TRAINING MANUAL

ON

FISH PRODUCTION

AND

MANAGEMENT

CAPACITY- BUILDING TRAINING WORKSHOP ON INTEGRATED AGRICULTURAL PRODUCTION AND MANGEMENT FOR YOUTHS, WOMEN AND FARMERS IN IWOYE-KETU COMMUNITY AND ENVIRONS IMEKO-AFON LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA

FISH FARMING PRDUCTION AND MANAGEMENT

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Introduction

Nigeria is still generally considered as an agrarian economy despite the country's reliance on the oil sector for her revenue This is because as agriculture remains the mainstay of the nation's economy. It provides about 70 percent of the nation's population, especially those in the rural areas, with employment opportunities, and acts as a source of food for the nation's teeming population (Ogen, 2007; CBN, 2010). The fishery subsector plays a notable role in the Nigerian economy as it continuously ranks third after the crops and livestock subsectors which ranked first and second respectively in terms of contribution to the Gross Domestic Product(GDP) (Basse*yet al.*, 2014). Aquaculture, which is the rearing of aquatic organisms including fish under controlled environment for the benefit of mankind, is the fastest growing livestock industry in the world (FAO, 2009; Ozigbo*et al.,* 2014). Fish farming is therefore a subset of aquaculture.

In Nigeria, the demand for fish is being met through two main sources which are domestic production and importation from foreign countries. The domestic production is from artisanal, industrial and culture fisheries with artisanal fisheries accounting for as much as 85% of total fish production, while industrial and culture fisheries accounted for 1% and 14% respectively. Due to the insufficiency of domestic production of fish, importation of fish and fish products accounts for more than half of fish supply in the country.

Fish farming development is following the poultry industry and is facing similar challenges in its development, the challenges include: I) the need to educate farmers, 2) the need for quality stocks of fish of known origins, 3) the need for high quality feeds, 4) the need for record keeping among fish farmers and 5) the need for quality extension service.

This training will focus on the areas of fish farming and general aquaculture practices as a means to diversify income for the target groups.

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- Types of Production Methods used in Aquaculture

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- Techniques of live feed production
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METHOD OF TRAINING
This Training will be run both in the class and field demonstration) as well as visit to notable private fish farms.

MODULE 1: INTRODUCTION TO FISHERIES DEVELOPMENT

- **Introduction to Fish Farming**

Aquaculture is the rearing of aquatic organisms (fish, molluscs, crustaceans and aquatic plants) in enclosed water bodies such as ponds, dams, cages, raceways, tanks, reservoirs.

Fish farming is a part of aquaculture but sometimes the two are used interchangeably because majority of output from aqua cultural production comes from fish farming. Fish farming/culture is the growing of fish in a controlled environment (concrete or earthen ponds), vats (wooden or fibre glass) and plastics (Osawe, 2007, Nwokoye*et al.*, 2007).

Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated.

Aquaculture has the potential to become a sustainable practice that can supplement capture fisheries, eliminate fish importation and significantly contribute to feeding the world's growing population.

- ***Agriculture vs. Aquaculture***
- Variable body temperature
- Better converters of foodstuffs
- Requires less energy for body support

❖ **Aquaculture Requires**

- Land
- Water in sufficient quality and quantity
- Money
- Training (Technical knowledge)

- **Relevance of Fish farming**

i. Employment Opportunity
ii. Economic
iii. Nutritional (high-quality protein) and Food security
iv. Income generation
v. Earning foreign exchange
vi. Health benefit
vii. Ecotourism and Leading to poverty relief

- **Identification of important fishes in Nigeria suitable for culture**

Figure 1: Warm-water fish: Catfish

Figure 2: Tilapia

Figure 3: *Heterotisniloticus* (Slap water), Aikaodo

- **Obstacles to Fish Farming**

(i) Lack of experts mostly needed in areas of pond design and construction, fish genetics and

(ii) Breeding, fish feed and nutrition, fingerling transportation management, fish pathology etc.

(iii) Shortage of trained professionals and technicians to carry out advisory extension and training services;

(iv) High capital cost in pond construction;

(v) Supply of poor genetic fingerlings which leads to reliance on fingerlings from the wild;

(vi) Inadequate supply of inputs;

(vii) Poor communication network in the producing area affecting fish distribution, marketing and extension work;

(viii) Dishonesty of some farm labours;

(ix) Management problems;

(x) Lack of efficient fish farmers' cooperatives societies to benefit from government financial assistance schemes;

(xi) Poor maintenance facilities and spare parts;

(xii) Lack of adequate infrastructural facilities and

(xiii) Declining productivity.

- **Hazards and Challenges involved in Fish Farming Business**

(a) Sources, frequencies, qualities and quantities of water available.

(b) Difficulty in sourcing for healthy and quality fish seeds.

