A commercial fish pond is one of the several production units used in fish farming. A pond must be able to hold water and sustain favourable conditions for production. One should also be able to undertake the required pond management activities (such as harvesting and feeding) effectively, with relative ease and safety. The physical attributes of a pond, therefore, have a direct influence on achievable levels of production and returns.

Consequently, poorly constructed ponds, give poorer production yields and returns. This is because additional management efforts and associated costs are required to achieve comparable yields. Paying attention to pond design and construction detail is, therefore, the first step to successful pond production.

3.1. Recommended Pond Construction Criteria

Recommended pond standards are discussed below in relation to management and production potential.

3.1.1. Pond Levees (Dykes)

The pond’s sides are called levees or dykes. The pond levees should be well compacted and have a gentle slope (see section 2.1.2 below for slopes). The greater the degree of compaction, the stronger the levees will be. Thus, during construction, one should lay down about 15 cm of soil which, when compacted will become about 10 cm high. There should be no stumps or debris left within the pond levees. Soil should be compacted shortly after it is laid to prevent hardening (some soils become rock-like if they are allowed to harden).

The level of compaction achieved when constructing the pond levees affects pond management and production as follows:

a. Poorly compacted levees are weaker and often collapse during the course of production when wind pushes the water and causes waves to wash against the levees thus eroding them. When pond levees collapse during the course of production:
Chapter 3 – Pond Requirements and Pond Preparation

- The ponds become shallower which lowers the ponds’ carrying capacity (see Chapter 5 for more details on carrying capacity).
- There is increased siltation and clay turbidity which have a negative effect on water quality for production.
- Mud at the pond bottom can become excessive which makes it more difficult to harvest ponds. It is a double tragedy if the collapsed levee also contained a lot of organic matter and not just soil because the organic loading in the pond will rise. High organic loads reduce dissolved oxygen and pH (see Chapter 4 for more details).

b. Increased Maintenance Costs. Pond construction is expensive. The life-time of a properly constructed pond should be at least ten years with minimum maintenance. Poorly constructed levees have to be re-constructed and the bottoms of such ponds will also have to be de-silted in between each cycle if meaningful yields are to be obtained. This is costly. It is therefore, cheaper in the long run to have the levees constructed correctly from the start.

c. Catfish, by nature, are bottom-dwellers. They tend to dig into the levees of ponds and create what is termed the ‘catfish highway’. The degree to which they are able to do so is affected by the amount of compaction of the pond levee and its slope. In addition to increased levels of siltation, deep catfish highways make harvesting with a seine less efficient as the fish have a hiding place and can circulate around the pond sides, thus avoiding the seine. Predators also take refuge in such places.

d. Control of Water Volumes and Quality. Proper compaction reduces the rate of seepage across the pond levees. The only source of water loss from a properly constructed pond should be from evaporation. When the levees are properly compacted:
  - One has better control over the water volume during the course of production. Significant falls in water volume result in reduced pond carrying capacity because there is less water to dilute wastes, such as ammonia, which is stressful to the fish. In addition, fish in shallow ponds are more subject to predation by wading birds such as the marabou stork. Consequently, feed performance, growth and survival rates fall.
• Significantly much less water is used per production cycle as the only water that needs to be added is to top up for evaporation. This has cost implications especially in a situation where a farmer has to pump water into the pond. Saving water is also environmentally friendly and can limit water use conflicts.

When the levees are poorly compacted:
• Ponds are leaky (constantly losing water) and, therefore, one has to frequently keep adding water to maintain the water levels. This makes it difficult to effectively adopt the 'Static Water Pond Management' technique which enables the farmer have more control over the water quality parameters in the pond. Leaky ponds are also risky because during dry seasons, adequate water for replacement may not be available.
• Such a pond needs constant refilling – cold water will always be entering the pond and acidity levels could be higher. Production from such a pond will be reduced. This is because warm, neutral pH water with oxygen levels nearing saturation is best for fish growth (see Chapter 4 for more details).

