Animal Production

Level II

Learning Guide #33

Unit of Competence: **Assist Fish Production**

Module Title: **Assisting Fish Production**

LG Code: **AGR APR2 M 10 LO1-LG-33**

TTLM Code: **AGR APR2 M 10 0919 V1**

LO3: Undertake fish farming work

Instruction Sheet	Learning Guide - 33

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:–

- Follow and clarify instructions and directions
- Undertake fish farming

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Instructions and directions provided by supervisor are followed and clarification is sought when necessary.
- Fish farming activity is undertaken in a safe and environmentally appropriate manner and according to enterprise guidelines.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 , Operation Sheet 3 and operation 4” **in page -18,19,20,and 21.**

Do the “LAP test” **in page – 22** (if you are ready).

General principles of undertaking fish farm

Good management Equals Successful culture and High yields of Fish, therefore:

- It is a good idea to pay at least one visit a day to the ponds in the morning if possible another visit to be made in the late afternoon to have full control. Hence, the following points should be checked every day.
  - Check the water level and see that no water is running through the outlet. If there is any leakage repair it.
  - Carry out necessary daily feeding after checking the food is eaten.
  - Watch them carefully to see that they are healthy & swimming strongly.
  - If you find any dead fish floating in the pond, take them out, and investigate the causing factors and change some of the water with new water, this is the first measure to be taken. Again if the fishes are coming to the surface and gasping for air, these is due to shortage of oxygen then add some water.
  - Avoid if any weeds are growing in the pond.

There are certain management aspects that are undertaken weekly or monthly.

- Add some manure as fertilizer every month to maintain high fish productivity by growing natural food of fish.
- Add some amount of Limestone every month to reduce disease incidence and to kill parasites of fish.
- Weekly release some water and let water into the pond slowly, never make like a fall.
- When the fishes reach market size about one year of age drain some of the water and harvest them with the appropriate net.
- Generally speaking, strictly following appropriate management
- Practices help the fish farm run profitably by raising (growing) large amount of fish by the most economical means.

Information Sheet-01	Following and clarifying instructions and directions

Instructions and directions provided by supervisor are followed and clarification is sough when necessary. Any employee who works in industry which fish rising or any farmer who raise his own stock must follow the following instruction and direction:-

- Enterprise policies and procedures
- Manufacturer instructions
- Material safety data sheets (MSDS)

The MSDS is a detailed informational document prepared by the manufacturer or importer of a hazardous chemical. It describes proper handling and rising activates of fish.

MSDS's contain useful information such as:

- Flash point
- Toxicity
- Procedures for spills and leaks and
- storage guidelines.

Information included in a Material Safety Data Sheet aids in the selection of safe products, helps you understand the potential health and physical hazards of a chemical and describes how to respond effectively to exposure situations

- *OHS standards and procedures*
- *Specifications for tools, equipments and materials*
- *Standard Operating Procedures (SOP)*

It is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations

- Verbal directions from manager or supervisor
- Work instructions and standards
- Work notes

Instructions and directions provided by supervisor must be followed and if we have any question we can ask when necessary. And also employee must observe and follow Enterprise policies and procedures in relation to workplace practices in the handling and disposal of materials.

Self-Check 1	***Written Test***

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. what is OHS ? (5 points)
2. What is MSDD ? (5 points)

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-02	Undertaking fish farming activities

3.2.1. Site selection of fish farm

Site selection: is the process by which various factors indicated are considered to enable one to decide on the right site for a specific production (culture) system. Success or failure of any fish culture venture largely depends on the right selection of the site for it. In choosing a site several factors other than the physical aspect of the site are to be considered.

Factors to be considered in site selection

There are several factors to be considered in site selection among these are;

1. Water Supply

Adequate supply of good quality water must be available year round in the site for fish culture.

- The water sources must be ***reliable and adequate***
- Good quality water is rich in oxygen, nutrients and free from pollutants. The most important sources of water for fish ponds are; Perennial streams, Lakes, Rivers, Springs and wells, and, Water reservoirs and dams.
- If there is no enough water all the year round, it is no good making ponds, as they will dry up and the fish will die. And also the water loss due to evaporation, leakage and percolation should be considered in determining the amount of water required.

2. Soil Type & Quality

- Many soil characteristics, especially those related to texture, determine its suitability for fishpond purposes.
- Soil texture refers to the relative proportion of sand, silt and clay content of the soil.

Types and Characteristics of soils

- ***Sandy soil*** - this soil can't be used for constructing fishpond, because it can't keep water. Its clay content<12.5%, sand content >87.5%.

Clay soil- This soil can be used for constructing fishpond, but it has much poor aeration. Clay conserves water well. It can be used on the pond bottom; however, because it cracks when dry, it is unsuitable for dike construction.

