Better Freshwater Fish Farming: The Pond

By: FAO Better Farming Series

Published by: Food and Agriculture Organization of the United Nations
Publications Division
Via delle Terme di Caracalla
00100 Rome
ITALY

Available from: Food and Agriculture Organization of the United Nations
Publications Division
Via delle Terme di Caracalla
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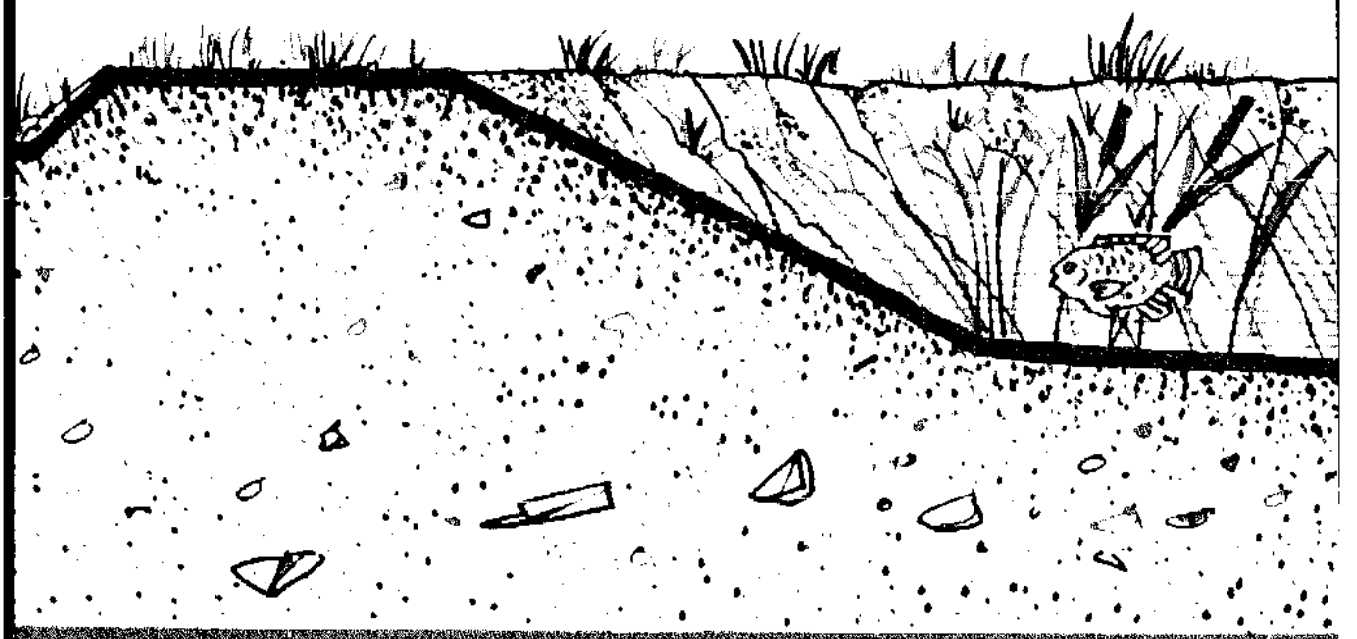
better farming series 29

1981 edition

better freshwater fish farming

the pond



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

BETTER FARMING SERIES

Twenty-nine titles have been published in this series, designed as handbooks for agricultural education and training. They may be purchased as a set or individually.

FIRST YEAR

1. The plant: the living plant; the root
2. The plant: the stem; the buds; the leaves
3. The plant: the flower
4. The soil: how the soil is made up
5. The soil: how to conserve the soil
6. The soil: how to improve the soil
7. Crop farming
8. Animal husbandry: feeding and care of animals
9. Animal husbandry: animal diseases; how animals reproduce

SECOND YEAR

10. The farm business survey
11. Cattle breeding
12. Sheep and goat breeding
13. Keeping chickens
14. Farming with animal power
15. Cereals
16. Roots and tubers
17. Groundnuts
18. Bananas
19. Market gardening
20. Upland rice
21. Wet paddy or swamp rice
22. Cocoa
23. Coffee
24. The oil palm
25. The rubber tree
26. The modern farm business
27. Freshwater fish farming: how to begin
28. Water: where water comes from
29. Better freshwater fish farming: the pond

Better freshwater fish farming

the pond

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome 1981

FAO Economic and Social Development Series No. 3/29

First printing 1981

P-69

ISBN 92-5-101127-3

PREFACE

The FAO Better Farming Series is essentially based on the **Cours d'apprentissage agricole** prepared in the Ivory Coast by the **Institut africain de développement économique et social** for use by extension workers in contact with illiterate or semi-literate farmers. The approach is deliberately a general one, the intention being to constitute basic prototype outlines, to be supplemented in each area according to local conditions of agriculture.

Many of the booklets deal with specific crops, while others, such as this one, are intended to give the farmer information concerning the general agricultural context, and thus to allow him to gain some understanding of **why** he does what he does so that he will be able to do it better.

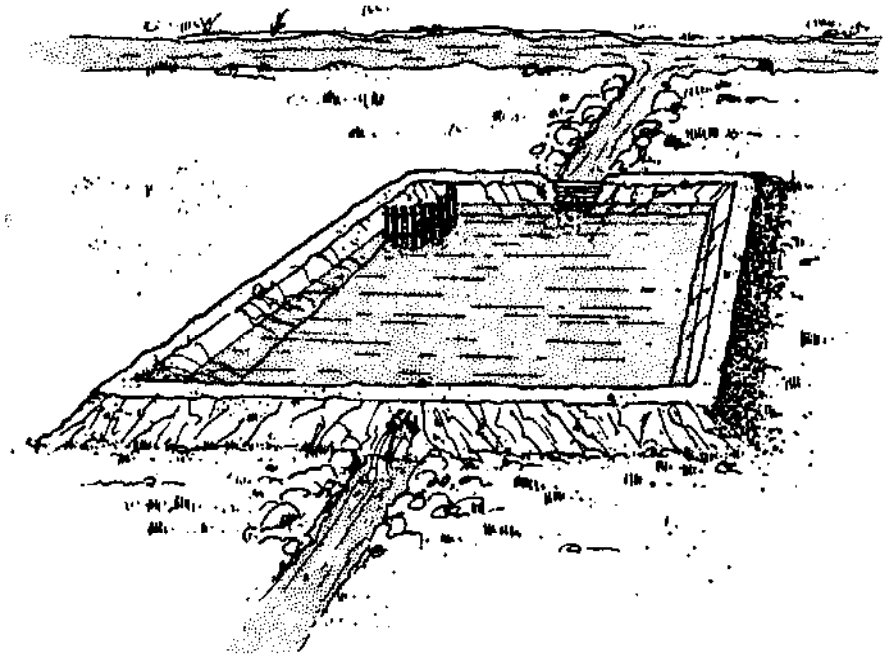
Adaptations of the series, or of individual volumes in it, have been published, among others, in Amharic, Arabic, Bengali, Creole, Hindi, Igala, Indonesian, Kiswahili, Malagasy, SiSwati and Turkish. This impressive list is some indication of the success and also of the value of the series. This volume has been prepared by the Inland Water Resources and Aquaculture Service, Fishery Resources and Environment Division of the Food and Agriculture Organization of the United Nations.

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.

OUTLINE OF THE COURSE

IMPROVING YOUR FISH FARM

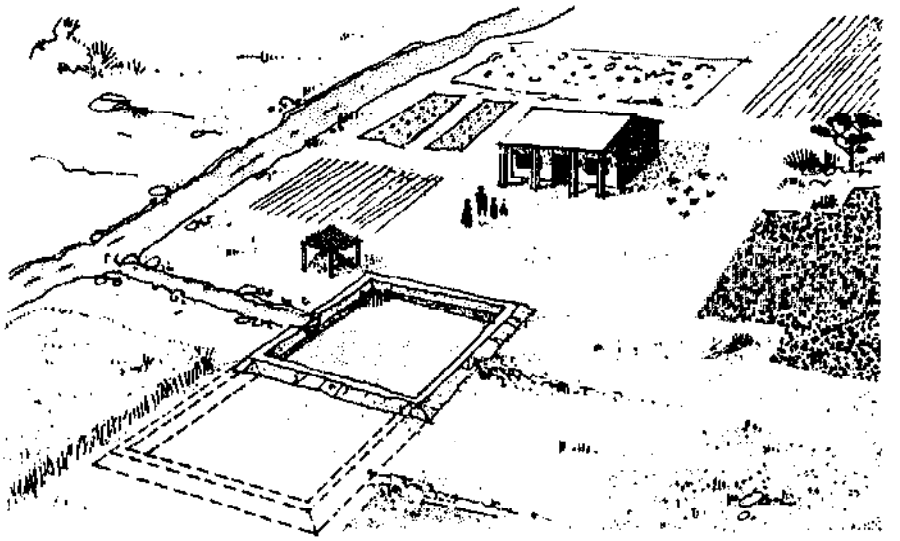
1. You have already built the small pond described in Booklet No. 27, **Freshwater fish farming: how to begin,** and you have grown many fish in it.



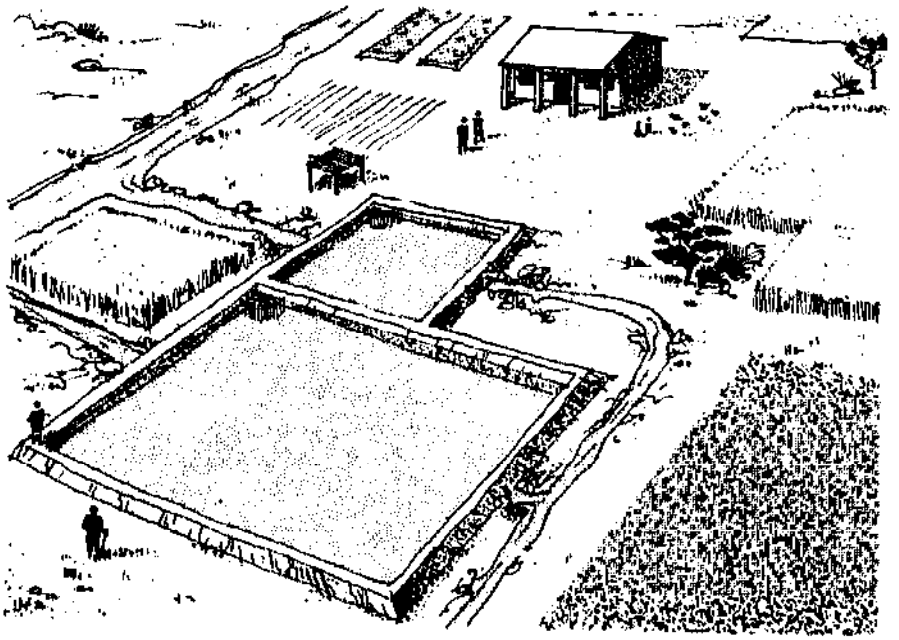
2. Your family would like to have more fish to eat, and you have learned at the market that you can sell more fish if you have them.

3. You would like to grow more fish to eat and to sell at the market so that you and your family can live better. Growing more fish is improving your fish farm.

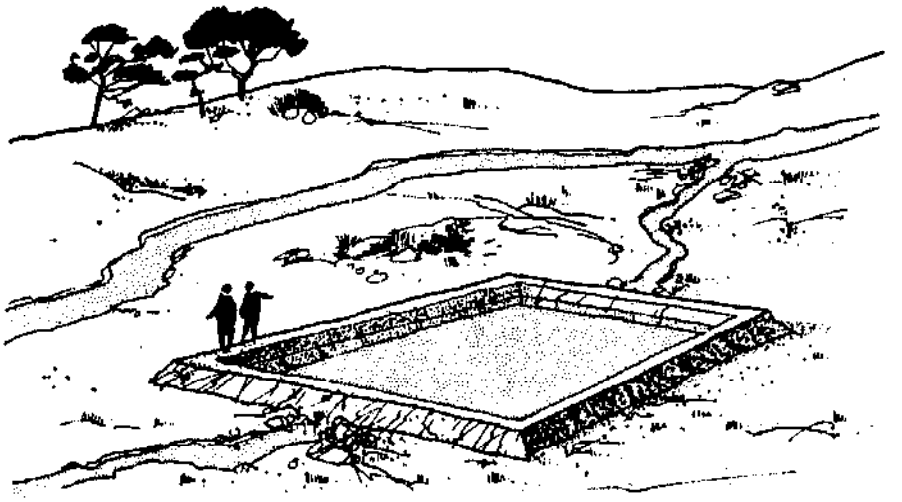
4. You can improve your fish farm
by making your old pond bigger.
If your old pond
was 10 by 10 metres,
you can make it twice as big
by moving some of the banks.
You can make it 10 by 20 metres.



5. You can improve your fish farm
by building a new, bigger fish pond
either next to your old pond



or in another place.



You can improve your fish farm
by building more than one pond.