e. Debris, such as tree stumps, sand bags or rock outcrops, left in the pond levees or at the bottom of the pond during construction reduce compaction and decay over time. When these obstacles protrude from the levees or pond bottom, they tear nets during seining and often injure the persons working in the pond. In addition, they become weak points through which water starts seeping. As time progress, the action of water results into creates actual holes being created from such weak points. Water is then continuously lost from the pond. Fish also escape from ponds through such points. Predators also use the obstacles or holes, as refuge or entry-points into the pond. Dissolved oxygen is also used up by rotting organic material. As tree stumps and other organic matter left in the pond levees starts to rot, levels of dissolved oxygen are depleted faster in the pond. Low dissolved oxygen levels result in poor fish growth.

f. Erosion into ponds increases the levels of clay turbidity and pond siltation. Production will then fall as has been explained in section 3.1.1.-a above. Therefore, it is important to plant grass over the
top-width down to the water level to prevent soil erosion into the pond.

### 3.1.2. The Slope of the Pond Levee

The slope of the pond *levee*, is the gradient of the *levee* from the edge of the top width to the inside *toe* at the bottom of the pond. It is described as the ratio between the horizontal distance and the vertical height of the dam *levee*. This means, for example, that if the distance from the inside *toe* to where the top width starts (edge of the pond from above) measures 2 meters and the height of the dam measures 1 meter, then the slope for that *levee* is 2:1 (see figure 3.1 below).

![Figure 3.1](image.png)

**Figure 3.1**: Parts of the Pond Levee. In this example the *levee* is only 1 m high but it is usually higher at the deep end.

It is recommended that pond *levees* have a gentle slope of about 2:1. This however, depends on the size of the pond. Larger ponds need to have a gentler slope (see table 3.1 below).

#### Table 3.1: Recommended Slopes for Production Ponds

<table>
<thead>
<tr>
<th>Size of Pond</th>
<th>Recommended Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 20 ha</td>
<td>4:1 to 7:1</td>
</tr>
<tr>
<td>1500 m² to 5,000 m²</td>
<td>2:1 to 4:1</td>
</tr>
<tr>
<td>+ 150 m² to 1,500 m²</td>
<td>2:1</td>
</tr>
<tr>
<td>≤ 150 m²</td>
<td>1.5:1 to 1:1</td>
</tr>
</tbody>
</table>

NB: Remember, the larger the pond, the gentler the slope should be. Large ponds have a greater surface area to perimeter ratio. This makes it possible to obtain the greater amounts of earth needed to make gentler slopes from within the pond during construction.
Having a gentle slope is beneficial in that:

a. A gentle slope helps break up the waves as they hit upon the pond **levee**. This reduces the impact of the water waves on the **levee**. Consequently, the **levee** is less likely to collapse and there is less siltation of the pond (see figure 3.2). The lifespan of the pond is also subsequently increased and maintenance costs are lower. Better yields (in as far as the pond infrastructure is concerned) can therefore be sustained beyond one cycle. The ability of catfish to make a deep ‘**catfish highway**’ will also be minimized.

---

**How a Pond Levee becomes Eroded Away**

The **levee** gets eroded mostly at the waterline and "**undercut banks**" are created, which then collapse as shown below.

![Diagram of how a pond levee becomes eroded away](image)

A properly constructed **levee** with the right slope and **freeboard** get less impact from wave action.

![Diagram of properly constructed levee](image)

---

**Figure 3.2**: How a Gentle Slope Reduces the Impact of Waves on a Pond Levee.
b. It is easier and safer to enter into and out of the pond to undertake activities such as seining. One should be able to actually walk into and out of a pond and **not** have to ‘jump in and climb out’ of the pond. The latter is dangerous for personnel.

c. It makes it easier to seine the pond and land the seine.

Significant environmental benefits are derived when pond **levees** are constructed as recommended with the appropriate slopes. There is less pond siltation when **levees** are constructed as recommended. Consequently, there is also a reduction in the level of suspended solids in pond effluent water. In addition, less water is required for production due to reduced seepage.

### 3.1.3. Average Water Depth

The recommended average water depth is 1 meter for non-aerated static water ponds (Schmittou et al., 1998). The water depth in the pond should be at least 80 cm at the inlet and no more than 1.2 m at the outlet.

**The Maximum Water Depth** for static water pond production is determined by the distance sunlight can penetrate into the water column. This is because photosynthesis can occur in the water column up to twice the depth the sun's rays can penetrate. In ponds, sunlight can generally penetrate to a depth of about 30-80 cm depending on the levels of water **turbidity**. Photosynthesis can occur up to a depth of twice that of sunlight penetration. The oxygen generated during the process of photosynthesis then dissolves into this section of the water. In addition, the sun's rays warm up the water. Hence, the upper water column in ponds has the best conditions for fish production (see figure 3.3 below).

