

Pisciculture

Pisciculture or Fish culture, a process of breeding & rearing of fishes in ponds, reservoirs (dams), lakes, rivers and paddy fields, of economically important fishes under controlled conditions. Fish culture helps in integrated rural development by generating employment and income to fishing community and fish farmers. Fish farming or fish culture, comes under 'aquaculture', and also defined as the 'farming and husbandry of economically important fish, under controlled conditions'.

Fish farming

Definition

The raising of fish for personal income or profit. Based on environment in which culture is done, called Fish farming. Fish farming may be categorized as freshwater fish farming, brackish water fish farming, saltwater or marine fish farming (mariculture).

Fish farming is a productive venture. Fishes are highly nutritious sources of easily digestible proteins (rich in lysine and methionine. They are essential amino acids); minerals like calcium, phosphorous, iron, sodium, potassium, magnesium and sulphur; vitamins such as A, D and health promoting fats. Fish are the source of polyunsaturated fatty acids which are helpful in cholesterol regulation and promoting cardiac health. Fish farming can help in integrated rural development by generating employment opportunities.

Characters of cultivable fish

The following criteria should be considered before selecting a fish for farming purpose.

- ◆ Rate of growth :Fish which grow to a larger size in shorter period are suitable for culture.Eg. Carps.
- ◆ Adaptation to climate: The cultured species of fish should be able to adapt to the local climatic conditions of the farm.
- ◆ Tolerance: The fish should have the capacity to tolerate wide fluctuations in the physico chemical conditions such as oxygen, salinity, temperature etc of the water.
- ◆ Acceptance of artificial feed : When more number of fish is to be accom-modated in a limited

space, there is the need for supplementary feeding on compounded diets. The fish should show ready preference for these feeds.

◆ **Resistance:** It is desirable that the cultured fish is hardy enough to resist the common diseases and attack of parasites.

◆ **Amiability and compatibility:** The fishes proposed to be cultured together ('poly culture') should be able to live together without interfering or attacking the other.

◆ **Conversion efficiency:** The species of fish which give more edible flesh per unit of food consumed, is preferred.

◆ **Consumer's preference:** Food preference of people vary with the geographic regions. Hence, the species cultured should be easily marketable locally or to the targeted consumers.

Types of fish culture practices

a) **Extensive fish culture:** Culture of fishes in large areas with low stocking density and natural feeding.

b) **Intensive fish culture:** Culture of fishes in small areas with high stocking density and providing artificial feed to increase production.

c) **Pond culture:** Rearing of fishes in pond water.

d) **Riverine fish culture:** Rearing of fishes in lotic water.

e) **Dam culture (Culture in Reservoir):** Culture of fishes in artificial man made constructed reservoirs.

f) **Lake culture (Culture in Lake):** Rearing of fishes in lakes which are natural standing water bodies.

g) **Monoculture:** Culture of single type of fish in a water body. It is also called mono species culture.

h) **Polyculture:** Culture of more than one type of fish in a water body. It is also called composite fish culture.

i) **Integrated fish farming:** It is the culture of fishes along with agricultural crops or

j) animal husbandry farming. Rearing of fish along with paddy, poultry, cattle, pig and ducks.

Types of ponds for fish culture

Fish farm requires different types of pond for the various developmental stages of fish growth. They are:

- a) **Breeding pond:** Healthy and sexually mature male and female fishes are collected and introduced in this pond for breeding. The eggs released by the female are fertilized by the sperm and fertilized eggs float in water as frothy mass.
- b) **Hatchling pits:** The fertilized eggs are transferred to hatching pits for hatching. Two types of hatching pits are hatcheries and hatching hapas.



Spawn production (Fish Seed) and stocking of Fingerling in hapas.

- c) **Nursery ponds:** The hatchlings are transferred from hatching pits after 2 to 7 days. The

hatchlings grow into fry and are cultured in these ponds for about 60 days with proper feeding till they reach 2 - 2.5 cm in length.

d) **Rearing ponds:** Rearing ponds are used to culture the fry. The fish fry are transferred from nursery pond to rearing ponds and are maintained for about three months till they reach 10 to 15 cm in length. In these rearing ponds the fry develops into fingerlings.

e) **Stocking pond:** The stocking pond is also called as culture pond or production pond. These ponds are used to rear fingerlings upto the marketable size. Before releasing the fingerlings, the pond is manured with organic manure and inorganic fertilizers.



Stocking Ponds

Cultivable food fishes in India

Freshwater cultivable fishes: Indian major carps (Kendai) – Catla, Rohu, Mrigal, catfishes (Keluthi), Murrels (Veral) and Tilapia (Jilebi kendai) are cultured in freshwater.

Marine water cultivable fishes: Sea bass (Koduvu), Grey mullet (Madavai) and Chanos chanos (Milk fish) are the fishes cultured in marine water.