(c) No organized marketing platform.
(d) Inability to process fish for wider market consumption.
(e) Up till date, funding for farmers has remained a night mare.
(f) A major challenge that scares fish farmers is problems associated with farm staff.
(g) Finally, poaching and direct stealing of fish from the ponds are still going on unabated.

- **Types of Production Methods used in Aquaculture**

❖ ***Production Methods***

- Ponds and Tanks
- Cages and Pens
- Raceways
- Closed re-use systems
- Raft culture
- Close high-density culture

Figure 4: Earthen fish pond

Figure 5: Concrete Fish Tank

Figure 6: Movable circular holding tanks

Figure 7: Circular holding tanks

Figure 8: Wooden trough

Figure 9: Re-circulating Aquaculture Systems (RAS)

MODULE 2: FISH FARM DESIGN AND CONSTRUCTION

- **Fish farm site selection**

The success of a fish farming project largely depends on your project site conditions. Site conditions determine whether your fish farm will competitively produce. Correct selection of the site, and correct design of your fish farm in this site, can 'make-or-break' your new business.

Site selection process takes into account the biological traits of the target fish or Shrimp crop, the intended production capacity, the facilities required to achieve optimal and cost effective production.

Factors to be considered for selection of Fish Pond Site

i. Water availability (adequate quantity and good quality);
ii. Land topography;
iii. Accessibility;
iv. Soil type;
v. Vegetation cover;
vi. Proximity and size of market;
vii. Availability of inputs; and
viii. Bio-security.

A Simple Test of the Suitability of a Soil for Pond Construction:

(a) Dampen a handful of soil with water. Use only enough water to dampen the sample (Do not saturate it).

(b) Squeeze the sample tightly in your hand.

(c) Open your hand:
(i) if the sample keeps its shape, it is probably good enough for building a pond (i.e. sufficient clay present).
(ii) if the sample collapses and does not keep its shape, it is probably not good enough for building a pond (i.e.too much sand present).
(d) The site should be in a region or area that is suitable and allowed for aquaculture production.
(e) Well drained and away from flood-prone areas or at least having potential for flood control.
(f) Allow for acceptable effluent disposal as required by Environmental Management Authorities.
(g) Have a climate suitable for production of the intended species.
(h) Have accessibility to a good and all-weather market.
(i) Have easy access to services and technical assistance.
(j) Have adequate room for intended investment and possible future expansion.
(k) Not in a pollution prone area.

- **The final size of a fish farm is determined by:**
  - Amount of water available for fish culture
  - The technology to be employed; Intensive systems require less land compared to semi-intensive systems, to produce the same quantity of fish.
  - The target production.
  - Capital available for investment.

❖ **The number, size and the shape of ponds will be determined by:**

(a) Land size
(b) Topography of the land
(c) Intended use of the Pond
(d) The Species to be produced
(e) Frequency of Harvest

(f) Target quantity per harvest
(g) Whether juvenile production is intended etc.

- **Different Types of Fish Ponds and their Designs**
  Pond Design

During the process of designing ponds, decisions on the following should be made:

- Total Area of the pond water surface (this is the actual pond size)
- The Length and the width of the pond water surface
- The water depth and the total pond depth at the deep end
- The slope of the dykes and the pond bottom
- The size of the free board (height of dyke above water level)
- The width of dykes

- **Steps of Fish Pond Construction**
- Reconnaissance survey: Visit to the site of the project to get first-hand information.
- Land clearing: The removal of the vegetation on the site.
- Land mapping: It is marking of the specific area for specific structure
- Excavation: It is the earth removal for specified structure e.g. pond, channel etc.
- Construction of associated structures e.g. monk, slice gate etc.
- Pond dressing: It the smoothening of the dykes to look good.
- Grassing: It is the planting of grasses on the dykes to prevent soil erosion.
- Pond impoundment: It is the introduction of water into the pond.

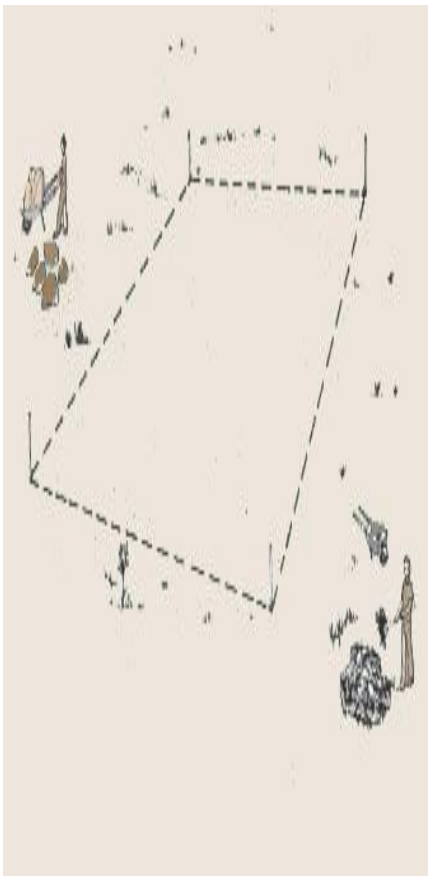


Figure10: Pegging on going now and land mapping

Design calculation:
- Dyke slope: 50% (0.5)
- Bottom slope: 1% (0.01)

