Chapter 8
Harvesting

Harvesting and preserving fish
Harvesting is the collection of fish from a pond, for selling at market or for cooking and preservation for family use. Harvesting can refer to collecting all the fish or to taking out only some of the fish (this happens often in tilapia ponds which have both young and adult fish).

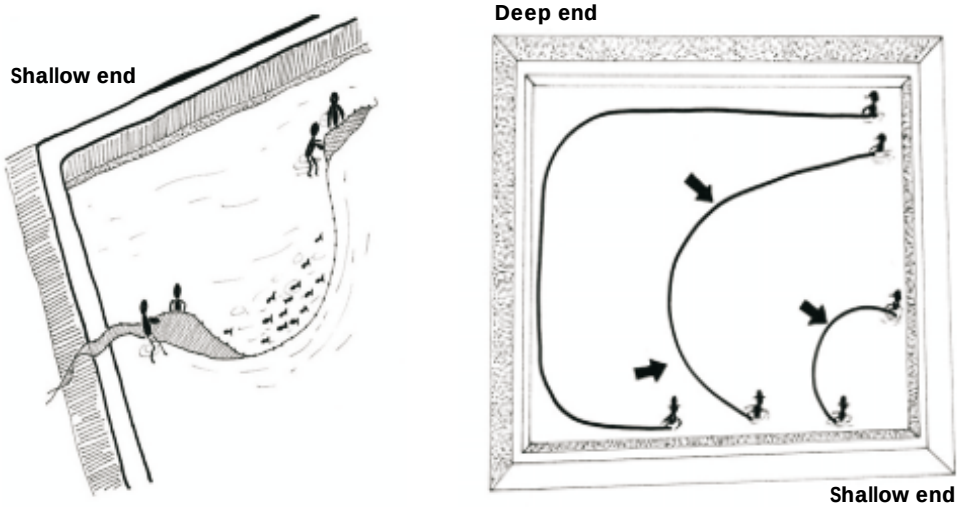
Harvesting from ponds
If the pond can be drained, harvest the fish by draining the pond into the catch basin and collecting the fish with a scoop net. If the pond cannot be drained, drain out as much water as possible and use seine nets to catch the fish. It must be remembered that, in practice, the catching of fish in ponds with seine nets can only ever be partially successful. After two or more pulls the fish become wise to the effort. Certain species such as *Tilapia rendalli* will invariably

Methods to harvest fish from ponds:

- Assemble equipment
- Set up holding tanks for the catch
- Seine net the pond and sort the catch
- As water level drops, clear catching basin of sludge
- Catch remaining fish from basin
- Once purged in holding tanks, pack into drums.

Equipment list for draining and harvesting ponds:

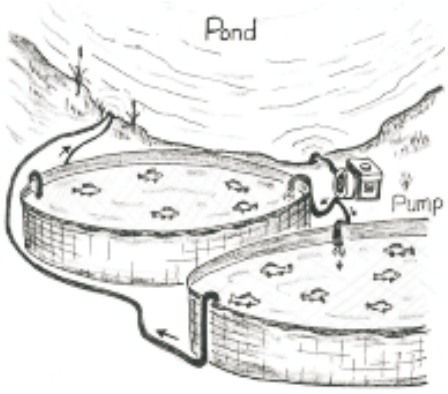
- Seine nets
- Large dip nets
- Small dip nets
- Throw net, fishing rods, bait, hooks, etc.
- Drums (several)
- Buckets (several, small and large)
- Tanks or porta-pools (2 or more), or
- Large keep-net that can float in dam
- Air blower or pipe with flowing water
- Air line, airstones, air-line valves, gang-valve for pipes
- Crocodile-clips or cigarette-lighter battery connection
- Nets to cover tanks (to stop fish jumping out)
- Shade cloth
- Bakkie with canopy
- Rope or strapping to secure drums in bakkie
- Some short lengths of piping (2 m x 20 mm pipe)
- Long lengths of piping (40-50 mm diameter) for through-flow of fresh water.



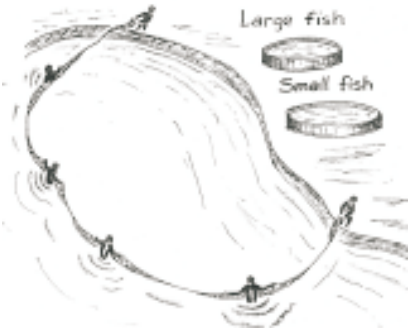
Seine nets can be used to harvest fish from shallow (or partially drained) ponds. The net should be pulled from the deep end to the shallow end. Hand-nets are then used to catch the fish and put them in buckets for sorting.

Sequence of events illustrating how fish could be harvested from ponds.

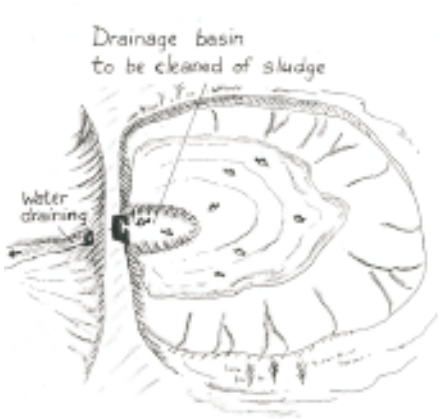
(1) Assemble equipment.



