

Best Management Practices (BMPs) for Ornamental Fish Farming and Exports

1 Site Selection

- Selected land for Ornamental fish farming should not be too expensive
- The site should have sufficient amount of good quality water that can be obtained at a low cost
- Site should have easy access and motorable roads
- Site should have necessary infra structure facilities such as electricity, telephone etc.
- Necessary man power should be available at the site
- The site should not have any pollution problems
- The site should have good accessibility to the market
- Farm activities such as water pumping, discharge of effluent water, dispose of dead fish etc. should be able to carry out without a negative impact to the community.
- For earthen pond construction , soil quality should have adequate clay content , low organic content, proper soil texture and the pH of > 6.5
- Soil should not contained iron and other heavy metals in unacceptable levels
- Existing Government legislations, regulations and Permits should be followed and obtained.
- Should not be affected by flooding conditions.

2 Farm Designing and Construction

Farm Designing

- Farm should be designed according to a production plan (production method)
- Important sections of a farm such as
 - ✓ Preparatory brood stock
 - ✓ Brood stock
 - ✓ Nursery and sorting area
 - ✓ Grow out
 - ✓ Grading area
 - ✓ Sales section

- ✓ Holding area
- ✓ Packing area
- ✓ Quarantine unit

Should be designed in separated areas within the farm

Construction

Cement Tank Construction

- Size, shape and depth – Depends on the life stage of the fish and the fish species .The most suitable sizes are 10'x10', 10'x5', 8'x4' 5'x5',4'x4'.The most suitable depth for live bearers is 16''and Other species 24''.
- Bottom of the tank should have a good slope and smooth surface. Tanks should be able to drain out completely.
- Inlet and outlet should be established in opposite directions near to a corner of the tank.
- Size of the outlet pipe should be 1.5''-2''
- Tank construction should be carried out in a solid manner. Bottom of the tank should be concreted at 2'' thickness. Walls of the tank can be constructed with cement slabs (Cement: Sand 1:3, Thickness 1'') to minimize the cost.
- Each tank should have an access at least from two sides for the easy maintenance.
- Cement tank should be covered with a black shade net (70% - 80%) at a height of 8-10 ft. to cut off excess light. Sides should be covered with a suitable bird nets. (Light cut off 35 %.)
- Supporting structure for covering nets should be constructed using suitable galvanized pipes.
- Tanks can be aerated. However aerators should not have dead ends. It means, the pipe system should be interconnected in a circulatory manner.
(Should be circulated)

Pond Construction

- Mud Ponds should be constructed only in suitable sites.
- Size of the pond varies according to the species of fish. Most suitable size for ornamental fish farming is 250-500m² . Most suitable depth is 1 m.
- Ideally a pond should be able to filled by gravity and also emptied by gravity.

3 Brood stock Development and Management

- Select only high quality fish as the brood stock
- Brood stock should maintain under optimum conditions according to the species
- Brood stock should replaced periodically depending on the species, with back up stocks
- Brood stock tank should be transferred to a new tank once a month and suitable prophylactic treatments should be given to remove potential pathogens during this transfer
- Suitable stocking densities and male and female ratios should be maintained for breeding according to the species
- Necessary steps such as crossing with wild strains should be taken to minimize inbreeding depression
- A prophylactic treatment should be given to brood fish tanks once in two weeks or once a month depending on the health condition of the farm

Ex: Kondis

Salt

Methylene Blue

- Male and female fish should be cultured separately before being used for breeding.

4 Breeding

- Only the brooders ready to spawn should be selected for breeding (For Egg layers)
- Efficient breeding substrates and tanks should be used for the breeding of different varieties.
- Different varieties should not be mixed during the breeding session
- Recommended breeding techniques should be followed for each species.
- Breeding tanks should be provided with optimum conditions for breeding

5 Rearing

5.1 Hatching and Post Larval Rearing

- For egg layers, optimum conditions should be provided for hatching
- Breeding pairs should be either removed or kept in the tank according to the fish species
- Larval feeding should be carried out with a feed of right type, right amount , right time and by the right person (trained person)
- Ideal conditions should be provided in larval rearing tanks, as they are highly sensitive for environmental changes.
- Suitable live feed should be used for feeding during post larval rearing periods
Ex :Paramecium, Infusoria, Artemia, Daphnia, Moina etc
- Recommended stocking densities should be maintained in larval rearing tanks.