Clayey soils are preferable because they are superior material for diking and holding water. They have good compaction characteristics and low permeability. A very simple general rule can be followed: As a clay content of the soil decreases, its suitability for fishpond construction also decreases.

Loamy soils are also recommended. They have good organic matter content which favor the culture and growth of natural fish food.

Desirable soil texture for ponds-Soils belonging to the following textural classification are desirable for fishpond development: clay, clay loam, silty clay loam, silty loam, loam and sandy clay loam. These types of soils are characterized by;

- *High water retention (holding) capacity*
- *Good aeration*
- *Adequate nutrient*
- *Favorable chemical properties.*

Soil characteristics greatly affect the quality of pond construction and influence fish yields. Therefore, soil quality should be carefully determined. In determining soil quality, it is insufficient to just examine the topsoil. Enough samples must be taken from various representative spots. The sampling depth should be 1 m. The soil should ensure that pond dikes would not leak or collapse.

Soil Quality Testing

There are several methods to test the quality of soil for pond construction, the most easy and practical methods includes;

The ball method

- Dig about 50cm deep pit, take a handful of soil from the bottom of the pit, and moisten it with some water. And squeeze it into a ball (fig.1)
- Throw the ball of soil into the air and catch it (fig 2).

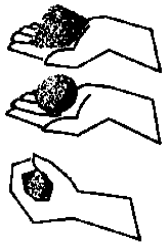


Fig 1 Fig 2

Conclusion: Bad soil with too much sand or gravel in it will not stick together and the ball will fall apart then *reject the site*. If the ball sticks together well the soil maybe be good, but you can't be sure. Now you should make a second test to be sure that the soil is good.

The pit method

1. Dig a hole as deep as your wrist early in the morning (Fig 1) fills it with water to the top (Fig 2).
2. By evening some of the water will have sunk into the soil (Fig 3).
3. Then fill the holes with water to the top again (Fig 4). Cover the hole with boards or leafy branches (Fig 5).
4. The next morning if most of water is still in the hole at least 60%, the soil hold enough water, therefore the soil is suitable to build fish pond(Fig 6).If there is some or no water remaining reject the site.

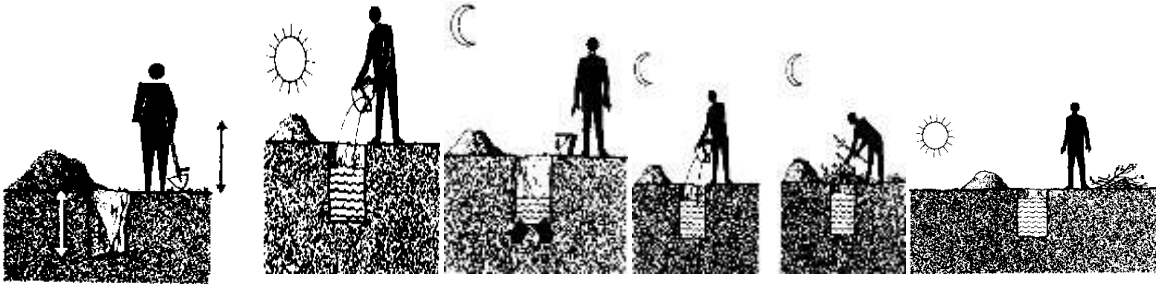


Fig 1 Fig 2 Fig 3 Fig 4 Fig 5 Fig 6

3. Topography of the site

Topography refers to the “lay of the land” or the changes in the surface elevations of the ground whether flat, rolling or sloping, undulating, and hilly. Fishpond design, layout and specifications are made largely in accordance with the land topography.

A suitable site for fishpond has a topography that can be converted into a pond economically. The cost of construction can be greatly reduced if the surface features of the land are used to advantage.

It is desirable or ideal to construct a fish farm on ***flat land with moderate slop*****.** However, there is no problem in setting up a farm on sloppy side of hills or valley areas. The topography should be suitable for;

- Gravitational flow of water can be exploited (water can easily enter into the pond)
- Reduce soil excavation and energy consumption, and
- Easy to drain water from the pond

4. Other criteria

There are other factors which are significant in fishpond site selection. These are equally as important as those previously mentioned and likewise require the same careful evaluation during the survey.

a. *Accessibility*. This is important for the transport of construction equipment and material, and for production inputs required for daily operations. Transporting costs can considerably increase if materials are manually carried through long distances. It is better if the site is accessible throughout the year by means of land and water.
b. *Availability of labour*. The cheapest sources of labour are those which can be provided by the local residents, or people living within or near the area. It is important that the customs and tradition of local laborers are known. The pattern of labour distribution and utilization should be considered as this is important in preparing the calendar of activities.
c. *Availability and cost of material*. In fishpond production, it is important that critical production inputs such as fish seeds, fertilizers, pesticides and other

related materials are readily available when needed. For some inputs, especially inorganic fertilizers, the supply is restricted and the cost is uncontrolled for non-agricultural uses. Other inputs like organic manures are difficult to obtain, or may be available only at certain times of the year.