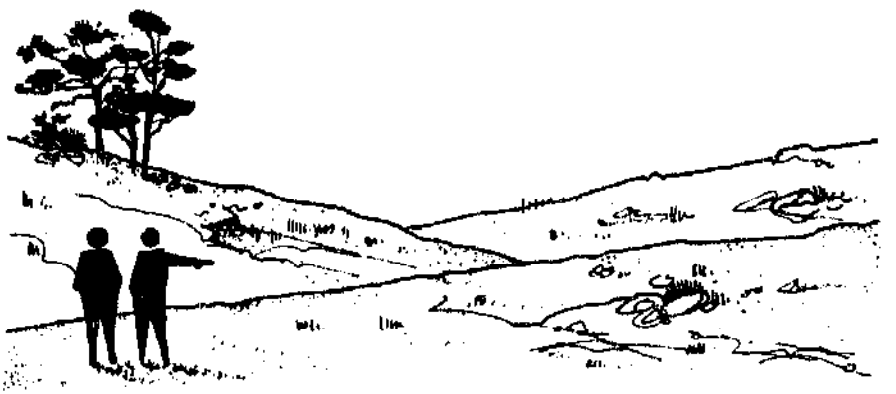
6. But start slowly and carefully.
First, build only one new pond.
After you have built
your first bigger pond
and you know how to use it
to grow more fish,
you can build more ponds
and grow fish all year round.

7. After you have built
one or more new, bigger ponds,
you will need more baby fish
than you did before.
You may decide to grow
your own baby fish
so that you will have them
when you need them.

8. This is another way
of improving your fish farm.
You will learn more about it
in Booklet No. 30.

9. Before you begin
to improve your fish farm,
you must be sure that:

- you have enough
of the right kind of land



- you have enough good water near by

- you and your family have enough time
to work a bigger pond or more ponds.

PLANNING A BIGGER POND

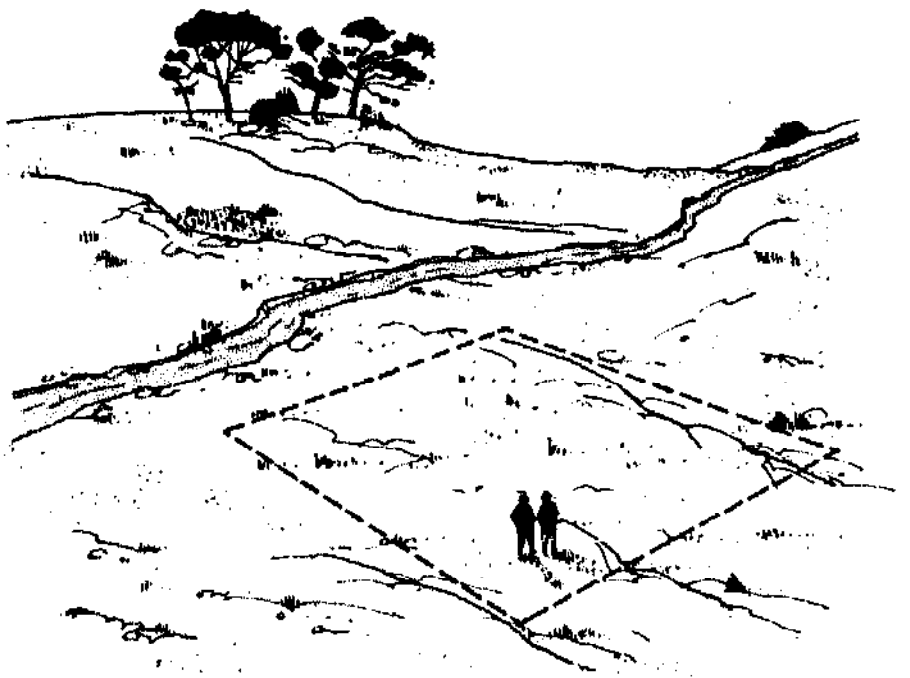
Where to put your pond

10. If your old pond
was in the right place
and you have enough water
and enough good land there,
you can make your old pond bigger
or you can build one or more new ponds
in the same place.

11. If there is no room
or not enough water
near your old pond,
you will have to choose
another place for your new pond.
You must choose the new place
very carefully.

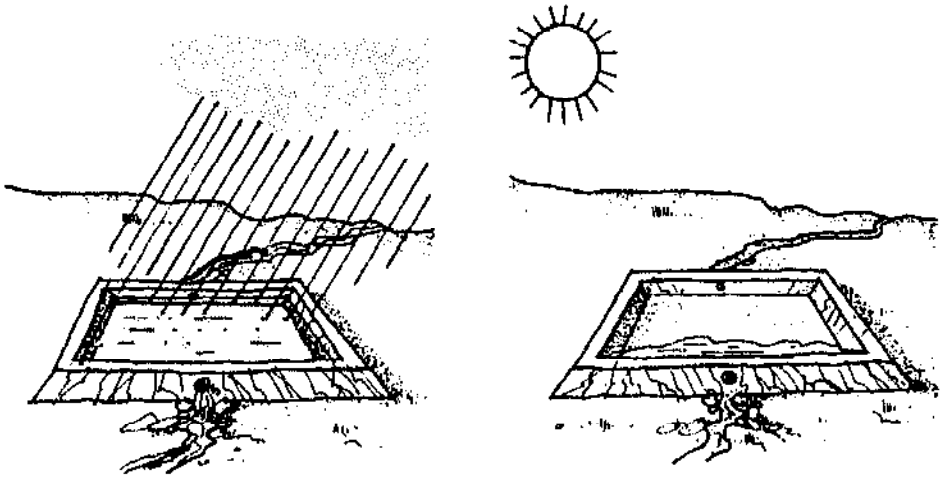
Water

12. Your new pond must be near
a good supply of water
such as a spring, stream,
lake or reservoir
with plenty of water
all year round.

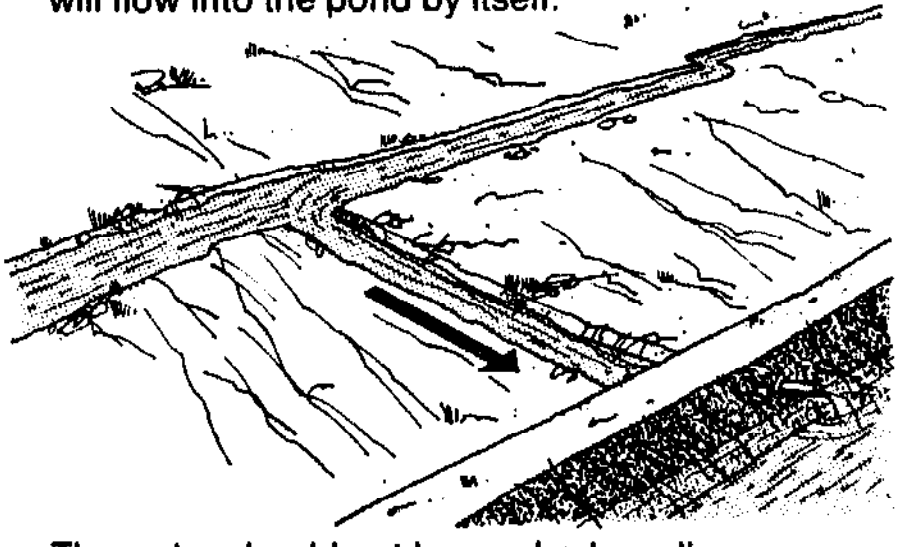


13. You must be sure
that you have enough water
to fill your pond
when it is time to fill it
and to add more water
when you need it.

14. Do not depend on rain-water
to fill your pond.
When it does not rain,
there may not be enough water
to keep your pond full
and the fish may die.



15. Your water must come from a place
that is higher than the pond
so that the water
will flow into the pond by itself.



16. The water should not have a bad smell,
taste or colour.
It should not be too muddy.

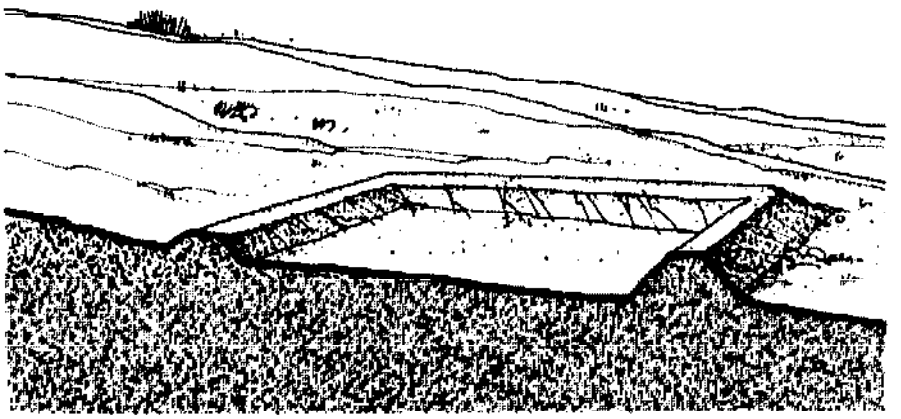
17. The water should not have
wild fish in it.
You do not want wild fish
in your pond
because they may eat your fish
or keep them from growing.

18. Water from a natural spring
close to the pond site
is usually good
and there will not be wild fish in it.

19. Water from a stream
or from a lake or reservoir
is usually good
but it may have wild fish in it.
You will have to be careful
that the wild fish
do not swim into your pond.

Place

20. It is best to put a pond
in a place with a slope or on a hillside
because you will not have to dig
as much soil to build it.
A pond built on a slope
is also easier to drain.

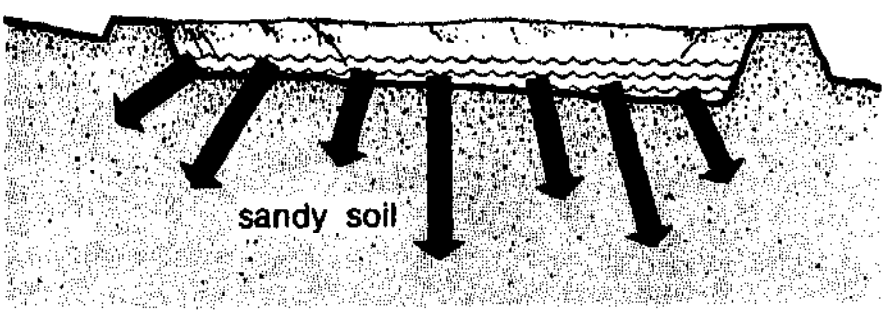


21. Do not build your pond
in a place that is so low
that it is flooded
during the rainy season.

Soil

22. The soil where you build your pond should not be too sandy.
Soil with too much sand or gravel in it will not hold water.

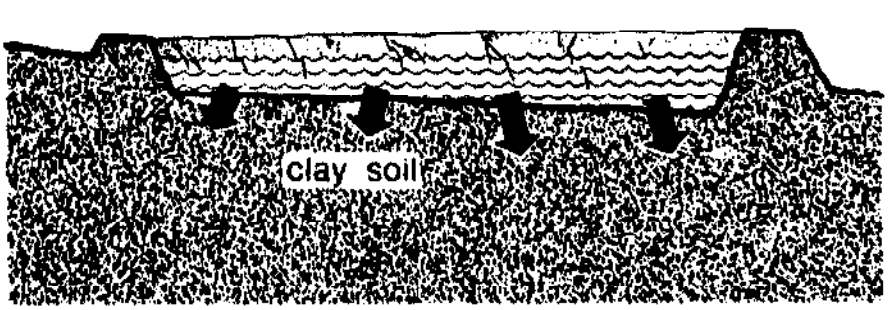
23. In sandy soil the water will sink into the ground and there will not be enough water for your fish.



24. If the banks of your pond are built of sandy soil, they will not be strong enough to keep the water from flowing away.

25. The soil where you build your pond should have enough clay in it.
Clay soil holds water very well.

26. In clay soil, very little water will sink into the ground, and banks of clay will be strong enough to hold the water in the pond.



Testing soil

27. You should test the soil
to see if it is good
for building a pond.

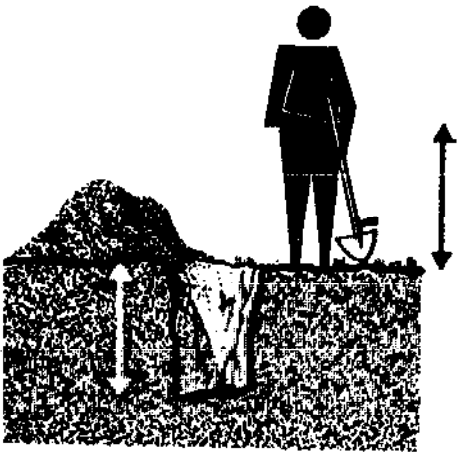
28. The **first test** is easy.
Take a handful of soil from the surface
and squeeze it into a ball.