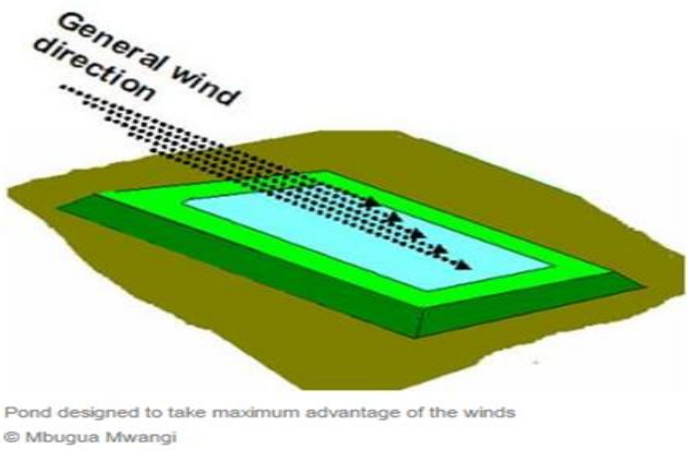
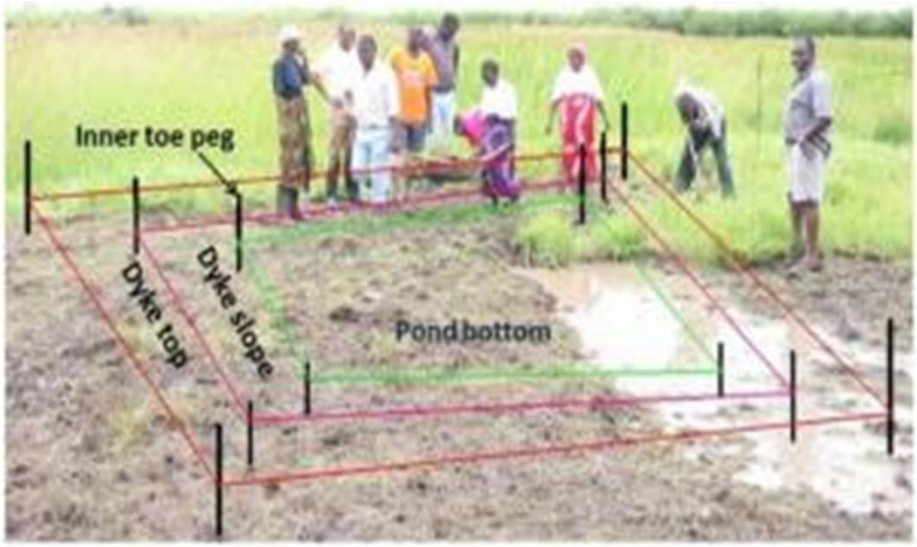


Figure 11: Pond Design to take maximum merit of the winds

Steps in the Construction

- ❖ Mark out the area that the pond will occupy using wooden pegs and strings and then remove all the vegetation
- ❖ Remove the top soil and keep it in a good location close to the site. It will be used to cover the pond bottom and the dyke tops to enhance fertility.
- ❖ Clear the area within the pond limit of all vegetation including the area within 10 m of dykes and pond structures and any access, water supply or drainage area.
- ❖ Establish a Temporary Bench Mark (TBM). A bench mark is a mark on the ground that establishes the elevation of a place and is used as a reference point for all other elevation.
- ❖ Using spirit level, measuring tape, pegs and strings, mark out:

- The dykes
- Dyke slopes
- Inner and outer toes
- The pond bottom



A site pegged ready for digging and filling

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Figure 12: Pond Pegging and Lining

- Using the determined pond depths and the actual elevations of the site, determine which areas need digging and which need filling. This is very important because it eliminates unnecessary movements of soil and thus keeps the construction cost at a minimum.
- Dig out the soil at the 'dig' areas and place it on the 'fill' areas. Most of the fill areas will be on the dyke position. Make sure to remove boulders and tree stumps from the pond area.
- Once the soil is placed on the fill area, make sure that this soil is properly compacted. To achieve good compaction, place soil in layers not exceeding 15 cm in height and compact back to at least 10 cm. When constructing dykes, soil layers are place 20 cm inside on top of each other to reduce amount of work during dyke cutting.

Figure 13: Pond excavation

Figure 14: Constructing earthen fish pond

Characteristics of Pond Dykes

Any pond dike should have three basic qualities:

(a) It should be able to **resist the water pressure** resulting from the pond water depth.

(b) It should be **impervious**, the water seepage through the dike being kept to a minimum.