d. *Availability of marketing outlets and prices*. Aquaculture products are highly perishable. Immediately upon harvest, products must be disposed of to maintain good quality and for better prices. If marketing outlets are located at a distance, larger quantities must be harvested and transported requiring some post-harvest marketing practices. If so, then the required support facilities especially ice-making plants must be available.
e. *Availability of credit and technical assistance*. Fishpond operations require high initial capital investment. In this respect, credit at reasonable terms play a major role in providing the needed cash outlays. Technical assistance may be obtained from government extension services, public or private university research stations and lending institutions. The services rendered by these agencies are important especially in cases of emergency.
f. *Pattern of land and water use*. It is important to assess the pattern of land and water use in the area to determine the impact of this on the project. Activities such as navigation, fishing, industries, public utilities, and recreation and nursery areas must be included in the overall assessment. It is best that a complementary rather than competitive relationship between these various uses and the project be established.
g. *Peace and order situation*. Good peace and order conditions at site are favorable for both public and private interests.

3.2.2. Pond preparation

After deciding on the site or location and design of fish pond the pond's shape size and depth has to be determined.

Pond shape: the easiest and perhaps best shape is the rectangular with a length twice the width. However, the shape could be modified based on the topography of the area.

Pond size: depend on the objective of the fish producer. If it is for home consumption then smaller size may be used(E.g. 20m by 10m).For commercial purpose large size is needed(more than 40m by 20m).

Pond depth: pond should be deeper near the outlet for easy drainage. The average depth of fish pond could be 1m to 1.5m.

Once the pond shape, size, and depth is decided, then the procedure to construct fish pond is:

- Measure the length and width of the pond on the ground and mark it. Then, clear any vegetation grown. This is illustrated in Fig.1&2
- Begin the excavation (digging).It could be done by machine or manpower. This is illustrated in Fig.3
- The earth that comes out should be thrown upon the sides to form embankment (dyke).
- The pond dyke should be well compacted and strong enough to withstand the greatest water pressure exerted on them, and to avoid water seepage This is illustrated in Fig.4
- The dyke should be sloppy that face the water to avoid sliding of earth.
- Then make the water inlet, outlet, and canal(Fig.5)

Pond water inlet: is the place water can be let into the pond. There should be a screen (wire net) to prevent wild fish entering pond and gate to open or close when water is needed or not.

Pond water outlet: water can be let out of the pond .This is usually a pipe fitted with screen and valve to avoid escaping of fish.

Canal: long and narrow pit leading water from the source into the inlet of the pond.

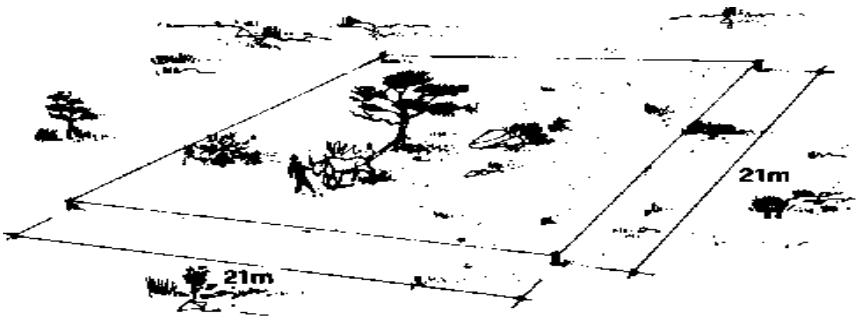
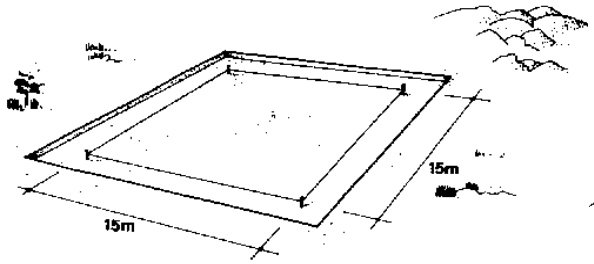


Fig.3 Measuring and marking the selected site for construction.



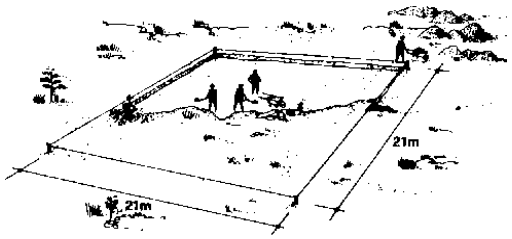


Fig 4. After clearing the area

Fig.5 Excavating(digging) the pond.

