in pens

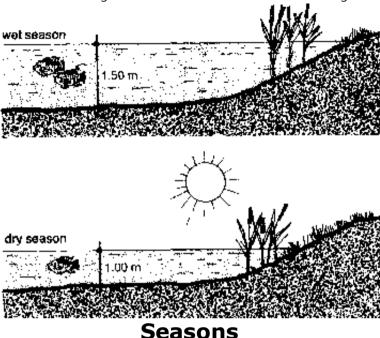
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#### **Pens**

33. You can build a pen in the shallow water of a stream, a river, a lake or a reservoir.

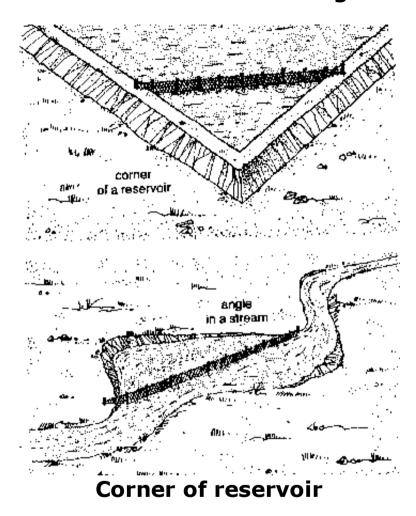


34. The water in a pen should be no more than 1.5 metres in the deepest part.



- 35. You must also be sure that the water in a pen will never be less than 1 metre even during the dry season.
- 36. A pen should be put in a place where the flow of water is gentle, not fast.
- 37. It should be protected from wind so that the surface of the water will be calm, not rough.
- 38. The water should be clean. You should not build a pen too near an inlet where the water may be muddy or full of rubbish.
- 39. Choose a place in the stream or lake where the bottom is firm. It is not so easy to build a pen if the bottom is too soft and where the water may become muddy when you have to work in the pen.

40. In addition, try to find a place where you can build a pen using very few materials, such as the corner of a reservoir or an angle in a stream.

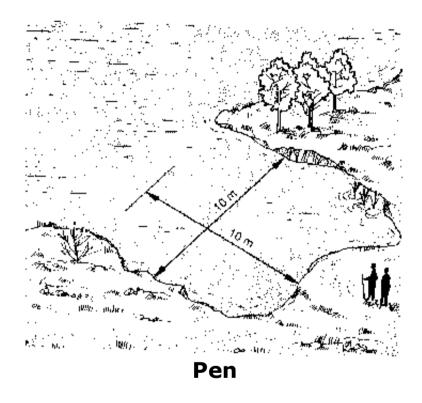


# **Building a pen**

- 41. A pen can be small or large depending on how many fish you want to raise.
- 42. However, when you first begin, start by building a small pen. You will need

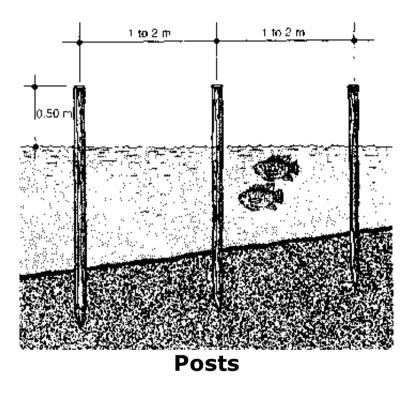
fewer materials. It will be easier to take care of.

43. You can begin with a pen that has about 100 square metres (10 by 10 metres). Later, when you have learned more, you can build bigger ones.



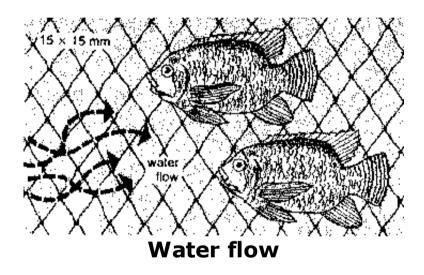
- 44. A pen is closed by a fence. So, start by driving a row of posts. Posts can be made either of bamboo or wood.
- 45. If you are using wood, choose wood that does not rot quickly when it is in the water.
- 46. The posts should be long enough to be driven firmly into the bottom. They should also be long enough to reach at least 50 centimetres above the highest

water level.

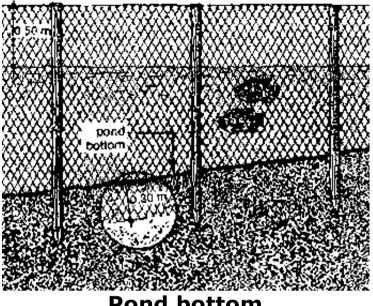


- 47. Posts should be 1 to 2 metres apart depending on the material that you use to close the pen.
- 48. The best material for the fence of the pen is ordinary fish net. You can also use plastic mesh, or woven material made from split bamboo or wooden strips.
- 49. If you are using fish net to close your pen, the posts can be further apart. If you use woven material or plastic mesh, the posts may have to be closer together.
- 50. The openings in the material that you use to fence in a pen must be small enough to keep the smaller fish from getting out.

- 51. However, if the openings are too small they may become filled with dirt or with the very small plants that grow in the water.
- 52. If the openings in the material become filled with dirt, fresh water will not flow through to clean out the pen and the fish may not have enough air.
- 53. So, be sure to use material with openings of 1.5 by 1.5 centimetres. This is the right size to keep in the smaller fish and also to let fresh water flow through.

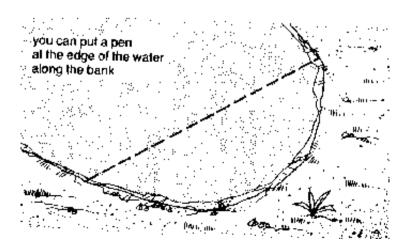


- 54. Whatever material you use for the fence, it should be high enough to be buried in the pen bottom at least 30 centimetres deep.
- 55. It should also reach to the top of the posts which, you were told in Item 46, should be at least 50 centimetres above the highest water level.

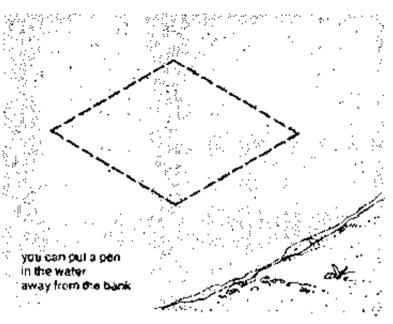


**Pond bottom** 

- 56. This will keep your fish from getting out of the pen along the bottom or jumping out over the top.
- 57. Now you will be shown how to build two kinds of pens, how to attach the fence material and how to bury the material in the bottom.

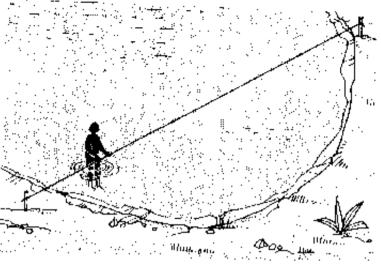


# Put a pen along a bank

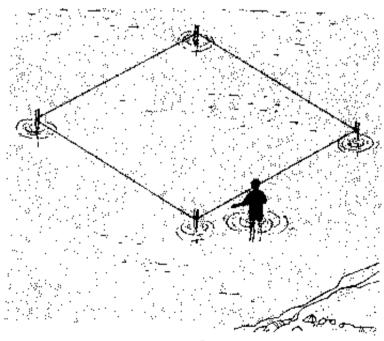


Put a pen away a bank

mark the place where you will put the fence using wooden stakes or poles and a piece of heavy line