29. Throw the ball of soil into the air
and catch it.

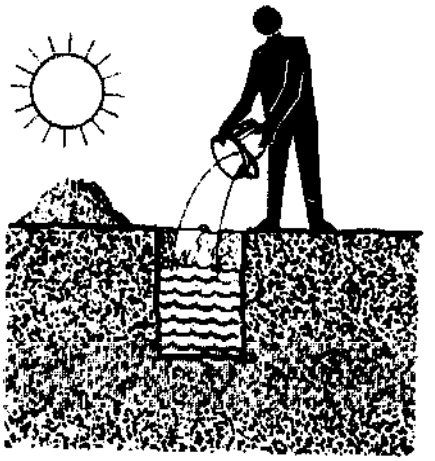
30. Bad soil with too much sand
or gravel in it
will not stick together
and the ball will fall apart.

31. If the ball sticks together well,
the soil may be good
but you cannot be sure.
Now you should make a **second test**
to be sure that the soil is good.

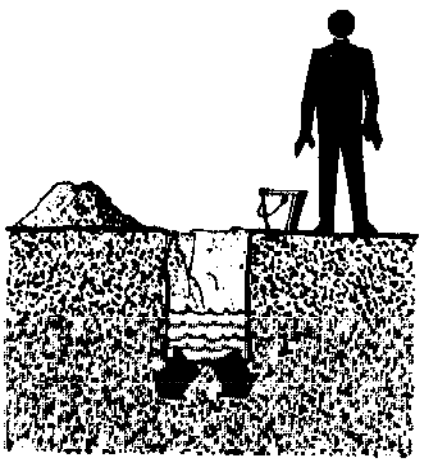
32. Dig a hole as deep as your waist.



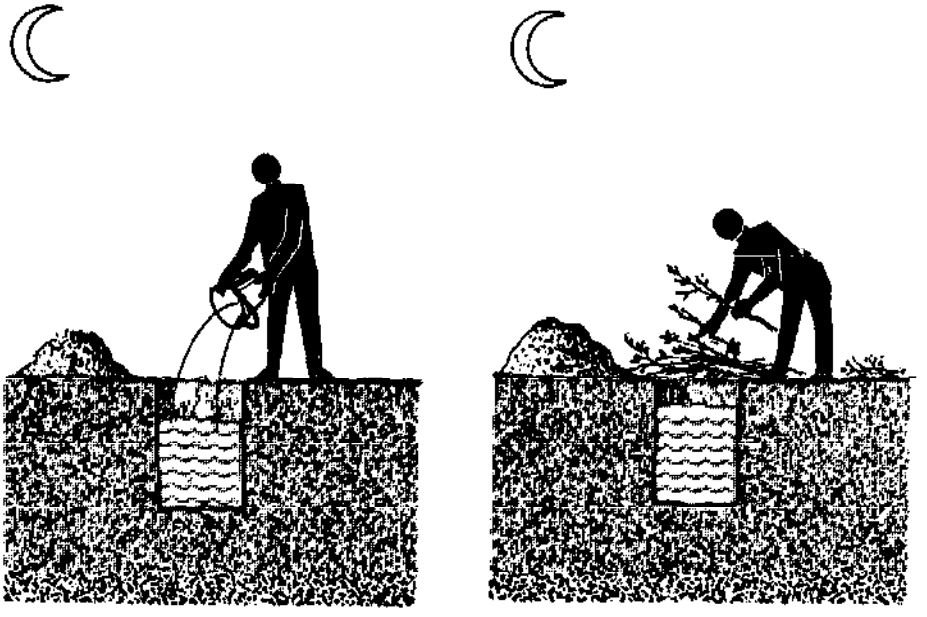
Early in the morning
fill it with water.
Fill it to the top.



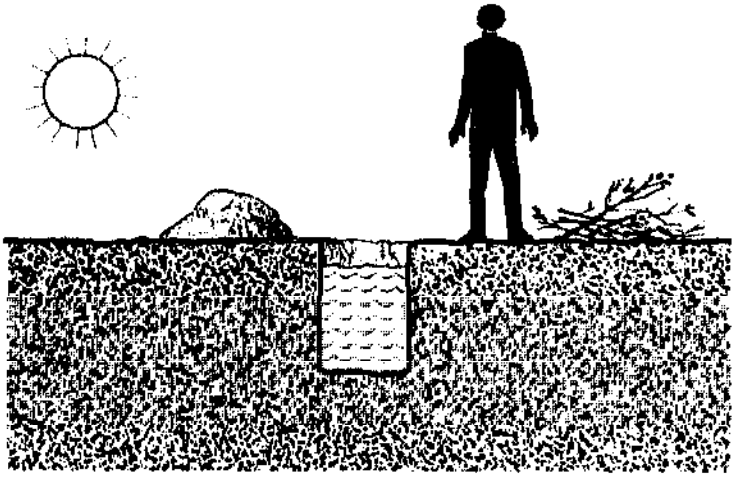
33. By evening some of the water will have sunk into the soil.



34. Then fill the hole with water again.
Fill it to the top.
Cover the hole with boards
or leafy branches.



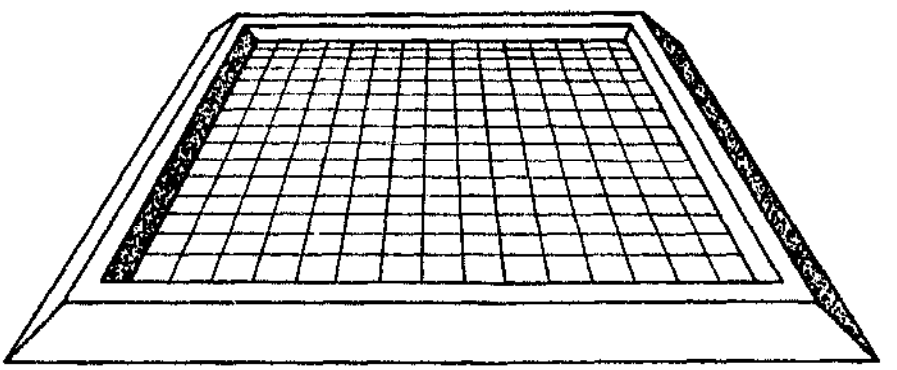
35. The next morning
if most of the water
is still in the hole,
the soil will hold enough water
to build a fish pond there.



How large should your pond be?

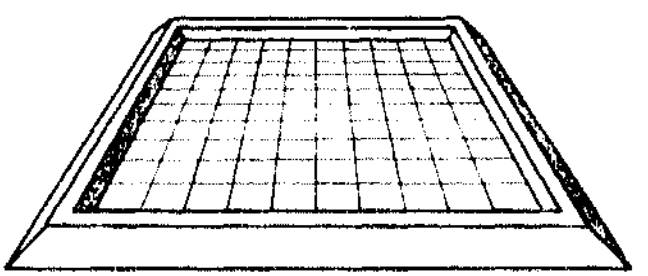
36. It is good to start with a pond
about twice as big
as your old pond.

37 For example,
if you build a pond
15 by 15 metres,
the pond will measure about 225 square metres.



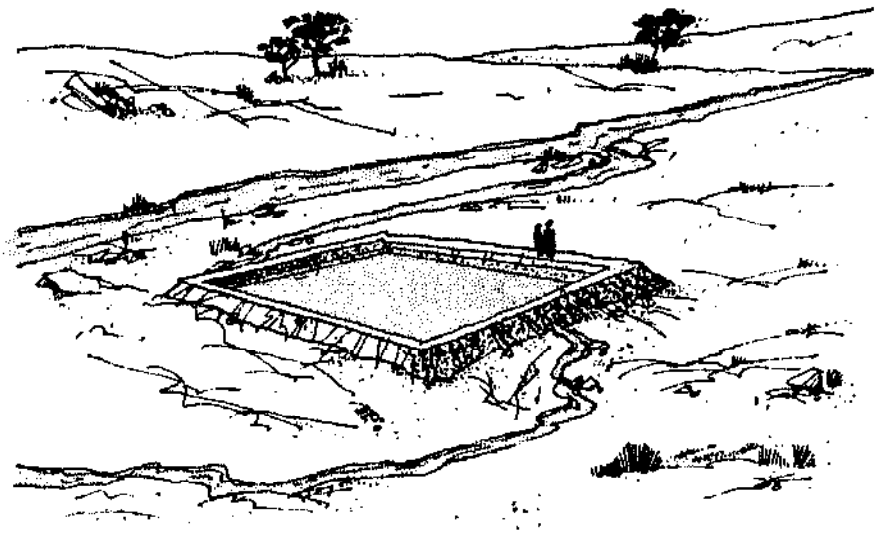
15m x 15m = 225m^2

Your old pond measured 100 square metres.

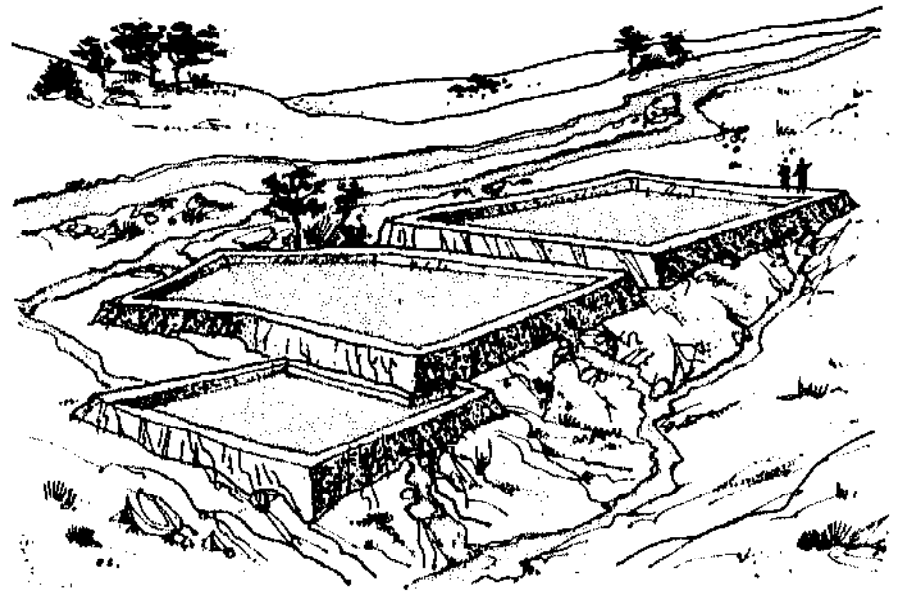


10m x 10m = 100m^2

38. A square pond is easier to build,



but your pond can have a different shape
to fit the size and shape of your land.

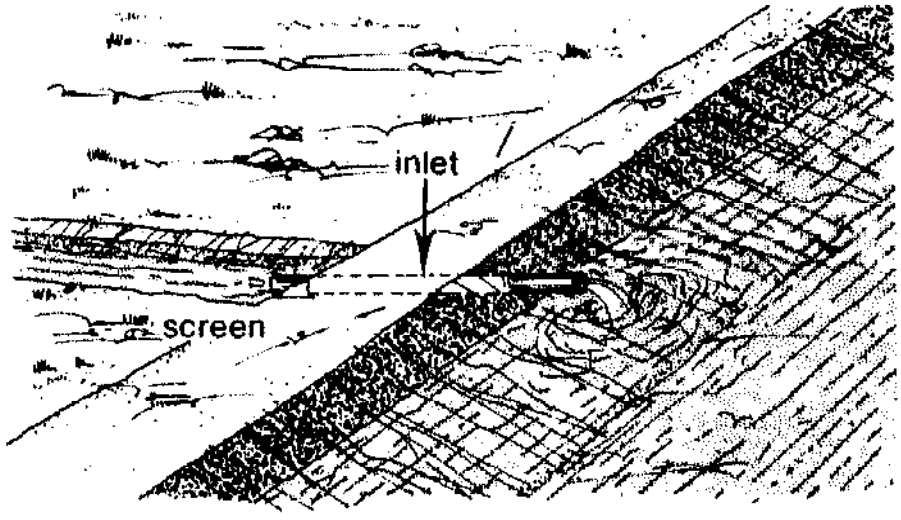


39. This book will tell you
how to make your old pond bigger.
Then it will tell you
how to build a new, square pond
measuring 15 by 15 metres.

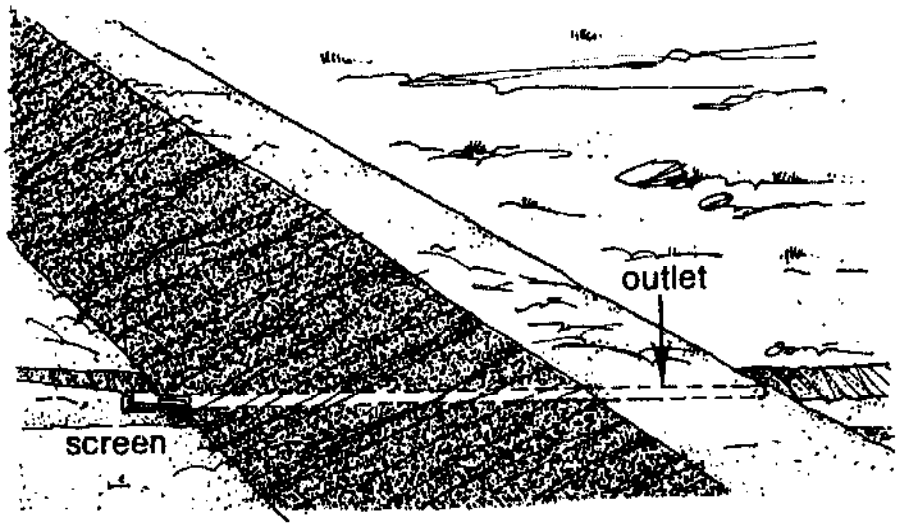
40. When you build a bigger pond,
you should try to make it better
than your old pond.