Fig .6 Compacting the pond dyke(embankment)

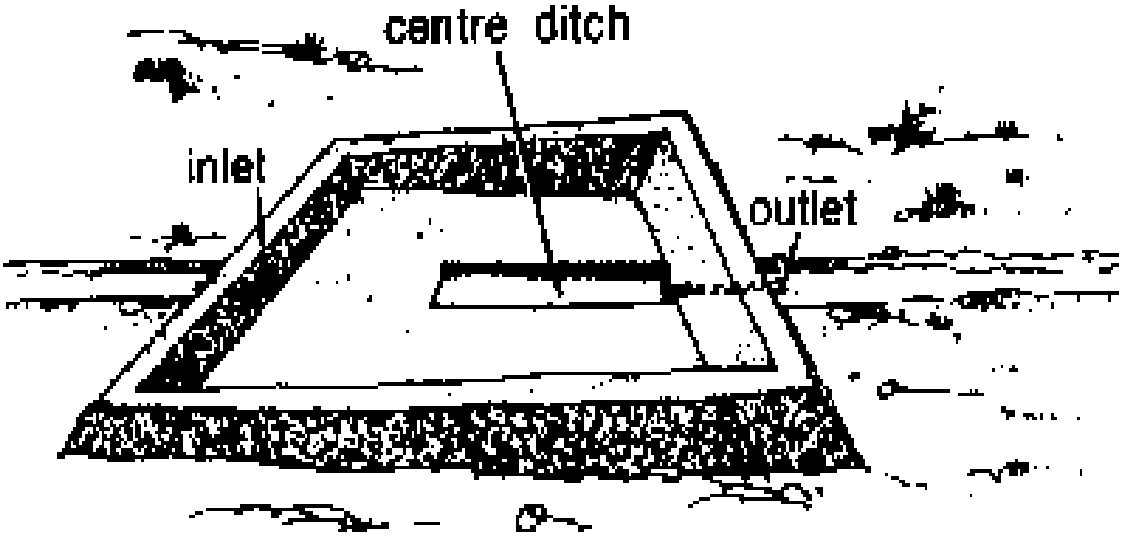


Fig.7 Body parts of a fish pond indicating water inlet, outlet and dyke

3.2.3. Carryout liming, fertilizing, feeding and water quality test

3.2.3.1. Liming fish pond

The main roles of liming are showed in the following:

- Lime is anti-parasitic. It destroys parasites (eggs, larvae) living in the water or the inter-medium hosts. Kill the fry enemies such as insects, frog and their larvae.

- Regulate the acid water to slightly alkaline (pH 7-8.5), which is suitable for fish growing and stabilize the pH value.
- Fertilize the pond because many algae fed by fishes need Ca^{2+} as nutrient element.
- Make the ooze of the bottom loosen sediment (or precipitate) material floating and muddy in the water and make water clear and transparency.

Types of lime

- The most common liming materials are agricultural limestone, hydrated or slaked lime and or quick lime.
- Liming materials differ in their ability to neutralize acid.
- Pure agricultural limestoneis the standard against which other liming materials are measured.
- The neutralizing value of agricultural limestone is 100 percent..
- Generally calcium oxide (CaO) called slaked lime or quicklime, and calcium carbonate ($CaCO_3$) called chalk or limestone is used as the liming material.

Disinfecting the pond

It's very important to disinfect the pond for preventing fish from getting diseases and getting high fish productivity.

Besides the limestone, some another materials can also be used for disinfecting the fishponds. There are three methods of pond disinfection: -

i. Using quick lime to sterilize the pond without water.
ii. Using quick lime to disinfect the pond with water.
iii. Using bleaching powder to sterilize the pond with water.

3.2.3.2. Fertilizer application

- Fertilization supplies the phytoplankton (free floating plants) with the materials essential for photosynthesis.
- As the phytoplankton photosynthesize and reproduce, zooplankton (floating organisms that is made up of microscopic animals), which feed on phytoplankton, flourishes.
- In turn, the fish, which feed on zooplankton, phytoplankton, and benthos, also flourish.
- Therefore, the importance of pond fertilization lies in the cultivation and propagation of various food organisms for the cultural fish.

Fertilizers can be divided into two:

Chemical fertilizers

According to composition, chemical fertilizers can be divided into three groups: nitrogenous, phosphoric, and potash fertilizers.

Organic manures

- Organic manures are mainly farm animal excrement.
- Generally; the term refers to manures containing organic matter.
- Faeces and urine of livestock and poultry, green manure, night soil, compost, and silkworm dregs are some of the organic matters.
- Fertility of ponds, therefore, is achieved by application of inorganic and organic fertilizers or a combination of both.
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(floating organisms that is made up of microscopic animals), which feed on phytoplankton, flourishes.