5.2 Nursery and Grow Out

- Nursery tanks should be properly dried out for a minimum of one day before filling with water and / or use a disinfectant (Hydrogen peroxide, Salt, Bleaching powder) Water should be conditioned for one day period to stock with post larvae
- If post larvae are introduced in to nursery tanks, water quality parameters specially pH and temperature should be same as the post larvae rearing tanks

- In the case of live bearers prophylactic treatment with a suitable chemical can be given to larvae during the transfer.
- Nursery tanks should be siphoned daily from the bottom of the tank to drain two thirds of water. This should be done throughout the nursery period.
- Recommended stocking densities should be maintained in nursery tanks
- Fry should be cultured in nursery tanks under natural conditions to maintain biological balance in the tank environment. Aquatic Plants can be introduced. 1/3 of the surface area for this purpose.
- Suitable feed with balanced nutrition should be used for feeding

6 Feed and Feeding

Feed Purchasing

- Feed ingredients should not contain excessive pesticides, chemical contaminants, microbial toxins, or other adulterating substances.
- Feed should be purchased fresh and not stored for more than a few months.
- Good quality ingredients should be used for preparation of fish feeds

Formulated feed preparation

- All nutrient requirements should be included in the feed. This should be adjusted according to the requirements of the cultured fish species.
- Ingredients should be processed without excessive damage to nutritional values.
- Water stability and palatability of the feed should be considered during feed preparation.

Feed storage

- Feed should be stored in a cool and dry environment (Temp. 20 – 26 °C) to minimize degradation of nutritional values.
- Contaminated feed should not be used.
- Feeds should be stored and used according to dates received.
- Feed storage facilities should be maintain under good hygienic conditions and free from insects and rodents.

Feeding

- Overfeeding and underfeeding should be prevented
- Feeding frequency, feeding amount, feeding time, particle size etc. should be adjusted according to the species and stage of the fish
- Wet feeds should be used immediately after preparation. Wet feeds can be stored in a refrigerator for a short period of time up to next feeding time
- Medicated feed should be used only if necessary for the control of a specific disease

Live feed preparation

- The quality and quantity of (Size and type) live feed should be selected according to the species and stage of the fish.
- Live feed cultures such as paramecium and moina should be maintained under good hygienic conditions to prevent contaminations. Cultures should be periodically replaced with pure starter cultures to maintain the quality
- Wild collected live feeds such as tubifex should be washed in running water for about 24 hrs. to remove potentially harmful organisms before use. Dead and spoiled organisms should be rejected.

7 Exporters and Exports

- Exporters should obtain a management license from NAQDA.
- Exporters should have following facilities and documents to obtain the management license
 - Quarantine unit
 - Conditioning unit
 - Packing unit
 - Laboratory facilities
 - Fish sales area
- Fish should be quarantined for a minimum period of two weeks prior to export
- Only filtered and conditioned water should be used for packing

- Water used for packing should be periodically checked for pathogenic bacteria such as Vibrio and Salmonella
- Fish should be conditioned in separate tanks for a period of 2 – 3 days prior to export. Fish should not be kept in conditioning tanks for more than 3 days, even under emergency situations depending on fish species.
- Appropriate packing densities should be followed to suit transport durations
- Certification system
 - Health certificate from DAPH (Department of Animal Production and Health)
 - Adhere to prevailing Government rules and regulations, especially, when exporting restricted fish varieties.

8 Social Aspects

- Socially accepted management practices should be followed.
- Every farmer should be trained to meet good social aspects

9 Data Management (Record Keeping)

- Record keeping should be considered as one of the most important activities for successful farm management and should meet the requirements ISO standards.

Culture Activities

- Brood stock and back up stocks
- Nursery
- Grow out
- Holding area
- Packing area
- Sales area

These areas should include,

- ✓ Date of stocking

- ✓ Date of harvesting
- ✓ Stocking density
- ✓ Mortality, survival rates, discards for each tank
- ✓ Target and actual production records
- ✓ Daily, weekly, monthly productions
- ✓ Feeding records and schedules should be maintained
- ✓ Growth rates should be monitored to ascertain expected growth
- ✓ Water quality parameters such as pH. Temp. , Hardness. Alkalinity, Ammonia. Nitrite and suspended solids should be monitored.

Disease problems

- Records should be maintained about the occurrence of diseases
- Date of occurrence
- Type of the disease
- Disease symptoms
- Severity
- Applied treatments and success of the treatments
- Prophylactic treatments

Records on environmental parameters (Tank and outside)

- Rainfall
- Temperature
- Wind
- Humidity
- Natural disasters

Management activities

- Cash book should be maintained
- Inventory should be maintained
- Stock book should be maintained
- Leger should be maintained (Sales records, expenses) for cost analysis

10 Health Management and Bio Security

Water Quality Management

Provision for optimum water quality parameters for the species cultured.