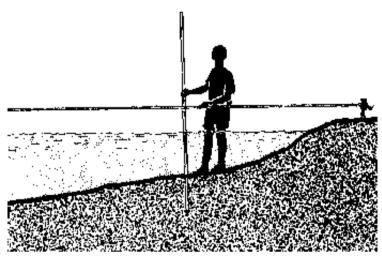
Put a fence



Put a fence

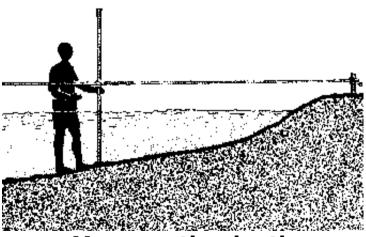
check the bottom along the line with a long pole to see how far you will have to

### drive in the posts so that they will stand firmly



Check the bottom

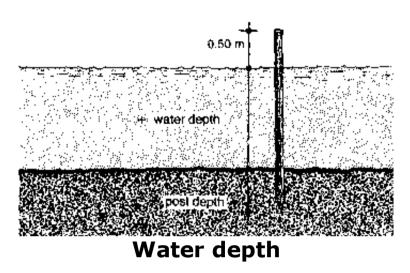
#### measure the depth of the water every 2 metres along the line



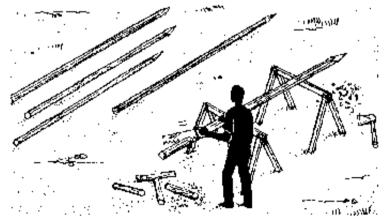
Measure the depth

remember, all posts must be at least 50 centimetres above the highest water level so, each post must be long enough to reach 50 centimetres above the water, plus

# the depth of the water, plus the depth that each post must be driven into the bottom



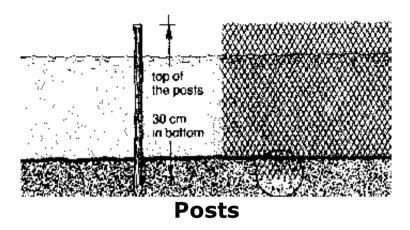
## now you can cut all of the posts to the proper length



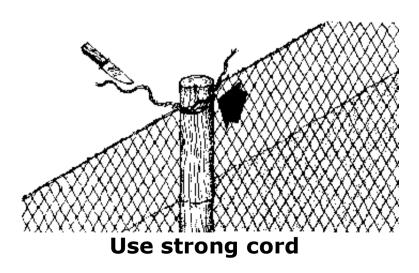
**Cut the posts** 

drive in the posts along the line 1 to 2 metres apart, depending on the kind of fence material that you are going to use (see Items 47 to 49)

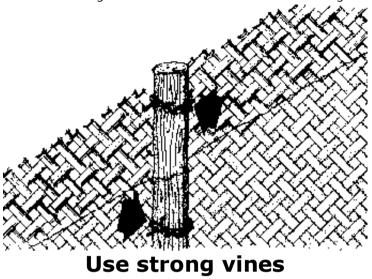
be sure to use material that is high enough to be buried at least 30 centimetres in the pen bottom and that can also reach the top of the posts



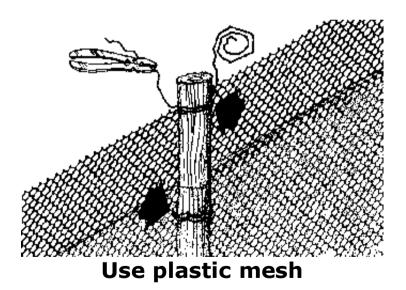
if you use fish net for the fence, tie the edge- line of the net to the top of the posts using strong cord



if you use woven material for the fence, tie it to the posts with strong cord or you can use strong vines

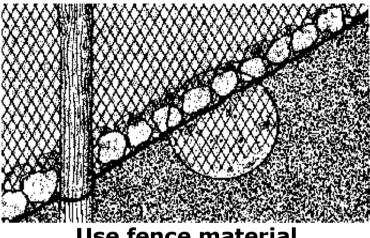


if you use plastic mesh for the fence, fasten it to the posts with wire



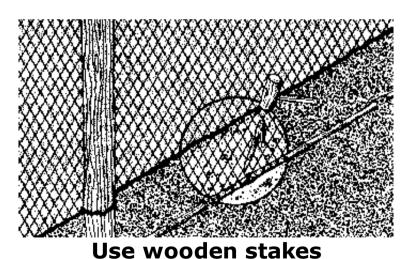
when the fence material is well fastened to the posts, you are ready to bury the material in the pen bottom

you can bury fence material by pushing it into the pen bottom and putting a row of stones on either side to keep it in place



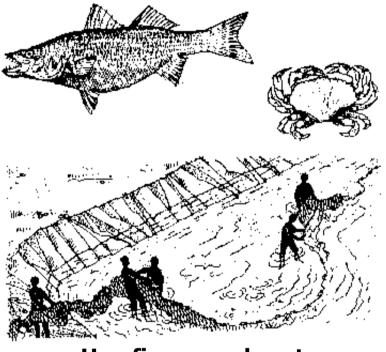
**Use fence material** 

you can also bury fence material by fastening it to straight poles and pushing the poles into the pen bottom with wooden stakes to keep it in place



note: to bury fence material you may have to work under the water

- 58. When your pen is finished, cut the weeds and grass on the banks clean out most of the plants in the water and take away any rubbish that you find.
- 59. Then, remove the unwanted fish, crabs or other water life in the pen. You can do this using a fine- mesh net.



Use fine- mesh net

60. When you have done this, you are ready to stock your pen with baby fish.

## **Carrying small fish**

61. Small fish can be hurt easily. So, you must be very careful when you handle them or carry them from place to place.

# 62. If you collect small fish using a seine net Carry them in a container such as

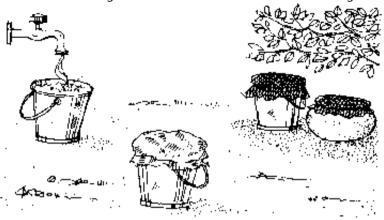
- clay pot with a cover
- a bucket with a lid
- a plastic bag.



Use a container

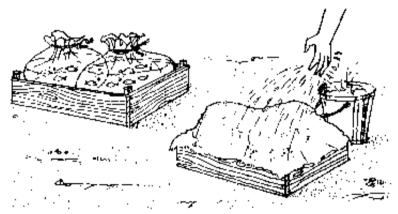
# 63. When you carry small fish you must be careful to

- use only clean water
- keep the fish out of the sun or cover the container with a well cloth 10 keep it cool.



Keep the fish out of sun

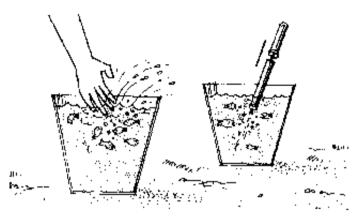
64. If you carry small fish in plastic bags, carry the bags in a box so that they will not break. Cover the box and the plastic bags with a wet cloth to keep them cool



**Use plastic bags** 

- 65. When you are carrying small fish, if you see that they are gasping for air pull some air into the water by
- splashing the water gently with your hand

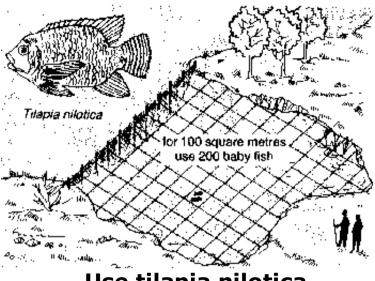
forcing air into the water with a tire pump.



Put air into the water

### Putting baby fish into your pen

66. If you are raising Tilapia nilotica you will need to put in two baby fish for each square metre of pen. So, if you have built a small pen of 100 square metres you will need 200 baby fish.



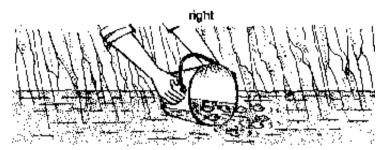
Use tilapia nilotica

67. The baby fish that you use should be at least 8 to 10 centimetres long or weigh about 15 to 20 grams each.

Note If you need any help or want to raise a different fish, your extension agent or fishery officer will be able to give you good advice.