41. A bigger pond should have:

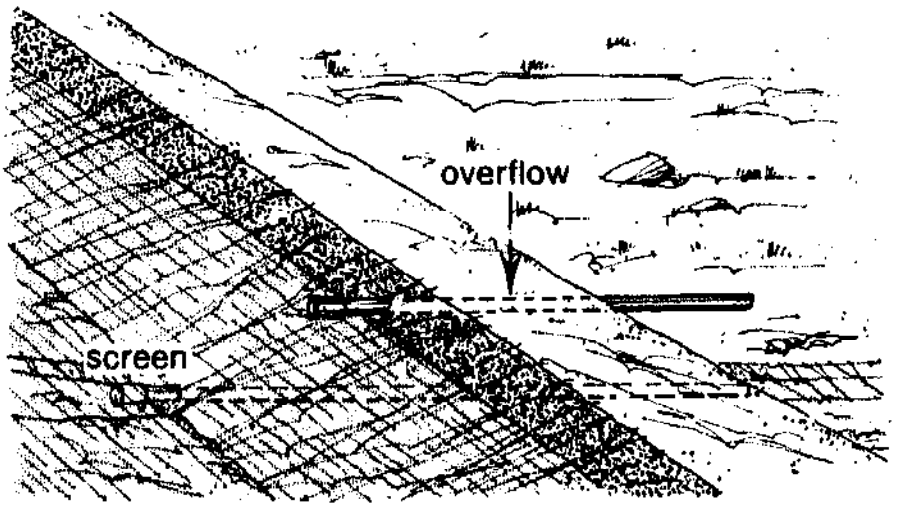
- an inlet
to let the water into the pond,
which should have a screen
to keep out wild fish,
twigs, leaves and other trash;



- an outlet
to let the water flow out of the pond
so that you can take out all the fish
and clean the pond,
the outlet having a screen
to keep your fish from getting away
when you drain the pond;



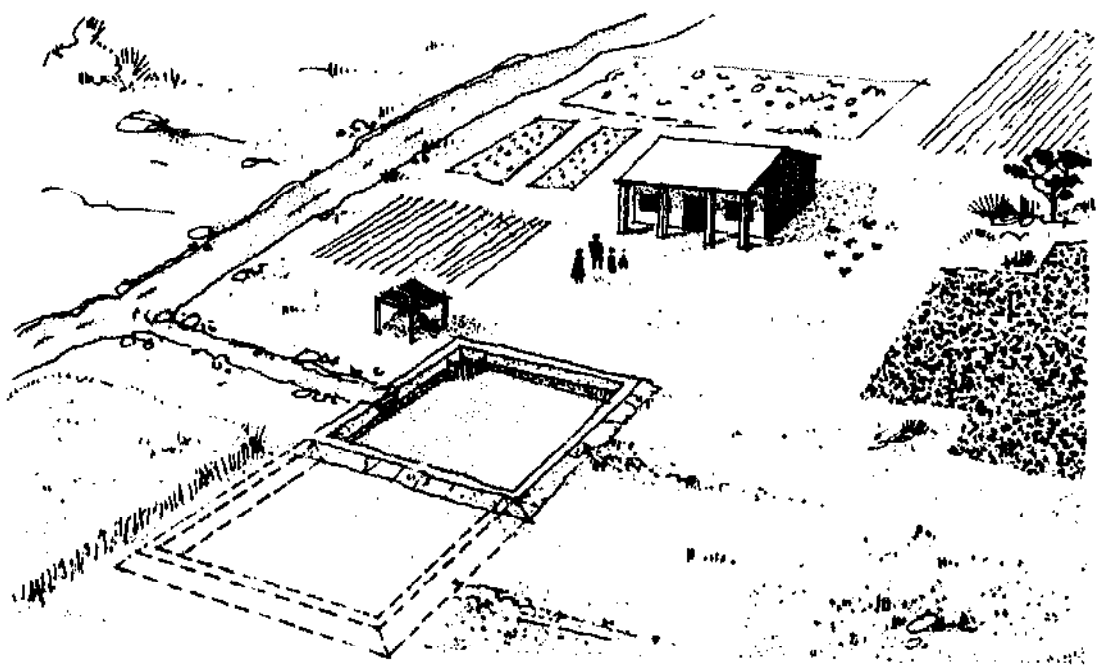
- an overflow
  to let some of the water flow away
  when there is too much water in the pond.
  If there is too much water in the pond,
  some of the water may flow over the banks
  and some of your fish may get away.
  The overflow should have a screen
  to prevent this happening.



BUILDING A BIGGER POND

How to make your old pond bigger

42. The easiest way
to make your old pond bigger
is to build a new, small pond
next to your old pond.



43. Build the new pond
in the same way that you built
the old pond.
Booklet No. 27
tells you how to do it.

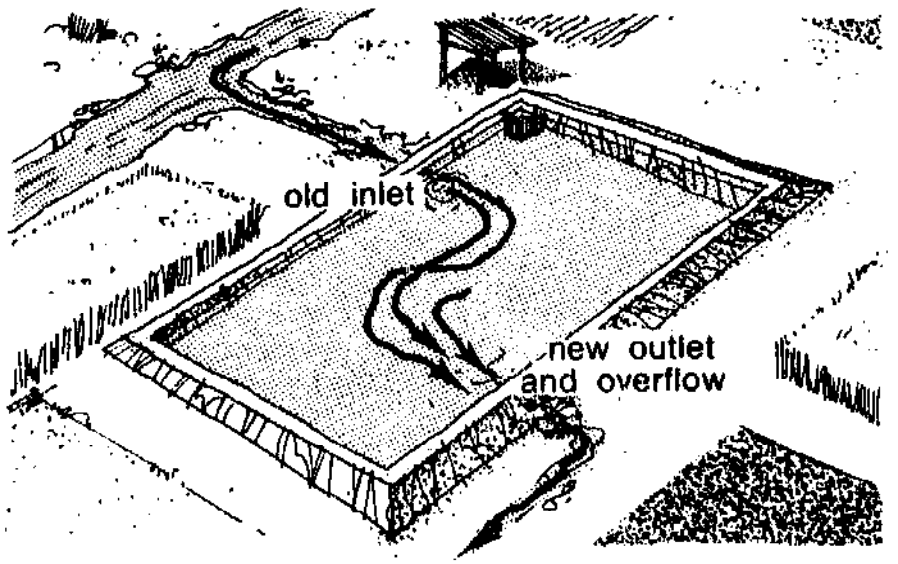
44. In building the new pond,
take away one side bank
of the old pond
and use the earth
to build the new banks.

45. **You will not need** to make a new inlet
for your new pond
because the old one in the old part of the pond
is all you will need.

46. **You will need** to make a new outlet
in your new pond
to let the water flow
from the old part of the pond
into the new part of the pond.

47. **You will also need** to make an overflow
for the new pond.
The old pond did not have one.

48. The drawing shows you
where to put the new outlet
and how the water should flow
and where to put the overflow.
You will learn how to build
an outlet and an overflow
later in this book.

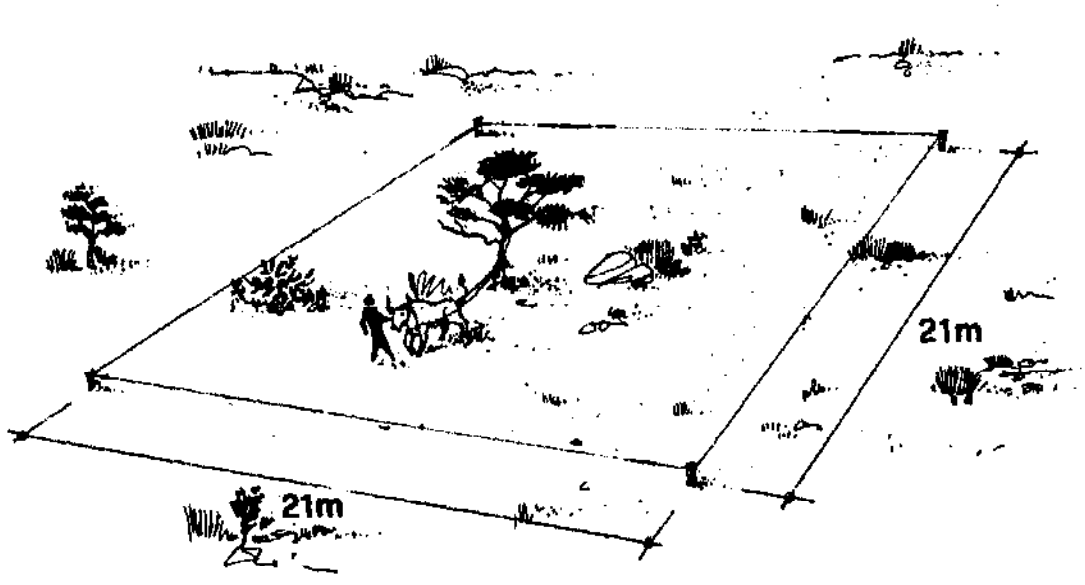


How to build a new, bigger pond

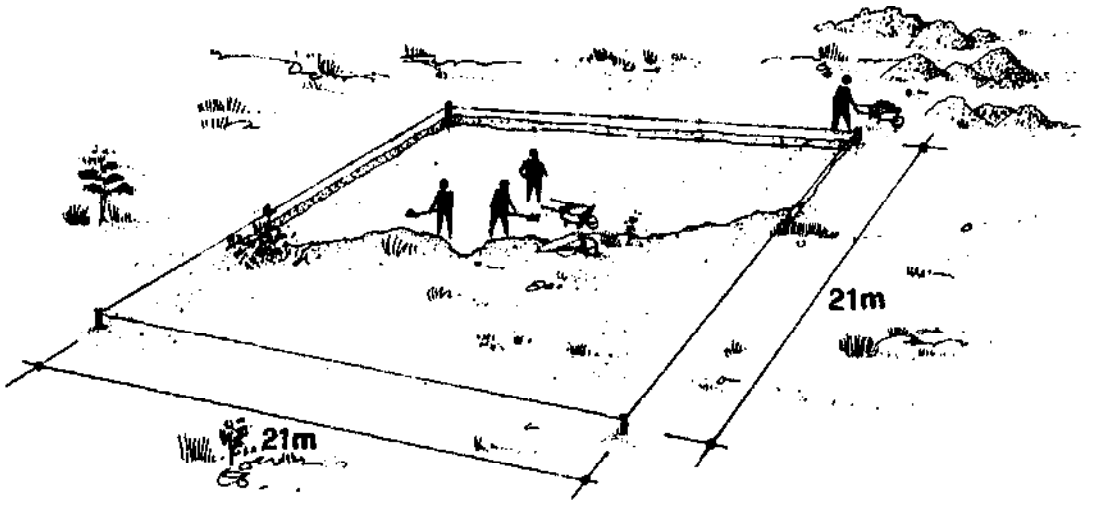
49. There is much more work to do
when you build a big pond
than when you build a small pond

50. First mark out a big square
on the site you have chosen,
about 21 by 21 metres.
Mark the corners with pegs
and run a string between the pegs
to show you where
the outside of the banks will be.

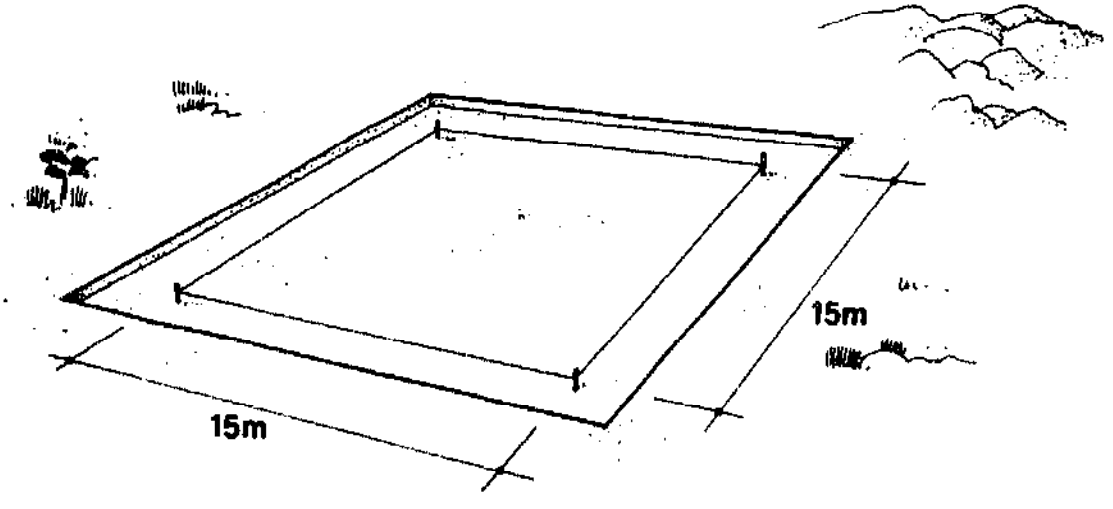
51. Clear the big square
of all trees, bushes and grass
and take away
all the big roots you can.



