



MINISTRY OF
AGRICULTURE, LIVESTOCK AND FISHERIES
(STATE DEPARTMENT OF FISHERIES)

Quick Guide to Farming Tilapia in Ponds Module: Pond Management



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Foreword

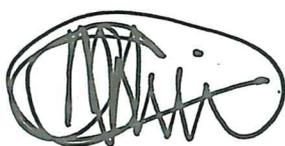
In the year 2006, the fisheries sector was contributing 0.5% of the Kenyan GDP. Owing to the prominence and potential of the sub-sector the Kenyan Government under the Economic Stimulus Program in 2010 supported fish farming by providing resources to 140 Constituencies. Each Constituency benefited with funds for 200 fish ponds, 15 kilograms of fertilizer and 1000 fingerlings. The second phase was in the 2011/2012 Financial Year where 20 additional Constituencies were brought on board adding an extra 100 fish ponds for the first 140 Constituencies and 300 fish ponds for the new Constituencies making a total of 48 000 ponds.

The sustainability of the fisheries of Lake Victoria is currently threatened by increase in fishing effort which is exerting excessive pressure on the lake. The fisheries of the lake are declining and fish stocks are being threatened with depletion. Fishing is the livelihood, source of food and income for residents surrounding the lake.

The demand for accurate and updated information on fish farming has steadily grown especially after the Government funding to the fisheries sub-sector under the Economic Stimulus Program. It is important that relevant and quality information is readily available to various end users and packaged in a user friendly way. The need for information and records mainly at the user's level is what informed the development of this manual.

The process of developing this manual was highly consultative. We wish to acknowledge the efforts of the Technical Experts who made the production of this manual possible; Officers of the State Department of Fisheries offices in Nairobi, Kakamega and Kisumu; The Lake Basin Development Authority; NARDTC (National Aquaculture Research and Developing Training Centre); Sagana Fish farm and Jewlet Fish Farm.

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Introduction

More and more people want to eat fish because it is healthy and is tasty. There is a good market for fish from ponds, because fish prices have doubled in the past two years and the catches from the lakes have gone down. If you manage your ponds well, you can earn a good amount of money; in addition fish eating is also very healthy!

This guide gives you an insight in the technical aspects of pond management. This guide is not exhaustive; it is for people who do fish farming as a business and not as a hobby. In case you need more information, please contact your County Fisheries Office, a certified hatchery (a list is available with your County Fisheries Officer (or at the National Fisheries Office). More information could also be sourced from a aqua-shops (input stores) or a successful fish farmer.

This quick guide gives an overview on:

- Pond construction
- Marketing and making money from farming fish
- Record keeping
- Post-harvest handling and processing

1. Pond preparation

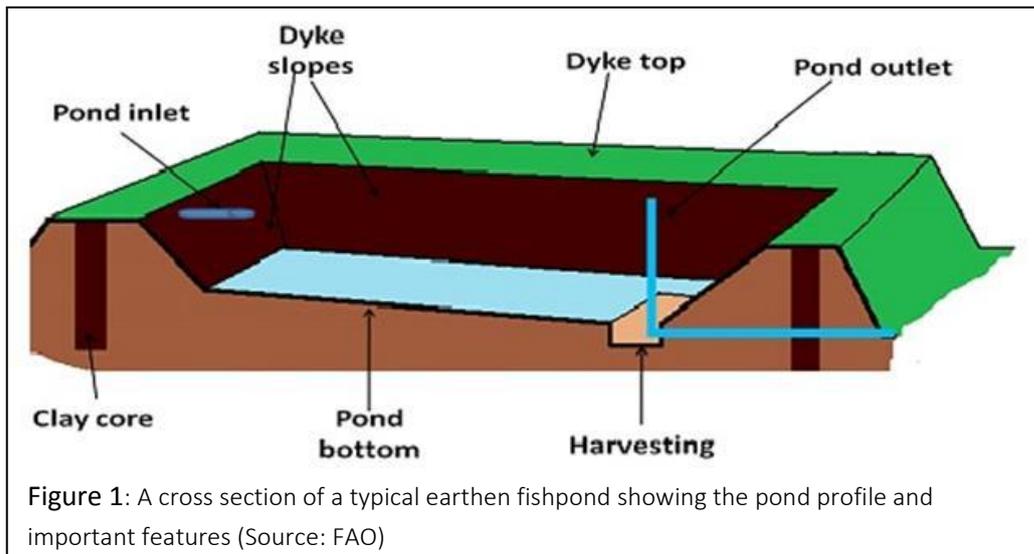
A good start is half the work!