- 68. Just before you put the baby fish in your pen, be sure that the water they are in is not hotter or colder than the water in the pen.
- 69. You can find this out by putting one of your hands in the water with the fish and the other in the pen.
- 70. If one is hotter or colder, slowly put water from the pen in the water with the fish until they are both the same.
- 71. If you do not do this the fish may die when you put them into the pen.

72. Do not pour the fish Into the pen. Gently put the container into the water, tip it a little, and let them swim out by themselves.



Put fish into the water



Put fish into the water

# Feeding fish in pens

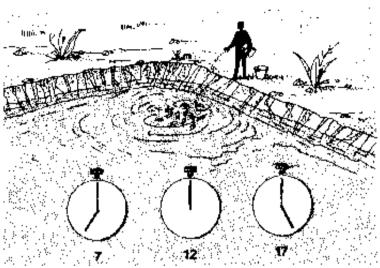
- 73. You have already been told that there may be very little natural food in a pen. So, you must be sure to give your fish very rich foods.
- 74. Here are some rich foods that fish like to eat. You can give them

- termites
- grain mill sweepings
- rice bran
- beer wastes
- cottonseed or groundnut cake.



**Foods for fish** 

- 75. Prepare all of the food for one day's feeding at one time. Give the fish part of this food at two or three different times during the day.
- 76. Always try to feed your fish at the same time each day.



Feed the fish at the same time

77. The bigger your fish grow, the more food they will need.

For each 100 square metres of pen feed them

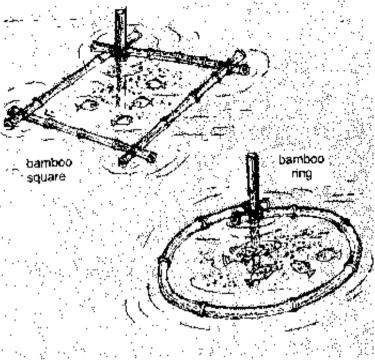
- 150 to 200 grams of food every day during the first month
- 200 to 275 grams of food every day during the second month
- 275 to 350 grams of food every day during the third and fourth months
- 350 to 450 grams of food every day from the fifth month until the time you are ready to harvest.

#### **Note**

100 grams of rice bran is about one handful. Use a small tin to measure this amount.

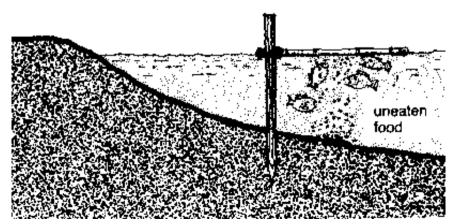


- 78. It is not easy to know exactly how much to feed your fish. You must watch them carefully to learn how much food they need.
- 79. Feed your fish in the shallow part of the pen so that you can see them eat.
- 80. If you see that the fish do not eat all of their food, give them a little less.
- 81. If you see that the fish eat all of their food quickly, give them a little more.
- 82. If you feed your fish in the same places each day you will be able to see whether they are eating well. If you give them too much, the food that is not eaten will stay on the bottom.
- 83. Too much uneaten food on the bottom of the pen will make me water bad for the fish.
- 84. To make it easier to see if your fish are eating well, choose several places in your pen and always feed them there.
- 85. Mark each place by making a square or ring of bamboo or light wood. Drive a pole into the pen bottom and attach the square or ring. The drawings at the top of the next page will show you how.



**Use bamboo** 

86. When you feed the fish, put the food inside the square farming. That way you can easily see uneaten food collecting on the bottom and you will know that you are giving your fish too much.

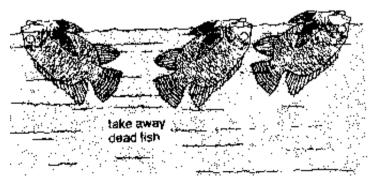


#### **Uneaten food**

#### Taking care of the fish and pen

#### The fish

- 87. You must always watch you fish to see that they are healthy and swimming strongly.
- 88. If the fish in your pen are not well, they will stop eating.
- 89. It this happens, stop feeding your fish for a day or two.
- 90. When you begin to feed them again, at first give them small amounts of food and then slowly more and more. When your fish begin to eat as before you will know that they are well again.
- 91. If you find any dead fish floating in the pen, take them out right away.



Take away dead fish

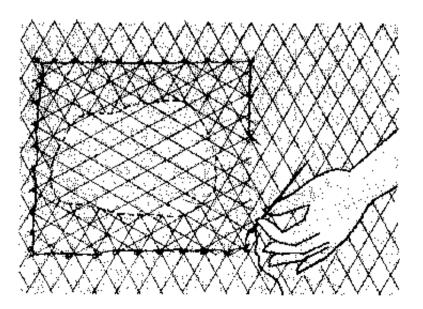
92. Then, stop feeding your fish and watch them very carefully during the next

days.

- 93. If no more fish die you can begin to feed them after a day or two.
- 94. If fish continue to die take them out as soon as you can and ask your extension agent or fishery officer for help.

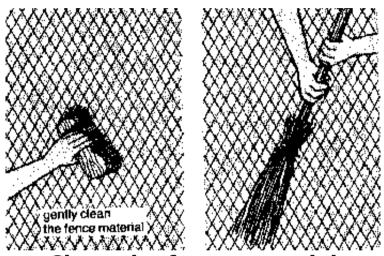
# The pen

- 95. You have already been told that a pen can be easily damaged. If this happens your fish may get out.
- 96. So, check the pen fence every day to be sure that there are no holes. At the same time, you should check that the fence is well buried in the pen bottom.
- 97. If you find any places where your fish can get out, repair them right away.



### Repair places where fish can get out

- 98. In addition, you must be sure that the openings in the fence are free of dirt and plants so that fresh water can flow into the pen.
- 99. You can clean the fence of a pen using a brush or a broom. However, do it very gently so that you do not damage the fence material.

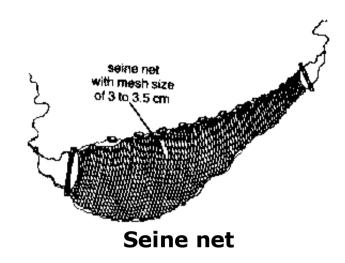


Clean the fence material

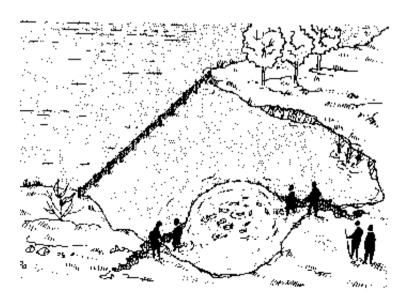
# Harvesting fish in pens

- 100. If you have used baby fish 8 to 10 centimetres long and have fed them well, they will be ready for harvest in about six to seven months. At this time the fish will weigh 100 to 150 grams each.
- 101. If you want to harvest only some of your fish you can use a seine net with a large mesh.

102. A seine net with a mesh size of 3 to 3.5 centimetres will catch only the biggest fish and allow the medium and smaller fish to escape.

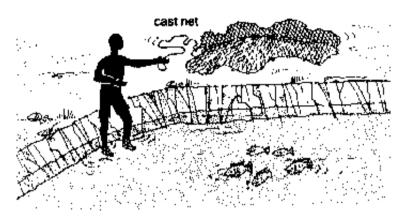


103. To harvest with a seine net you will need several people. Start at the deep end of the pen and pull the seine net slowly toward the shallow end. The drawing below shows you how.