52. Take away about 20 centimetres
of topsoil from all over the square.
Put the topsoil aside.
Later you will put it back
on the top and outer sides of the banks.



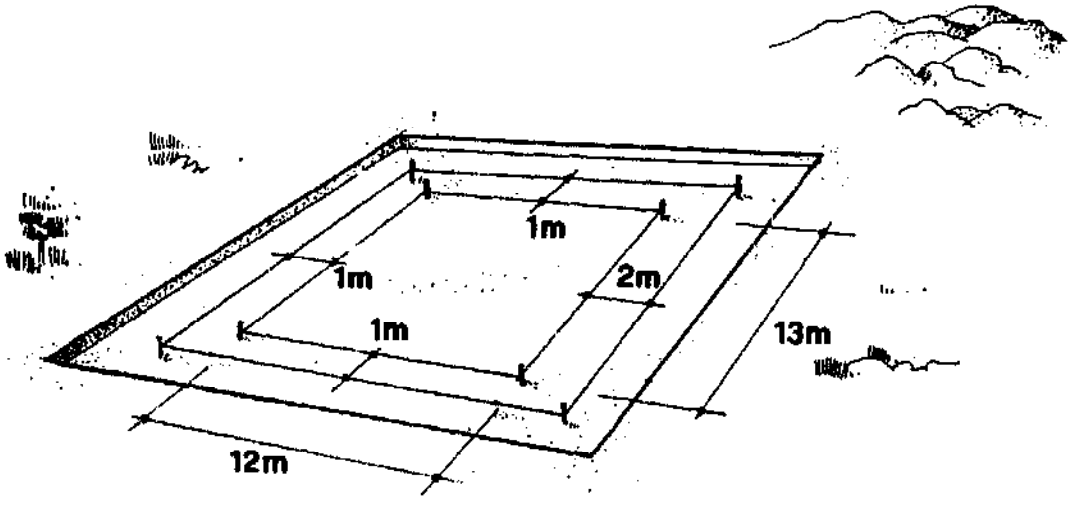
53. Then mark out a small square
inside the big square,
about 15 by 15 metres.
Mark the corners with pegs
and run a string between the pegs
to show you where
the inside of the banks will be.



54. The bottom of the bank
in the shallow part of your pond
and along the sides should be about 1 metre
from the upper end and sides
of the small square.

55. The bottom of the bank
in the deepest part of your pond
should be about 2 metres
from the lower end
of the small square.

56. Now mark out a third smaller area
in the centre of your pond,
about 12 by 13 metres.
We will call this the central area.
Mark the corners with pegs
and run a string between the pegs
to show where
the bottom of the banks will be.



57. Be sure that all the pegs and strings
marking the 21-metre square,
the 15-metre square
and the central area
are set up in the way
shown in the drawings.

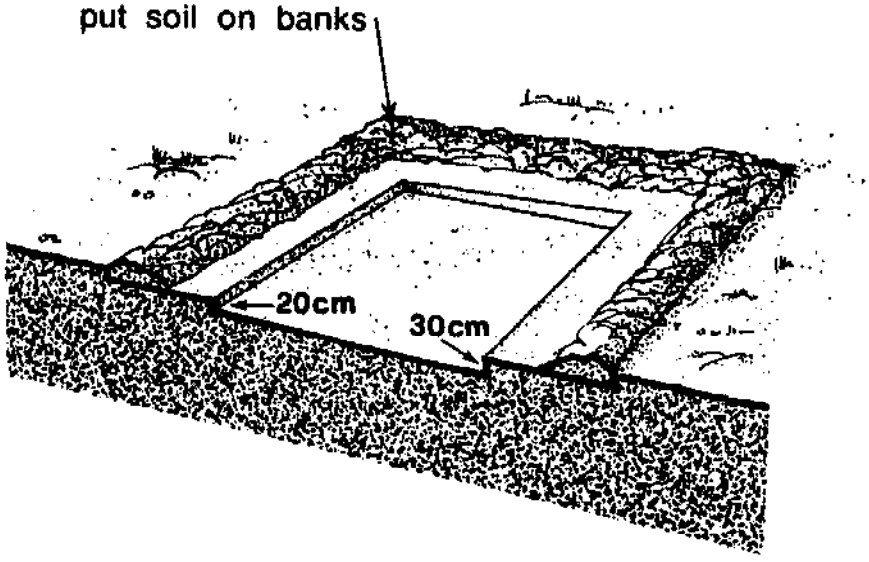
58. Now you are ready
to begin digging out soil
from inside the central area
to build the banks of your pond.

59. Ask your neighbours to help you
to dig your big pond.
Then you can help them in turn
to dig their ponds.

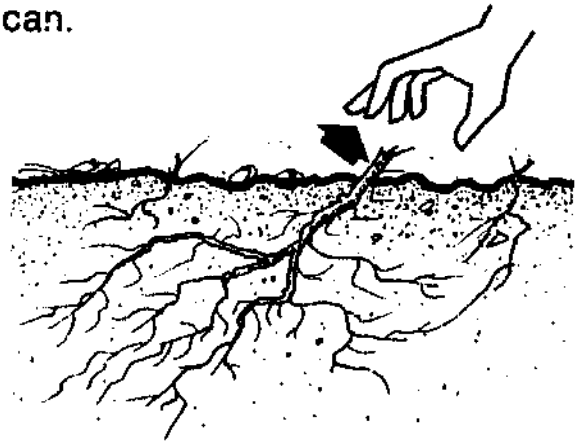
60. Shared work is lighter work.
When we work together
with our neighbours,
the work is easier and better.

61. Begin digging at the 1-metre string
marking the central area
at the upper end of your pond.
Dig about 20 centimetres deep.
As you dig toward the lower end,
dig a little deeper.
When you get to the deepest part,
at the 2-metre string
marking the central area,
you should be digging
about 30 centimetres deep.

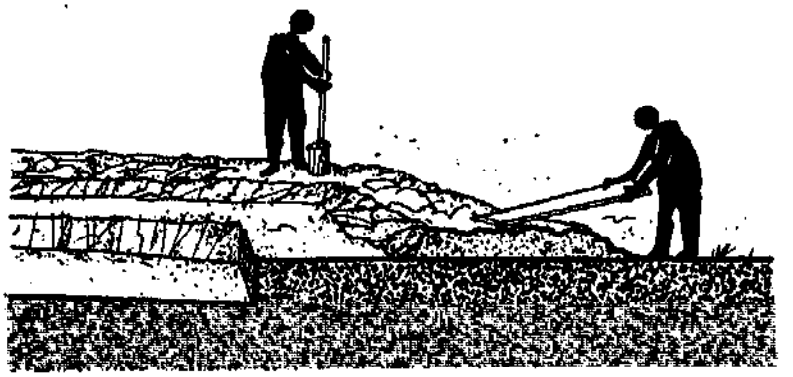
62. As you dig out the soil,
put it between
the 15 by 15-metre square
and the 21 by 21-metre square
where the banks will be.
Put it nearest to where you are digging.
This way, the banks
will be higher and wider
as you move toward the lower end.



63. When you come to roots,
take away as much of them
as you can.

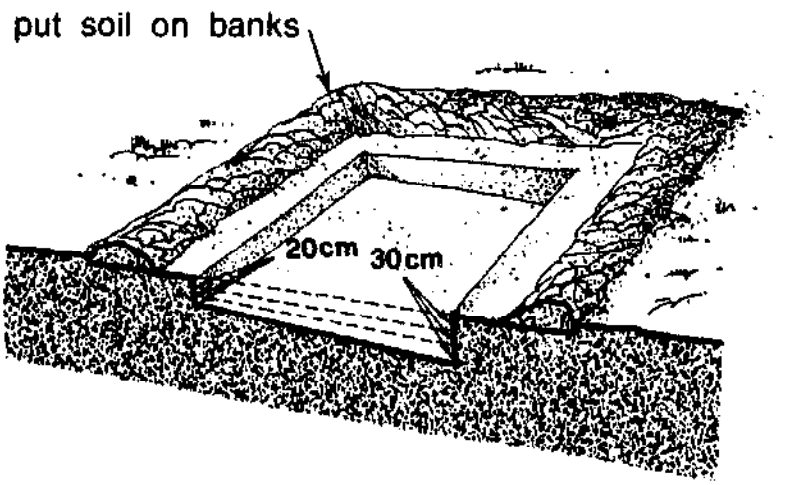


64. Whenever the loose soil
you put on the banks
reaches half as high as your knees,
pack it down tightly.
You can do this
by beating the soil with a heavy plank,
a length of tree trunk
or an earth tamper.



65. When you are digging,
keep the slope of the pond bottom
as regular as you can.
It should slope gently down
from the upper end to the deepest part.
The bottom of the pond
should have slopes
like those in the drawings.

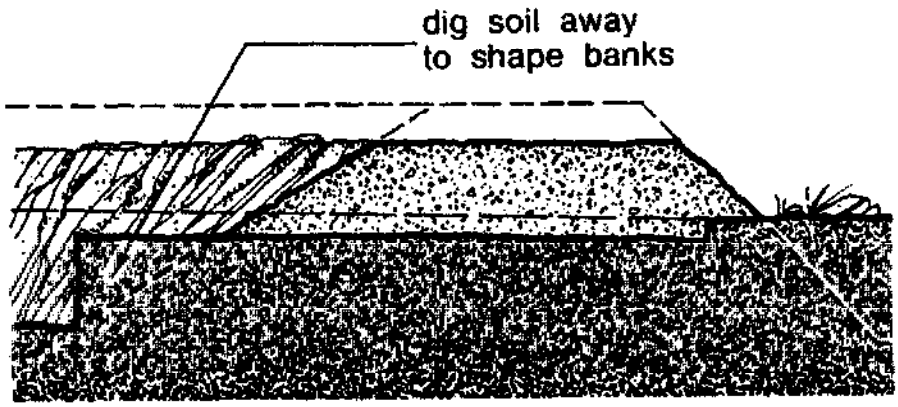
66. Begin again
to dig soil out of the central area.
Dig 20 more centimetres from the upper end
and 30 more centimetres from the deepest part.
Put the soil on the banks
and pack it down tightly as before.



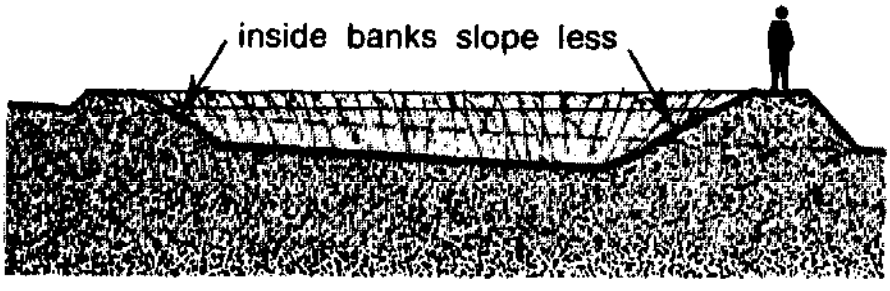
67. Now begin again,
for the third and last time,
to dig soil out of the central area.
Dig 20 more centimetres from the upper end
and 30 more centimetres from the deepest part.
Put the soil on the banks
and pack it down tightly.

68. When you have finished
digging out the central area
and you have put on the banks
all the soil that you have taken out,
you will have a hole 12 by 13 metres
with straight sides.
Now it is time to shape the banks.

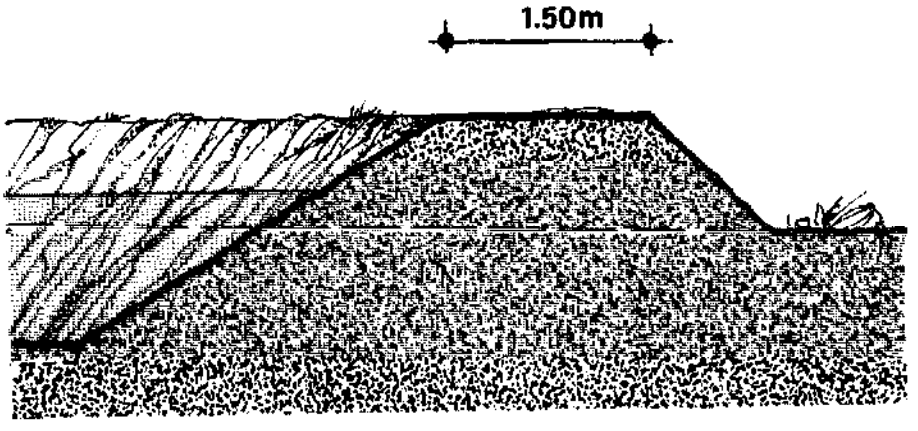
69. Dig the soil away
from the edges of the central area
to form the slope of the banks.
Put this soil on top of the banks
and pack it down tightly.