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- Therefore, the importance of pond fertilization lies in the cultivation and propagation of various food organisms for the cultural fish.

fig 8 . compost bin in the pond

3.2.3.3. Fish feeding

Natural fish feedings

plankton is a collective term applied for very small (microscopic largely) extremely diverse forms of organism, both plants and animals that are floating forms, drifting into currents. The plankton occurs in all natural water as well as in artificial ponds, reservoirs, irrigation channels, etc.

Phytoplankton: the organisms are exclusively of plant origin and are thus autotrophs belonging to the first trophic level (producers).

Zooplankton: the organisms are exclusively animals, and are therefore heterotroths, belonging to the second trophic (primary consumer) level.

The objective of feeding fish is to provide the nutritional requirements for good health, optimum growth, optimum yield and minimum waste within reasonable cost so as to optimize profits.

Every farmer should be particular about the quality of feed fed to the fish because it is the feed that determines the:

(i) Nutrient loading (and ultimately carrying capacity) in the pond, hence water quality within the culture system

(ii) Fish growth rate,

(iii) Economic viability of the enterprise. 60-70% of variable production costs in a normal production cycle is due to feed.

(iv) Health status of the fish.

Feeding fish correctly means:

- ❖ Giving feed of the correct nutritional quality for the specified age of fish,
- ❖ Feeding the right feed size for easy consumption,
- ❖ Feeding the correct amounts,
- ❖ Feeding at the right time(s) each day. When fish are fed correctly, growth rates are good and uniform across the population, feed conversion ratios (FCRs) are low and pond water quality is better managed.

The physical attributes of a good feed, therefore, are:

- The ingredients used in the feed should be finely ground. The pellets will have uniform color and you should not be able to distinguish morsels of maize for example.
- The feed must be without fines or dust. If too many fines are in the feed, too much will be wasted in the form of a powder that floats on the water surface. Tilapia may eventually consume this powder but larger catfish will not.
- The pellet should be firm with a water stability of at least 30 minutes. The pellet's water stability refers to the time it takes for the pellet to completely fall apart in water.
- The pellets should be of uniform size and of correct size so the fish can swallow them. A size of about ¼ the gape of the mouth is advised.
- The feed should be palatable to the fish with a good taste, smell and feel. Fish will spit out or only slowly consume feed that is not palatable.

Floating feed

provides an added advantage in that the farmer not only knows when the fish have started feeding, but the farmer will know when the fish have stopped feeding. Even though catfish are thought to feed on the pond's bottom, they are easily trained to feed wherever the food is, even at the surface. Therefore, it is much easier for the farmer to evaluate feeding response when using a floating feed. However, floating feed often costs more. It is therefore up to the farmer to decide if floating feed is worth the added expense by evaluating fish performance and feed conversion.

fig. 11 fish feed

Example: If there are 1000 young fishes in a pond, and each weighs about 10 grams, then the total amount of food to be given will be:

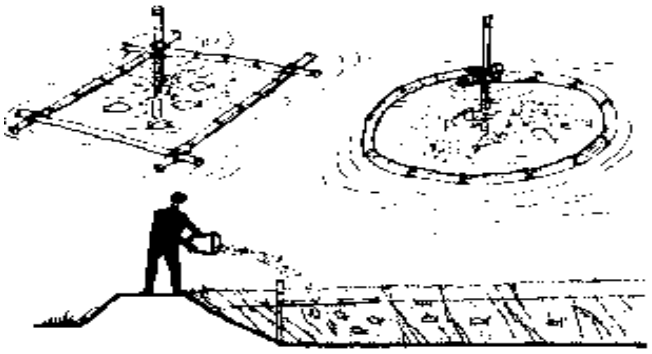
10gramsx1000x4/100= 400grams of food is required

When do we feed fishes?

- Always try to feed your fish at the same time every day preferably early in the morning and late in the afternoon when the pond is cooler by dividing the food into two.

Where do we provide feed to fishes?

- The food should not be spread all over the surface of the water, but on a certain side of the pond on feeding platform(prepared from bamboo by cutting into 4 pieces of 150cm in length and joining each corner and fixing with rope or wire to form a square.



