

# Composite fish culture in ponds



## Introduction

The technology developed for fish culture in which compatible and non-competing fishes are cultured simultaneously through the utilization of different feeding zones (all the natural niches) from a pond so as to increase the total production from unit area of water is known as Composite Fish Culture and it is the most advanced and popular culture technique in the country.



## **1. Steps in Composite Fish Culture**

### **1. Site selection:**

Factors to be considered are a) Ecological factors- depends on location, topography, soil suitability, water quality and quantity, hydrological and meteorological factors

B) Biological factors includes species selection, predator and disease control

C) Economical and social factors includes type of facility, marketing, safety and security, social considerations etc

1. Pond area: 0.5-2 ha ideal, but even 0.02 ha ponds can be used.
2. Ideal depth is 1.5-2m
3. pH: 7.5-8.5
4. DO >5ppm
5. Salinity <2ppt
6. Clayey loam soil is ideal for as it has low permeability & high fertility. Clayey loam contains textural components like sand: 20-45%, silt: 15-23% & clay: 27- 40%.
7. Desilting of existing ponds
8. Deepening of shallow ponds.
9. Excavation of new ponds
10. Impoundment of marginal areas of water bodies.
11. Construction / repairs of embankments.

12. Construction of Inlets / Outlets.

13. Any other item like civil structures, watchmen sheds, pump sets water supply arrangements / electricity supply arrangements etc. depending on requirements of the project based on its size etc.

## **2. Pond Management**

Pond Management plays a very important role in fish farming before and after the stocking of fish seed.

### **a) Prestocking:**

New ponds, pre stocking operations starts with liming and filling of the pond with water. The first step for existing pond requiring development deals with clearing the unwanted weeds and fishes either by manual, mechanical or chemical means from the pond. Different methods are employed for this.

i) Removal of weeds by Manual/Mechanical, Chemical or biological means.

Chemical means- herbicides like 2,4-D(2,4-dichlorophenoxy acetic acid), Paraquat or aqueous ammonia and Diuron/Karmex, Biological means- introduction of Grass carp, Tilapia, Common carp, Pearl spot, Gaint gouramy

ii) Removal of unwanted and predatory fishes and other animals by repeated netting or using mahua oil cake @ 2500 kg/ha meters or by sun drying the pond bed. Other toxicants includes tea seed cake with a dose of 15ppm in salinity less than 15ppt, tamarind seed powder with a dose of 175-200ppm

iii) Liming - The soils/ tanks which are acidic in nature are less productive than alkaline ponds. Lime is used to bring the pH to the desired level. In addition lime also has the following effects -

a) Increases the pH.

b) Acts as buffer and avoids fluctuations of pH.

c) It increases the resistance of soil to parasites.

d) Its toxic effect kills the parasites; and

e) It hastens organic decomposition.

The normal doses of the lime desired ranges from 200 to 250 Kg/ha. However, the actual dose has to be calculated based on pH of the soil and water as follows:

SoilpH	Nature	Lime(kg/ha)
4.0-4.5	Highly acidic	1000
4.5-5.5	Medium acidic	700
5.5-6.5	Slightly acidic	500
6.5-7.5	Near acidic	200
7.5-8.5	Alkaline	Nil

Liming materials- calcium carbonate, calcium oxide, calcium hydroxide etc

#### iv) Fertilisation/ Manuring

Fertilisation of the pond is an important means for intensifying fish culture by increasing the natural productivity of the pond. The fertilisation schedule has to be prepared after studying the quality of the pond soil. A combination of both Organic and Inorganic fertilisers also be used. The fertiliser programme has to be suitably modified depending on the growth of the fish, available food reserve in the pond, physico chemical conditions of the pond and climatic conditions.

##### a)Organic

Farm yard manure(FYM)- Cowdung @ 5000 kg/ha, Poultry, sheep manure

Crop byproducts- cotton seed meal, mustard oil cake

##### b) Inorganic

Inorganic fertilisation to be undertaken after 15 days of organic manuring. Requirement of nitrogenous and phosphate fertilisers would vary as per the nature of the soil fertility indicated below. However any one of the nitrogen and phosphate fertilisers could be used as per given rate.