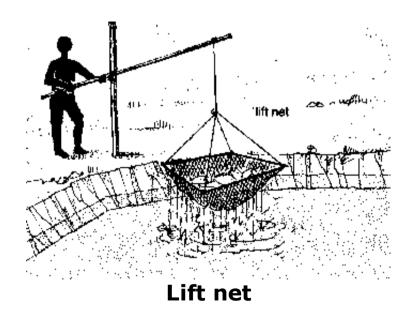


#### Harvest with seine net

104. If you want to harvest only part of your fish, you can also use a cast net or a lift net.



**Cast net** 



105. If you use a cast net or lift net you will catch both big and small fish. Keep

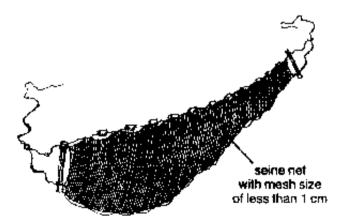
the fish that you want and put the others back in the pen.

106. With a cast net or a lift net it is easier to catch the fish while they are eating and they are all together. So, feed them some food first.



Give fish some food

107. If you want to harvest all of the fish you can use a seine net with a fine mesh of less than 1 centimetre.

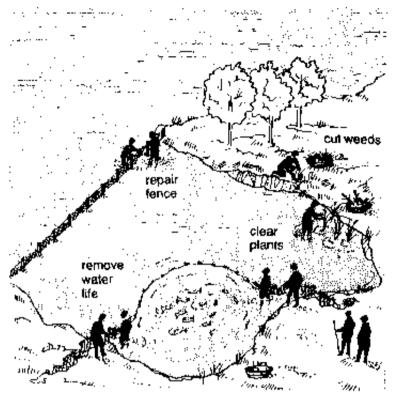


Seine net

Now if you do not need all of the fish harvest only what you need and leave the rest in the pen. Fish can be left in a pen as long as you continue to feed them.

### Now you must begin again

- 108. After you have harvested, clean and repair your pen as quickly as you can so that you can begin again. You must
- cut the weeds and grass on the banks
- clear out most of the plants in the water and take away all rubbish
- clean and repair the fence and make sure that it is still buried in the pen bottom
- remove unwanted fish, crabs and any other water life using a fine- mesh net.
- 109. If you have harvested using a large- mesh seine net there will be many baby fish left in your pen.
- 110. So, to begin again you will not need to put in more baby fish. However, you will have to be careful not to let the baby fish escape when you clean and repair the pen.
- 111. If you have harvested using a fine- mesh seine net you will catch all of the baby fish.
- 112. You can hold the baby fish that you catch in a pen or in a cage for small fish (see Item 114 and Item 184) until you have finished cleaning and repairing the pen.



Hold the baby fish in a pen or cage

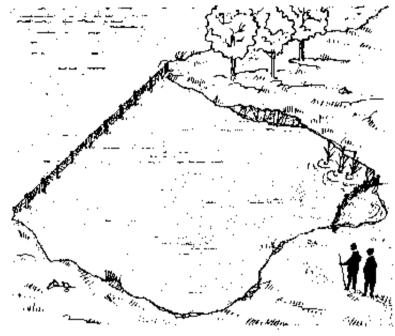
#### **Note**

The faster you can do all of these things, the sooner you will be able to raise another crop of fish.

113. When you are ready, put in two baby fish 8 to 10 centimetres long for each square metre of pen. However, be sure to choose your biggest and best baby fish to put back into your pen.

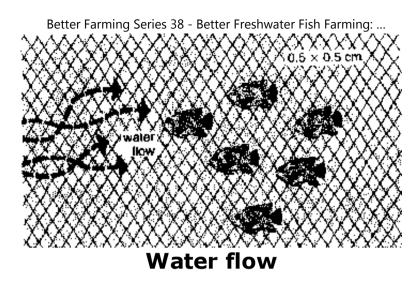
Raising your own baby fish in pens

114. You can build a small pen in a corner of your big pen and raise your own baby fish there. You can also use a small pen like this to keep the baby fish that you catch when you harvest.



**Use small pens** 

- 115. The small pen should be about 2 by 2 metres and at least 50 centimetres deep. Build the small pen just as you built your large pen.
- 116. However, the material that you use for the fence of a small pen should have smaller openings to keep in the baby fish. So, be sure to use material with openings of 0.5 by 0.5 centimetres.



- 117. Material with such small openings will get dirty more quickly. You must be sure to clean it often enough so that fresh water can flow into the small pen.
- 118. You can put up to 500 baby fish 1 to 2 centimetres long in a small pen this size. However, do not put in more than you need to use or sell.

#### **Note**

If you have more baby fish that you can use or sell you can dry them in the sun. After you have dried the baby fish, grind or pound them and mix them with crushed cottonseed, groundnut cake or rice bran to feed to your big fish, your poultry or your pigs. You can also use the baby fish to fertilize your farm garden.

- 119. Feed your baby fish two or three times each day just as you do with your big fish. You can give them
- termites
- rice bran

cottonseed or groundnut cake.



Food for baby fish

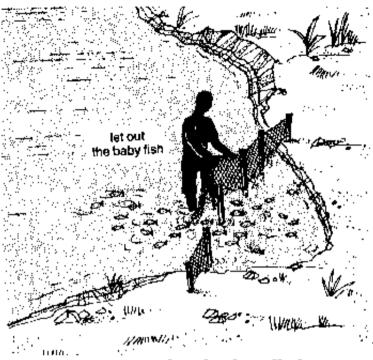
120. Feed your baby fish carefully. Break their food into very small pieces and sprinkle it little by little on the surface of the water. Watch very carefully that they eat well and stop giving them food as soon as they stop eating.



**Sprinkle food** 

- 121. With a small pen, it is important to give the baby fish only what they can eat and no more. Uneaten food on the bottom of a small pen is very bad for baby fish.
- 122. In 30 to 40 days the baby fish will grow to 8 to 10 centimetres long and you can let them into the big pen. To do this open a part of the fence. However, do not

take out the posts.



Let out the baby fish

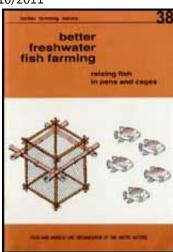
123. The baby fish can then swim into the big pen through the open fence. Later, when you need to raise more baby fish or keep small fish you have caught, you can use the small pen again.





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Better Farming Series 38 - Better Freshwater Fish Farming: Raising Fish in Pens and Cages (FAO, 1990, 83 p.)





Building a cage

Carrying small fish

Putting baby fish into your cage

Feeding fish in cages

Taking care of the fish and cage

Harvesting fish in cages

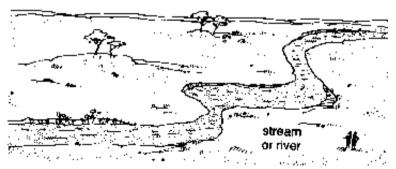
Now you must begin again

Raising your own baby fish in cages

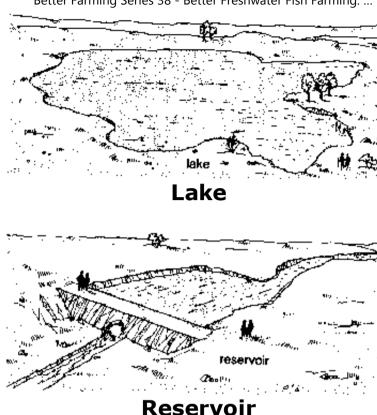
Better Farming Series 38 - Better Freshwater Fish Farming: Raising Fish in Pens and Cages (FAO, 1990, 83 p.)

# **Cages**

124. You can build a cage and put it in a stream, a river, a lake or a reservoir.

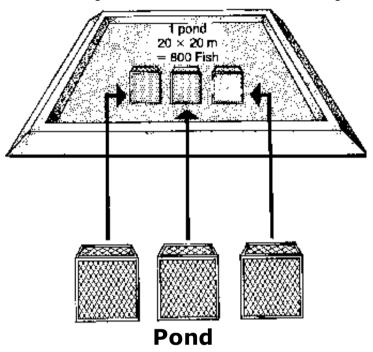


Stream or river



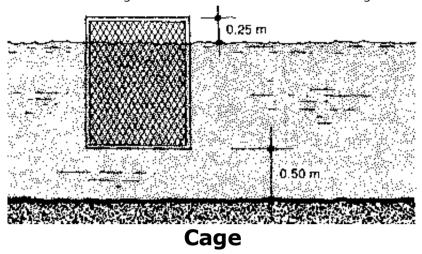
125. In addition, as you have already been told, you can put a cage in a fish pond.