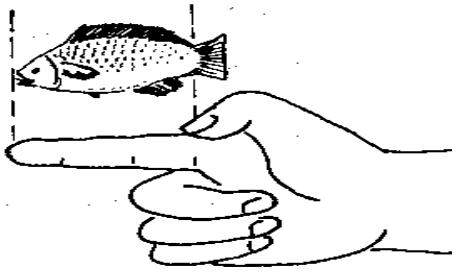


Fig. 12 Structure of feeding platform and method of feeding Fig.13 A fish at fingerling stage

3.2.4. Filling fish culture with water

- After renovating and disinfecting fishponds, the freshwater can be filled into the pond.
- The water must be nontoxic.
- In order to prevent the wild fishes and another harmful animals enter the ponds, dense net or filter should be installed in the pond inlet.
- After or before filling the water, base manures should be put into the pond.
- The dosage of base manure is 200 kg/ha for dry cow dung, or 6000kg/ha for fresh grass or another fresh manures.
- One week later, the pond water will be changed into green or brown color and plankton grow well.
- When filling the water into pond, at first one-third of water needed should be

filled gently.

- Then other water can be added until the full of pond when the water color has been changed to green or brown.

3.2.5. Type and size of fish culture

Culture systems found in Africa include semi-intensive and intensive culture of Nile tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*), and common carp (*Cyprinus carpio*). The species used at any given site are commonly found in the region and more or less appropriate to the agro-climatic zone. They are warm water fish species and are mainly cultured in a freshwater environment.

Desirable characteristics for cultured fish species include:

- Ease of reproduction
- Attainment of market size prior to reaching sexual maturity
- Acceptance of supplemental and/or manufactured feeds
- Feeds low on the food chain, i.e., eats plant material
- Rapid growth
- Efficient feed conversion
- Resistance to diseases
- Tolerance to relatively high stocking density and poor environmental conditions
- Is highly desired in the marketplace.

Few species have all of these characteristics, but the Nile tilapia, carp and the African catfish have enough of them that their popularity in the market and the ready availability of technical information about their culture make them suitable candidates for warm water fish farming in Africa.

There are two options in the production of fish in artificial ponds. These are starting with parent fishes and fish seed collection method.

Starting with parent fishes

In this production system one small pond called nursery pond is prepared. This pond may have size of 10 m length, 5 m width and about 1 m depth. After filling with water, disinfecting and fertilizing the pond. Now you are ready to put four fully grown males and 10 females' tilapia fish or 1 male and 2 female carp fish in nursery pond. After one or two weeks they will start to reproduce. For instance, one mature female tilapia may produce from 1000-3000 fish seeds every month and carp may produce from 200,000 to500, 000 fish seeds every four month. The newly born fish seeds will stay for two months in this pond then they are collected and transferred into production or growing pond.

Stocking fish seed should be 120 seeds/m^2 until 20 gram weighs each fish then reduce the stocking rate to 30 young fish/ m^2 for growing from 20-60 grams usually this is at the age of 3 month. After this reduce the stocking rate 4 fish/ m^2 until marketable size is attained.

Fish seed collection

Other option is collecting fish seeds from lakes, rivers or fishery research centres (such as Sebeta fishery research centre) and growing in artificial ponds until they are marketed.

From these two options starting with parent fishes is more appropriate because fish seeds are obtained when needed but collecting fish seeds from natural water bodies may be unreliable, seasonal and insufficient for the fish farm.

3.2.6. Stocking

Stocking fish seed should be 120 seeds/m^2 until 20 gram weighs each fish then reduce the stocking rate to 30 young fish/ m^2 for growing from 20-60 grams usually this is at the age of 3 month. After this reduce the stocking rate 4 fish/ m^2 until marketable size is attained.

- It is usually expressed as the number of weight of fish per ha.
- The stocking density must be reasonable because it is inversely

proportional to the quality of marketable fish under the same pond condition and culturing measures.

- The optimum stocking density for silver carp and bighead carp is 150 000-180 000 fry per 1000 m^2; for grass carp and black carp 120 000-150 000 fry per 1 000 m^2; for tilapia 200 000-300 000 fry per 1 000 m^2.
- Lower stocking density rate will decrease yield and increase production costs though fry grows faster. Stocking density can be optimized with skillful farming and careful management.

3.2.7. Predator and disease control

Various animals including fish are harmful to fish cultivation so far as they either live upon the cultivated fish species or their eggs and fry, even compete them for food. To this category of fish enemies belong all groups of vertebrates as well as insects. Depending upon the population of any of these a control becomes necessary as part of pond management. Some measures taken are as follows:

- Periodical drainage of pond
- Use of quicklime treatment to pond
- Destruction with quicklime or removal with scoop net of eggs keeps a control on multiplication of harmful amphibians.
- Use of traps is an effective measure against harmful amphibians, birds and mammals.
- Shooting when permitted is especially effective against harmful birds.
- Use of toxic substances is quite effective in certain cases. Notonectids (back swimmers) can be easily controlled by spraying an emulsion of various oils (mustard, castor, etc.) in washing soap with the ratio of 3:7 and at the rate of 66 pounds per acre of water surface.

