COMPOSITE FISH CULTURE

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COMPOSITE FISH CULTURE

In order to obtain high production/ha of water body, fast growing compatible species of fish of different feeding habits or different weight classes of same species, are stocked together in the same pond so that all its ecological niches are occupied by fishes. This system of pond management is call **Mixed Fish Farming** OR **Composite**

Fish Culture OR **Polyculture**.

Aim: to obtain high production/ha of water body, by utilization of the pond's productivity

Procedure: Intensive culture of fast-growing, compatible fish species with complementary feeding habits occupying different ecological niches in the pond.

- **The objective** of raising **healthy and economically viable fish crops** is realized through **appropriate manipulation of fish stock and pond ecology**

Methodology of Composite Fish Culture

A. SELECTION OF PONDS

- Size & shape of stock pond: Fingerlings are raised to table-sized fish through composite fish culture may vary
- Preferably around 0.5 hectare in area (restriction to less than 5 hectares),
- Rectangular in shape, 2 to 3 meters deep (1.5 m minimum depth) exhibiting a gentle slope and an even bottom
- Embankment should be firm with guarded inlets and outlets.
- Soil should be retentive with an assured supply of water.
- Perennial ponds with at least 1.0 meter water depth during peak summer are preferable.
- Seasonal ponds retaining sufficient water for 8–9 months can also be utilized.

METHODOLOGY OF COMPOSITE FISH CULTURE

1. PRE-STOCKING OPERATIONS

This phase refers to pond preparation to ensure maximum survival and proper growth of cultured fishes and involve **repairs of embankments, removal of weeds and undesirable aquatic biota, and correction of physicochemical properties of water and soil.**

a. Control of noxious aquatic vegetation:

- **Adverse effects**: **living space, sunlight penetration, oxygen circulation, sheltering of fish enemies**

- They should either be kept under check or cleared from the pond:

  i. Increasing the depth of the pond

  ii. Manual means (smaller ponds),

  iii. Mechanical means,

  iv. Chemical means

  v. Biological means.

b. Eradication of fish enemies:

- Draining of ponds or repeated netting
- Chemical piscicides (Aldrin, Dieldrin, Endrin, Tafdrin-20)
- Oil cake of mahua (*Bassia latifelia*) containing 4-6 per cent saponin serves initially as a **PISCICIDE** at 200–250 ppm and later acts as **ORGANIC MANURE**.
- Sugar cane jaggery is used in many parts of India
- Powdered tamarind seed husk (*Tamarindus indica*) and
- Anhydrous Ammonia at 15–20 ppm are found effective as piscicides, the latter also serving as a fertilizer.
- **Commercial Bleaching Powder (C**alcium hypochlorite, Ca(OCl)Cl), to be not only a good substitute for mahua oilcake but also economical

- It is effective at 25–30 ppm (250–300 kg/ha-m.)
- Affecting fishes within 15–30 minutes of application
- Kills all fishes including catfishes and murrels within 1–2 hrs.
- Crabs are also affected.
- Besides detoxification being quicker, Bleaching Powder disinfects the pond and helps in faster mineralization of organic matter.

c. Liming

- Ground limestone ($CaCO_3$) or slaked lime ($Ca(OH)_2$) or quick lime (CaO) are used
- Applied at the pond bottom or spread over the water surface
- For correcting pH of water and soil,
- Maintaining the sanitation of the pond,
- Checking marked fluctuations in pH, and
- Hastening mineralization of organic matter.

Soil pH	Soil type	Lime (kg/ha/yr)
5.0–6.5	Moderated acidic	1000
6.5–7.5	Near neutral	500
7.5–8.5	Mildly alkaline	200

- Under Indian conditions, lime is used in stock ponds at the rates of 200–1000 kg/ha/yr in instalments based on soil pH as given below

- A pH range of 6.5–9.0 is ideal for soil water interactions resulting in a satisfactory biological regime. **Liming is an essential preliminary to successful pond manuring.**

d. Fertilization

- ✓ Fertilization keeps the **metabolic cycle in operation**, increases natural productivity and fish production

- ✓ Cowdung, pig and poultry manures, spoiled oilcakes, spoiled cotton and soyabean meal, compost and sewage as **organic manures** and

- ✓ Nitrate of sodium, ammonium sulphate, ammonium superphosphate, muriate of potash as **inorganic manures** are used in fish ponds

- ✓ A **combination** of both **inorganic** and **organic fertilizers** is recommended for ponds with neither too clayey nor too sandy soil possessing medium organic matter content

- ✓ Selection of fertilizers, particularly inorganic, is governed by the reaction of the soil. N-P-K (6-8-4), Urea (N-46%), ammonium sulphate (N-20%), single superphosphate (P-16%), Calcium ammonium nitrate (N-20%) and triple superphosphate (P-48%) are used under Indian conditions.

✓ **Organic manuring** has to take into account the oxygen budget of the medium.