70. The inside of the banks
should slope less steeply
than the outside.
The drawing shows you
what the banks should look like
when they are finished.

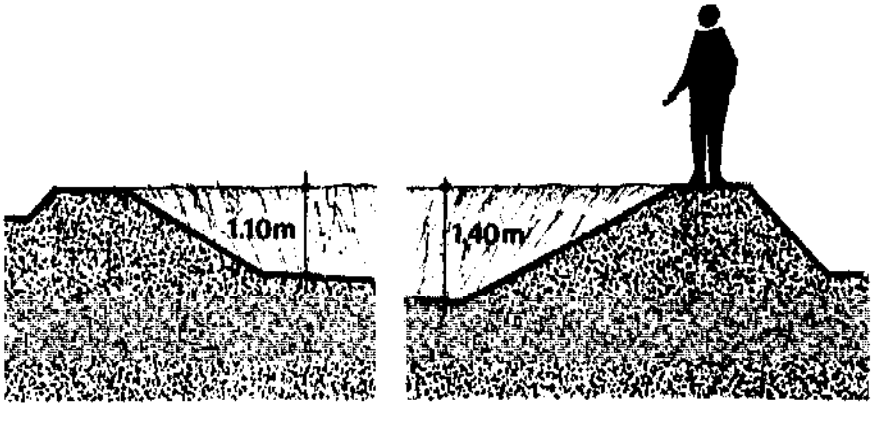


71. The top of the banks
should be about 1.5 metres wide
and should be straight and flat
all the way around the pond.



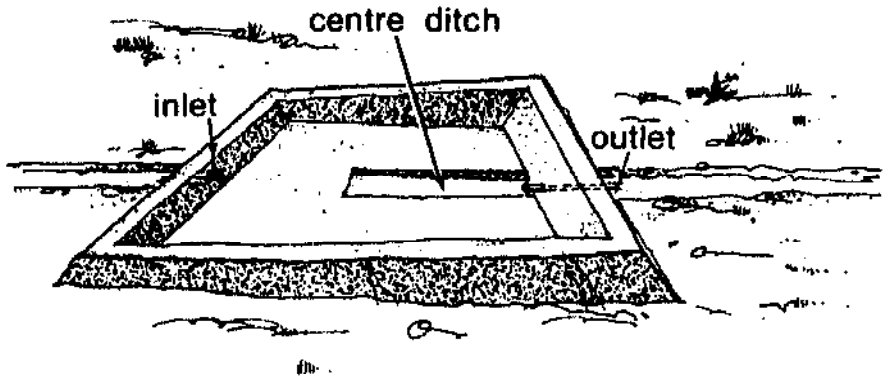
72. Put the 20 centimetres of topsoil
you took away when you began digging
on the top and outer sides of the banks.
Plant grass on the banks.
Banks covered with grass last longer.

73. The bottom of your pond should be
about 1.10 metres from the top of the banks
at the shallow upper end
and about 1.40 metres from the top of the banks
at the deepest part.



74. Be sure that the bottom of the pond
is fairly smooth and regular.

75. Now dig a ditch
in the bottom of the pond
from the centre to the lower end.
The ditch should be
about 50 centimetres wide
and about 20 centimetres deep.
This ditch will help
to drain out all the water
when you empty your pond.



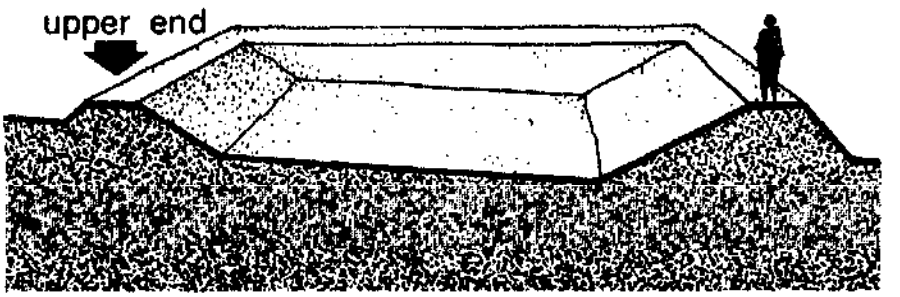
76. When the ditch is finished,
remove all loose soil and other trash
from the bottom of the pond.

77. Now you are ready
to install your inlet,
outlet and overflow.

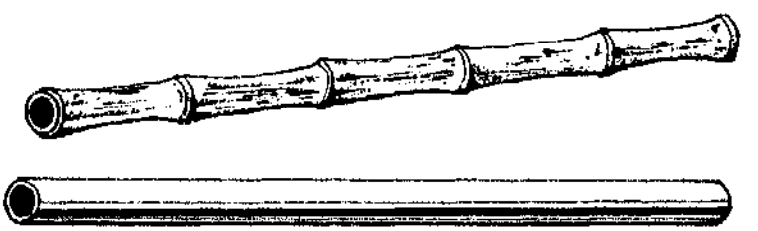
The inlet

78. You will need an inlet
to let water into your pond
when you want to fill it.

79. You should place the inlet
at the point nearest to the water supply.
Most often this will be at or near
the **upper end** of your pond.

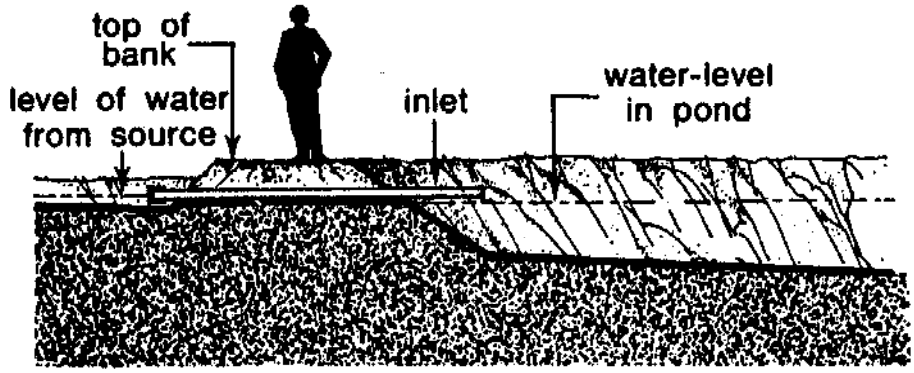


80. Your inlet can be made
from a piece of heavy bamboo
or a pipe of plastic or metal.
The inlet pipe should be
about 10 centimetres in diameter.



81. The inlet pipe should be long enough
to reach through the top of the bank
from one side to the other.
You will need a pipe about 3 metres long
to reach through the bank
at the upper end of your pond.

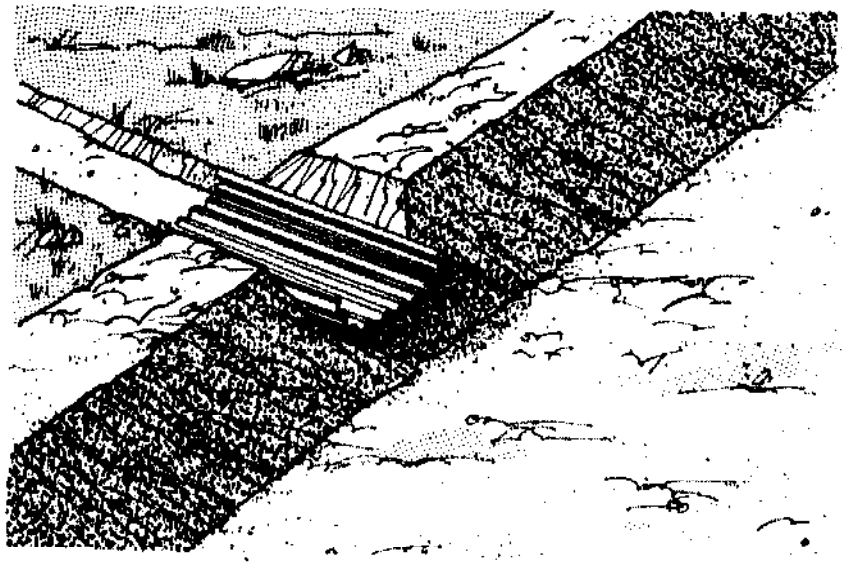
82. Now dig a gap in the bank
where you want the inlet to be.
It should be a little above the water-level
on the inside of your pond
and a little below the level of the water
which flows from the source
on the outside of your pond.



83. Put the inlet pipe
in the gap in the bank
and rebuild the bank over it.

84. You can also make an inlet
by cutting a shallow trench
through the bank
to let the water into the pond.

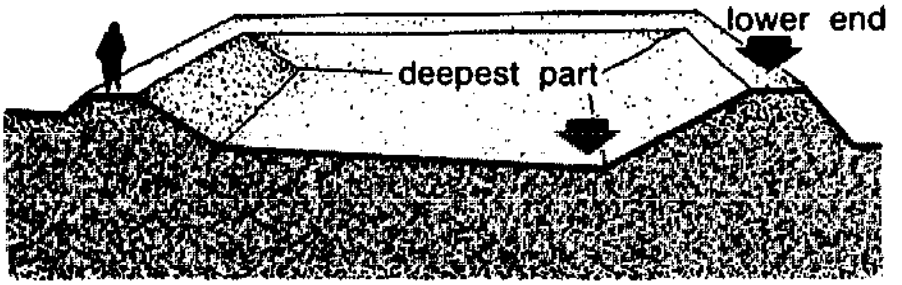
85. If you use a shallow trench
to get water into your pond,
you can improve it
and keep it from washing away
by using a trough of roofing metal
to line the bottom of the trench.



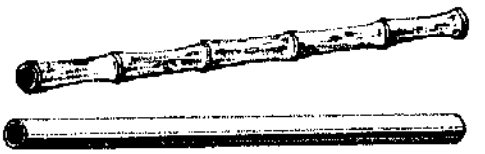
The outlet

86. You will need an outlet
to let water out of your pond
when you want to empty it.

87. You should place the outlet
at the bottom of the bank
at the **lower end** of your pond
at the **deepest part.**

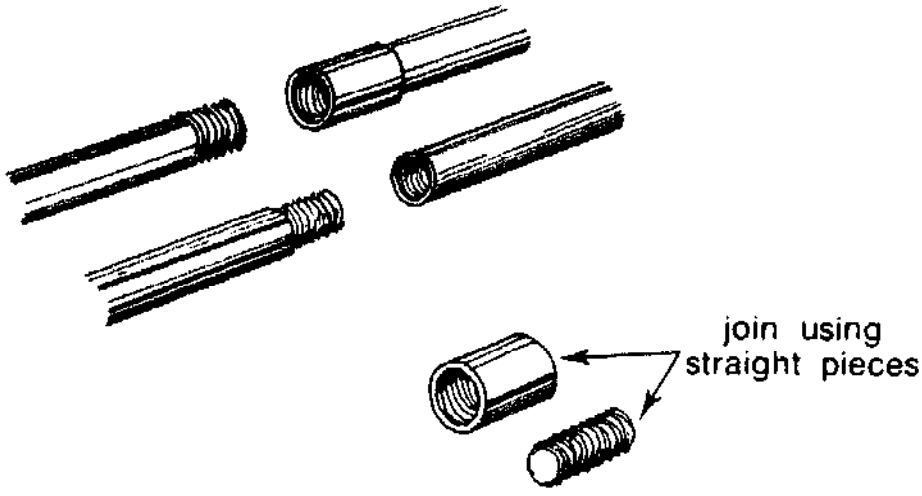


88. The outlet can be made
from a piece of heavy bamboo
or a pipe of plastic or metal.
The outlet pipe should be
about 10 centimetres in diameter.
The bank of your pond
is much wider at the lower end
than at the upper end,
so the outlet pipe
will have to be longer
than the inlet pipe.