Types of cultivable fish

Cultivable fish are of 3 types

- a) **Indigenous** or native fresh water fishes (Major carps, Catla, Labeo, Clarias)
- b) **Salt** water fishes acclimatized for fresh water (Chanos, Mullet).
- c) **Exotic** fishes or imported from other countries (Common carps)

Among these, major carps have proved to be best suited for culture in India, because the carps

1. Feed on zooplanktons and phytoplanktons, decaying weeds, debris and other aquatic plants.
2. They can survive in turbid water with slightly higher temperature
3. Can tolerate O₂ variations in water.
4. Can be transported from one place to other easily.
5. They are highly nutritive and palatable.

Lists of culturable Fishes

Culturable Fishes of India

- ◆ Carps, Catfishes, Murrels, Tilapia etc are the main culturable fishes
- ◆ Indian major carps:
 - ◆ Carps (Kendai)
 - ◆ Catla catla (Catla)
 - ◆ Labeo rohita (Rohu)
 - ◆ Cirrhina mrigala (Mrigal)
- ◆ Exotic (Chinese) carps
 - ◆ Cyprinus carpio (Common carp)
- ◆ Minor Carps
 - ◆ Labeo bata (Bata)
 - ◆ Catfishes ('Keluthi')
 - ◆ Wallago attu (freshwater shark : 'Valai')

- ◆ Mystus aor (Cat fish)
- ◆ Clarias batrachus (Magur)
- ◆ Murrels or snake heads ('Viral')
- ◆ Channa striatus (Striped snake - head)
- ◆ Tilapia
- ◆ Oreochromis mossambicus ('Jilebikkendai')
- ◆ Sport fishes (Cold - water fishes)
- ◆ (i) Trouts (Order : Salmoniformes)
- ◆ Salmo gairdneri (Rainbow trout)



Catla - *Catla catla*



Rohu - *Labeo rohita*

Marine water fishes



Sea Bass



Grey Mullet



Mrigal - *Cirrhinus mrigala*



Milk Fish

Freshwater and Marine water fishes

Marine fishes

Lates calcarifer (Sea bass or cockup, 'Koduva') Mugil cephalus (Grey mullet, 'Madavai') Chanos chanos (Milk fish) esides these food fishes, there is an enormous potential for the mass culture of a variety of ornamental fishes, which can bring in high profit, also from overseas markets.

External factors affecting fish culture

The factors that affect fish culture are temperature, light rain, water, flood, water current, turbidity of water, pH hardness, salinity and dissolved O₂. Light and temperature also play an important role in fish breeding.

Management of fish farm

To culture fish, one should have an idea about different stages of fish culture such as topographic situation, quality, source, physical, chemical and biological factors of water. Breeding, hatching, nursing, rearing and stocking fishes in ponds has to be managed properly. Keeping in view the various stages of fishes, the following different types of ponds have been recommended to manage them.

Breeding pond

The first step in fish culture is the breeding of fishes, therefore, for proper breeding special types of ponds are prepared called breeding ponds. These ponds are prepared near the rivers or other natural water resources.

Types of breeding

Depending on the mode of breeding, they are divided into

1.Natural breeding (Bundh breeding)

These are special types of ponds where natural riverine conditions or any natural water resources are managed for breeding of culturable fishes. There bundhs are constructed in large low-lying areas that can accommodate large quantity of rain water. The shallow area of such bundhs is used as spawning ground.

2.Induced breeding

The fish seed is commonly collected from breeding grounds but does not guarantee that all fish

seeds belong to the same species. Hence advanced techniques have been developed to improve the quality of fish seed by artificial method of fertilization and induced breeding. Artificial fertilization involves removal of ova and sperm from female and male by artificial mechanical process and the eggs are fertilized. For artificial fertilization the belly of mature female fish is held upward. Stripping is done with the thumb of the right hand from the anterior to posterior direction for the ejection of eggs due to force. In this way eggs are collected separately. Further, the male fish is caught with its belly downwards. The milt of fish is striped and collected separately, and then the eggs are fertilized.

Induced breeding is also done by hypophysation (removal of pituitary gland). The gonadotropin hormone (FSH and LH) secreted by the pituitary gland influences the maturation of gonads and spawning in fishes. Pituitary gland is removed from a healthy mature fish. Pituitary extract is prepared by homogenising in 0.3% saline or glycerine and centrifuged for 15 minutes at 8000rpm. The supernatant is injected intramuscularly at the base of the caudal fin or intra-peritoneally at the base of pectoral fin. Male and female fishes start to spawn (release of gametes) and eggs are fertilized. The fertilized eggs are removed from the spawning place and kept into hatching hapas.