- Checking using test kits
 - Temperature
 - Hardness
 - Alkalinity
 - Total ammonia with toxic ammonia
 - Nitrite
 - Nitrates

If tap water is used, aerate for 24 hours. Without aeration 2-3 days storage,
Treat with Sodium Thio Sulphate

- Check available chlorine concentration and treat with Sodium thiosulphate two times as chlorine amount.

If Iron is present in water,

- Use Bio -chemical remedial methods.

Re circulation

- Filtration chlorination, aeration, store and re use

Maintenance of water quality

- Correct stocking density
- Correct feeding regime
- Routine cleaning of culture facility
- Sufficient aeration
- Filtration
- Routine Monitoring and Adjustments

Disease Management

Prevention

- Separate culture facilities according to the different production stages
- Separate section for quarantine and treatment

- Quarantine the new fish and plant
- Provide nutritionally balanced diet in correct feeding regime.
- Regular observation for any abnormality
- Random sampling and observation for clinical signs
- Remove fish with any abnormality and dead fish

Prevent the contaminations

- Foot baths and hand wash
- Separate equipments for tank
- Disinfect the equipments in a saturated salt bath
- Cover the culture facilities with nets and fences
- Handle fish with minimum stress
- Acclimatization
- Transfer fish from tank to new tank
- Prophylactic treatments after handling and transport.(Common salt or MB)
- Restrict the entrance of visitors and vehicles
- Prevent the entrance of predators (Birds and other aquatic animals)

Treatments

- Correct diagnosis
- Observe behavioral changes, gross clinical signs and measure water quality parameter, apply suitable corrections
- Microscopic observations with affected fish
- Internal
- External

If definite diagnosis could be done, apply recommended treatment

In the case of unconfirmed diagnosis contact a diagnostic laboratory

Submission of sample to a diagnosis laboratory,

How to ,

Sample should contain 5 moribund fish in same culture water

100 ml of same culture water should be submitted separately.

Disease history and relevant information should be provided with the sample.

Treat according to the instructions.

11 Harvesting

- Check a random sample before harvest.
- Size
- Health
- Preparation of holding tanks
- Determine the # of tanks required
- Disinfect before 48 hrs prior to harvest
- Fill water and aerate for 24 hr (the pH difference less than 1)

Reduce the stress

- Arrange flow through 3-4 days prior to harvest (mud ponds)
- Avoid harvest on rainy days (mud ponds)
- Harvest between 6-10am
- Train the fish for harvesting (mud ponds)
- Reduce water level
- Select a correct gear
- Knotless, smooth, with correct mesh size
- Minimum disturbance to the bottom

Harvesting Process

Mud Ponds

- Sufficient manpower (to minimize the number of attempts; to minimize disturbance to the sediments)
- Drag the net towards the inlet
- Arrange water flow, rinse and capture
- Transfer with low density within minimum possible time
- Drain the pond and capture the remaining fish
- Disinfection the pond (bleaching 30-50g/m² or sun dry) till the pond bottom cracks
- Disinfect the equipment used (don't use the same net without disinfection)

Process in the holding tank

- Allow the fish to swim into the water
- Arrange flow through at least for 15 min and siphon the bottom
- Preventive treatment for 24 hr (salt or Methylene Blue)
- Avoid feeding for 24 hrs.
- Condition for 2 days
- Observe random samples for disease and treat, recheck for recovery
- Grade with minimum stress
- Send for packing

Cement tanks

- Observe random sample for size colour and disease
- Stop feeding for 24 hrs
- Siphon the bottom
- Harvest with the suitable gear
- Grade for colour and size; remove deformed fish
- Send to holding tanks

Conditioning for packing

- Sort for final quality
- Starve the fish for 24-48hr depends on the species.
- Pre-pack in 2ppt salt, flow through in pre-pack tank
- Final packing in new bags, maintaining correct stocking densities according to species (depending on the total flying time)

Quarantine

- Maintain a separate unit for quarantine (14 days quarantine is mandatory for all exports)
- Buyers requirements should also be fulfilled

- From every export consignment a sample should be given to quarantine department
- Importers should obtain import permits
- At importation the quarantine department should be informed (a sample for testing and water should be disinfected and discarded).

12 Effluent Management and Bio-Security

- Infrastructure and a designed mechanism should be in place for proper discharge of farm effluents
- Immediate discharge should be to settling (sedimentation) tanks
- Allow sedimentation, treat supernatant with chlorine, leave to dissipate and re-circulate or discharge
- Sediments should be dried and removed from the system
- After any chemical treatment leave for bio-degradation before discharge
- When using chemicals in the farm, precautionary measures should be adhered to safeguard the personnel in the facility.

13 Personnel Safety

- Workers should be informed about risk factors
- Trained the workers on their responsibilities
- Train them on first aid practices.