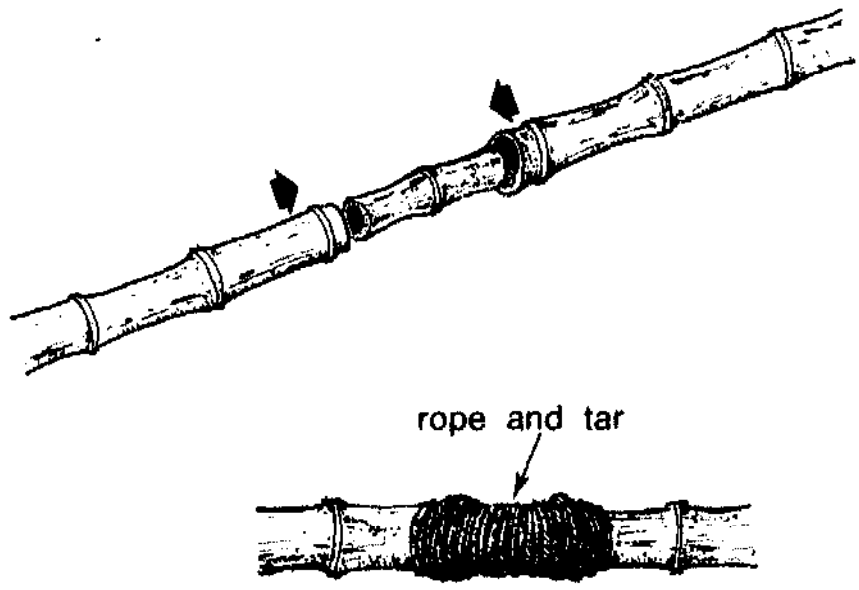


89. The outlet pipe should be long enough
to reach through the bottom of the bank
from one side to the other.
You will need a pipe about 6.5 metres long
to reach through the bank
at the lower end of your pond.

90. If you cannot get a pipe
that is long enough to go through the bank,
you can join shorter pieces of pipe together
using straight pieces of pipe
like the ones in the drawing.

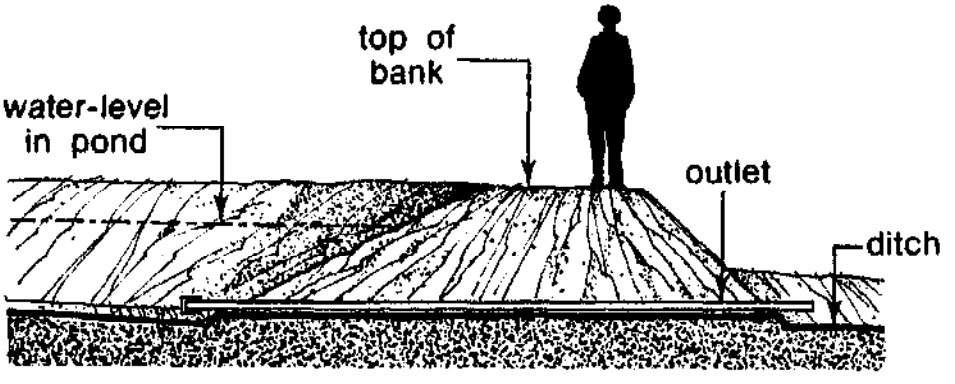


91. If you are using bamboo,
you can join short pieces of bamboo together
with pieces of smaller bamboo in the centre,
but the smaller pieces should be
at least 8 to 9 centimetres in diameter.
Wrap the bamboo joints
with rope and close them with tar
to keep water from seeping out.



92. Now dig a gap in the bank
where you want the outlet to be.
It should reach from the deepest part
on the inside of the pond
through the bank
to the outside of the pond.

93. If the outlet pipe
is below ground level
on the outside of the pond,
you will have to dig a ditch
to take the water away from the outlet.



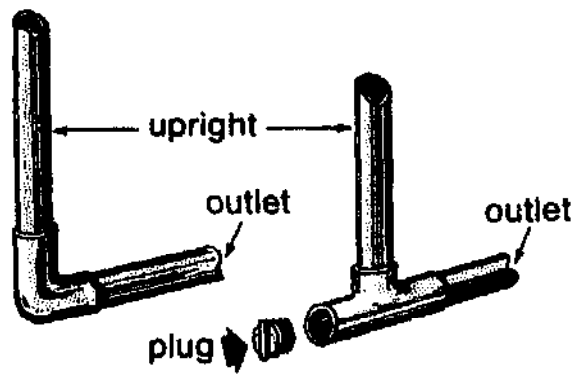
94. Put the outlet pipe
in the gap in the bank
and rebuild the bank over it.

95. If you use an outlet
of about 10 centimetres in diameter,
it will take about half a day
to empty your pond.

96. It is easier to place the outlet
where you want it to be
before you dig out the centre of the pond
and build the banks.
When you build another pond,
you will understand this
and you will be able to do it
when you are building the banks.
But now, when you are building your first pond,
you should place the outlet
in the way you have just learned
in this booklet
because it is easier to understand.

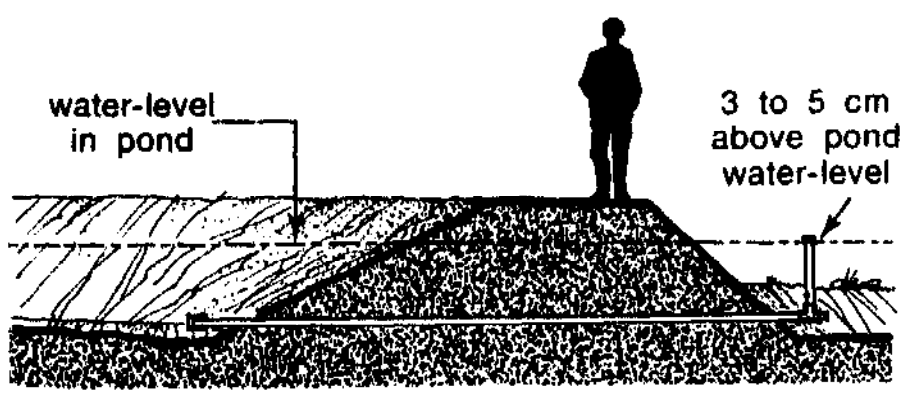
A better outlet

97. If you use a plastic or metal pipe
for the outlet of your pond,
you can make it better
by putting an upright length of pipe
on the end of the outlet
using an L or a T piece
like the ones in the drawing.
Close the T piece with a plug as shown.



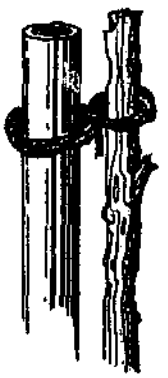
98. Put the L or T piece and the upright pipe
on the end of the outlet outside the pond,
but protect it so that it cannot be reached
by animals or other people.

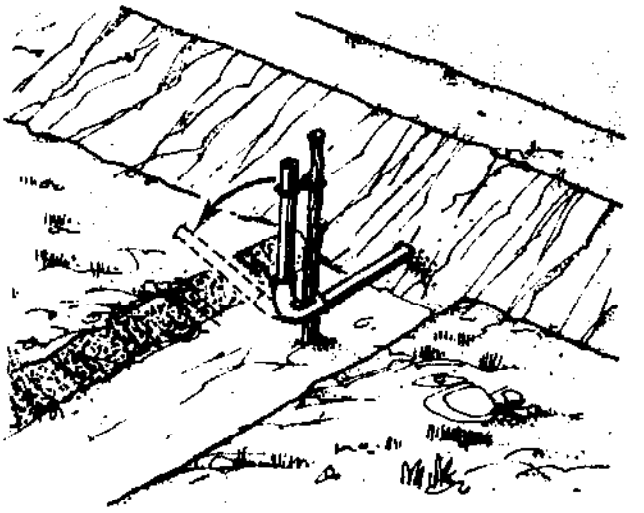
99. The top of the upright pipe
should reach about 3 to 5 centimetres
above the water-level of your pond.
If the water rises above this level,
it will overflow from the upright pipe.



100. Tie the upright pipe to a pole
which has been pounded into the ground
so that it will not slip down
and let the water out of the pond
before you want it to.

101. When you want to let out the water,
untie the upright pipe
and push it down.
The water will then flow out of the pond.





102. There is still another way
to let water out of your pond,
using a siphon.
You will learn how to use a siphon
in Items 114-124.

The overflow

103. If there is too much water in your pond,
some of the water may flow over the banks.
This may wash the banks away
and some of your fish may get out.

104. You can use an overflow
to keep the water in your pond
from rising over the banks.

105. The better outlet
you learned about in Items 97-101
will act as an overflow.

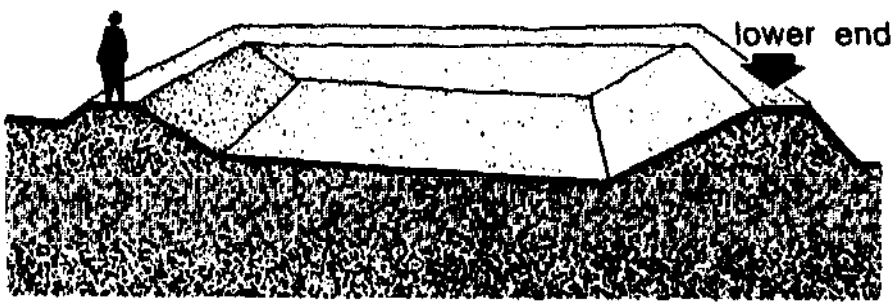
106. If you use a straight pipe outlet
or a siphon
to let water out of your pond,
you will need another kind of overflow.

107. This kind of overflow can be made
from a piece of bamboo
or a pipe of plastic or metal.
The overflow pipe should be
about 6 centimetres in diameter.

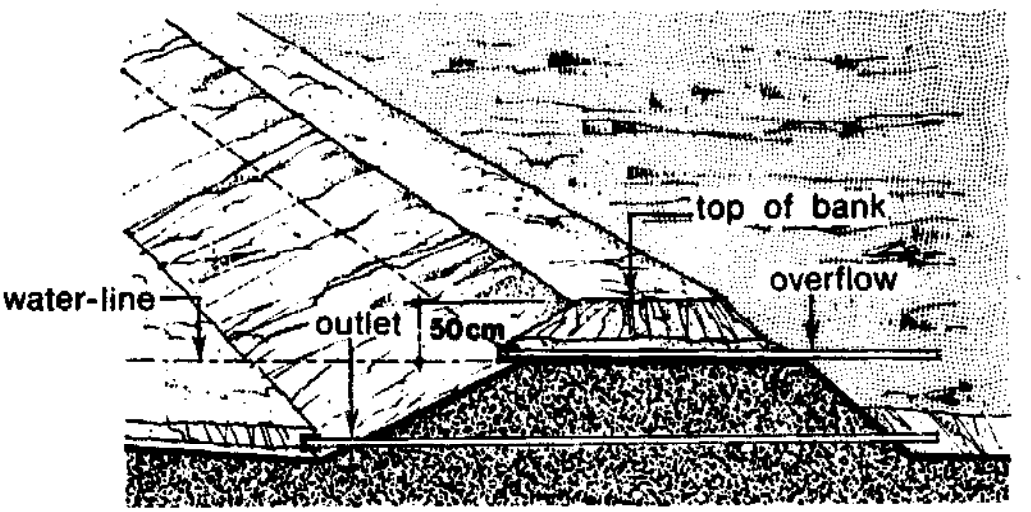
108. The overflow pipe should be long enough
to reach through the top of the bank
from the inside of the pond
to a place far enough on the outside
to keep overflow water
from washing away the bank.
You will need a pipe about 4.5 metres long
to do this.

109. If you cannot get a pipe
that is long enough,
join short pieces of pipe or bamboo together.
(see Items 90 and 91).

110. It is best to place your overflow
in the bank
at the **lower end** of your pond
right above the outlet
so that the water that overflows
can run off in the outlet ditch.

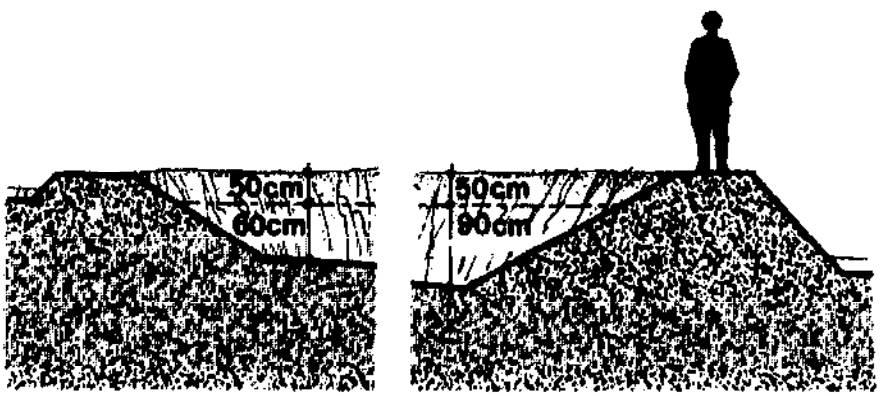


111. If you are going to put the overflow
over the outlet,
you can put it in the same gap
that you dug for the outlet in Item 92.
The water-line should be
about 50 centimetres
below the top of the bank,
so put your overflow there
as you rebuild the bank.



112. If you are going to put the overflow
in another place,
you will have to dig another gap in the bank
about 50 centimetres deep.