(c) It should be **high enough** to keep the pond water from ever running over its top, which would rapidly destroy the dike.

Dyke slopes should be determined bearing in mind that:

- Steeper slopes erode easily
- The more the soil becomes sandy, its strength decreases, and slopes should be more gentle
- The bigger the pond size, the stronger is the erosive power of the water waves
- As the slope ratio increases, the volume of earthwork increases, and the overall construction cost and the land area required for the ponds increases
- There are two common types of inlet structures used:
- Pipe inlets & Open inlets
- **When designing and constructing an inlet:**

(a) Place the inlet at the shallow end of the pond.

(b) Make sure that the bottom level of the inlet is at the same level as the bottom of the water feeder canal and at least 10 cm above the maximum level of the water in the

pond.

(c) Design the inlet structure to be horizontal, without a slope.

(d) Make it wide enough to fill the pond completely in reasonable time.

(e) Make it such that water splashes and mixes as much as possible when entering the pond.

(f) Provide a screen to keep unwanted fish and other organisms out.

(g) Control mechanism e.g. gate valves

Pond Outlets

Pond Outlets are built to:

- ❖ keep the water in the pond at its optimum level, which should be the maximum water level designed for the pond
- ❖ allow for the complete draining of the pond and harvesting of the fish when necessary

A good Outlet should ensure that:

- ❖ the time needed to drain the pond completely is reasonable
- ❖ the flow of the draining water is as uniform as possible to avoid disturbing the fish excessively
- ❖ fish are not lost even during the draining period
- water can be drained from any pond levels
- allowance are made for overflow of excess water
- it can be cleaned and serviced easily
- construction and maintenance costs are kept at a minimum
- ❖ In most cases, outlets have three main elements:
- water control plugs, valves, control boards, screens or gates
- a collecting sump inside the pond, from which the water drains and into which the fish is harvested
- a Conduit through the dyke through which the water flows out without damaging the dykes or the drainage canal
- materials that can be used to construct pond outlets and inlets include
- Bamboo poles,
- PVC pipes,
- Wood,

- Bricks,
- Cement blocks or
- Concrete.

Figure 15 :Screened water outlet duct& Screened water inlet duct

Figure 16: Pond dressing and Dyke dressing

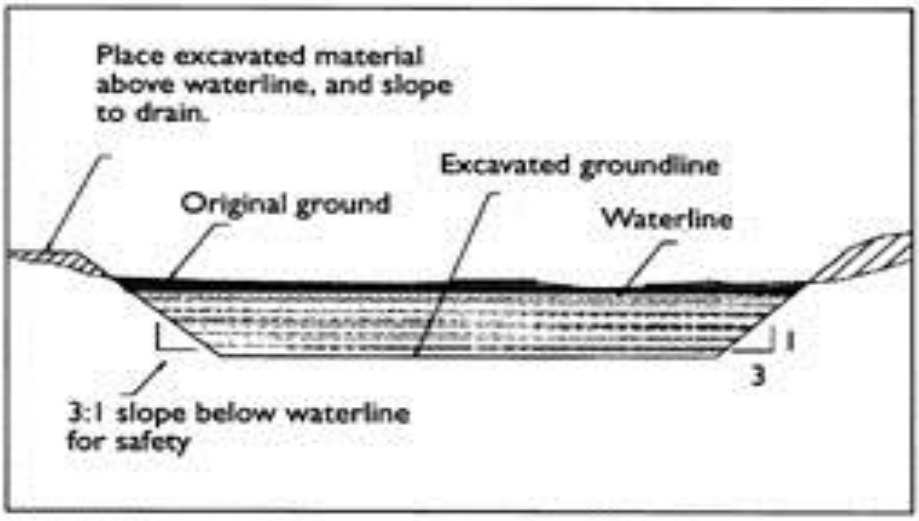


Figure 3. Typical section of an excavated pond (not to scale)

Figure 17: An excavated Fish Pond

Figure 18: Concrete fish tank

Figure 19: Plastic fish tank and Plastic Fish Pond/Tank

Figure 20: Collapsible Mobile Pond

Concrete trout race ways

Simple wooden cage

Figure 20: A Fish Cage and Pen

MODULE 3 : FISH POND PREPARATION

LIMING (NEUTRALIZATION)

- Liming is the process of application of agricultural/industrial limes to fish ponds e.g. CaO, $Ca(OH)_2$, $CaCO_3$.
- Agricultural lime is the best liming material for fish pond.
- Lime corrects the acidity of pond water to the suitable PH range(Hydrogen Ion Concentration).
- Lime makes available phosphorus added in fertilizer for plant use.
- Lime acts as disinfectants of pond bottom, especially in newly constructed ponds or ponds in fallow.
- Lime helps in reducing water turbidity i.e. in settling soil particles in muddy ponds.
- It is applied by broadcasting or sacking.

