

FISH FARMING MANAGEMENT

BY

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INTRODUCTION

- Aquaculture is the farming or culture of aquatic organisms (shell fish, fin fish, crustaceans, aquatic plants etc.).
- Fish farming is a form of aquaculture that specifically involves the farming of fish. Fish is a major source of protein for the increasing world population especially in the developing countries of Africa, Asia and South America.
- Fish farming is more than 50 years old in Nigeria but was thought to have begun in China some 2,400 years ago.
- It is also an important foreign exchange earner for many countries
- China earned US\$4.5 billion (about ₦650 billion) in 2002 from export of fishery products (FAO 2004).
- Nigeria imported US\$246.8 million (about ₦35 billion) worth of fish and exported US\$1.572 million (about ₦220 million) worth of fish in 2000.
- Fish farming is growing in popularity worldwide due to the increasing recognition that fish is a healthy food, low in calories and cholesterol levels, but rich in protein and also decrease in world fish stocks.
- Fish farming in many areas is hampered by obsolete, technology, dearth of quality fish seed, manpower, high cost of aquaculture operations etc.

Fish farming management (FFM)

- This can be defined as the whole gamut of on farm management activities involved in the production and sale/marketing of fish at a profit.
- Fish farming, like most other types of farming, is a risky business that requires special knowledge, skills, and careful considerations.
- The main goal of fish farming management is to combine all available resources – capital, land, water and labor to maximize farm profit.

Fish farming management involves:

(1) Setting of objectives – A fish farm manager should decide on the objectives he wants to achieve within a specific period of time.

- Customer satisfaction
- Production and sale of fingerlings
- Raising of broodstock
- Production of fish and feed
- Produce and sale within 6 months
- Sport fishing
- Fish production and restaurant etc.

(2) Pre-production planning – fish farming plan

❖ What to produce – depends on market demand, price and the ability of the farm to efficiently and competitively produce the selected fish. Good market survey needed.

❖ What will be used for production. Cost considerations will be addressed at this stage and decision on the availability of enough financial resources for both capital and operating costs

❖ How to produce it – this is function of using a technically sound, cost effective and competitive production system and depends on the available manpower, infrastructure, equipment and machinery.

❖ How much to produce – this is depends on financial capability, market price and sufficient market for fish produced. Demand is influenced by factors like tastes and traditions of consumers, and availability of competing products. Appropriate market survey should be done before undertaking the operation.

A complete fish farm should have the following facilities:

- Personnel
- Source of water (borehole, river, tap water etc.)
- Hatchery (tanks, WRS, aerators, oxygen cylinders etc.)
- Ponds (earthen, concrete, indoor, outdoor ponds etc.)
- Feed production unit with store
- Store (nets, water pumps, bowls etc.)
- Lab (water quality kits, weighing balances, microscope etc.)
- Source of power supply (PHCN, generator)
- Aeration system
- Vehicles, overhead tanks etc.

PROCESSES INVOLVED IN FISH FARMING MANAGEMENT

- **Water management**
- **Hatchery management**
- **Pond management**
- **Feed and feeding management**
- **Fish health management**
- **Security management**
- **Harvesting and marketing**
- **Record keeping**
- **Labour management**

Water management

- (a) Adequacy and nearness of water supply
- (b) Water manipulation (tap water should be exposed to sunlight for 24hrs before use, borehole water has low oxygen and should be aerated or splashed while filling pond with it)
- (c) Water quality – this is the physical, chemical and biological characteristics of water i.e. the suitability of water for the growth and reproduction of fish. Water quality is enhanced by
 - Correct stocking density
 - Correct feeding regime
 - Routine cleaning of culture facility
 - Sufficient aeration
 - Filtration
 - Routine Monitoring and Adjustments
- (d) Upstream use of water is also important if water is sourced from a natural waterbody since upstream human activity may deposit toxins that will kill fish when used in the farm.