![Figure 3.3: Water Quality Dynamics in a Pond](image-url)

Figures 3.3: Water Quality Dynamics in a Pond
For this reason, a maximum water depth of 1.2 m is recommended. Beyond this depth, pond waters start becoming devoid of oxygen and stay cooler. Ponds thermally stratify from about 1.2 m water depth downwards. This means that the temperature and quality of the top 1.2 m of water will be distinctly different from that of the water below 1.2 meters deep. When the pond is deeper than 2 meters, the total volume of bottom zero-oxygen water is greater than that of the water containing oxygen. Incidences of fish kills consequently, become more likely when there is a change in weather (for example when it rains, it is windy, it becomes cold, etc). This is because, the cool rain causes the oxygen rich water at the surface to go down and in the process, the oxygen-deficient water from the bottom is pushed up. The mixing of the oxygen-deficient water from the bottom with the rest of the pond water results into an overall total oxygen depletion. When this happens, the farmer observes that fish which showed no signs of stress the previous day, or a few hours ago, are suddenly all dead and floating on top of the pond. Even though catfish above 100 g can survive water deficient in oxygen for a while by breathing atmospheric air, there is also the additional risk of the mixing of hydrogen sulfide and other toxic chemicals that may be present in the deep, zero-oxygen layer. Hydrogen sulphide is lethal to fish, even in extremely small amounts. See chapter 5 for more details on water quality requirements for catfish production.

Therefore, there is no added advantage in having a pond with a water depth greater than 1.2 m. The deeper the pond is, the more expensive it is to construct, and the riskier it becomes to manage water quality because stratification becomes more likely - unless one has equipment to mechanically mix and aerate the water. Such equipment is expensive and requires a reliable source of power. In addition, for the current farm-gate price offered for table sized catfish in Uganda, it does not yet make economic sense to invest in mechanical aerators for grow-out ponds.

**The Minimum Water Depth** in a pond should be not less than 60 cm. When the pond water depth is less than 60 cm:

a. The pond’s *carrying capacity* is reduced considerably (see figure 3.4 below). For catfish ponds, the total water volume is very important because the water dilutes the catfish wastes. Because catfish can breathe air *after* they have surpassed the *fingerling* stage (i.e. from +100g), waste build-up becomes the first limiting factor. Shallow ponds have less water volume than deep ponds and
therefore have a lower *carrying capacity*. This means fewer kilograms of fish can be harvested from the same pond area. Having the recommended depth therefore, increases potential to harvest more kilograms of fish from the same pond, making it more productive.

![Graph showing the effect of pond depth on fish yields](image)

**Figure 3.4**: An Example of the Effect of Pond Depth on Fish Yields. Data from Ponds at ARDC – Kajjansi *stocked* with tilapia. The ponds were at carrying capacity when harvested.

Figure 3.4 shows that the deeper the pond, the greater the ponds *carrying capacity*. This implies that more and/or larger fish can be produced from a given pond area depending on the water depth- up to a point. The graph indicates that a farmer whose pond is about 55-cm deep can expect to harvest 64 % of what a farmer whose depth is about 80 cm - 1.00m harvests. For catfish in *static water* ponds fed commercial pellets, the pond *carrying capacity* is 18 to 20 tons/ha when average pond depth was 90cm. *Carrying capacity* was reached at 12T/ha when catfish ponds were 60 cm deep.

b. It is easy for wading birds, such as the marabou stork and heron to enter the pond, scare predate upon the fish. Such birds can only enter ponds they can step down in (see Plate 3.1).

c. Aquatic weeds are more likely to grow in shallow ponds (see Plate 3.2). Excess weeds in the pond interfere with seining and reduce the levels of dissolved oxygen available for fish production.
Consequently, FCRs are likely to increase and pond yields to decline (see Chapter 5 for more details).

### 3.1.4. The Inlet and Outlet

The diameter of the inlet pipe should be less than that of the outlet pipe in order to prevent overflow from the pond in the event that someone accidentally leaves the inlet open.