Drying of the pond

The preparation for the next crop begins the day after the last fish are harvested from the pond. First of all, the pond has to be completely drained – which might be a challenge especially in the rainy season. If necessary use a (Fuel) water pump. Dig small trenches towards the outlet (or the pumping pit) so that only little water puddles remain at the pond bottom. The pond is completely dry when all water puddles have been dried out by the sun and the first cracks appear at the pond bottom. Proper drying of a pond will take 2 to 3 weeks, but it has huge benefits. It will improve availability of nutrients in the pond bottom, the mud will decompose and most pests, water insects, amphibian larvae (e.g. tadpoles) and unwanted wild fish will disappear. So it is worth the time spent waiting! Drying is the cheapest and easiest way to get a clean pond for the next crop.

Small pond repairs

When drying the pond, it is important to carry out pond repairs. The pond (especially the dykes) should be cleaned and weak spots reinforced, cracks filled in, holes dug by crabs or rats should be filled in to avoid water seepage and prevent the dykes from collapsing. For small repairs, the dry soil from the pond bottom can be used and should be compacted well. Do not use the mud for repairs since it will fall apart easily when it gets wet again! Repairs include correcting the slope of the dykes. Grass that grows in the pond should be removed and excess mud/silt from the pond bottom has to be removed as well. The mud from the bottom of the pond is very fertile and can be applied to your vegetable garden. Some people have doubled their vegetable production with this!



It is recommended to have 1 to 1½ meters (3 to 5 feet) of water in the pond. For ponds where fish are fed with algae (no additional feeding) a depth of 1 meter is recommended. Don't use the mud from the pond bottom, but the soil to reinforce the dykes.

Disinfection with lime

If it is not possible to completely dry the fish pond (until the bottom cracks) you will have to use lime to disinfect your pond. Proper disinfection of the pond bottom and the dykes is very important especially if the pond cannot be dried completely (e.g. during the rainy season). Lime kills most small creatures (parasites, insects, tadpoles, etc.) which are harmful to your fish, or which might transfer diseases. All small fish have to be killed, because if it is tilapia (either wild or your own fish) it can lead to overcrowding of your pond and/or they could carry diseases that will affect your new fish. Your own fingerlings could be growing slower because they are mixed sex and could suffer from inbreeding. Wild tilapia grows slower than the selected fingerlings from good hatcheries.



Tadpoles



Insects

Figure 2: Pictures of tadpoles, and insects in ponds

Liming

Disinfecting the pond is possible by increasing the pH to 10 or 11. This can be achieved by using two types of lime which can be purchased at most agricultural stores:

- **Agricultural lime:** Rule of thumb: use 500 gram of agriculture lime (CaCO_3) per m^2 . Sprinkle it over the whole pond if it is still wet or sprinkle it only over the area which has water puddles.
- **Quick lime:** Rule of the thumb: use 250 gram of Quick lime (CaO) per m^2 .

How to apply lime:

Lime for disinfection is preferably applied when there is hardly any water left, but the soil is still moist. If there are areas where there are still puddles of water apply more lime on these spots. The right amount of lime is applied to your pond by sprinkling it evenly on to the pond bottom and the slopes of the dykes of your pond. After applying, verify if the lime is working by observing if the insects are dying, signs are that they reduce their movement.

Caution: always wear protecting gloves, protective goggles and face masks while applying the lime. Wash off any dust immediately after applying it.