Fish seed

Fish seed is collected from breeding ponds. The spawn collecting net is commonly called Benchijal (Shooting net) and transferred to the hatching pits

Hatching pit

The fertilized eggs are kept in hatching pits. The hatching pits should be nearer to the breeding grounds, should be smaller in size with good quality water. There are two types of hatching pits, hatcheries are small sized pond in which unfertilized eggs are transferred and hatching happens. Hatching hapas are rectangular trough shaped tanks made up of mosquito net cloth supported by bamboo poles and fixed in the river.



Fish Pond- Showing fish breeding hapas

Nursery pond

The newly hatched fries are transported from the hatching hapas to nursery ponds where they grow into fingerlings.

Rearing pond

Fingerlings are transferred to rearing ponds that is long and narrow and allows long distance

swimming. The rearing pond should be free from toxicants and predators. Antibiotics are used for washing the fingerlings and then transferred to the stocking ponds.

Stocking ponds

Stocking ponds should be devoid of weeds and predatory fishes. Proper organic manuring should be done to increase the production with cow dung and chemical fertilizing should also be done.

Harvesting

Harvesting is done to capture the fishes from the water. Well grown fishes are taken out for marketing. Small sized fishes are again released into the stocking ponds for further growth. Different methods of fishing are carried out to harvest fishes. These include Stranding, Angling, Traps, Dipnets, Cast nets, Gill nets, Drag nets and purse nets. The harvested fishes are preserved by refrigeration, Deep freezing, freeze drying, sun drying, salting, smoking and canning.

Composite fish farming

Few selected fishes belonging to different species are stocked together in proper proportion in a pond. This mixed farming is termed composite fish farming or polyculture. The advantages include,

1. All available niches are fully utilized.
2. Compatible species do not harm each other.
3. No competition among different species is found.
4. Catla catla, Labeo rohita and Cirrhinus mrigala (surface feeder) are the commonly used fish species for composite fish farming.

Exotic fishes

The fishes imported into a country for fish culture are called exotic fishes and such fish culture is known as exotic fish culture. Examples of such exotic fishes introduced in India are Cyprinus carpio and Oreochromis mossambicus.

Disease Management

Diseases can be of viral or bacterial origin. Regular monitoring of parameters like water

quality, aeration, regular feeding, observation for mortality should be checked. Parasitic infestations and microbial infections should be observed periodically.

Economic importance of fish

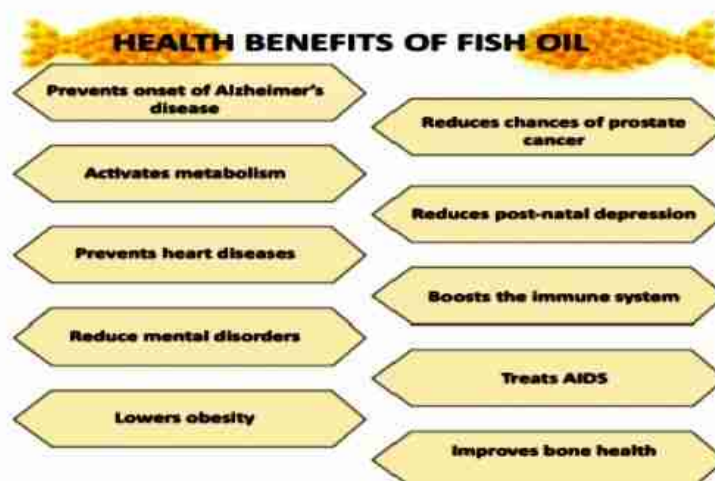
Nutritional value of fishes

Cultivable freshwater and marine food fishes are highly nutritious, rich source of animal proteins and are easily digestible. They are rich in essential amino acids such as lysine and methionine, minerals like calcium, phosphorus, iron, sodium, potassium and magnesium. Fat soluble vitamins A, D and water soluble B-complex vitamins like pyridoxine, cyanocobalamine and niacin are found in fishes. Polyunsaturated fatty acid (PUFA) which are helpful in regulation of cholesterol are present in plenty in fishes and thus promote cardiac health.

Fishery by-products

In addition to providing food, most of the fishing industries yield a number of by-products of commercial importance. These processed byproducts are used for human consumption and also for other purposes. These include:

a. **Fish oil:** It comprises of liver oil and body oil. Liver oil of Cod, Tuna, Halibut and Shark are of great medicinal value and are rich in vitamin A, D and E. Body oil is extracted from Sardines, Herrings, Salmons, Mackerels and Anchovies. They are used in industries for the preparation of lubricants, paints, varnishes and cosmetics.



b. Fish Meal

It is prepared from the wastes of fish oil or from whole fish and contains nutritents like protein, fat, minerals and vitamins. It is used as feed for cattle and poultry farming animals.

Other by-products obtained from fishing industry are fish flour, fish manure, fish silage, fish guano, fish sausage, fish glue, fish leather and isinglass.

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