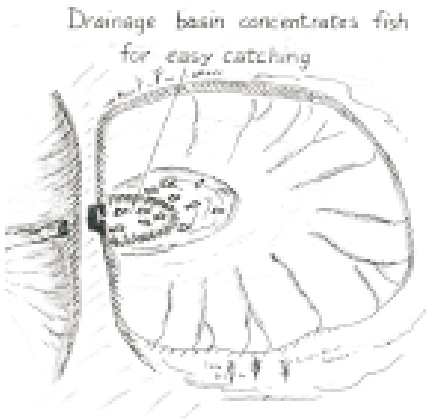
(2) Set up holding tanks for catch.



(3) Seine net the pond and sort the catch.



(4) As water level drops, clear the catching basin of sludge.



(5) Catch remaining fish from basin.

(6) Once purged in holding tanks, pack into drums.

jump over the top rope of the seine net, and catfish often slide under the bottom rope. Seine nets are therefore only an interim solution to harvesting until the pond can be drained.

Harvesting is one of the most important jobs in the work of fish farmers, therefore considerable planning needs to be done in advance to prevent the fish caught being spoiled after harvest, and to prevent stressing those fish being returned alive to the ponds. If bad planning results in loss or spoiling of the fish harvested, all those months of work and the expense of feeding and taking care of the growing fish will have been wasted.

A net full of fish is a reward for any fish farmer.

Harvesting from tanks or cages

Catching fish from either tanks or cages is somewhat easier than from large earth ponds. Tanks are drainable and the fish can therefore be caught progressively as the water drops, as opposed to all-at-once in a large seine net. However, the quantity of fish held in large tanks or cages may be very considerable (tonnes); thus careful planning is needed to determine

A sorting table to sort the different species and sizes of fish obtained from the pond after harvest.

Harvesting trout from cages placed in dams. This is a cost-effective method of growing fish as there is no need for the expensive equipment related to growing fish intensively.

what to do with the catch immediately after harvesting. Cages may pose distinct problems during harvesting as the volume of each cage can be large and the working space confined and difficult. Again, partial catches of the fish in a single cage can be done progressively using nets, but care has to be taken that the fish do not panic in attempting to flee the net and so damage themselves against the cage sides. Precautions also have to be taken against loss of fish over the sides of the cage. For trout cages the fish can be crowded to one end of the cage using screens then dip-netted out into a floating keep-net. This net has a top to prevent fish from jumping out. The keep-net can be towed back to shore and then removed from the water and the contents emptied into ice-filled rectangular plastic holding boxes. The fish should be immediately taken by vehicle to the processing factory.

Once fish are harvested, they must be marketed. Marketing includes the transportation and sale of fish. As the introduction to the manual pointed out, one very important thing to consider before building a pond is the availability of a market. If a market is far away, the farmer must have transportation to it over passable roads. If the market is very near, the farmer may want to advertise the date of the harvest by word-of-mouth so that people will come directly to the pond to buy the fish. If he wants to sell his fish to a shop he should make a written agreement with the tradesman at the market to be sure that he has a buyer for his fish when they are harvested. If there is no market, or if the farmer is going to use all the fish himself, then he probably will want to preserve some of the fish.

Collecting broodstock:

- Start draining pond (overnight)
- Assemble equipment
- Set up tanks or porta-pools with clean water
- Cover to keep cool
- Pull seine nets, sort catch to large and small
- As pond drains, clean catching basin
- Dip net fish from catching basin
- Keep flow of fresh water through tanks or porta-pools
- Once all fish collected, fill drums 1/3rd full with clean water
- Sort broodstock into drums using dip nets, keep in shade if hot
- Load drums into bakkie and fill to 80% full
- Cover drums and fit air lines and blower
- Secure drums with rope
- Take to destination
- Try to equalize temperatures before releasing fish to new habitat.

Preserving methods

Salting fish

Salting is one of the oldest methods of preserving fish. Salting allows a farmer to keep fish for long periods so that they can be used when fresh fish are not available. Salting depends on the species, the size of the fish, and on the amount and quality of the salt used. Fish that have been well salted last a long time without going rotten.

One of the most important things when salting fish is the quality of the fish. Only fresh fish should be used – fish that have been left dead

When harvesting fish from the dam ensure that all necessary equipment and services are ready— for example, a scale to weigh the fish (far left) and ice to keep the fish fresh. It is always recommended to initially talk to your customers to make sure that the fish is harvested and packaged in a way that is desired.

Salted catfish from the Northern Cape. This product is popular among the local community. Farmers may need to try different methods to sell their fish.

for a few hours are not good for salting. The fish and all equipment used for salting should be clean.

There are four major steps to salting fish:
1. gutting and cleaning
2. salting
3. washing and drying to remove excess salt
4. air drying.