Liming to improve the pond (soil) fertility (see next chapter) is different from liming for disinfection (see above). To measure the acidity of your pond soil, mix some of the soil from just below the surface with rain water (or tap water), stir it well, wait for some minutes and measure the acidity of the water. You can test the acidity by using small test strips for pH (Lackmus or Litmus paper, it is available in e.g.: Agrovets, lab equipment stores or aquashops) or pH water test kit (ask your extension officer where to buy or if the State Department of Fisheries has one, request to use that one). If the strips are not stored well or are too old they don't work anymore. To find out if they are working you can put a strip on your tongue and then it should read a pH of 7. By knowing the pH of your pond you are sure you give the right amount and do not waste your money.

Table 1: Amount of Agricultural lime (CaCO_3) to be used for liming (DISINFECTING) a pond

Soil pH	Amount of Agric. lime (CaCO_3) per m^2	Calculation:	Amount of Agric. lime (CaCO_3) per 300 m^2
Below 5	0.3 kg	$0.3 \text{ kg} \times 300 =$	90 kg
5 – 5.5	0,25 kg	$0.25 \text{ kg} \times 300 =$	75 kg
5.5 – 6.0	0,2 kg	$0.2 \text{ kg} \times 300 =$	60 kg
6.0 – 6.5	0,15 kg	$0.15 \text{ kg} \times 300 =$	45 kg
6.5 - 7	0,1 kg	$0.1 \text{ kg} \times 300 =$	30 kg

1kg= 1000 Grams, 0,1Kg = 100 grams

Measurements: For a serious farmer it is important to know exactly how much is needed. For that every farm should have a:

- * measuring tape of minimum 10 meters
- * weighing scale for fish (10-50kg) (precision 100 grams)
- * Weighing scale for feeds/lime 0-10kg (precision 10 grams)

2. Filling the pond with water & fertilization

Filling the pond with water

When filling the pond with water or whenever you release water to the pond (e.g. for topping up or flushing) make sure the inlet pipe of your pond is always covered by a mosquito net bag (see figure 3) and make sure that this mosquito net bag is well fixed to the pipe so that it is not removed by the



Figure 3: Protection of inlet pipe with a mosquito net bag

water force during filling. You have to use a bag of at least 1 m (3 feet) in length otherwise the net will be clogged by dirt or silt. It is very important to protect the inlet (and the outlet as well) with a mosquito net to keep harmful insects and wild fish out of your pond and keep your own fish in the pond.

By placing a splash board under the inlet pipe unwanted turbidity is avoided. Water is essential for a successful farmer; as a rule of thumb, a site should have enough water to fill one pond in 7 days.

Fertilization

Fertilizing the pond is to stimulate the growth of algae. Tilapia feeds on green algae and hence will reduce your feeding costs. In addition algae produce oxygen during daytime which helps keeping the fish healthy. Algae grow best if the pH (acidity) of the soil is above 7 and if there are enough nutrients (fertilizers). Liming increases the pH of the soil.

When the pond has approx. 20 cm (9 inches) of water you can apply fertilizer. If you use inorganic fertilizer, make sure it is dissolved completely in a bucket before you sprinkle it evenly on the water surface. Make sure you splash it into the water and not onto the dykes. If you use dry manure, you can broadcast it directly onto the water surface.

When the water becomes green (in 5 to 7 days) you can fill the pond completely up to the desired level. You have to measure the turbidity of the water weekly with a secchi disk or by using your hand. If the disk (or your hand) is not visible at a depth of 30 - 40 cm (1-1½ foot) stop fertilizing. Too much fertilizer deteriorates the water quality and oxygen levels. On the other hand, with too little fertilizer your algae will grow slowly. If the secchi disk (or your hand) is visible below a depth of 30-40 cm continue applying fertilizer every week as specified in the table below:

Table2: Weekly amount of fertilizer

		Weekly amount per m ²	Calculation (example for 300m ² pond)	Weekly amount for a 300 m ² pond
Option A	Di-Ammonium Phosphate (DAP) ¹	2 g	2g x 300m ²	600 g
	Urea ¹	3 g	3g x 300m ²	900 g
Option B	Dry manure ²	50 g	50g x 300m ² = 15,000g 15,000/1,000 = 15kg	15 kg

¹ It is highly recommended to use DAP and Urea together.

²Dry manure, from chicken, pigs, cattle, goat, sheep etc.