Important for Water quality parameters and desirable concentrations for fish growth

- Temperature: 23 – 35⁰C
- Transparency: 20 – 50cm
- pH: 6.5 – 9 units
- Dissolved oxygen (DO): ≥ 5 mg/lit
- Nitrate: <10mg/lit
- Nitrite: ≤ 0.1 mg/lit
- Ammonia: 0.05mg/lit
- Phosphate
- Free chlorine: ≤ 0.01 mg/lit
- Conductivity, $\leq 350 \mu\text{Scm}^{-1}$
- Colour: non-intense green/dark green colour
- Heavy metals: copper < 1.0; lead < 0.1; chromium < 0.05; zinc < 0.5mg/lit etc.
- Faecal coiliforms: < 1000 cells/100ml of water

Hatchery management

(1) Broodstock management

- ✓ Broodstock should be sourced from reputable hatcheries or fish farms because the quality of broodstock determines the quality of the offspring.
- ✓ Sexing and separation of broodstock into sexes
- ✓ Feeding of broodstock
- ✓ Monitoring of water quality in broodstock ponds
- ✓ Selection of gravid (ripe) broodstock for induced breeding

(2) Induced breeding management

- ✓ Induced natural spawning with or without hormone treatment
- ✓ Stripping and artificial fertilization

(3) Raising of fish fry to fingerling stage (Nursery management)

- ✓ Management in indoor nursery tanks
- ✓ Management in outdoor nursery tanks
- ✓ Management in Water Recirculatory System (WRS)
- ✓ Collection of zooplankton and feeding of fry with it
- ✓ Sale of fingerling/transfer to rearing tanks or earthen ponds

Pond management

- Pre-impoundment- measure soil pH (6-9 is ideal) and lime soil if necessary. For concrete ponds store water in for 3 days and wash thoroughly before use
- Concrete vs earthen vs other pond types – Ideally a pond should be filled and emptied by gravity.
- Siting and design of ponds (square or rectangular)
- Monoculture vs polyculture vs integrated fish farming
- Stocking density: 5-10 fingerlings/m² for ponds and higher for water recirculatory systems (WRS)
- Stocking ratio (polyculture) – 3 tilapia:1 catfish
- Sorting of fingerlings before stocking and Stocking ponds based on size. Stock only healthy ones
- Water quality management

Siting and design of ponds

- The site should be free from litigation or land dispute
- The site should have sufficient amount of good quality water that can be obtained at a low cost (water source should be near the site)
- Site should have necessary infrastructure like electricity, access roads, telephone etc.
- The site should not have any pollution or flood problems
- The site should be accessible to the market
- Farm activities such as water pumping, discharge of effluent water, dispose of dead fish etc. should be carried out without a negative impact on the community.
- For earthen pond construction, the soil should have adequate clay content, low organic content, proper soil texture and the pH of 6.5 – 9
- Soil should not contain unacceptable levels heavy metals
- Existing government legislations, regulations and Permits should be followed and obtained.
- Ponds should be designed in such a way that they are filled and emptied by gravity

Manipulation of pond water

- Increase pH by adding lime (quicklime and hydrated lime , 20-50g/m²; limestone or agric lime, 50-100g/m²). Decrease pH by flushing pond with fresh water, reducing feeding rates or addition of gypsum (CaSO₄). Alum (AlSO₄) can be added in extreme cases.
- Remove turbidity by adding animal manure or alum (20-30 mg/lit of pond water)
- If pond water colour is not green, fertilization may be needed
- Fertilize pond by adding organic (animal) manure or inorganic fertilizer (NPK, urea). This increased the growth of natural fish food. Application rates: chicken manure, 50g/m²; Cow dung, 100g/m²; NPK 5-10g/m²; urea 3g/m².
- If water has bad odour, has bubbles or fish gasps for air, low dissolved oxygen is indicated. Partially remove water and add plenty freshwater, increase aeration etc.