Application of Lime (kg/ha)

S/N	Name of Neutralizers	New Pond (kg/ ha	Old pond (kg/ha
1.	Agricultural Lime	250- 500	200-300
2.	Slaked Lime	750-1,500	600-1,000
3.	Quick Lime	750-900	500-800
4.	Carbide Waste	250-500	100-250
5.	Wood Ash	2,500- 5,000	1,000 -1,500

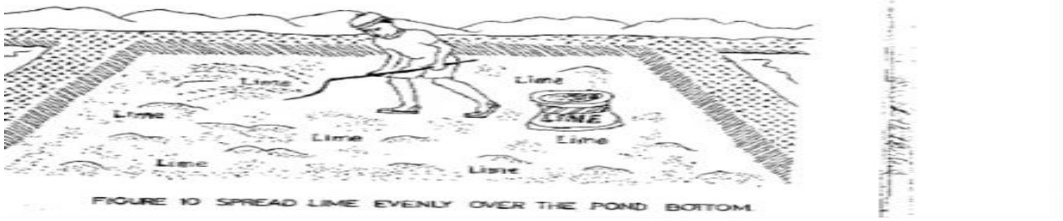


FIGURE 10 SPREAD LIME EVENLY OVER THE POND BOTTOM

Figure 21: Limed fish pond

POND FERTILIZATION (MANURING)

- Two types of fertilizers can be used for pond fish culture (organic manures and inorganic or agricultural fertilizers).
- Application could be done before or after impoundment;
- It could be done through broadcasting or sack method (Fig);
- **Types of fertilizer: Organic and Inorganic**

The following is the recommended fertilizer application rate:

- **Organic:** Cow dung – 500kg/Ha

  Poultry dropping (Guano dropping) 112-224kg/Ha
  Pig manure 560 kg/Ha
- **Inorganic:** NPK - 224 KG/Ha
  Triple Super Phosphate - 57kg/Ha
- Fertilizer helps in enriching water nutrients for plankton production on which fish feed.

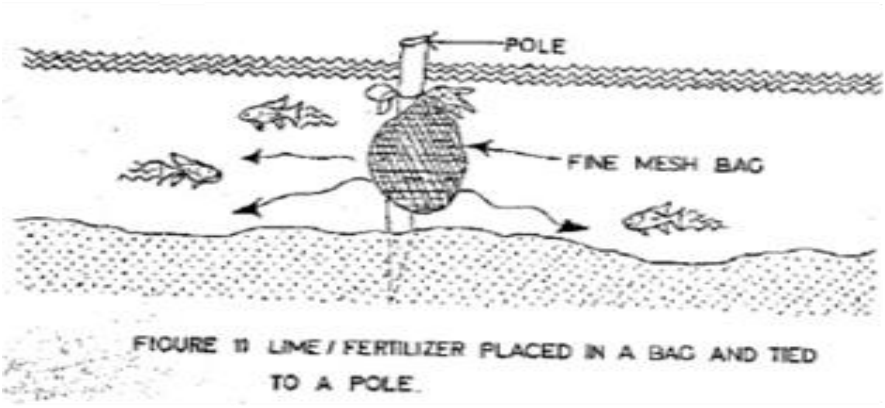


FIGURE 11 LIME / FERTILIZER PLACED IN A BAG AND TIED TO A POLE.

- **Mode of application**
- Broadcasting
- Spot placement

MODULE 4: POND STOCKING MANAGEMENT

- In any fish enclosure, healthy fingerlings of 5-7cm (2"3") should be stocked. Juveniles of 7-10cm (3"-4") are most advisable;
- Stocking densities should range between 10 - 50 fish/m^2 depending on water conditions, size of fish seed, culture system and management, and specific specialist research-extensionist's advice;
- Procure your fish seeds from reputable sources and make allowance for mortalities (at least 10%);
- Fish seeds should not be fed for 24-48 hours before transportation as they survive better on empty stomach when in transit;
- Stocking of fish should be done early morning or late evenings in moderately cool weather &when fish are less active;
- Fish seeds should be transported and packed in water-filled oxygenated polythene bags or various containers used;
- Release fish fingerlings to their new home surroundings slowly to avoid shock due to temperature changes;
- Introduce feed into the fish tank/pond 6-12 hours after stocking;
- Stocked fingerlings should be sorted after 15 days (2 weeks) of initial stocking to remove shooters (jumpers) in order to reduce cannibalism and ensure even growth of fish;
- Sorting could be done as advisable, preferably in the morning (8-10am); and
- Sorted fish should not be fed for 2 hours minimum or 3 hours maximum. This will help to relieve the fish of handling stress and regain lost energy.

CULTURABLE FISHES: Fishes that can be raised in tanks or dugout ponds.