113. When the pond is full,
the overflow will keep the water
about 60 centimetres deep
at the shallow upper end
and about 90 centimetres deep
at the deepest part.

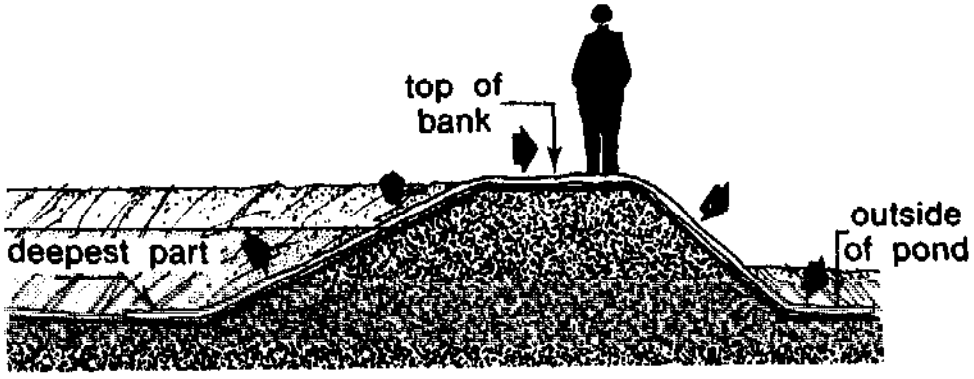


A siphon

114. You can also use a siphon
to empty your pond.
If you use a siphon,
you will not need an outlet
but you will need an overflow
like the one described in Items 103-113.

115. A siphon is a simple tube
that runs from the inside of the pond
over the bank
and lies on the ground outside the pond.

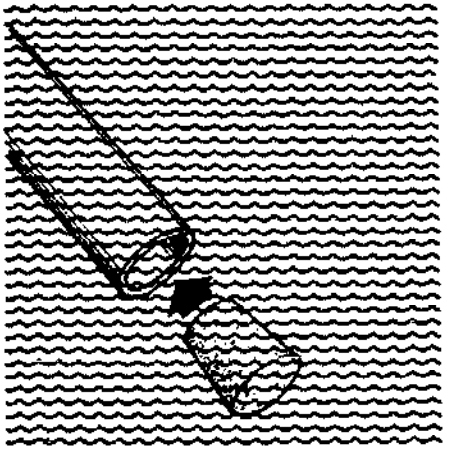
116. A siphon can be made
of plastic or rubber tubing
at least 3 centimetres in diameter.

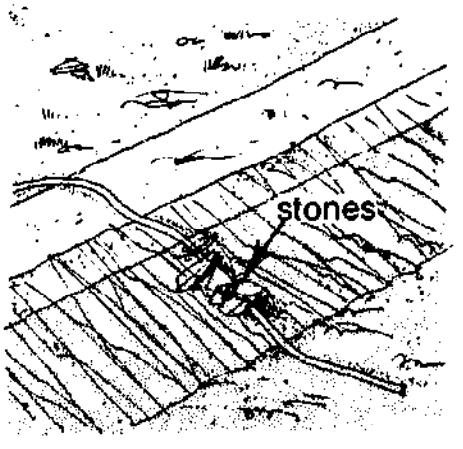


117. The siphon must be long enough
to reach from the deepest part of the pond,
run over the top of the bank
and down the outside of the bank.
You will need a siphon about 8 metres long
to reach over the top of the bank
from the deep part to the outside.

118. When you are ready to empty your pond,
put all of the siphon into the pond.
It will fill with water.
Be sure the tube is full of water
from one end to the other.
If the siphon is not full of water,
it will not work.

119. While the siphon is still in the water,
close one end of the tube with a plug
and leave the other end open.

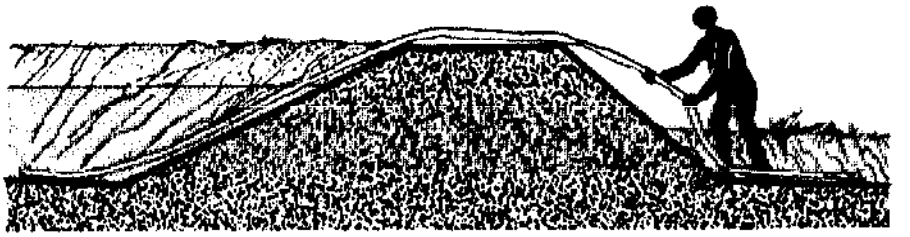




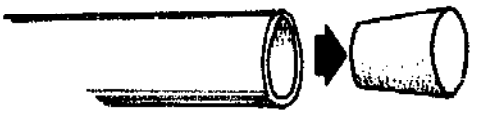
120. Leave the open end of the siphon
below the surface of the water.
You can use stones
to hold the siphon under the water,
but be sure that they are not so heavy
that the water will be shut off.

121. Take the other end of the siphon,
which is closed with the plug,
over the top of the bank
and put it on the ground outside the pond.

If the ground on the outside of the pond
is higher than the pond bottom at the deepest part,
you will have to dig a ditch
so that the end of the siphon
on the outside of the pond
will be lower than the end of the siphon
in the pond.
The ditch will also take the water away
when you empty your pond.



122. Now, take the plug out of the siphon.
If the end on the outside
is lower than the end in the pond
and if the end in the pond
is under water,
water will start to flow through the tube
and out of your pond.



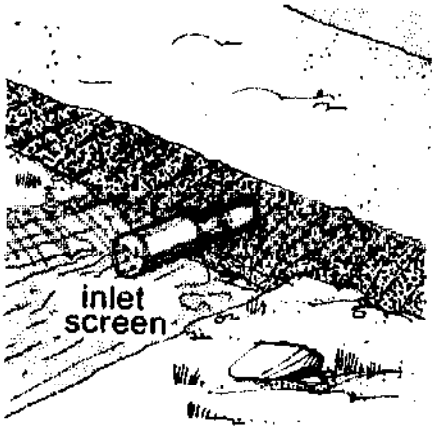
123. If the end of the siphon
in the pond
comes to the surface,
the water may stop flowing.
If this happens,
put the siphon into the pond
to fill it with water
and begin again.

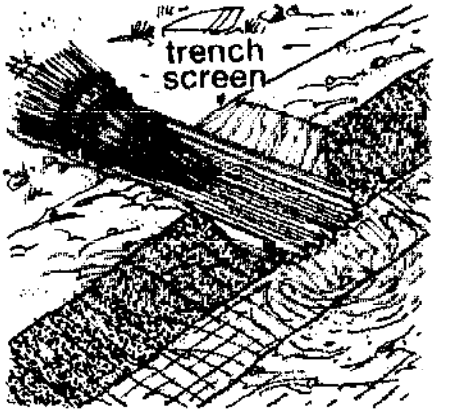
124. It will take a lot more time
to empty a pond with a siphon
than with an outlet.
If you use a siphon
of about 3 centimetres in diameter,
it will take about three days
to empty your pond.

Screens

125. Your inlet should have a screen to keep out wild fish, dirt and trash when you fill the pond.

126. If you fill your pond with an inlet trench, it should have a screen, too.

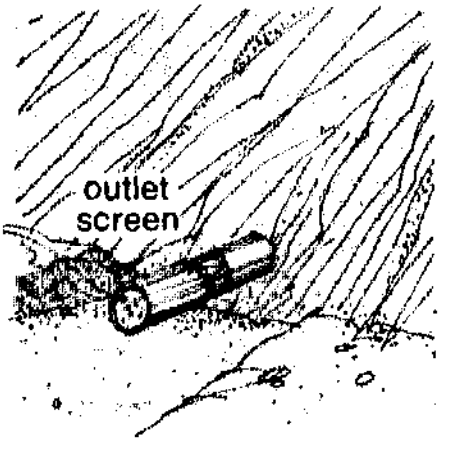


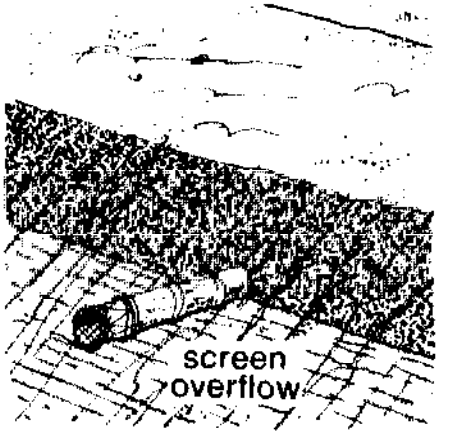


127. A siphon, which is very small, usually does **not** have a screen.

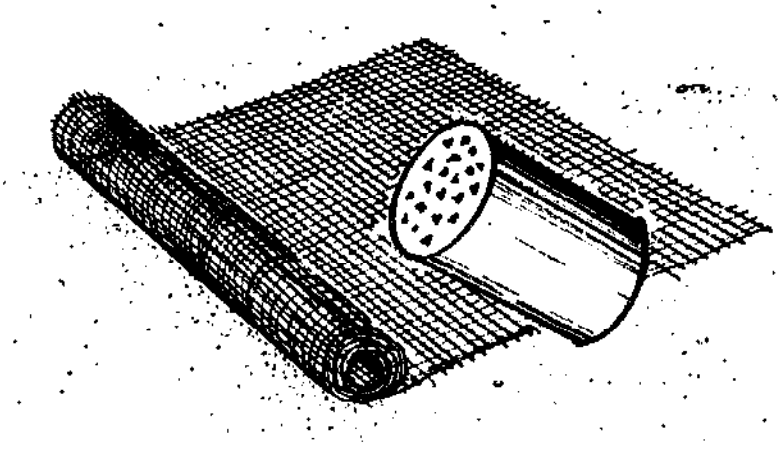
128. Your outlet should have a screen to keep your fish from getting away when you empty your pond.

129. Your overflow should have a screen to keep your fish from getting away when the pond is too full and the water begins to overflow.

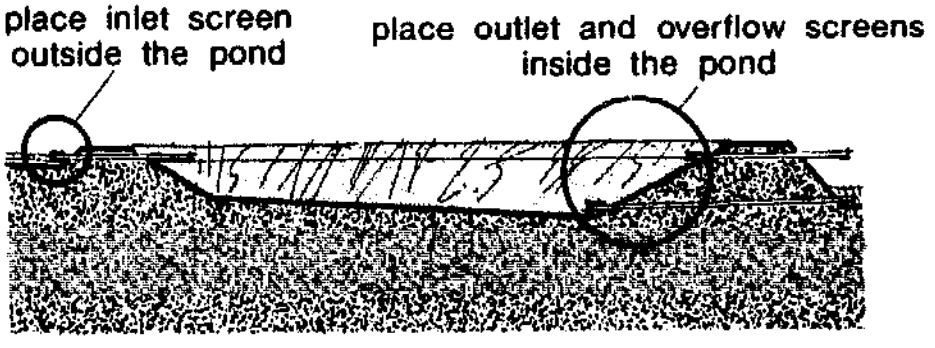




130. You can easily make screens
for your inlet, outlet and overflow
from fine-mesh plastic or metal
or from a tin with holes in the end.

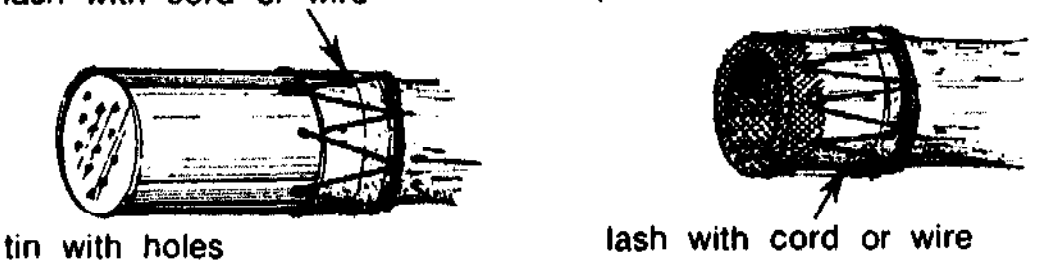


131. Screens should be placed
outside the pond on the inlet pipe
and **inside** the pond
on the outlet and overflow pipes.



132. This will keep the pipes
from filling with trash
which could stop the flow of water.

133. Lash the screens tightly in place
on the pipes,
using heavy cord or light wire.



134. If you fill your pond
by cutting a trench through the bank,
you can screen the opening
using a fish trap, split and woven bamboo,
a clay pot with holes in the bottom
or a piece of metal roofing with holes,
as you did in Booklet No. 27, page 21.

135. When you are filling or emptying your pond,
clean the screens often.
If you do not do this,
dirt and leaves will cover them up
and the water will not flow.

136. This book has told you
how to build a bigger pond
and how to build it better.

137. Now that your new pond is built,
you will have to learn more.
You will need to learn

- how to fill your pond with water
- how to fertilize your pond
- about the fish
  you will put into your pond
- how to feed your fish every day
- how to care for your fish
- how to harvest your fish

138. The next booklet in this series,
Booklet No. 30, **Better freshwater fish farming: the fish,** will help you.