The inlet pipe should be at least 20cm above the water surface to prevent fish from escaping. If the inlet is set at or near the level of the water, fish will swim against the current of the inflowing water and escape from the pond (see plate 3.3). When the inlet is above the water level and properly screened, fish are unable to jump into the pipe and escape through the inlet pipe. The screen also prevents fish outside from the pond entering it. Avoid open earthen channels as inlets to commercial ponds. Such channels are difficult to screen effectively and often erode, thus becoming closer to the pond water level each year. *Clarias catfish are more likely to escape from the pond through the inlet as opposed to climbing out of it on the pond sides.* They also escape when the pond overflows totally due to a blocked standpipe, during heavy rains.

Old literature recommends that the pond inlet and outlet be located at opposite ends of the pond to facilitate *flushing* (good water in and poor water out) when poor water quality becomes an issue. However, this is not all that important if you *flush* the recommended way (see chapter 5).

Pond outlets should have an anti-seep collar and an anchor-collar. The anti-seep collar prevents water seepage from the 'joint' where the outlet pipe and clay soil meet. These two substances do not bond together and water tends to follow the outside of the pipe unless interrupted by an anti-seep collar. Anti-seep collars are standard construction principles but have been ignored in most pond construction and most ponds have leaks as a result.

When not in use, the drain pipe is full of air, which makes the pipe tend to float. If the PVC pipe is not secured at the pond bottom, the pipe can be dislodged at the bend or leaks can develop due to the pipe floating up slightly. (*Plate 3.4*). Having an anchor-collar just after the pipe bend prevents this by keeping the drain pipe and its bend down.
3.1.5. The Free-Board Height

The recommended freeboard height is 20 to 30 cm for the following reasons:

a. It allows for more free movement of air currents above the pond water surface which improves mixing and oxygenation of the water.
b. It becomes easy to undertake routine tasks such as feeding, seining, checking water quality and removing dead fish.
c. It is cheaper to construct and maintain.
d. There is less surface area for erosion into the pond. Therefore, this contributes less eroded silt to the pond water and soil.

However, in ponds of over one hectare a freeboard of up to 50 cm can be accommodated (Table 3.2).

Table 3.2: Recommended Free-Board Heights for catfish grow-out ponds

<table>
<thead>
<tr>
<th>Pond Size Range</th>
<th>Freeboard Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smaller ponds (100 m² up to 1 ha)</td>
<td>20 to 30 cm freeboard is sufficient.</td>
</tr>
<tr>
<td>Large ponds (&gt;1 ha)</td>
<td>50 cm is recommended because there can be large waves on the pond.</td>
</tr>
</tbody>
</table>

It is undesirable to have a free-board higher than what is recommended because:

a. It is an unnecessary added construction cost - expensive to make.
b. It attracts predators and burrowing animals such as nutria and muskrats. Plate 3.5 shows a picture of kingfisher nests in a high freeboard.
c. High freeboards above the water favor the nesting flying ants and termites, which later leads to leaks.
d. It makes working on the pond difficult and dangerous.
e. A high freeboard prevents air currents from reaching water surface, thereby preventing mixing and reducing oxygen exchange.
f. Looks ridiculous.

3.1.6. The Pond Bottom and Ability to Drain.

The pond bottom should be smooth and firm. Pot-holes at the bottom provide shelter for fish to hide after ponds have been drained. Such fish, if not removed, will predate upon the new stock. Survival rates for the new cycle will subsequently be lower with a few very large shooters. The pot-holes also pose a danger to persons seining the pond who may trip and injure themselves. If the bottom is not firm, fish can hide in the
mud. Thick layers of pond bottom mud not only have a negative effect on pond productivity, but are also more difficult to seine. At drainage, a lot of fish also get trapped within the mud. Sampling and harvesting is therefore, more difficult and time-consuming in such ponds.

It should be possible to completely drain and dry the pond bottom, after harvests and between cycles. This helps to ensure that all fish have been harvested. Being able to drain ponds completely in between cycles makes it easier to undertake routine treatments and required maintenance work with better results. Preferably, ponds should be able to fill and drain completely by gravity to avoid pumping water, which is costly. Therefore, a pond bottom slope of 1-2% to the outlet is recommended. Ponds and drainage canals should also be constructed above the water table. Ponds constructed below or at the level of the water table, are impossible to drain and dry completely. In addition, yields and returns from such ponds are poorer, because of the constant infiltration of cold, non-oxygenated sometimes acid water from the water table into the pond during the course of production. Consequently, the quality of water within the pond becomes less suitable for production.