Gutting and cleaning
- Gut the fish by cutting along the belly from the gills to the anal vent.
- Remove the guts and the black membrane in the gut cavity.
- If preferred, cut off the head.
- Remove the gills and all blood vessels after cutting open the throat.
- Cut the fish into the right shape for salting: small fish may be left whole; larger fish should be split in half from head to tail, so that all the fish flesh will be exposed to the salt.

Salt the fish
- Place a layer of salt on the bottom of the container that will hold the fish.
- Place a layer of fish, flesh side up, on the salt. Do not let the fish touch each other.
- Cover the fish with a thin layer of salt.
- Continue to place fish, then salt, stacking them almost to the top of the container.
- Place the last fish layer with the skin side up.
- Sprinkle with salt — the last layer must be salt.
- Place boards and weights on top of the fish in the container to press them down.
- Leave the fish in the container for 15 days.

Add salt as necessary, until the fish are thoroughly full of salt. As the fish lie in the salt, the salt draws out all the water in their flesh. The moisture from their flesh forms a solution (brine) with the salt as the salt dissolves. It is necessary to add more salt as the salt is diluted in the solution. As the moisture is removed from the fish by the salt, the level of fish in the container falls.

Wash and dry the fish
Remove the fish from the container when they are fully salted. The fish are properly salted when they are firm and have a whitish salt layer on their flesh.

Wash the fish in clear, clean, sea water or brine:
- Brine can be made by dissolving one large cup of salt (about 300 g) in a bucket of clean fresh water (10 liters).
- Place the fish on a flat surface and press them down with boards and weights to make them as flat as possible before drying.

Air dry the fish
Dry the fish in the sun and open air, or use heating and fans. Usually fish are dried outside in an area that is exposed to sun and wind and is very clean.

Dry the fish under a shelter of leaves or branches for the first few days, so that they do not dry too quickly. After the first few days put the fish into as much sunlight as possible. Lay the fish on triangular slats or hang the fish by their tails from lines strung between trees. Cover the fish if it rains. Any moisture at all, at this stage in the salting process, will cause the fish to go rotten. Dry the fish for about one week. Pack and store the fish in dry, waterproof containers.

How to use salted fish
Soak salted fish in fresh water for 12 hours. Change the water at least once during this time. Soaking removes the salt; the longer the fish is soaked, the more salt removed. After the fish has been soaked, it can be used in any way that fresh fish is used.

Smoking fish
Smoked fish do not last as long as salted fish. This is because they need to be refrigerated, frozen, or canned if they are to be kept for long periods. A smokehouse is used to make smoked fish. A simple smokehouse is a shed or box built over a (controlled) fire so that it produces smoke instead of flames. Fish are hung inside the smokehouse so that they are surrounded by smoke.

Smoked fish are cleaned the same way as fish for salting. After they are bled and gutted, they are split from head to tail. They are then washed in freshwater and placed in a saltwater brine made by dissolving 1kg of salt in one liter of water for one hour. Then the fish are removed from the brine and washed in clean, fresh water again. The fish are then drained and hung in a cool breezy place for about an hour.

At this point, the fire can be built in the smokehouse. When it is smoking properly, place the fish on hooks and hang (or tie) the fish in

Frozen catfish (far left) and tilapia (left) ready for sale. The catfish has already been priced. It is important to make the fish look presentable to the customers.

the top of the smokehouse, away from the fire. Make sure the fish are placed securely so they will not fall. Watch the fire carefully to make sure it is smoking, and not cooking or burning the fish. It takes about six hours to smoke fish so that they can be eaten or stored.

After the fish are smoked for six hours, they can be eaten immediately, stored frozen or refrigerated until they are eaten. Smoked fish do not last as long as salted fish, so do not smoke all of the fish, unless they will be eaten soon after harvesting.

Freezing

Often fish are preserved by freezing. Freezing requires a constant supply of electricity, something many farmers do not have. However, if electricity is available, freezing is one of the easiest and safest ways to preserve fish.
In this method, fish are gutted, cleaned, cut up (if desired), placed into packets or containers, and put into freezers. Frozen fish can last for a very long time if they are not allowed to thaw (become unfrozen). Once frozen fish are thawed, they must be used immediately, or they will spoil. You CANNOT refreeze fish that has thawed – if you do, you risk getting anyone who eats it very sick.

Air drying

Fish can also be preserved by simple air drying. Air drying involves only cleaning and washing the fish and drying them in the sun and wind until they are a clear white color.

INFO BOX: FISH PREPARATION

- Fresh fish is fish that has been cleaned of scales, gills and guts, but not frozen (although it may be chilled).
- Frozen fish is that which has been deep-frozen and packed in some way.
- Dressed fish is that which has been further prepared or value-added.
- Filleted fish is where boneless portions are removed from either flank of the fish; this is sold fresh, smoked or even dressed with breadcrumbs or spices.
- In-the-round fish is fish that has been cross-cut into circular portions with the central vertebra still in place.
- Freezer burn is when unpackaged fish becomes discoloured and damaged by freezing.
- Refreezing of previously frozen and then thawed fish is dangerous because bacteria that have entered the flesh when unfrozen can remain active and toxic.