3. Stocking & Sampling

Stocking

Before stocking, you have to think of selling. Find out from the market what size of fish people prefer and then calculate your profits. Grow fish up to a size that is both profitable and easy to sell.

Example calculation:

5 fish of **200** grams each = 1 Kg. Each piece is sold at 140 shillings which is in total **700** Ksh
 2 fish of **500** grams each = 1 Kg. Each piece is sold at 250 shillings which is in total **500** Ksh
 actually you make more profit with the smaller fish, but if people in your area only like the big fish you will not be able to sell them!

Once you know what size of fish to grow you can, based on table 3 below, calculate how many fingerlings you will have to buy. Make optimal use of your space; stocking too many fish will lead to slow growth and in the long run the fish will be gasping for oxygen. Low stocking density means that you are losing out on profit. If you are a beginning fish farmer start with lower stocking density because the management is easier and there is less risk of the fish getting diseases or lack of oxygen.

After the pond is filled with water and the water is green (algae bloom) the pond can be stocked with fingerlings.

Table 3: Stocking numbers of fish for different feed qualities. The average weight for a fish at harvest is estimated at 200 grams per piece.

Quality of the available feed	Recommended density at harvest in Kg/ m ²	Number of fish per m ² (fish of 200g each)	Number of 200g fish in a 300 m ² pond at harvest	Number of fingerlings to be purchased at 10% mortality
Only Algae, no other feeds available	0.3 - 0.5	1.5 - 3 fish	450 - 900 fish	500 – 1000
Community fish feeds available	0.6 - 0.8	3 - 4 fish	900 – 1,200 fish	1000 – 1350
Commercial fish feeds available	0.8 – 1.0	4 - 5 fish	1,200 – 1,500 fish	1,350 – 1,700
Aeration possible	1.0 – 1.5	5 - 8 fish	1,500 – 2,400 fish	1,700 – 2,700
Intensive fish farming	Up to 50Kg/m ³	Only for closed circulation systems (expensive!)		

Mortality:

In fishfarming you have to take into account that some fish will die either through diseases, damages or predators. Therefore you will have to buy more fingerlings than the desired number of fish at harvest; a rule of thumb is that mortality is 10% over a period of 6 months. Meaning if you buy 1000 fish, you will end up with 10% less which is 900 (as seen in table 3 above). Fry are smaller than fingerlings and therefore more sensitive which means that the mortality is higher, but the price is also lower. When starting with fry or small fingerlings overall mortality can be over 20%.

Stocking

Stock the pond with all male fingerlings. The use of mixed sex tilapia is not recommended because:

- 1) Males grow faster than females and
- 2) Mixed sex tilapia will start to reproduce after a few months. This reproduction cannot be controlled, even by stocking some catfish with tilapia. Uncontrolled breeding leads to poor growth of the fish and other problems like diseases. Spending a bit more money on buying all male tilapia fingerlings of good quality and of good size from your trusted fingerling producer will pay off at harvest!

All male tilapia fingerlings grow much faster than mixed sex tilapia fingerlings. This means you spend more on stocking, but in the end you will make more profit.

The recommended minimal size for stocking tilapia fingerlings into an open pond is 5-10 g. If you can only get smaller tilapia it is recommended to stock them in hapas first until they have grown to 5-10g or even bigger (see figure 4). In the hapas they are safe from predators like frogs and a cover net will keep them safe from birds. You can stock 500 fish in a 5 m² hapa net. Start feeding the fish 1 or 2 days after stocking to allow them to recover from stress of transport. The advantage of the hapa is that you can easily count the number of fish and you know exactly how many you have.



Figure 4: Hapas for nursing fry until they reach the size of 5-10 g.

Sampling

For calculating the right amount of feed you have to get the total weight of fish in the pond and the calculate average bodyweight of the individual fish. To calculate this you will need a weighing scale 0-10kg precision 100grams, alternatively you could use a measure cup or a bucket where you have marked the liters (1 kg of fish is the same as one liter).

Sample your fish every two weeks to calculate the total weight of fish in your pond and the individual weight of your fish. This allows you to calculate the growth, daily feeding rations and Food Conversion Ratio (FCR).

Fish are not potatoes!