**NOTE:** All it takes is one catfish left in the mud, and the next round of fingerlings stocked in the pond after re-filling will be eaten by the remaining large catfish. The survival rate of the following cycle will be extremely low.

### 3.1.7. Harvest Basins

Having a harvest basin set in the pond or between ponds is optional but recommended. Harvest basins make it possible to hold and handle fish alive while draining ponds. They also reduce the amount of labour required during complete pond harvests. A harvest basin can either be set within or outside the pond. [Plate 3.6](#) shows pictures of a harvest basin set in a pond and outside the pond respectively. Ponds that are to be drained frequently, for example nursery ponds, are much easier to harvest if they have a properly constructed harvest basin.

### 3.1.8. Shape of Pond

Typically, ponds are rectangular. Rectangular ponds are more practical to construct, feed and manage. The narrower pond dimension dictates the size of the seine that will be needed. Therefore, if one has ponds of several sizes on the farm, it is a good idea to have them of similar widths, if possible so that the same seine can be used for all ponds.
3.1.9. **Accessibility**
All ponds on the farm should be easily accessible for adding inputs and transporting harvested fish from the pond with relative ease and safety.

3.2. **Pond Preparation**
Pond preparation for stocking marks the beginning of the 'grow-out' production cycle. Before the pond is stocked for production, it should be prepared in the following way:

3.2.1. **Remove Excessive Silt from Pond Bottom**
The bottom of the pond bottom should be free of excessive amounts of silt. It should also be dry and firm before filling. Silt removed should **NOT** be put at the top of the pond *levee* (as this will increase the free board), but rather away from the ponds and/or used to repair the pond *levee* slopes. **Remember, much of the bottom “silt” came from the slopes of the levees.** It should, therefore, be put back from where it came. If the soil is heaped on top of the dykes, it will wash back into the pond when it rains. Because the bottom silt often contains high levels of nutrients, e.g. from leftover feed (if the person is a bad feeder) and faeces, it is sometimes used to fertilise vegetable gardens. However, unless the feed input was excessive, the amount of nutrients in the silt is often not enough to justify the labour that is required to move the silt to a garden.

When soil builds up on the bottom of the pond, the pond becomes shallower. Over time, the bottom mud becomes increasingly *anoxic* (no oxygen), forming hydrogen sulphide which lowers water quality for production. This is of particular problem when a farmer overfeeds the fish, which can often occur when sinking feed is being used. After several seasons of mud build-up in the pond, the pond's yield and *carrying capacity* for the new cycle will, therefore, be lower than that of the previous cycles.

If there is not so much silt, the bottom can be left to dry until the surface cracks slightly before the pond is re-filled with water for the next cycle (see Plate 3.8a). The cracks allow air to enter between the mud and *aerate* it. Alternatively, the soil can be disked to *aerate* and increase the rate of decay of organic matter which in turn, reduces the rate of formation of substances such as hydrogen sulphide.
3.2.2. Ensure the Pond is not leaking
Repair all broken dam levees and make sure there is no seepage through the pond levees or around inlets or outlets for the reasons already discussed in section 3.1 above.

3.2.3. Screen the Inlet and Outlet
The objective of screening, is to prevent undesirable substances (fish and fish eggs, inclusive) from entering or leaving the pond without obstructing the flow of water. Therefore, the mesh size of the screen material should be small enough to prevent un-wanted substances passing through, while at the same time be large enough to allow water to flow through. However, the efficiency with which the screen works, is not solely determined by the mesh size of the screening material. It is largely determined by the total surface area of the screen and the rate at which clogging occurs.

3.2.3.1. Screening the Inlet
It is therefore, recommended that inlets be screened using a 'filter sock' made of fine mesh (see Plate 3.7a). Figure 3.5 shows and explains how a filter sock should be fixed over the inlet pipe. In this way, a large surface area is provided and the rate of clogging significantly reduced because the debris collects at the tip of the sock. In this case, water will still flow un-obstructed from the top of the sock. Remember, it is not practical or possible to check the screen every hour and clean it. Screens tied flat tend to clog fast and do not allow water to flow through within a short period.
How to Screen an Inlet

What do I need to for screening an inlet?
1. 2 long rubber bands of about 1.0 to 1.5mm thick.
2. Screening material which can be made of several materials e.g. old gunny bag, shade cloth, mosquito net, fire hose casing, etc.
3. Sew this material into the form of a sock i.e. only open at one end or purchase as tubing and tie a knot in one end.