✓ The quality of manure to be applied also **depends on the organic carbon** content of the soil as detailed below:

Organic carbon content of the soil (%)	Cattle dung (kg/ha/yr)
Less than 0.5	20000
0.5–1.0	15000
Above 1.0	10000

Favorable ranges in water quality parameters for fresh water composite fish culture

Parameters	Safe limit for culture
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
Carbon Dioxide	Less than 8ppm
Iron	Less than 0.5ppm
Total Alkalinity	20-150ppm
Total Hardness	20-200ppm
Hydrogen Sulphide	Less than 0.002ppm

2. STOCKING OPERATIONS

a. Selection of species

- Selection of fish species is important as it decides ultimate fish production
- Choice of species as the first biological element for increasing fish production
- Fishes with shortest food chain give the highest production
- Quantitative production, therefore, is highest with herbivorous, omnivorous, plankton eating and detritus feeding fishes
- **Silver Carp** (phytoplankton feeder) and **catla** (zooplankton feeder) are surface-dwellers
- **Rohu** is a column-dweller (utilizes decaying macro-vegetation, filamentous algae, periphyton, etc.)

- **Mrigal** is a bottom feeding fish (makes use of filamentous algae and detritus)
- **Common Carp** is omnivorous (feeds on both animal and plant origin at the pond bottom and margins)
- **Grass Carp** consumed effectively Macrovegetation
- **The semi-digested faecal matter of grass carp serves both as a feed for the bottom-dwellers as well as a pond fertilizer.**
- **An association of the above six carps, therefore, ensures proper exploitation of the food niches in the pond.**

Species Combination

	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

b. Stocking density and species ration:

- Fingerlings (100–150mm) @ below the carrying capacity of the pond
- Prerequisite for stocking program is information on the **food requirements** of cultivated fishes

$$\textbf{Number of fishes to be stocked per unit area} = \frac{\text{Total expected increase in Wt}}{\text{Expected increase of Wt of individual fish}} + \text{Mortality (not more than 10\%)}$$

3. POST-STOCKING OPERATIONS

a. Supplementary feeding:

- Food as the main governing factor in determining the growth rate of pond fish
- Natural fish food produced in a **limited way cannot supply the energy required for growth**
- Therefore, the need for supplementing the food arises
- Artificial feeding enhances fish production (80% more)
- Artificial feed should be balanced and complete
- It is necessary to understand the basic requirements of the food at the different stages of cultivable fish.

- Several feeds have been formulated using locally available ingredients

- GOC(78.4%), rice bran(9.8%), sal seed cake(9.8%), fortified with minerals+trace minerals+vitamins (Feed-1)

- GOC (24.5%)+sesame oilcake (24.5%)+rice bran (49.0%), also fortified with minerals, trace minerals and vitamins,

- GOC (40.0%)+fish meal (20.0%)+wheat bran (35.0%) with yeast have shown promising trends in so far as growth and digestibility are concerned.

- Further improvement in the feeds is to be effected after understanding the extent of utilization of the natural food by the carps, **amino acid requirements** and **amino acid profiles of ingredients and enzymatic pattern**

b. Harvesting and marketing:

- Harvesting of stock ponds can effectively be done **by drag netting**
- Fishes attaining the **marketable size are harvested** to reduce the pressure of density on the pond and thereby provide sufficient space for the growth of other fishes
- **Replenishment of the harvested species** ensures maintenance of the ecological balance that the particular species exhibit
- Periodic harvesting with replenishment facilitates stock manipulation, are biological means for increasing fish production.

c. Pond sanitation:

- ✓ Liming corrects the ill-effects of organic matter decomposition and restores hygienic conditions in the pond.
- ✓ Gathering of organic matter helps releasing of noxious gasses from the bottom.
- ✓ Feeding should stopped when algal blooms appear
- ✓ Aeration of the pond water from the bottom, surface agitation, replenishment of water and netting are measures taken to counteract periods of oxygen depletion
- ✓ Treatment with lime in concentrations not exceeding 10 ppm if water becomes acidic due to putrefaction and with 1.5 ppm potassium permanganate if water becomes foul
- ✓ Alum is added to settle suspended silt which may cause fish mortality

d. Fish diseases and their control:

- ✓ Fish culture under artificial conditions make fish prone to parasitic and non-parasitic diseases by lowering their resistance power when adverse hydrological conditions set in

- ✓ Prophylactic measures are taken for the few diseases encountered.

- ✓ Affected fishes are treated with solutions of either potassium permanganate (2 mg/100 ml) or common salt (3 g/100 ml) or copper sulphate (50 mg/100 ml) for all bacterial and fungal diseases, and with Gammaxene solution (3 g/100 ml) for fish lice infection

- ✓ Rational management of stock ponds with caution exercised at every phase of management can give rich dividends making fish culture a profitable proposition.

4. ECONOMICS

Production cost, income and returns in Composite Fish Culture

Sl No.	Expenditure			
1	Pond rental			
	Pond developmental cost, maintenance, embankment repairs etc. (estimated)			
	Fingerlings			
	Feed			
	Weeds			
	Fertilizers			
	Miscellaneous costs			
	Interest on working capital (6 months)			
	Total recurrent costs			
	Monthly recurrent cost			

Sl No.	INCOME			
	Gross production kg/ha			
	Income @ 120/kg			
	Cost of production/kg			
	Net income/ha			
	Net Income/ha/Month			

GROW FISH **GROW WITH FISH**

THANK U

FISH FOR HEALTH **FISH FOR WEALTH**