

Lecture: Nursery, Rearing and Growout Ponds: Preparation and Management

Different types of Ponds:

- *Nursery ponds*: Ponds where spawn are reared to fry stage. In carps it takes about 15-20 days to grow spawn to fry size
- *Rearing ponds*: These are ponds where fry are grown to fingerling size. In carps it takes about 2-3 months to rear fry to fingerlings size.
- *Grow-out ponds*: In these ponds fingerlings are stocked and grown to harvestable size. Carps grow from fingerlings to marketable size in about 10-12 months.

Intervention strategies to enhance pond production of fish can be broadly classified as pre-stocking management stocking and post-stocking management

Pre-stocking Management

- The ponds need to be prepared such that the pond environment provides optimum condition for growth of the fish.
- The pond environment should be free from predators, aquatic weeds, weed fish; it should have optimum water quality parameters and sufficient natural food should be available in semi- intensive culture systems.
- The steps involved in pre-stocking and post-stocking management are similar in the nursery, rearing and grow-out ponds.
- An additional step in the pre-stocking management in nursery ponds is the eradication of aquatic insects which predate on spawn and fry.

The pre-stocking pond management of drainable ponds, which can be dried, is as follows.

1. Draining and drying
2. Ploughing
3. Liming
4. Filling with water and
5. Fertilization

Perennial un-drainable water bodies require the following additional pre-stocking management measures.

1. Control of aquatic weeds
2. Eradication of weed fish and predatory fish and animals. (Mostly done in Nursery Pond)

Pre-stocking pond management of drainable ponds

1. Drying:

This is considered as the initial step of pond preparation before culture begins. The pond should be dried for 7-8 days. The importance of drying is mentioned below

- Oxidation of organic matter
- Degassing of toxic gases such as ammonia and hydrogen sulphide
- It kills pathogenic micro organisms
- Kills predatory and weed fish
- Kills unwanted aquatic plants

2.Ploughing

The ponds should be ploughed using wooden ploughs or power tillers or tractors. Ploughing helps in Mixing up of soil which helps in oxidation of organic matter, Proper degassing of soil from toxic gases Mineralization of nutrients.

3.Liming

Pond bottom is important for productivity since process of mineralization of organic matter and release of nutrients to the overlying water takes place.

Liming helps in improving the quality of the pond soil, thus enhancing productivity.

A range of liming materials are used such as

- Agricultural lime or calcite (CaCO_3)
- Dolomite [$\text{CaMg}(\text{CO}_3)_2$]
- Calcium hydroxide/slaked lime $\text{Ca}(\text{OH})_2$
- Calcium oxide/quicklime - CaO

The dose of a particular variety of lime depends on its effectiveness and soil pH. Generally 200-500 kg/ha of lime is used for application to pond soil

Note: Quick lime is preferred for applying to soil and calcite agricultural lime for application to water after stocking of the ponds

Liming helps in

- Correcting soil pH
- Mineralization of organic matter
- Release of soil bound phosphorus to water
- Disinfection of the pond bottom

4. Control of Aquatic Weeds:

Has been discussed in details in the next section

5. Eradication of Predatory and Weed fish

Predatory fish severely affect survival of fish primarily in nursery and rearing ponds. Weed fish compete with stocked fish for food, space and oxygen and result in reduction in production of desirable fish. Common predatory fish are murrels (Snakeheads), Catfishes such as *Wallago attu*, *Clarias batrachus*, *Heteropneustis fossilis*, *Ompok* sp. Etc., Weed fish include *Puntius*, *Barbas Danio*, *Aplocheilichthys*, *Anabas* etc.,

Most predatory and weed fish breed prior to the onset of carp breeding. They infest the ponds before carp fry and fingerlings are stocked. Hence their eradication prior to stocking of carps is necessary

Control

Dewatering followed by sun drying is most effective way to control weed and predatory fish. In ponds which cannot be dewatered, piscicides are used.

A suitable piscicides should have the following characteristics:

- Effective at low dose
- Not injurious to people and animals
- Doesn't make fish unsuitable for human consumption
- Gets detoxified quickly
- Easily available and economical

Types of piscicides

Following are the three types of piscicides that can be used to eradicate weed fish and predatory fish

- Plant origin
- Chemicals
- Pesticides (Chlorinate hydro carbons and organophosphates)

Piscicides of plant origin

A. Derris root powder

- Rotenone is the active ingredient
- It is a contact poison
- Lethal to other organisms also such as zooplankton, Benthos and insects

- Dosage is 4-20 ppm (mg/l)
- The powder is mixed thoroughly with water and sprayed all over the pond
- It is effective only on sunny days when the temperature is above 25°C
- It is less effective in cold waters.

B. Mahua oilcake

- The active ingredient is saponin
- It causes lysis of the RBC and kills fish, frogs, snakes and turtles
- Dosage is 250 ppm
- The cake is soaked in water for 2-3 hrs and applied all over the pond.
- Detoxification takes about 25 days
- The toxicity can be reduced to 10 days through aeration and application of oxidizing agents.