- Examples of Culturable fish include:

➢ *Oreochromisniloticus*(Mango fish/NileTilapia - Epiya

➢ *Heterotisniloticus*- Aikaodo

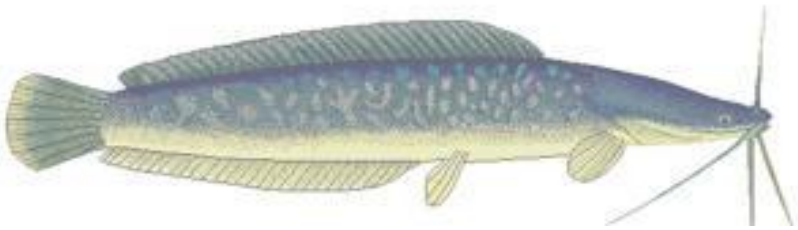
➢ *Clariasgariepinus* (African mudfish) - Aro

➢ *Gymnarchusniloticus*(Trunk fish) – Osan

➢ *Heterobranchussp*(African sharp tooth)

➢ *Cyprinuscarpio* (Common/Mirror carp)

CULTURABLE FISH SPECIES



MODULE 5: FISH NUTRITION

FEEDING OF POND FISH

- Fish feed on a variety of foods. These include food produced from the natural pond environment and feeds given as supplement to the pond;
- Feed is placed in pond water by broadcasting, point placement or automation (Fig);
- Fish could be fed two or three times a day, at specific times;
- Quantity of feed depends on the size and age of fish;
- Pellet size of feed depends on the size of fish;
- Feed fish with high quality feed/diet.

METHODS OF FEEDING FISH: Manual or Mechanical

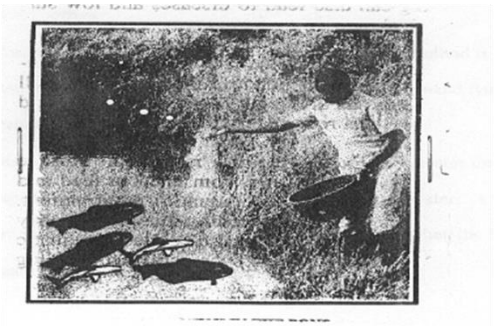


Figure 4. Feeding Fish in the pond by broadcasting.

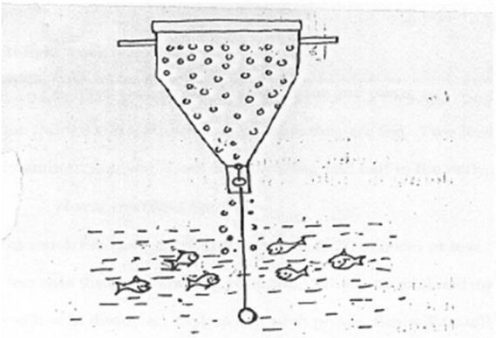


Figure 6.Demand Feeder.

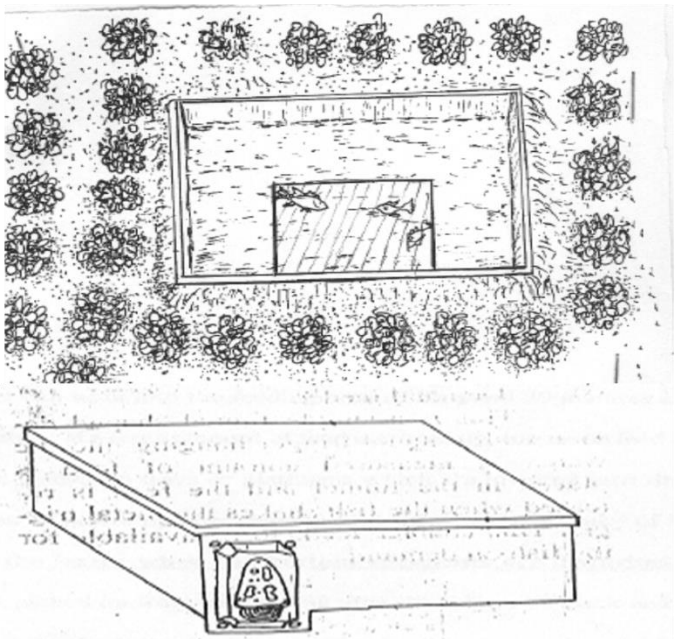


Figure 7. Automatic Feeder.

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MODULE 6: FISH FARM MANAGEMENT

- Water quality management
- Fish enclosure management
- Fish management
- Fish sampling
- Fish feed management
- Predators prevention and control

❖ FISH FARM MANAGEMENT

- Management is responsible for organizing the elements of productive enterprise-money, materials, machine/equipment, and man/people – in the interests of economic ends (4M).
- Management of a fish farming system is aimed at increasing the survival and growth of the stock (i.e. fish) so that a high yield per unit area of land can be obtained.
- It involves the duties that are necessary for successful operation of fish in cost effective manner.
- Many measures have to be taken to combat all the harmful and limiting factors imposed by the natural environment and other extraneous factors in order to arrive at the expected high yield in fish farming system.
- These usually vary between species, different socio-economic and cultural settings.