A. Tie a long rubber band made out of an old tyre tube around the pipe until you get a bump.

B. Pull the sock over the pipe beyond where the rubber band is tied.

C. Clasp the sock with your hand after the bump and tie the sock now with another rubber band.
   Tie this one behind the first one as shown.

D. Fold the extra flap over the second rubber band as shown and finish.

Tying your screening sock as illustrated above prevents it from being pushed off the inlet pipe by the inflowing water.

Figure 3.5: How to Screen the Inlet Pipe.
3.2.3.2. Screening the Outlet

The outlet stand pipe, on the other hand, is best screened with cone mesh (see Plate 3.7b). Figure 3.6 shows how a cone mesh should be fixed over the outlet pipe. Again, this increases the total screen surface area to ensure water can flow out with minimal clogging. Ensuring the outlet screen is in place prevents loss of feed during feeding and of fish during drainage.

**How to Screen the Outlet Pipe**

What do I need to for screening an outlet?

1. Wire mesh
2. Bits of string or wire to tie mesh as a cone.

A. Cut out a piece of coffee mesh of about 0.5m (get measurement of the square)
B. Roll it into a cone similar to those made for roasted groundnuts. But open up the tip
C. Fix the cone into the standing pipe as shown above.
   The screen is kept in place by out-flowing water.

*Figure 3.6: How to Screen the Outlet Pipe.*

*Keeping the water level slightly below the top of the standpipe allows one to collect rain water and prevents unintentional outflow of fertile water during heavy rainfall.*
The stand pipe should be cut to the maximum height you would like to have water in the pond. Doing so prevents flooding beyond the levee wall, because the pond will start draining once it gets to the desired water height. However, for practical reasons, during the course of production it is best to maintain the water level at about 10cm below the standpipe height. This is to act as a buffer in the event that it rains as it allows the pond room to capture rainwater.

3.2.3.3. Maintenance of Screens during the Course of Production

It is important to check all screens daily to ensure they are not clogged nor damaged. If there is a lot of debris, remove it and clean off the dirt by shaking and rinsing the screen. Do not shake the screen into the pond as the debris will only go back into the pond and re-clog the screen. Place the screen back immediately after cleaning. If damaged, repair or replace screens immediately. Damaged screens are an urgent matter. If you find fish or frogs in the screen, bury them as they are likely to find their way back into the ponds which is undesirable.

3.2.4. Fertilizing the Pond

There is no need to fertilise ponds for catfish grow-out if the fish are fed on nutritionally-complete pellets. This is because all their food requirements are derived from the feed. Catfish grow-out monoculture ponds fed nutritionally complete pellets only need to be limed if:

a. The pond soils are acidic, pH 5 and below. In this case, lime with agricultural lime, preferably in the fine powder form by spreading uniformly over the pond bottom or pond (see Plate 3.8b).

b. The pond cannot drain completely. In this case, lime the remaining puddles with builders lime ($\text{Ca(OH)}_2$) or quick lime ($\text{CaO}$) until the water pH increases to 11. The objective of attaining such a high pH in this case is to kill off any fish, frogs, potential diseases or parasites that might remain within the pond. Spread the lime over the pond bottom while paying extra attention to potential hiding places. This is necessary because any catfish left in a pond from a previous cycle can easily literally predate on all the new stock.

After liming, the pond can be filled with water the following day but only stock it when the pH has decreased to below 8.
3.2.5. Filling the Pond
Fill the pond with water after properly screening the inlet and stock it within 7 to 10 days of filling. However, ALWAYS check that the water quality is suitable for fish production before stocking, especially if treatments have been applied to the pond. If no water quality test kit is available, place a few catfish in some netting material for a couple of days before the intended stock date. If the fish do not die, then most probably the pond water quality is good enough. The pond can then be stocked. If the fish die, wait for a couple of days and try again.