Handle fish with care, always wet your hands/equipment and keep them as long as possible in the water.

To sample the fish you have to catch some fish (about 100) with a cast net or with a drag net. To catch them easily you can attract them with some feed. Place the fish gently into a weighing basket (the water has to pour off) weigh them and quickly release them back into the pond while counting. Make sure all your equipment including your hands are wet before you handle the fish.

Table 1: How to calculate the estimated total weight of your fish (biomass) in your pond

Explanation	Calculation
Data from your sampling	Number of fish caught : 78 pieces Total weight : 680 grams
<u>Average bodyweight of one fish:</u> Total weight / number of fish	$680g / 78 \text{ pieces} = 8.7g$ rounded to 9 gram
<u>Actual number of fish:</u> Initial number of fish stocked : 1,000 Dead fish (get this from your records) : 89	$=1,000 - 89 = \mathbf{911 \text{ pieces}}$
<u>Actual weight of all fish in your pond:</u> Number of fish x average bodyweight Convert grams to kg (divide by 1,000)	$=911 \text{ pieces} \times 9 \text{ gram} = 8,199 \text{ gram}$ $8,199 \text{ gram} / 1000 = \mathbf{8.2 \text{ Kg}}$

You can compare your result with growing tables you can find in the internet or you can get from your feed producer to see if your fish are growing up to expectation or not.

4. Feeding

Feeding your fish is the most important daily routine task at your farm and with wrong feeding techniques you can make losses. In fact correct feeding is more an art than a business.

Feed = Money!

Feeding fish is throwing money in the pond; make sure it is money well spent.

Feed types

Small fish need small pellets, big fish require bigger pellets. Good pellets have ingredients that are ground very fine (like ugali flour) which the fish can digest better. Only people who have been trained on how to make feeds should make this to make sure the feed is of good quality. Below is a table of the different types of feed on the market:

Figure 5: Types of feed and their characteristics

Type of feed	Price range	Remarks
Algae	Cheapest	Algae can be used as additional feed for your fish. Fertilizers make algae grow. Algae are a complete diet, but fish grow slow with only algae and you can only have less fish per m ² but with same growth (see table 3). ⊗ The quantity of algae cannot directly be controlled by the farmer (only through fertilization).
Floating pellets (extruded)	Expensive	☺ Less waste ☺ Feed is easier to digest since it is cooked (best FCR) !! It is not a “must” to have
sinking pellets	Less expensive	☺ Cheaper ☺ better FCR than mash ⊗ once feed has sunk to the bottom fish will not eat it anymore (it is a loss) !! Needs careful feeding
mashed (powdered) feed	Cheap	☺ Easy available !! calculate your FCR and expenses
Homemade pellets	?	!! Not recommended, it is very difficult to do it good ⊗ not a complete diet ⊗ not for professional farmers ⊗ a lot of work for little feed, accumulates at the pond bottom and lowers oxygen levels on the long run

Daily amount of feed

The daily amount of feed is determined by the size of your fish and the total amount of fish biomass in your pond. Normally the fish feeds manufacturers give recommendations as they know the exact formulation of their feed. As a basic guideline you can use the figures from table 6.

Figure 6: Tilapia feeding chart

Weeks in production	Size of Fish (in g)	Feed amount (% of bodyweight)	Total daily amount of feed per fish in gram	Size of feed Diameter*	Protein content in %
Fry	0.2 - 1			1 mm	
Fingerling	1 - 3			1 mm	
1	10	5.0	0.5	2 mm	35
2	13	4.8	0.6	2 mm	35
3	17	4.8	0.8	2 mm	35
4	22	4.6	1.0	2 mm	35
5	29	4.5	1.3	2 mm	35
6	37	4.5	1.7	2 mm	35
7	46	3.8	1.7	2 mm	35
8	56	3.7	2.1	2 mm	35
9	69	3.5	2.4	3 mm	35
10	83	3.4	2.8	3 mm	30
11	98	3.4	3.3	3 mm	30
12	115	3.2	3.7	3 mm	30
13	132	3.2	4.2	3 mm	25
14	149	3.0	4.5	3 mm	25
15	167	3.0	5.0	3 mm	25
16	185	2.9	5.4	3 mm	25
17	204	2.8	5.7	3 mm	25
18	223	2.6	5.8	3 mm	25
19	243	2.5	6.1	3 mm	25
20	263	2.4	6.3	3 mm	25
21	284	2.3	6.5	3 mm	25
22	305	2.3	7.0	3 mm	25
23	326	2.0	6.5	5 mm	25
24	347	2.0	6.9	5 mm	25
25	368	2.0	7.4	5 mm	25
26	389	2.0	7.8	5 mm	25
27	410	2.0	8.2	5 mm	25
28	431	1.8	7.8	5 mm	25
29	452	1.8	8.1	5 mm	25
30	473	1.8	8.5	5 mm	25
31	494	1.7	8.4	5 mm	25
32	515	1.7	8.8	5 mm	25
33	536	1.4	7.5	5 mm	25