Note If you have a fish pond and decide to put in some cages, you will raise many more fish. For example, a pond of 20 by 20 metres (400 square metres) will hold 800 fish. If you also put in 3 cages of 1 cubic metre each, you can raise 450 to 600 more fish. So, in this case you can raise as many as 1400 fish in the same pond.



3 cages 1 x 1 x 1 m = 450 to 600 fish 800 + 600 = 1 400 fish in all

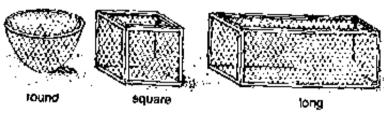
126. The water should be deep enough so that when the cage is in place it will be at least 50 centimetres from the bottom.



- 127. A cage should be in a place where the flow of water is gentle and not fast. In addition, it should be protected from the wind.
- 128. The water should be clean You should not put a cage too near an inlet where the water may be muddy or full of rubbish.

**Building a cage** 

129. A cage can be any shape. It can be round, square or long.

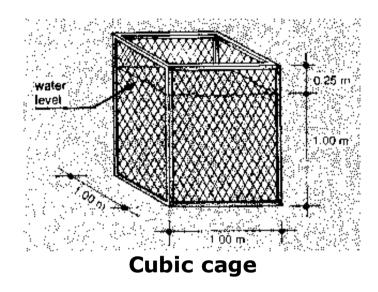


**Cage shape** 

130. A cage can be small or large depending on the number of fish that you want

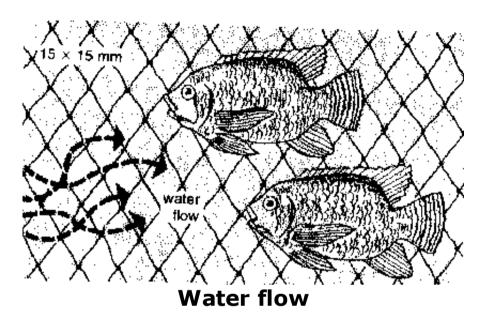
to raise. However, when you first begin, start by building a small cage. You will need fewer materials. It will be easier to take care of.

131. You can begin with a cage that has about 1 cubic metre (1 metre by 1 metre by 1 metre) of space for the fish. Later, when you have learned more, you can build bigger ones.

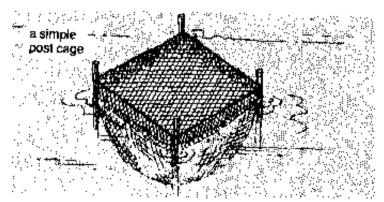


- 132. The best material to cover a cage is ordinary fish net. If you cannot get fish net you can use either plastic mesh, woven material made from split bamboo or wooden strips.
- 133. The openings in the material that you use to cover a cage must be small enough to keep the smaller fish from getting out.
- 134. However, if the openings are too small they may become filled with dirt or with the very small plants that grow in the water.

135. So, be sure to use material with openings of 1.5 by 1.5 centimetres. This is the right size to keep in the smaller fish and also to let fresh water through.

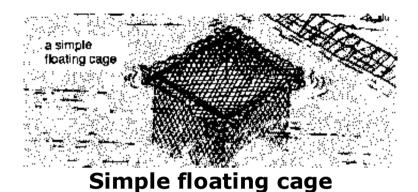


136. You can build a simple cage by driving four or more posts into the bottom under the water and hanging a fish net inside.

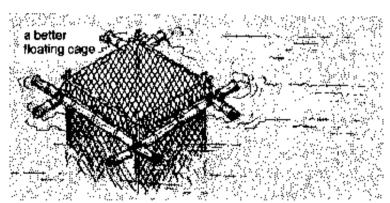


Simple post cage

137. You can also build a simple cage by putting a square float on the water and hanging a piece of fish net inside.



138. If you want a better floating cage, you can build a frame with floats and close it with fish net, woven material or plastic mesh.



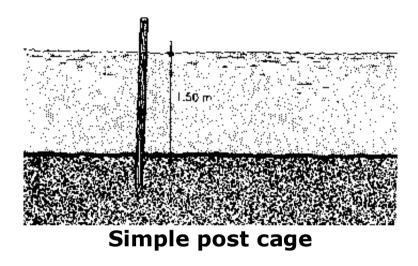
**Better floating cage** 

- 139. You can use either bamboo or wood for the posts, floats or frame. However, if you are using wood, choose one that does not rot quickly when it is in the water.
- 140. The drawings on pages 50 to 66 show you how to build these cages. You will

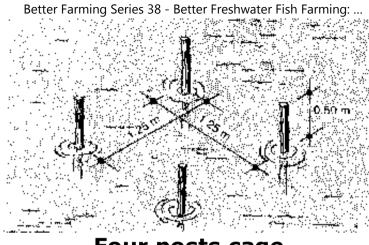
also be shown how to close the tops of cages and how to fix cages in the water.

# A simple post cage

you can build a simple post cage using bamboo or wooden posts and fish net find a place where the water is at least 1.50 metres deep even during the dry season

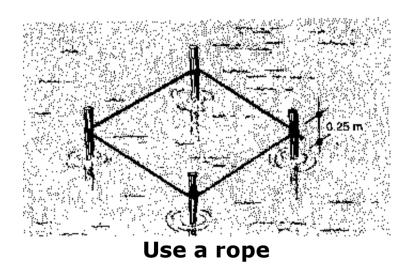


drive 4 posts into the bottom to form a square 1.25 m  $\times$  1.25 m the posts should be about 50 cm above the water

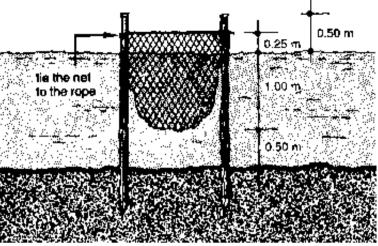


Four posts cage

tie a rope around the top of the posts to hold the fish net at least 25 cm above the water



hang a piece of fish net over the rope inside the posts and make sure that it is at least 1 m under the water at the deepest part tie the net to the rope all the way around the cage using strong cord



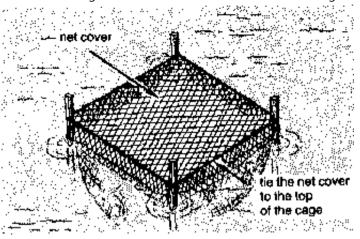
Lie the net to a rope

you can put in the fish now (but first see Items 141 to 145)



Put the fish

if you have enough fish net stretch a piece over the top of the cage and tie it to the rope using strong cord



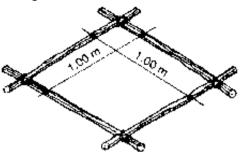
**Net cover** 

when you feed the fish, do not remove the cover however, you may have to open part of the cover from time to time to take out any dead fish

# A simple floating cage

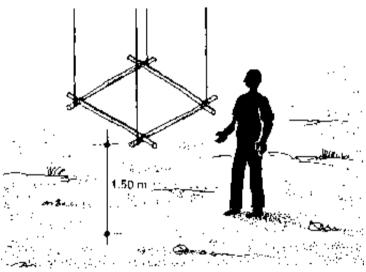
you can build a simple floating cage using any wood that floats well, such as bamboo or banana stalks, and covered with either fish net, woven material or plastic mesh

tie 4 pieces of wood together using strong cord or rope to form a float 1 m square