Control of fish diseases in farm ponds

Diseases are caused by parasites and infectious pathogens. Disease can significantly decrease the productivity of fish farm by:

- Minimizing the productive &reproductive performance of fish
- Marketing is delayed due to slowed growth
- Increasing cost of production incurred for treatment. Due to the above effect of disease to the fish and fish farm. It is much better to prevent disease. “Prevention is cheaper than disease treatment”, and avoids lose due to poor growth and death.

Factors Affecting Fish Health

1. Nutrition- proper nutrition (feeding) is required for fast growth and to avoid nutritional deficiencies. Adequate nutrition enable the fish defend itself against diseases.

2. Physical & environmental stress – this increase susceptibility of the fish to diseases. Some of physical & environmental stress includes:

- Very high or low environmental temperature
- Low dissolved oxygen content of the water
- Increase in acidity or alkalinity of the water
- High stocking rate (overcrowding)
- Very turbid water due to silt and/or waste from the fishes.
- Rough handling (poor management practice)

3.2.8. Harvesting and measuring fish

As in any other type of farming the final phase in the fish farming cycle is the catching /harvesting and use or sale of the product. There are two ways that a farmer can harvest his product, he can either take out the whole population from a pond at the same time or he can selectively catch fish from the pond throughout the year. For this, different capturing techniques have been employed.

Passive Fish Capturing Methods

In these fish capturing methods catching is dependent on the movement of the fish. The fishes should move into the trap or net by themselves.

- ✓ **Fishing With Traps:** Fishes can be caught with simple locally made traps such as basket from bamboo made in conical shape. In this method it allows the fish to enter easily but prevent its escape by means of a valve net. Farmers put food inside to attract fish in the non- return valve trap .It is common in lake and rivers the fish are used for home consumption.
- ✓ **Gill Net:** The principle in this method is that if a net is hung in a pond or lake the fish will attempt to swim through the net by selecting the appropriate mesh size the farmer can make sure that any fish smaller than he wishes to harvest will swim through the net while the larger fish will get stuck. Fish are caught by the operculum (gill cover), and because of this the net is called a gill net, which rank first in tropical small scale fisheries.
- ✓ **Hook and Line (Angling):**The principle used in hook and line fishing is to offer the fish a bait (food) fixed to hook and at the end of a line (rope) Which is attacked to a short bamboo or wooden pole. The fish while trying to bite the bait (food) swallows the hook and then gets caught. The bait may be small animals as earthworms, insects, small fish, and pieces of bread. With this method several hooks could be attached to a long rope fitted with float to catch more fish at one time.

Active Fishing Methods

In these methods the catching process involves the movement of the net than the fish. The net is moved by manpower to encircle a group of fish and bring it on the shore.

- ✓ **Seine Nets:** Seine nets are the most common and effective to collect all the fish in ponds. During Operation, one end of the net is fixed either by means of a stick or by anchoring to the bottom. The free end of the net is moved or pulled along to surround a certain area making a semicircle and finally brought to the fixed stick end(i.e. the starting point) the net is then dragged or pulled into the bank(dyke) enclosing the fish. This can be used in lakes one standing on the shore and other person standing on boat holding the other end and making a circle and then collect them.(This is the method mostly used in different Ethiopian lakes such as lake Ziway, Lake Tana, Lake Awassa.

- ✓ **Cast Nets** The cast net is thrown over a group of fish either from land as in ponds or from a boat. The net encircles the fish. The hand line (rope) fatted with lead (weight) and then slowly pulled closing the net, which is then lifted up with the fish.
- ✓ **Hand (scoop) Net:** This net consists of bag of netting materials with the mouth of the bag kept open by circular framing with iron fixed to wooden pole or stick. This method usually used to take out alive fish for sample from the pond.

Harvesting by complete and partial draining of the pond if the ponds are small and have convenient inlet and draining system and enough water resource, it is the best measures for harvesting by complete draining of the pond. The correct harvesting time should be determined according to marketable requirement and size and age of fish.

The following times are the best for harvesting:

i. Good marketable price of fish
ii. Size of fish just meets consumer's need (e.g. over 200g for tilapia; 0.5—0.6kg for common carp).
iii. Age of fish has reached or surpassed the one of biggest growth speed or sexual mature.
iv. Pond's other need.