TYPES OF MANAGEMENT TECHNIQUES

1. Fish Stock management
2. Water Quality management
3. Tank Management

FISH STOCK MANAGEMENT

Discussed in Module 4

WATER QUALITY MANAGEMENT

- This is the degree of excellence that given water possesses for the propagation of desirable aquatic organisms. The growth of the fish is dependent on the alter quality.
- The most important water quality to be monitored and controlled can be divided into physical, chemical and biological parameters of water.
- Allow fresh water into fish tank daily.
- Create water outlet to empty dirty water and tank bottom debris. Aerate concrete tanks by allowing a flow through system if possible or stirring the water
- Change water when you observe foaming or frothing, deep green or gray/black coloration, accompanied by foul odour/rotten eggs smell (Hydrogen sulphide).
- When fishes are swimming sluggishly, they are stressed, stop feeding and change water.
- Boil animal products before introduction into tanks
- It must not be too acidic or too alkaline (pH 6.5-9.0)
- It must contain enough dissolved oxygen. The dissolved oxygen level should be between 4-8 mg/litre and measures through use of secchi disc/hand.
- It must have an offensive odour
- It must be free of pollutants such as industrial waste (effluent, detergents and herbicides)
- Poor water quality can be improved through liming and fertilization
- Know hydrology of the water and ensure that all water parameters are in the right conditions for the fish production
- The desirable water temperature level varies between $21^{o}c – 32^{o}c$.

CHARATERISTICS OF WATER FOR AQUACULTURE

- It should be bottle-green in colour reflecting the presence of plankton
- It must neither be too acidic nor alkaline; best pH range for fish production is between 6.5 – 9.0.
- It must contain enough dissolved oxygen of at least 4mg/litre
- It must not have offensive odour, colour, surface foaming, or scrumming
- Water temperature range should be between $21^0C - 32^oC$

FISH TANK MANAGEMENT

- Proper tank management after construction ensures the durability of the tank. It involves the maintenance of tank environment and tank itself. That is meal control, pond bottom restoration, predations and competitors' eradication, liming and fertilization
- Avoid cement toxicity in concrete tanks
- Allowed the tanks to stand for four weeks
- Wash concrete tanks thoroughly with hard brush or broom and allowed to dry for minimum of 24-48 hours before being impounded with water.
- Fill tank with water up to 50% volume wash again and discharge water.
- Fill tank with water up to 90% volume allow to stand for 7-10 days and discharge.
- Add dry poultry manure or inorganic fertilizer tied in a jute bag suspended in the water
- That tank is ready when the pond water turns "leaf green"
- Avoid over fertilization (deep green colouration and foul, odour and rotten egg smell).

POND MANAGEMENT PRACTICES

- **STOCKING**

- Stocking is the introduction of fish (fingerlings or juveniles) into the new pond environment;
- Fish seed can be collected from the wild (rivers, streams, lakes, etc) or from hatcheries/existing fish ponds where fish are already adapted to culture condition;
- The right type and the right number of fish is placed in a pond at the right time (cool hours of the day);
- Test stocking (pre-stocking) should be practised by introducing few fish into the new environment. Test stocking period range from two days to one week. If the fish survive well, then the pond can be fully stocked;

- The type of aquaculture influences the type of fish stocked;
- Acclimatize/allow fish to swim out into pond;
- Recommended stocking rate of fish (ratio of one species to another or male to female) and stocking density (number of fish per square metre of pond water) to avoid over-crowding, should be practised;
- This will ease management problems and enhance the success of the fish culture.

MODULE 7: FISH HEALTH MANAGEMENT
CONTROL OF DISEASES AND PREDATORS
Common Fish Diseases

- Fish diseases are caused mostly by fish parasites.
- Maintaining a hygienic pond environment is the bestpreventive method of checking diseases outbreak.

Diseases can occur in fish pond due to:-

- Overcrowding, i.e. high density stocking.
- Poor water quality resulting in fish kill
- Erratic feeding practices. Starved fish are highly susceptible to diseases attack.
- Intrusion of predators into the pond. Most predators act as intermediate host to fish parasites.
- Over fertilization of pond water leading to high density algal bloom can reduce the amount of dissolved oxygen (DO), affecting fish health.

Fish Predators

- Predators are natural enemies of fish. Common fish predators that should be prevented from causing fish losses in ponds include water snakes, turtles, frogs, water birds (king fisher and water duck, etc), crocodiles, crabs, et
- .
- Wild carnivorous fish intruding into ponds are also predators and as such should be prevented.
- Ensure regular clearing of pond site. Predators hide in bushes.
- As much as possible, the farmer should fence the pond site.
- Most aquatic predators get into the pond through flood water.
- Measures should be taken to protect the pond from flood water.
- Hunt the predators, using traps or point blank killing.