The other less widely use fish toxicants of plant origin are

- Tea seed cake – 60 ppm
- Tamarind seed husk – 50-100 ppm

6 . Stocking

- Nursery, rearing and stocking ponds are stocked with spawn, fry and fingerlings respectively. They need to be acclimatized in ponds before stocking to prevent abrupt changes in water quality which will stress them resulting in poorer survival. Generally mono-culture is followed in nursery and rearing ponds, while poly-culture of carps is followed in grow-out ponds. When rearing space is limited polyculture is also followed in the rearing ponds. Grow-out culture of carnivores is done under monoculture. The stocking densities followed vary according to the level of management that can be under taken. For example when carp spawn are stocked in earthen nursery ponds, a stocking density of 300 to 500 numbers per m² of pond area, while, stocking densities of 1000 to 2000 numbers per m² followed when they are stocked in cement tanks where, higher level of management is followed.

Rearing ponds are stocked with carp fry @ 20 to 30 numbers per square meter in rearing ponds while carp grow out ponds are stocked @ 5000-1000 numbers per hectare when polyculture is followed.

Stocking has to be done in cool hours, early morning is better, but they can be stocked in evenings or nights. One disadvantage of stocking early in the morning in fertilized ponds is that if plankton bloom is heavy, dissolved oxygen could be less in the early morning. The disadvantage if stocking in the evenings is that the temperature of the water may be high resulting in stress to the stocked fish. These aspects should be taken care of while stocking ponds with spawn, fry or fingerlings.

7. Supplementary feeding

When fish are stocked at high stocking densities, the natural food produced through fertilization and manuring may not be sufficient to sustain high growth in shorter period of time. Hence, the stock has to be fed with supplementary feeds. Commonly, supplementary feeds such as mixture of rice bran or wheat brawn mixed with oil cakes such as groundnut cake or mustard cake or cotton seed cake and other cakes are used in a ratio of 1:1. In order to improve the quality of feed to get better growth and production, extra ingredients such as fish meal, soya flour, vitamin and mineral mixtures could be added to the feeds. The feed mixture is generally mixed with appropriate quantity of water and made in dough which is then shaped into a form of ball or cake is either broadcast into the ponds or kept in feeding trays at several places in the pond.

Feeding rates vary according to the size of the fish. Spawn are fed at a rate of 8-10% of the biomass, while fry when stocked in rearing ponds up to fingerlings stage are generally fed @ 6-8% of the standing crop. In grow-out ponds the fish are fed initially at a rate of 5% which is gradually decreased to 2-3% biomass till harvest. Periodic sampling of the stock is necessary to estimate the biomass and adjust feeding rates.

8. Supplementary fertilization

Ponds are fertilized prior to stocking fish with manures and fertilizers, when

they are applied as a basal dose. Due to overfeeding by fish on the plankton and other natural fish food organisms, the plankton biomass may get depleted. In order to maintain the crop of fish food organisms, supplementary feed post-stocking may be required. When the water starts to lose its plankton turbidity, amounts less than basal dose of fertilizers need to be applied to ponds and fortnightly intervals. For example in carp rearing and grow-out ponds are manured with cow dung as a basal dose of 3-4 tons/ha. The ponds are subsequently fertilized with cow dung at a dose of 0.5 tons/ha at fortnightly intervals. However, supplementary fertilization should be followed with caution since application of excess of fertilizers and manures may lead to poor water quality of the pond, or undesirable blue green algae such as *Microcystis* may develop which apart from being toxic, will not form food for the fish

9. Water quality management

Good growth and production of fish not only depends on availability of good quality feed, but also and the quality of the water in which they live.

Physico-chemical properties of the water should be within the range of tolerance of the species being cultured. Normally water quality will not be an issue with lower stocking densities and lower yields (extensive and lower level of semi-intensive culture). However, when higher stocking densities are followed, water quality tends to deteriorate, particularly when the stock grows and biomass increase

The most important water quality parameters are the dissolved oxygen.

Oxygen dissolves from the atmosphere and also produced by photosynthesis phytoplankton and higher macrophytes which produce liberate oxygen during the day but consume oxygen during night. The levels of DO in culture systems should be above 5 mg/L. When oxygen tends to fall below this level, which usually occurs during night, aeration of the ponds becomes necessary.

Various types of aerators are commercially available, which may be expensive. A simple way to aerate is to circulate the pond water such that bottom water comes to the surface and surface water goes to the bottom. This

can be done using a pump whose intake (foot valve) is lowered into the pond and water is pumped such that the water splashes back into the same pond. Aeration may also become necessary during cloudy weather since lack of sunlight prevents photo-synthetic production of oxygen by the algae and higher plants.

Accumulation of metabolites and decayed matter will also result in poor water quality in ponds. Ammonia may get accumulated which is toxic to fish. In order to maintain water quality, water exchange may be required to be carried out. The frequency and amount of water to be replaced with freshwater depends on the quality of the water. This requires experience as well as analysis of the water quality.