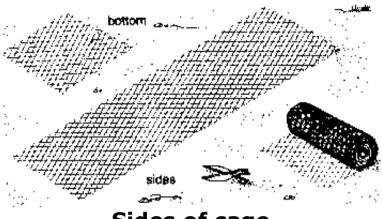
Float square

hang the float about 1.50 m above the ground so you can work on it easily



Hang the float

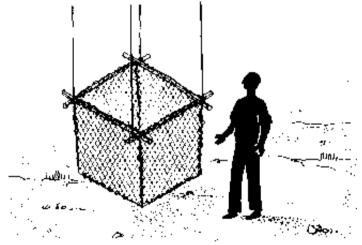
cut 1 long piece of material for the sides of sides of the cage and one square piece of material for the bottom



**Sides of cage** 

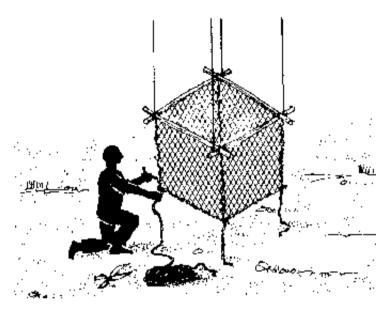
depending on the material that you are going to use, tie or wire the long side piece arround the outside of the cage

then, tie or wire the square bottom piece to the lower edges of the sides in the same way



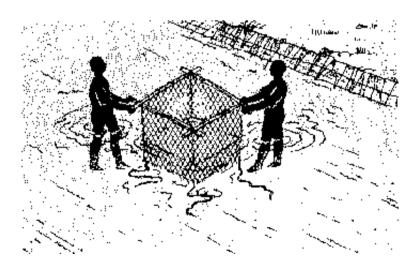
Make the cage

if you have used fish net or woven material, tie a length of rope to the bottom of each corner to be used for weights when the cage is in the water



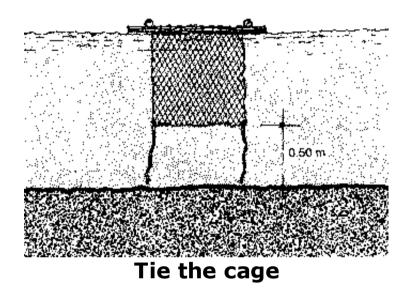
Tie the rope

# carefully pull the cage into the water

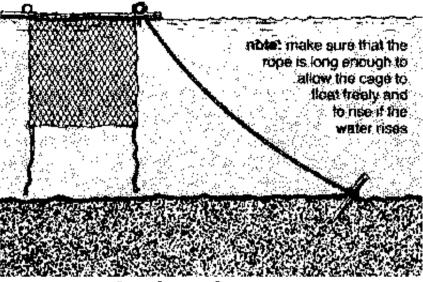


### Put the cage into the water

make sure that there are at least 50 cm of water under the cage and tie it firmly in place

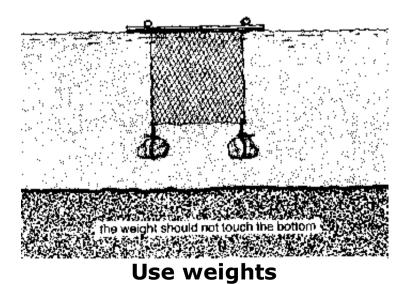


to do this, tie a piece of rope to one comer at the float and anchor the other end to a stake in the bottom



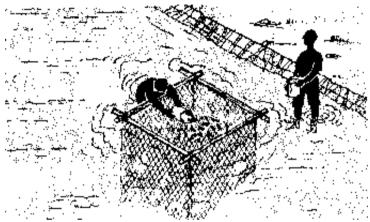
**Anchor the cage** 

if you have used fish net or woven material, tie a weight to the rope on each comer



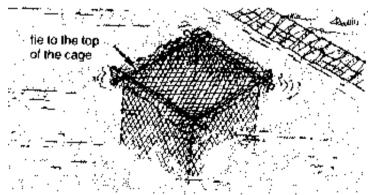
note: if the that sinks below the water, tie on more pieces of wood until it floats on the surface

now you can put in the fish (but first see Items 141 to 145)



Put the fish in cage

after the fish are in, you can cover the cage with fish net

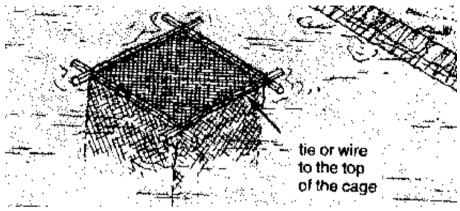


**Cover the cage** 

if your cage is built of woven material or plastic mesh you can use this material for

#### a cage cover

depending on the material that you have used for the cover tie or wire it in place just as you did the sides and the bottom of the cage



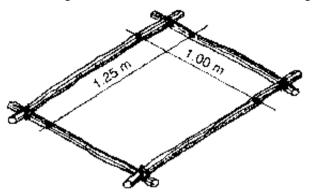
Tie the top of cage

however, you may have to open part of the cover from time to time to take out any dead fish

# A better floating cage

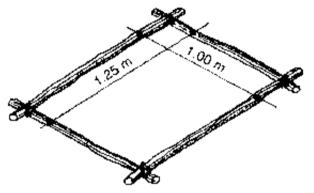
you can build a better floating cage by making a light frame from bamboo or straight pieces of wood cut from trees and covered with either fish net, woven material or plastic mesh

tie 4 pieces of wood together using strong cord or rope to make one side of the frame, which should be about 1 m by 1.25 m



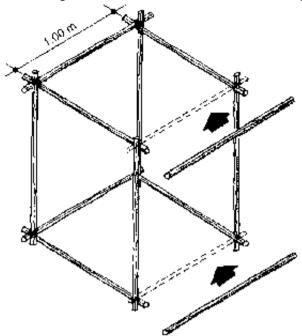
**Use a bamboo frame** 

#### make another side the same as the first



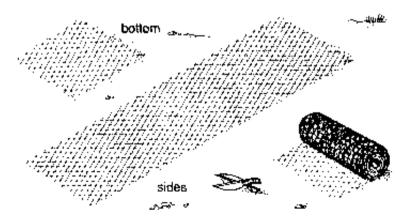
Make another frame

using 4 more pieces of wood, tie the two sides together 1 m apart



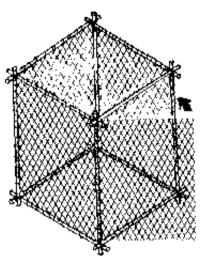
Use 4 more pieces of wood

cut 1 long piece of material for the sides of the cage and 1 square piece of material for the bottom



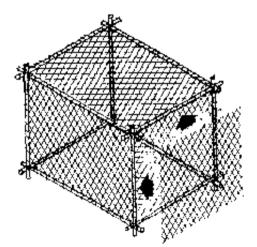
**Cut the material** 

depending on the material that you are going to use, tie or wire the long side piece around the inside of the float



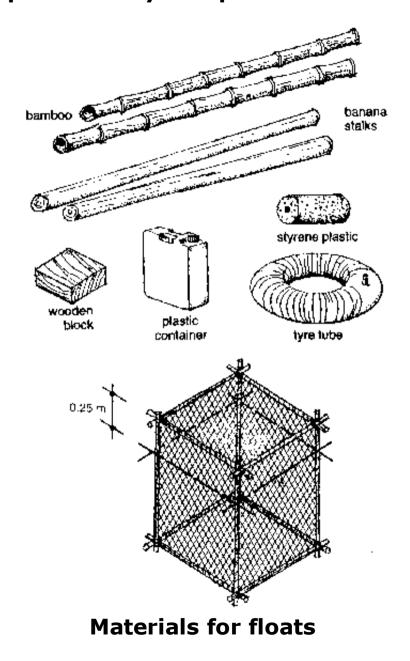
**Put the material** 

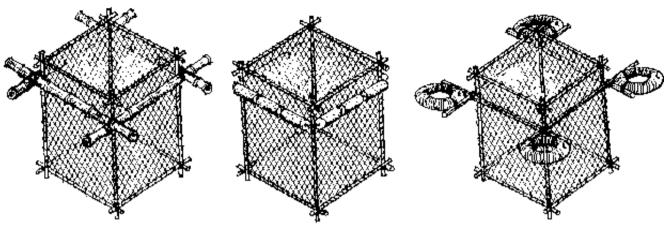
then, turn the cage on its side and tie on the bottom piece in the same way