Stocking the pond as soon as possible after it has been filled, gives the stocked fish a head start before other animals, such as frogs and predatory insects establish themselves. Frogs can tell when fish are in a pond. Frogs search for ponds with water but no fish to lay their eggs. When unwanted animals become established in ponds, they:

(i) can predate upon the fingerlings,
(ii) consume some of the fish feed, and
(iii) compete for dissolved oxygen.

This results in reduced fish survival, increased FCRs, and a slight reduction in carrying capacity due to competition. Consequently, depending on the severity, yields obtained are lower than would be expected. A pond full of tadpoles is especially disastrous if you are going to stock very young catfish fry.

3.2.6. Pond Record Keeping
Document all details of pond management and treatments, as well as any other observations associated with pond preparation, in the pond's record sheet. See Chapter 9 for more details and figure 9.2 for an example of a properly filled pond management record sheet.
Summary Guidelines for Pond Construction and Preparation for Stocking

The pond is the foundation for success in pond fish production. It directly affects pond yields and returns because of its influence on the following:

1. The pond carrying capacity,
2. Water quality and water volume control in the pond,
3. The number of fish that survive to harvest.

A] Recommended Standards for Commercial Grow-Out Ponds

1. The pond levees must be well compacted with a slope of at least 2:1.
2. There should be no debris, such as tree stumps, within the pond levees.
3. Average water depth in a pond should be 1 meter (0.8m at shallow end to 1.2m at the deep end).
4. Inlet pipe at least 20cm above the pond water level and screened with a properly fitted sock.
5. Outlet pipe fitted with collar and screened correctly with cone mesh.
6. Freeboard of about 30 to 50cm depending on size of pond and its levees planted with grass are recommended.
7. Having a harvest basin is optional but is highly recommended.
8. The pond should be able to drain completely. The pond bottom should be firm, without ‘pot-holes’ and gently sloped (1 to 2%) from the inlet to outlet.
9. Preferably, the pond should be rectangular in shape.

B] Recommendations for Preparing Ponds for Stocking

1. Remove excess pond bottom mud and dry pond bottom.
2. Ensure pond is not leaking and is deep enough. Undertake the necessary repairs.
3. Screen the inlet and outlet.
4. Treat the bottom of the pond with lime, if needed such as if pond cannot drain completely.
5. Ensure there are no live fish left in the pond.
6. Fill the pond.
7. Maintain pond record sheets with the details of any management treatments.
8. Check pond water quality before stocking.
Plate 3.1: Predation by a Wading Bird in Shallow Water
Wading birds are only able to enter and hunt in ponds they can step down in. (Picture of courtesy of Uganda Wildlife Authority)

Plate 3.2: Aquatic Weeds Growing in a Shallow Pond
Plate 3.3: Fish Escaping through an Un-Screened Inlet
Fish swim against the current. They often escape from ponds by swimming out the inlet. This is an extreme example.

Plate 3.4: A Dislodged Standpipe
Poor anchorage of the standpipe frequently results in the standpipe becoming dislodged from just below the bend.
Plate 3.5: **Kingfisher Nests within the Freeboard**
Potential predators such as the kingfisher as well as termites build their nests in the *freeboard*. The nests eventually become points through which leakages can occur.

a. A Harvest Basin Set Within the Pond.

b. A Harvest Basin Set Outside a Pond.

Plate 3.6: **Harvest Basins**
a. Overhead Picture of Inlet Properly Screened with a Sock. 
   The inlet pipe should be set at least 20 cm above the water surface to prevent fish from swimming out of the pond. However, if protected by a filter sock, the drop is not so important.

b. A Properly Screened Outlet. 
   Note that the cone mesh screen is set inside the standpipe. The standpipe should be cut to 10 cm above the intended maximum water level to collect rain water. Otherwise, when it rains, the precipitation will just wash out the overflow. However, make sure the standpipe level is lower than the pond levee.

Plate 3.7: Proper Screening of Inlet and Outlet Pipes
a. **A Dry Pond Bottom.**
   After draining, the pond should be left to dry before the next cycle.

b. **Limed Pond.**
   Lime spread uniformly over the pond bottom in a catfish nursery pond to kill diseases and parasites and to ensure that there are no catfish left in the pond before re-stocking.

**Plate 3.8: Pre-stocking Treatment**