Note!: The 25% protein feeds is ONLY applicable where the ponds are adequately fertilized (green). If the pond water is not well fertilized (not always green) continue with 30% protein feed.
 * 2mm and smaller is crumble, 3mm and above are pellets

Figure 7: How to use the feeding table:

Explanation	Calculation
Data from your records	Average body weight sampling of fish: 123 g Number of fish: 750 Pieces
Total weight of fish in the pond: Weight x number of fish	123g x 750 pieces = 92,250 g /1,000 = 92,25 Kg rounded is 92 Kg.
Lookup in the table the size of the pellets:	A fish weighing 123g, best pellet size is <u>3 mm</u> , daily feeding rate is <u>3.2%</u> of the body weight
Total amount to feed daily to your fish: Weight of fish in the pond x daily feeding rate	3.2% = 0.032 (if you use your phone to calculate) 92 Kg x 0.032 = 2.944 Kg =2.9 Kg
Feeding portions (for this example 2 portions):	Morning feed : 2.9 / 2 = 1.45 Kg Afternoon feed : 2.9 / 2 = 1.45 Kg

Make sure you feed the right pellet size to your fish. As fish cannot chew they have to swallow the feed particles whole. And if the feed is too big they cannot swallow it, thus they will not eat.

As a rule of thumb, never feed pellets which are bigger than the eye of your fish.

Calculation of FCR

The FCR, Food Conversion Ratio, is a good indicator to see how the fish are growing. It shows how efficient the feed makes the fish grow. Below is a box that shows you how to calculate it.

How to calculate the FCR= Feed Conversion Ratio = Kg of feed / Kg of gain in body weight
in other words how much feed did the fish eat to gain 1 Kg of body weight.

Example: an FCR of 2 means that you fed our Fish 2Kg of feed to gain 1 Kg of bodyweight
an FCR of 1.3 means that you fed your fish 1.3 Kg of feed to gain 1 Kg of bodyweight

Conclusion: **a lower FCR is better if the feed has the same cost.**

After you have sampled your fish and you have determined the growth rate and the body mass of your fish you can calculate the FCR.

Figure 8: How to calculate your FCR

Explanation	Calculation
Data from your sampling	Previous weight of all fish in your pond: 95 Kg Current weight of all fish in your pond: 130 Kg Feed given to fish (from your records) 3 bags of 20Kg = 60Kg in total
Weight gain: Current weight - Previous weight	130Kg – 95Kg = 35 Kg
FCR: Kg of feed / Weight gain in Kg	60Kg / 35 Kg = 1.7
An FCR of 1.7 means: by feeding 1.7Kg of feed you have produced 1 Kg of fish. In the analysis also take into consideration the price of the feed (and the algae you are growing (through fertilization of the water).	

In other words you have fed the fish 1.7 kg of feed to have a weight increase of 1 kg.

Storage of feeds

Always measure the weight of the bags when they arrive; if you pay for 20Kg of feed you should also get 20Kg of feed.

When storing the feed NEVER store it directly on the soil but always store it on pallets and off the walls. Store feed in a completely dry and cool area. If feed gets wet try to feed it immediately as wet (or even moist) feed gets moldy within a day or two. Moldy feed shall never be fed to fish as it is poisonous.