Turn the cage on

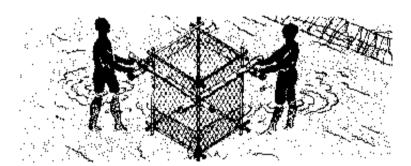
for floats you can use bamboo, banana stalks, wooden blocks or, if you can get them, plastic containers, pieces of styrene plastic or used tyre inner tubes.





bamboo floats, styrene plastic floats, tyre tube floats

### carefully put the cage into the water

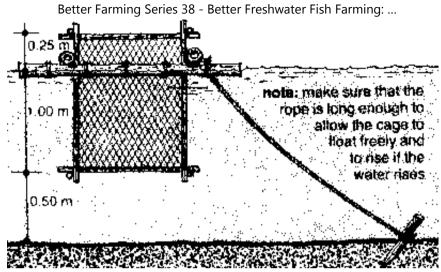


Put the cage into water

make sure that there is at least 50 cm of water below the cage and tie it firmly in place

to do this, tie a piece of rope to one corner at the float and anchor the other end to a stake in the bottom

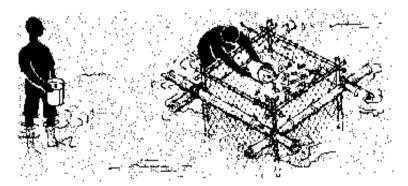
the cage should float so that 25 cm of it is above the water and 1 m of it is below the water



Let the cage float

note: if the cage does not float 25 cm above the water tie on more floats until it does

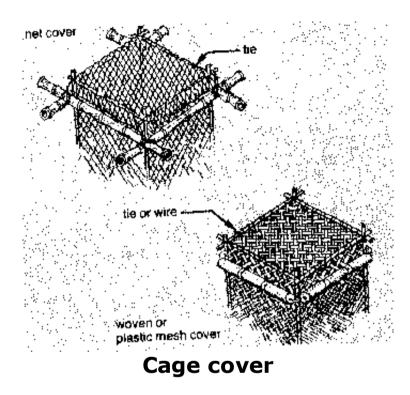
now you can put in the fish (but first see Items 141 to 145)



Put the fish in the cage

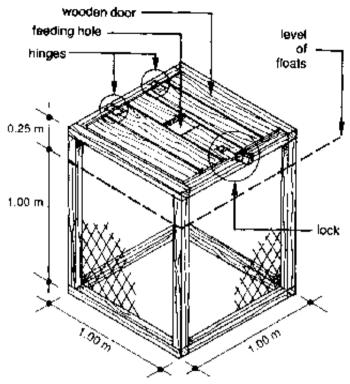
after the fish are in, you can cover the cage with a fish net

if your cage is built of woven material or plastic mesh you can use this for a cage cover



when you feed the fish do not remove the cover however, you may have to open part of the cover from time to time to take out any dead fish you can build an even better floating cage using pieces of squared, rough- cut wood.

you can build this kind of cage with a door that can be locked and with a special opening for feeding the fish



Use rough- cut wood

with a locked door it is more difficult for people to steal your fish however, you may need more floats for a cage with a heavy wooden door

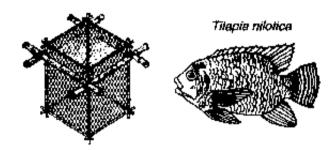
141. When your cage is finished and in place in the water, you are ready to stock it with baby fish.

# **Carrying small fish**

142. You have already been told that small fish can be hurt easily. So, you must be very careful when you handle them or carry them from place to place. Items 61 to 65 in this booklet will tell you how.

#### Putting baby fish into your cage

143. If you are raising Tilapia nilotica you will need to put in 150 to 200 baby fish for each cubic metre of cage.



Use tilapia nilotica

144. The baby fish that you use should be at least 8 to 10 centimetres long or weigh about 15 to 20 grams each.

Note If you need any help or want to raise a different fish, your extension agent or fishery officer will be able to give you good advice.

145. Put the fish in your cage just as you were told to do in a pen. Items 68 to 72 in this booklet will tell you how.

## Feeding fish in cages

146. You have already been told that there may be very little natural food in a cage. So, you must be sure to give your fish plenty of very rich food.

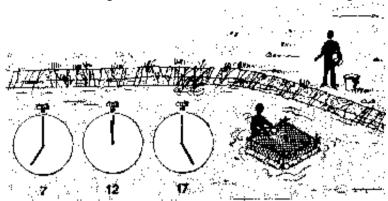
147. Here are some rich foods that fish like to eat. You can give them

- termites
- grain mill sweepings
- rice bran
- beer wastes
- cottonseed or groundnut cake.



**Food for fish** 

- 148. Prepare all of the food for one day's feeding at the same time and give the fish part of the food at two or three different times during the day.
- 149. Always try to feed your fish at the same time each day.



Feed the fish at the same time

150. The bigger your fish grow the more food they will need. For each cubic foot of cage feed them

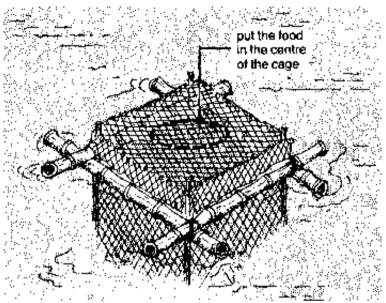
- 150 to 200 grams of food every day during the first month
- 200 to 350 grams of food every day during the second and third months
- 350 to 450 grams of food every day from the fourth month until the time you are ready to harvest.

Note 100 grams of rice bran is about one handful. Use a small tin to measure this amount.



51. It is not easy to know exactly how much to feed your fish. You must watch them carefully to learn how much food they need.

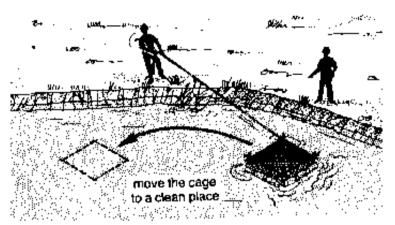
152. Put the food for your fish near the centre of the cage so that they can eat it before it floats away through the holes in the sides.



Put the food in centre of cage

- 153. Put in the food little by little so that you can watch the fish and see that they are eating.
- 154. If you see that the fish do not eat all of their food, give them a little less.
- 155. If you see that the fish eat all of their food quickly, give them a little more.
- 156. Remember, that if you give your fish too much food to eat it will collect on the bottom and make the water around the cage bad.
- 157. So, check the cage often. If you see too much uneaten food on the bottom, you will know that you are feeding too much. When this happens, move the cage

to a clean place.

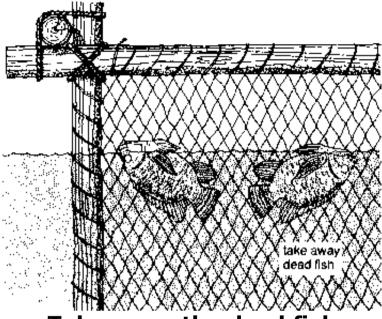


Move the cage in clean place

## Taking care of the fish and cage

#### The fish

- 158. You must always watch the fish to see that they are healthy and swimming strongly.
- 159. If the fish in your cage are not well, they will stop eating.
- 160. If this happens, stop feeding your fish for a day or two.
- 161. When you begin to feed them again, at first give them small amounts of food and then slowly more and more. When your fish begin to eat as before, you will know that they are well again.
- 162. If you find any dead fish floating in your cage, take them out right away.