Pond management after harvesting

- ❖ Dry the pond bottom until the cracks
- ❖ Plough the bottom of pond
- ❖ Put lime on the bottom, wall and dyke of the pond
- ❖ Wait two weeks
- ❖ Add water
- ❖ Check the water quality

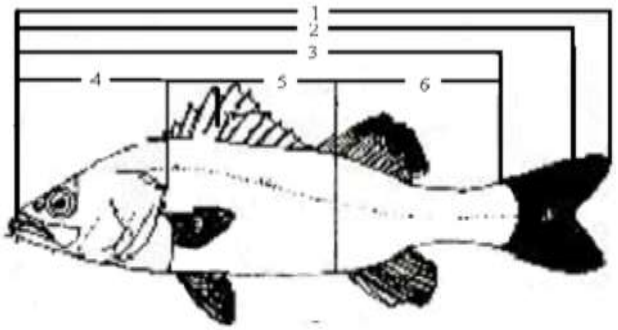
Mesh size of the net–means the size of each square parts of the net, usually for Tilapia species t recommended size is 10cmx10cm mesh size for larger species such as Nile perch the size could be increase

Measuring fish length

Total length: This length represents the maximum elongation of the body from end to end.. For this measurement, mouth is kept closed and caudal fin squeezed/compressed. For forked fin, tip of the longer lobe is used.

Fork length or Ac length: It represents the length of fish from the anterior terminal to the notch of the forked caudal fin i.e., the tip of the media fin rays. It is regarded as the most convenient length.

Standard length or A.D length: It represents the length of the body from the tip of snout to the base of the caudal fin. This is the commonest length used for fishery work, head length, trunk length and tail length.



1-----Full length
2-----Fork length
3-----Standard length
4-----Head
5-----Trunk
6-----Tail

Fig 1.1 External Feature of a Perch

Standard length=head length+ trunk length+ tail length

Self-Check 2	**Written Test**

Directions*:* Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What are the requirements of fish farm site selection? (3 points)

2. What is the difference between liming and fertilization of pond? (2 points)

3. What is the role of lime in fish culture? (3 points)

4. Why is mandatory to conjugate fish pond farming with other agricultural activities? (3 point)

5. Write some pond management activity after harvesting? (5 points)

6. How do you control fish from disease and predator? (4point)

Note: **Satisfactory rating - 19 points Unsatisfactory - below 19points**

.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet 1	Liming

pond liming

procedures : procedures of pond liming.

1. Select and fulfill personal protective clothing's.
2. Arrange all necessary materials tools and equipment
3. use calcium oxide (CaO) called slaked lime or quicklime, and calcium carbonate ($CaCO_3$) called chalk or limestone is used as the liming material
4. Calculate the quantity of lime required.
5. Weigh the liming material and convert it into powder.
6. Take the powdered lime in a bucket and spread it evenly in the pond.
7. Wash your hand thoroughly.
8. Using quick lime to disinfect the pond with water.
9. add the lime until the pH of acid water to slightly alkaline (pH 7-8.5)
10. Check the result of disinfecting pond with indicator fish or other aquatic creature after 7 days.
11. Find out the pH value of the pond with the help of litmus paper or pH strips
12. Clean work areas and dispose wastes

Operation Sheet-2	Fertilizing of pond with organic fertilizer

Fertilizing of pond with organic fertilizer

Procedures

1. Put PPE
2. Arrange all necessary materials tools and equipment
3. Use Faeces and urine of livestock and poultry, green manure, night soil, compost, and silkworm dregs .
4. prepare compost bin inside the pond around the corner of the pond so as to pour the compost
5. Apply this fertilizer with the proportional amount of the pond water
6. Apply 10 -15kg/ $100m^2$ for dry cow dung or 2-3 kg/m^2 poultry manure around the corner of fish pond
7. Leave it at least a week
8. Check and repot changes on the pond

Operation Sheet- 3	Water filling

Water filling

Direction: Perform the following the Procedure given below.

1. Put PPE
2. Arrange all necessary materials tools and equipment

A. renovating and disinfecting fishponds,

B. Fill the freshwater into the pond.

C. The water must be nontoxic.

D. Base manures should be put into the pond.

E. The dosage of base manure is 200 kg/ha for dry cow dung, or 6000kg/ha for fresh grass or another fresh manures.

F. One week later, the pond water will be changed into green or brown color and plankton grow well.

G. When filling the water into pond, at first one-third of water needed should be filled gently.

H. Then other water can be added until the full of pond when the water color has been changed to green or brown.

Operation Sheet- 4	Water quality measurement using pH

Direction: Perform the following the Procedure given below.

1. Put PPE
2. Arrange all necessary materials tools and equipment

Calibration-Follow these steps to calibrate a pH meter:

A. Turn the meter on.
B. Connect the probe to the meter.
C. Place the probe in *buffer* 7 solution and wait for the reading to stabilize.
D. Press the "Cal" button to enter the calibrate mode.
E. Press the "Con" button to set the meter to pH 7.
F. This method can be repeated for a buffer 4 and/or a buffer 10 solution.
G. Press the "Meas" button and Measure will appear on the display screen.
H. Rinse the probe with distilled water.
I. The pH meter is now calibrated and ready for use.
J. Measure the pH of the pond

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task 1- liming

Task 2- fertilizing

Task 3- Water filling

Task 4- Water quality measurement using pH

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