How to feed your fish

Feed the fish twice a day, in the morning and early afternoon. Recommended feeding times are between 11am and 4pm.

Feed the fish always at the **same time** at the **same place** of your pond. You can “call” your fish by knocking to the feed bucket or making a sound. Fish will learn fast when and where to get the feeds. Try to attract the fish to the feeding place by only throwing a small amount of feed over a larger area of the pond in the beginning of your feeding session.

If the fish are not responding stop the feeding!

Don't feed your fish when the oxygen levels are low or the water temperature is low. See the table for possible signs of problems. Signs for low oxygen levels and discomfort of the fish are: fish gasping on the surface, brown or grey water color, etc. Fish cannot digest the feed effectively when the oxygen levels or temperature levels are too low. Never feed the fish when they are not healthy, or when the oxygen levels or the water temperatures are low (e.g. after some heavy rain falls). If you use sinking pellets the fish have to take the feed before it has reached the pond bottom. Usually tilapia will not eat the feed anymore when it reaches the bottom. At the bottom it could even decrease the water quality and lower the dissolved oxygen levels in the water. As feed is very expensive (in fact it is by far the most expensive single expenditure in your fish farming business) it is important to feed the correct amount. Stop feeding the fish 24 hours before you transport them.

Figure 9: Trouble shooting

Observation	Possible problem	Possible solution
The fish are not feeding well	Low water temperature (e.g. just after the rain)	Stop feeding and wait till the water has warmed up
	The oxygen levels are low	Don't feed the fish and
	Wrong feeding time	See chapter 5 for timing
Fish are floating belly up	Low oxygen levels/poisoning	Contact an expert!
Fish gasping on the surface	Low oxygen levels	Contact an expert! Too many fish in the pond?
Fish start dying in the pond	Ammonia levels have become toxic in the pond water, Nitrite poisoning or very low or lack of oxygen	Contact an expert Flush out part of the pond water; allow fresh water into the pond.

5. Fish health

Healthy fish eat well and grow well and are more resistant to diseases. Fish health is influenced by three factors: Environment, stress and pathogens (diseases).

To have healthy fish you will need e.g. to have enough good food available, enough oxygen in the pond, protect them from predators, avoid too high stocking densities and handle fish well.

Anything that comes from outside is a potential source of diseases, therefore you should make sure you get feeds and fingerlings from a reliable source, keep wild fish out of your ponds and always disinfect your pond to kill anything that could carry diseases.

This chapter should be very long and you will need to know much more about it than these few lines, but this will give you an idea of what diseases are and how to deal with it. If you need more information contact your fisheries office for more information.

6. Harvesting and transport to the market

The following steps are essential for a successful harvest and making good money.

Plan early to avoid surprises and do not let your customer down; give honest and good information. This way you will make good money and have customers for the next harvests.

Step 1: Announce that you are harvesting fish at least a week before. You could also talk to hotels before to notify that you want to harvest your fish, but then you will have to tell them how many fish you have, what size and try to fix the price to avoid disappointment.

Be honest because if you disappoint a client he will not buy fish from you again.

For more information on marketing see the marketing manual. When you say you will harvest on Wednesday then do not change the date, unless the client wants to.

Step 2: Stop feeding the fish 2 days before the harvest

Step 3: Prepare the tools and labor for harvesting; this includes repairing big holes in the sein net.

You will need: Plastic buckets, sein net, weighing scale.

Step 4: Reduce the water level in the pond; this makes it easier to harvest the fish.

Step 5: Harvesting is preferably done very early in the morning. While harvesting handle the fish with care to avoid damages and post-harvest losses.

Step 6: If you bring fish to the market put the fish on ice, if you have the sellers already at your farm, then it is up to them to organize this.

7. Record keeping

For serious business people it is essential to keep records. The records show you how much profit you are making and the records show you which type of pond management is the most profitable.

The two forms in the annexes will help you to keep records of your business. These are basic forms, over time you can make your records more advanced; your county fisheries office can provide advice on more advanced data record forms.

The two attached forms in this manual can be used directly, or you could use this as a model and draw it in your own notebook. Have a separate notebook for each pond and a separate notebook for the harvest of and planning for the whole farm.