Take away the dead fish

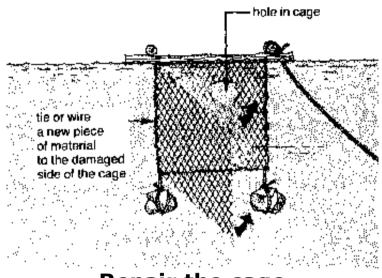
- 163. Then, stop feeding your fish and watch them carefully for the next few days.
- 164. If no more fish die, you can begin to feed them after a day or two.
- 165. If fish continue to die, take them out as soon as you can and ask your extension agent or fishery officer for help.

## The cage

- 166. You have already been told that a cage can easily be damaged. If this happens you may lose fish.
- 167. So, it is very important to check your cage every day to be sure that there are no holes where your fish can get out.

168. If you find any places where the fish can get out, repair them right away.

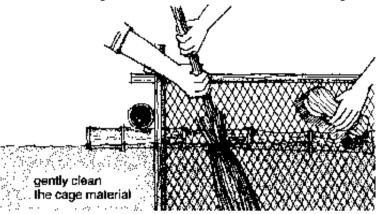
Note If your cage is in shallow water you may be able to repair any holes in it as you were shown on page 33. However, if the water is deep it may be easier to completely cover the damaged side of the cage with a new piece of material.



Repair the cage

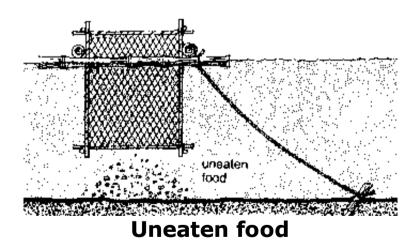
169. In addition, you must be sure that the openings in the cage material are free from dirt and plants so that fresh water can flow into the cage.

170. You can clean the material of a cage using a brush or a broom. However, do it very gently so that you do not damage the cage material.

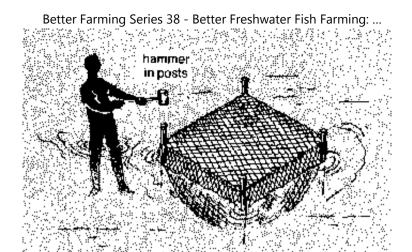


Clean the cage material

171. Also, do not forget to check for uneaten food on the bottom under the cage from time to time.



172. If you have put your cage on posts in the water, make sure that the posts are firmly in place so that the cage cannot float away.



**Hammer in posts** 

173. If you have a floating cage, make sure that the floats and that the cage is firmly tied in place so that it cannot float away.



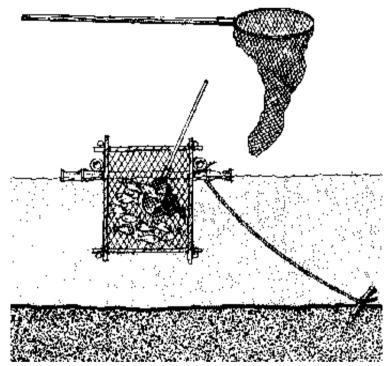
**Check float and anchor cage** 

# **Harvesting fish in cages**

174. If you have used baby fish 8 to 10 centimeters long or weighing about 15 to 20 grams and have fed them well, they will be ready for harvest in about five

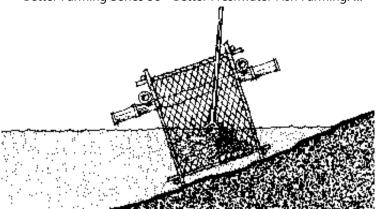
months. At this time the fish will weigh 100 to 150 grams each.

175. If you want to harvest only some of your fish, use a small hand net and collect what you want without moving the cage.



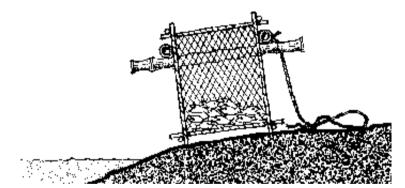
collect what fish you want without moving the cage

176. If you want to harvest all of your fish and your cage is small enough, pull it into shallow water and begin to collect the fish using a small hand net.



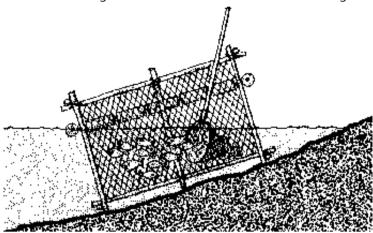
collect some of the fish after moving the cage to shallow water

177. When you have collected most of the fish, you can lift the cage out of the water and collect the rest.



then, collect the rest of the fish after moving the cage out of the water

178. If your cage is too big to lift out of the water, pull it into shallow water as far as you can and collect the remaining fish.



if your cage is too big you may have to collect all of the fish in shallow water

Note If you do not need all of your fish, harvest only what you need and leave the rest in the cage. Fish can be left in a cage as long as you continue to feed them.

Now you must begin again

179. After you have harvested, clean and repair your cage as quickly as you can so that you can begin again.

180. If your cage is small and you took it out of the water when you harvested the fish, clean and repair it before you put it back into the water.



clean and repair a small cage out of the water

181. If your cage is too big to take out of the water, you will have to clean it and repair it in the water.



clean and repair a big cage in the water

#### Note

The faster you can do this, the sooner you will be able to raise another crop of fish.

182. You can hold the baby fish you catch in a small pen or in another cage for small fish (see Item 114 and Item 184) until you have finished the cleaning and

#### repairing.



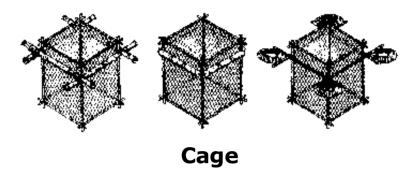
Hold baby fish in a small pen

183. When you are ready to begin again, put in 150 to 200 baby fish 8 to 10 centimetres long for each cubic metre of cage. However, be sure to choose your biggest and best baby fish to put back in your cage.

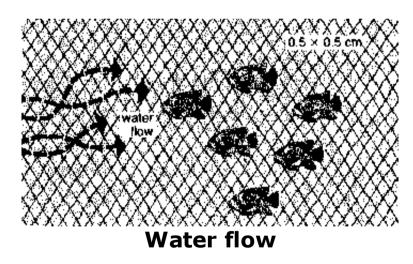
Raising your own baby fish in cages

184. You can raise baby fish in a cage. To do this build a cage just like one of the

ones shown on pages 50 to 66.



185. However, the material you use to cover the cage should have smaller openings to keep in the baby fish. So be sure to use material with openings of 0.5 by 0.5 centimetres.



- 186. Materials with such small openings will get dirty more quickly. So, you must be sure to clean it often enough so that fresh water can flow into the cage.
- 187. You can put up to 1 000 baby fish 1 to 2 centimetres long in a cage of 1 cubic metre. However, do not put in more than you need to use or sell.

#### **Note**

If you have more baby fish than you can use or sell you can dry them in the sun. After you have dried the baby fish, grind or pound them and mix them with crushed cottonseed, groundnut cake or rice bran to feed to your big fish, your poultry or your pigs. You can also use the dried baby fish to fertilize your farm garden.

188. Feed your baby fish two or three times each day just as you do with your big fish. You can give them

- termites
- rice bran
- cottonseed or groundnut cake.



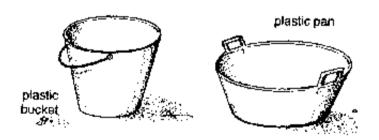
Food for fish

189. Feed your baby fish carefully. Break their food into very small pieces and sprinkle it little by little on the surface of the water. Watch very carefully that they eat well and stop giving them food as soon as they stop eating.



**Sprinkle food** 

- 190. With a cage, it is important to give the baby fish only what they will eat and no more. Uneaten food under a cage is very bad for baby fish.
- 191. In 30 to 40 days the baby fish will grow to 8 to 10 centimetres long and you can put them in a pond or another cage.
- 192. To do this take them out carefully using a smooth plastic containers.



plastic containers