- Keep pond well aerated to prevent disease outbreak
- Foot baths are provided for visitors at the entrance of the farm;
- Farm appliance/tools/equipment are kept clean and disinfected;
- Minimize stress/handing fish;
- Fresh fish stock are quarantined;
- In case of disease outbreak consult experts;
- Keep your surrounding clean;
- Maintain good water quality.

Figure 22: Cannibalism in young catfish

Figure 23: Sand Bagging and Wire Mesh fencing that is expected to prevent flood

Figure24: *Clariassp*Tumour & Cancer

Fish Farm Security Important to prevent investment losses

(i) Use of armed security guards
(ii) Use of dogs
(iii)Against Predator cover tanks with mosquito net/chicken wire mesh/Nets
(iv)Wire fence round the earthen ponds
(v) Local means

Figure 25: Staking of sticks and stringing to deter poaching

MODULE 8: FISH FARM RECORDS KEEPING

FISH FARM RECORDS KEEPING

- It is important to keep records in order to;
- afford evaluation of the profitability and general economic of fish farm investment
- provide vital management information for future planning, improvement and development of the farm
- provide necessary grounds to obtain credit or funding support from financial institutions

MODULE 9: MARKETING IN FISHERIES BUSINESS

- ❖ Producers who are ready to harvest their first crop of fish often ask the following questions: “Where will I sell them?”
- Who will purchase my product?
- Where do I have to deliver the product?
- When do I have to deliver?
- Upon what criteria will the product be evaluated?
- What price will I pay or be paid and how is it determined?
- To avoid certain failure of an aquaculture enterprise, producers must determine the market place as an initial step.

- High potential market demand for farmed fish
- Lack of systematic marketing of products – e.g90% farmed fish are sold at farm gate.
- Implication is that **Price** is solely controlled by marketers or buyer.

Marketing Plan

- Your marketing plan is your road map to implementing your business ideas and measuring your success along the way.
- But a plan is useless without implementation and then evaluation of the results.
- Year-end is a good time to determine where you are with this year's business marketing plan while your sales numbers, weather conditions, and the successes and challenges of this production year are still fresh in your mind.
- It also helps you in filing information to use in year-end purchasing decisions.

Marketing Strategy

1. Co-operation of fish farmers' association/group in the area of:

(a) Collective marketing of product to ensure farmed fish are delivered at cheaper prices.

(b) Collective procurement of inputs such as fish seeds, feed, fertilizers, lime, drugs etc. to reduce production cost.

2. For expansion of markets and maintenance of favourable prices – specific information on consumers, marketing channels, utilization of fish and fish products should be regularly provided by the relevant authority

Marketing and Market Information

Marketing Information is a broad concept that comprises information about the supply of, and demand for; commodities. It includes information about the availability and costs of farm inputs such as seeds, fertilizers, breeding stock, and value-adding. It is also data on prices and quantities exchanged, duly processed and available to market actors (e.g. agents, traders).

A Marketing Information system is a system that collects, processes, manages and disseminates marketing information using a variety of channels, which may include:

- An extension services, which may consist of public (government) and private-sector service providers.
- Institutions such as rural resource centers or commodity exchanges.
- The use of ICT's such as mobile phones, internet and radio.

Merits of Marketing Information

- Know what products the market wants so that you can plan well to meet the market requirements
- By pass middlemen and reach the market directly
- Improve your bargaining power with buyers in the marketing place
- Obtain better input and product prices
- Be efficient in your production and competitive in your marketing activities
- Reduce costs and improve revenue and profit.

Marketing Channels of Farmed Fish

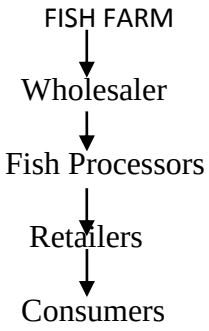

Figure 26:Matured Farmed Fish

MODULE 10: How to Succeed as a Fish Farmer

1. Know their Market before Starting Fish Farming.

2. Know the Market Demand.

3. Invest wisely, step-by-step.

4. Seek Advice only from Proven, Qualified Advisers

5. Do not cover up your mistakes but rather learn from them as well as from other farmers' mistakes.

6. Keep and use your records as management tools. Track your expenditure and losses.

7.Follow recommended Best Management Practices.

8. Use the best feed locally available to you correctly; closely monitoring their Feed Conversions and cost.

9. Owners are Managers: Owners are involved in the running and/or management of the farm.

10. Market Driven Management: Invest and manage your farms based on the market opportunities and their resource limitations.

11. Proper siting of the farms and adopt appropriate production technology.

12. Sell your fish to the market as soon as they reach market size and appreciate turnover.

13. Honor promises to your customers, even if occasionally it means they may have to make a no-profit sale or replace fish at no charge.

14. Are able to analyze your farm data yourselves and use the data you obtain to assess the farm's production and economic performance.

15. Use your own data as the primary basis for making management and investment decisions.