#### Inorganic Fertiliser Application (kg/ha/month)

Soil fertility status	Ammonium sulphate	Urea
1. Nitrogen (mg/100 g soil)		
i) High (51-75)	70	30
ii) Medium (26-50)	90	40
iii) Low (upto 25)	140	60
2. Phosphorus (mg/100 gm soil)	Single super phosphate	Triple super Phosphate
i) High (7-12)	40	15
ii) Medium (4-6)	50	20
iii) Low (upto 3)	70	30

## B) Stocking

The pond will be ready for stocking after 15 days of application of fertilisers. Fish fingerlings of 50- 100 gm size (approx) should be used for stocking @ 5000-8000 nos. per hectare. However, if fingerlings of smaller size are used, suitable allowance may be made accounting for mortality. The present model envisages stocking of advanced fingerlings and rearing for 10-12 months. Depending on availability of seed and market condition, stocking can be of 3, 4 or 6 species combination in the following ratio.

### Fish species involved in composite fish culture

Depending on the compatibility and type of feeding habits of the fishes, Indian as well as Exotic varieties have been identified and recommended for culture in the composite fish culture technology

### Species feeding habits and feeding zone

#### 1.1. Indian Major Carp

Catla	Zoo plankton feeder	Surface feeder
Rohu	Omnivorous	Column feeder
Mrigal	Detritivorous	Bottom feeder

#### 1.2. Exotic carps

Silver carp	Phytoplankton feeder	Surface feeder
Grass carp	Herbivorous	Surface, column and marginal areas
Common carp	Detritivorous/Omnivorous	Bottom feeder

#### Species combination (ratio)

Species	3-species	4-species	6-species
Catla	4.0	3.0	1.5
Rohu	3.0	3.0	2.0
Mrigal	3.0	2.0	1.5
Silver Carp	-	-	1.5
Grass Carp	-	-	1.5
Common Carp	-	2.0	2.0

Feeding groups	Group %	Species	Species %	Ratio
Surface feeder	40	Catla	15	1.5
		Silver carp	25	2.5
Column feeder	20	Rohu	20	2.0



Bottom feeder	30	Mrigal	15	1.5
		Common carp	15	1.5
Macro-vegetation feeder	10	Grass carp	10	1.0



**Catla- *Catla catla***



**Rohu- *Labeo rohita***



**Mrigal- *Cirrhinus mrigala***



**Common carp-*Cyprinus carpio***



**Silver carp- *Hypophthalmichthys molitrix***



**Grass carp- *Ctenopharyngodon idella***

**Favourable ranges in water quality parameters for fresh water composite fish culture**

Parameters	Safe limit for culture
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Turbidity	30-45cm
Salinity	Less than 0.5ppt
Dissolved oxygen	5ppm
Un ionized Ammonia	Less than 0.05 ppm
Nitrite	Less than 0.1ppm
Nitrate	50-150ppm
Carbondioxide	Less than 8ppm
Iron	Less than 0.5ppm
Total alkalinity	20-150ppm
Total hardness	20-200ppm
Hydrogen sulphide	Less than 0.002ppm

### **C. Post stocking:**

#### **a) Supplementary feeding**

Supplementary feeding is a requisite for pond fish farming. Fishes can be fed with a mixture of rice bran and oilcakes in the ratio 4:1. Due to the high cost of Ground nut Oil Cake (GOC) alternate sources like Cotton seed oil cake which is comparatively cheaper than GOC. GOC and cotton seed oil cake can be mixed in equal proportions and fed to the fish and is reported to give almost the same growth rate as that of GOC. The feed should be placed on a feeding tray or in feeding bags and lowered to the pond bottom or it can be dispersed at the corners of the pond. After some time the fishes will habituated to this method of feeding and aggregate at the same place at particular time for regular feeding thereby reducing the feed losses. The recommended feeding rate is 5-6% of the body weight upto 500gm size of fish and then reduce to 3.5% of body weight from 500- 1000gm size. The feeding is supplementary in nature.

#### **b) Manuring**

i) Organic manuring may be done in monthly instalments @ 1000 kg/ha. ii) Inorganic fertilisation may be done at monthly intervals alternating with organic manuring. However, the monthly rate of fertilisation will depend on pond productivity and the growth of the fishes. It should be ensured that excess fertilisation does not take place which may result in eutrophication.

**c) Harvesting:** Harvesting is generally done at the end of first year, when the fishes attain average weight of 800 gm to 1.25 kg. With Proper management a production of 4 to 5 tons/ha can be obtained in a year. Harvesting is done by partial dewatering and repeated netting. In some cases complete dewatering of ponds is resorted to. Some farmers resort to partial harvesting also depending on the season and demand for fish.



Fish harvest