Feed and Feeding management

- Feed is crucial to success of fish farming – takes 60-70 % of operating costs
- Floating vs sinking feed
- Intensive vs semi-intensive vs extensive operation
- Feed ingredients should be free from contaminants. Purchase from reputable dealers
- The nutrient requirements of the cultured fish species should be taken into account during feed formulation
- Feed should be purchased fresh and stored under good hygienic conditions at the right temperature, in air tight containers etc.) for a few months.
- Avoid overfeeding and underfeeding: **Feeding frequency; feeding amount** – feed at 5% of fish body weight which is determined through sampling; **feeding time** (stick to a particular time schedule); **particle size-** fish fry of wt. <0.1g, 0.2-0.5mm feed; fry <0.25g, 0.5-0.8mm feed; fry of wt. 1g, 1.5mm feed. Adjust feeding regime as fish grows
- Medicated feed should be used to control of a specific disease(s)

Fish health management (1)

(1) Fish disease surveillance and prevention plan

- Regular observation for any abnormality (sluggish fish movement, skin decolouration, broken head etc.)
- Random sampling and observation for clinical signs
- Remove dead fish and fish with any abnormality
- Disinfect the equipments in a saturated salt bath
- Cover the culture facilities with nets and fences
- Handle fish with minimum stress
- Provide nutritionally balanced diet and a correct feeding regime
- Restrict the entrance of visitors and vehicles
- Prevent the entrance of predators (Birds, snakes, wildfish etc.)

Fish health management (2)

(2) Fish disease management plan

- Observe behavioral changes, gross clinical signs and measure water quality parameters and apply suitable corrections
- Correct diagnosis is important
- Microscopic observations with affected fish (internal or external)
- If definite diagnosis can be done, apply recommended treatment eg. salt bath, antibiotic like oxytetracycline, KMnO_4 , formalin for water etc.
- Contact experts in the field in the case of unconfirmed diagnosis

(3) Prepare periodic fish health report

Security management

- ❑ Poaching – this can be prevented by employing enough security men
- ❑ Weed control – mechanical control is the most fish-friendly
- ❑ Pest control – Wildfish, birds, snakes, frogs and insects. Wildfish compete with fingerlings for feed and space while some may devour fry and fingerlings. Some birds like Herons and kingfishers eat adult fish and fingerlings and may be carriers of parasites. Snakes, frogs and some insects also prey on small fish. Screen inlets/outlets, check fingerlings before stocking and drain pond completely after harvesting. Always keep banks and dikes clean to prevent snakes from harboring in the ponds.

Harvesting

- Ready market for harvested fish – advertise before harvest if necessary
- Partial or total harvest
- Time of harvest – early morning (b/4 12 noon)
- Appropriate harvest gear
- Sorting of harvested fish, counting and weighing
- Post-Harvest Management and Processing – This is very important because it prepares the products for sale after harvesting and any laxity can lead to heavy losses. Processing involves drying, salting, fermenting, freezing etc.

Marketing

- Type of demand – seed fish, food fish or both
- Fresh fish deteriorate in quality very quickly once they are harvested so sell immediately or freeze
- Try and understand opportunities to sell, barter or trade them is important.
- Understanding customer tastes, seasonal trends and cultural norms is important.
- Keep live fish ready to sell in small enclosures so that customers will be attended to immediately

Farm record management

- Record keeping is a very important activity for successful farm management and involves keeping records on:
- **Culture Activities** – Brood stock and back up stocks; nursery and grow out; holding, sales and packing area; date of harvesting; stocking density and ratio, mortality, survival rates and discards for each tank; target and actual production records; daily, weekly, monthly productions; feeding records and growth rates; water quality parameters etc.
- **Disease problems** – date of occurrence of disease, type of the disease, disease symptoms, severity, applied treatments and success of the treatments etc.
- **Records on environmental parameters** – rainfall, temperature, wind, humidity and natural disasters
- **Management activities** – Cash book, inventory records, stock book and ledger should be maintained (Sales records, expenses) for cost analysis.

Managing Labour

- The most important resource of an organisation is the human resource
- Adequate motivation should be given to fish farm staff so that they can put in their best
- Capacity building measures should also be adopted to enable staff improve on the job



Figure 1. Tilapia and catfish hatchery using local materials



Figure 2. An earthen pond with monk to the left



Figure 3. Concrete ponds



Figure 4. integrated rice-fish farming



Figure 5. Poultry-fish farming

**THANKS FOR
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