The harvest sheet record will help you to monitor prices and quantities of fish sold (and to whom) this can be done for all your fishponds.

On the Input records per pond form write all inputs per pond. For items that you use from your own farm, calculate the price that you would have gotten for it if you would have sold it at your farm. This way you will be able to monitor how much money you will have spent and how much profit you are making.

By trying out different feeds or feeding techniques, different stocking densities and different fingerlings you can compare and see what the most profitable type of management is. You can also see which ponds are more productive and find out which are less productive.

8. Your 6 steps to success (Summary)

- 1. Disinfection:** Always disinfect the pond after the final harvest. This will keep your fish healthy, reduces infections, pests, predators and stops unwanted natural fish reproduction
- 2. Fertilization:** Always apply the right amount of good quality and effective fertilizers to create a good algae bloom and maintain green waters. This will help you to maintain good water parameters, to keep your fish healthy and reduces your feeding costs.
- 3. Fingerlings:** Always stock your pond with the right numbers of good quality fingerlings. Do not overstock (maximum 3 fish per m²). Use all male fingerlings as the males grow faster and unwanted reproduction will be prevented. Stock big fingerlings (> 5 g) to your ponds.
- 4. Feeding:** Preferably use quality fish feeds and fertilize your pond well to keep the water green. Monitor the quality of your feed by calculating the FCR.
- 5. Record keeping:** Always keep records (see annex). Write down all the expenses of your business. Do regular fish sampling and calculate growth and bodyweight. Also document all losses of fish and mortalities. Calculate the FCR and the feeding costs. Record your amount of harvested fish and the sales prices for different fish sizes and the total revenue to calculate your profits.
- 6. Post-harvest:** In order to receive the highest price for your fish inform potential buyers before harvesting. Make sure that the buyer gets fresh fish or if you take it to the market yourself make sure that the fish is kept fresh and chilled until you reach the selling point (market).

Act as a professional, responsible and business oriented fish farmer!

HARVEST RECORDS FOR THE WHOLE FARM

Total pond area: _____

Total number of ponds: _____

Pond No.	Date	Size of fish	FISH HARVESTED		FISH SOLD				FISH USED FOR OTHER PURPOSES				
			Species	Quantity		Quantity		Unit Price	Total Price	Quantity		Total Value	What did you use the fish for?
				Pieces	Total kg	Pieces	Total kg	Kshs	Kshs	Pieces	Total kg	Kshs	Food/ Gift/ in kind
Pond 1	01.09.2013	Small (<15cm)	Tilapia	3	0,3 kg	0	0 kg	30 Kshs	0 Kshs	3	0,3 kg	120 Kshs	Food
		Medium (15-25cm)	Tilapia	5	1,5 kg	2	0,6 kg	80 Kshs	160 Kshs	3	0,9 kg	240 Kshs	Food
		Large (> 25cm)	Tilapia	25	12,5 kg	20	10 kg	120 Kshs	2400 Kshs	5	2,5 kg	600 Kshs	in kind
		SUM		33	14,3 kg	22	10,6		2560 Kshs	11	3,7 kg	960 Ksh	
		Small (<15cm)											
		Medium (15-25cm)											
		Large (> 25cm)											
		SUM											
		Small (<15cm)											
		Medium (15-25cm)											
		Large (> 25cm)											
		SUM											
		Small (<15cm)											
		Medium (15-25cm)											
		Large (> 25cm)											
		SUM											

INPUT RECORD PER POND

Pond number: _____

Pond area: _____ m²

Date	INPUTS						Remarks
	Item	Type	Source	Quantity	Unit cost*	Total cost	
01/01/13	Chicken manure		Own farm	2 bags	400.Kshs	800 Kshs	
12/01/13	Tilapia fingerlings	Mono-sex	Samaki square EXAMPLE!!!	1000	5 Kshs	6000.Kshs	Including transport (1.000)

Inputs examples: DAP; Manure; Pellets (floating/sinking, mash); Lime; Fingerlings; Labor costs; Electricity/fuel cost (pumping etc.); Drugs applied

* If it comes from your own farm write the value of the item for which you could have sold it.

Notes:

Notes: