

Brackishwater Cage Culture

1. Introduction

Brackishwater is water having salt content more than that of freshwater but less than that of seawater. It results from mixing of freshwater discharged by the rivers and canals with seawater. Typically, salinity of brackishwater ranges from 0.5 to 30.0 parts per thousand (‰), and this water is highly productive. Fishes adapted to such salinity range are known as euryhaline fishes and often occur in coastal waters, estuaries, backwaters, coastal lagoons/lakes, etc. Most of the fishes adapted to brackishwaters are tasty and have a high market value. It is estimated that there are 12.40 lakh ha of brackishwater resources in India, some of which could be beneficially put to use for aquaculture of highvalue fish and shellfish.

NFDB is promoting brackishwater cage culture with an integrated approach in the backwaters and estuarine regions of the country as an alternative livelihood and income generation programme for the coastal population under Blue Revolution Scheme of Government of India with ICAR-CMFRI as the technology partner.

2. Resources

The estimated 12.40 lakh ha of brackishwater areas comprise of estuaries (deltaic river mouths), coastal lagoons, lakes, backwaters, tidal creeks, canals, mudflats, mangrove plants, etc. These water bodies lying between the freshwater and marine regimes have certain characteristics: (i) fluctuating water level synchronizing with the tides, (ii) wide salinity range of 0-35 ppt, (iii) higher nutrient content and productivity, (iv) serve as nursery grounds for numerous marine organisms, (v) harbour a rich diversity of flora and fauna, and (vi) support artisanal capture fisheries and provide livelihood to the coastal fishers.

3. Status and Potential

The tidal currents carrying with them the juvenile fish and shrimp, and the rising and falling water level formed the basis of traditional brackishwater fish and shrimp farming practices in the Bheries of West Bengal and Pokalli paddy fields of Kerala. Scientific brackishwater aquaculture started around 1980s, wherein shrimp were cultured in well-designed and managed ponds, as there was high demand for them in the export market. At present about 1.60lakh ha are under shrimp culture.

Andhra Pradesh and West Bengal States are the chief producers of shrimp accounting for about 80% of the total country's production. However, of late, culture of high-value euryhaline marine fish species is being undertaken in brackishwater ponds and cages to meet the demand in domestic market. The most commonly cultured fish are Mulletts, Milkfish, Seabass, Pompano, Grouper, etc.

4. Project Location and Implementation

A. Site Selection: A committee comprising of representatives from State Fisheries Department/ Fisheries Development Corporation, ICAR-CMFRI and NFDB would identify and select suitable sites for project location and development in the estuarine/ backwaters/ lagoons of coastal States.

B. Beneficiaries: Beneficiaries include SHGs/fishers/ fisherman societies/ farmers/ entrepreneurs; selection would be based on their interest and awareness. Fishers living in hamlets along the backwater areas, farmers involved in aquaculture and owning homestead near backwater resources, fisherman societies or entrepreneurs of coastal region could directly benefited from this project. Fisherwomen would be encouraged to earn their income and become independent by doing cage culture activities as it requires less capital investment but gives more financial returns.

C. Project Implementation:

- Management of cages will be under the technical guidance of ICAR-Central Marine Fisheries Research Institute (CMFRI).
- The '*Aqua One Centre*' would provide training on cage farming of fish and shellfish in brackishwater besides technical services to the beneficiaries.
- Periodic evaluation of progress would be done by CMFRI Project Monitoring Unit (PMU) for the successful operation of the project.
- NFDB would provide financial assistance to the States having brackishwater resources for enabling an institutional setup and development in a project-mode.

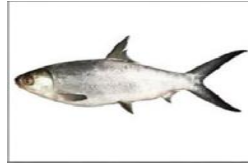
5. Project Components

A. Cage Setup: Each cage measures a minimum of 2 x 2 x 1.5 m (6 m³); 3 such cages constitute a Unit and are encircled by a bigger outer net (predator net) measuring 8 x 3 x 2 m; 5 cages constitute a Battery that can be installed at the selected location. Cages may be free floating or fixed. Floating HDPE cages with GI pipe-frame are preferred as they last longer than bamboo framed floating cages. These cages can be used to rear fish fry to fingerlings or for grow-out to table fish. Cages measuring 4 x 4 x 3 m (48 m³) are also used for brackishwater culture.

Each SHG/ Society will be provided a maximum of 5 Cages (1 Battery), while individual farmer/ entrepreneur will be provided a maximum of 3 Cages (1 Unit).



A. Targeted Fish Species: Milk Fish (*Chanos chanos*), Asian Seabass (*Lates calcarifer*), Grey Mullet (*Mugil cephalus*), Pearlsplit (*Etroplus suratensis*) and Nile Tilapia (*Oreochromis niloticus*), Silver Pompano (*Trachinotus blochii*).



Milk Fish



Asian Seabass



Grey Mullet



Pearlsplit



Nile Tilapia



Silver Pompano

B. Stocking and Yield: Although stocking densities should be determined by requirements and operational considerations, the influence of stocking densities on growth and production has been determined empirically. The indicative stocking and harvest details are as follows:

- Advanced Fingerlings (10-12 cm) Stocked: 240 nos./cage
- Fingerlings Stocked per Unit: $240 \times 3 = 720$ nos./ 3 cages
- Survival (80%): 576 nos.
- Average Body Weight at Harvest: 1.25 kg
- Total Biomass per Unit: $576 \text{ nos.} \times 1.25 \text{ kg} = 720 \text{ kg/ 9 months/ 3 cages (18 m}^3\text{)}$

C. Cage Management: Maintenance of cages, feeding, harvesting, etc., would be done by the beneficiaries themselves, i.e. SHGs/ Fisherman Society, fish farmers.

D. Harvesting: Harvest of fish in cages is less



labour intensive compared to that in ponds. Cages can be towed to a convenient place and harvested by lifting the cage net. Also based on demand, partial or full harvest can be done. Crop could be harvested during the marine fishing ban period and marketed fresh to get higher returns.

6. Integrated Project Components and Unit Costs

Component	Unit Cost (Rs)
Cost of GI Cage (4 x 4 x 3 m = 48 m ³) and Inputs	2.50 lakh
Small Feed Mill (1- 5 quintals/day)	10.00 lakh
'Aqua One Center'	20.00 lakh

7. Estimated Project Costs & Returns

Item	Amount/ Quantity
Setup Cost: GI Cage (4 x 4 x 3 m = 48 m ³) and Inputs Costs: Fish Seed, Feed, etc.	Rs. 2,50,000
Fingerling Stocked/Cage (survival 80%)	2,500 nos.
Culture/ Grow-out Duration	6-9 months
Weight of Fish at Harvest (average)	1.0 kg
Expected Yield/Cage/8 months	2,000 kg
Estimated Returns/Cage/8 months (Sale Price Seabass @ Rs. 300/kg)	Rs. 6,00,000
Estimated Total Costs/Cage/8 months	Rs. 2,50,000
Net Returns/Cage/8 months	Rs. 3,50,000

8. Project Monitoring Unit (PMU)

The Technology Partner ICAR-CMFRI would constitute a PMU, and the Project Monitoring Indicators would broadly include:

- Installing and Stocking Cages in timeso as to synchronize harvesting with marine fishing ban period.
- Fish-escape prevention structure to be in place.
- Ensuring predator net is secured and in place.
- Formation of local level people-institutions (Cooperatives, SHGs, etc.).
- Creation of Sustainability Fund Account.

9. Aqua One Centre (AOC)

An 'Aqua One Center' would be established to provide technical services:

- The AOC would register fishers holding lease of brackishwater areas.
- Where the beneficiaries choose to avail AOC advisory services, a sum of Rs. 1200/- will be charged per crop towards registration, monitoring water quality, growth, health, etc. If not, this amount will be released to beneficiaries as part of the input cost.

- The AOC will carry out inspection/field visit and submit report to the Project

- Monitoring Unit (PMU), in the prescribed format.
- The PMU will compile and submit reports to NFDB.

10. Governance and Socio-Economics

Brackishwaters are generally under the ownership of Dept. of Fisheries of the State Govt. They are usually leased out to Fishermen Cooperative Society (FCS)/Self Help Groups (SHGs)/Entrepreneurs for a period of 7 years. The routine activity of an FCS/SHGs is managed through an executive committee under the command of the President and Secretary.

Functional linkages among Fishers/Fish Farmer Interest Groups (FIGs)/ Self Help Groups (SHGs), line departments, technology partner, input suppliers and marketing agencies

will be established for the sustainability of the Group as well as for the Project

Development. Workshops, capacity building, forward & backward linkages (fish seed

hatcheries, feed mill, post-harvest handling and marketing) and sustainability fund will ensure continuity and adoption of the technological intervention.

11. Outcomes

- Availability of high-value fish to local/ domestic markets will prevent the supply of low- quality fish to the consumers.
- It will increase the income and generate alternative employment opportunities to coastal population.
- Efficient use of water bodies in a production perspective will reduce pollution of coastal waters.
- Empowerment of fishermen, women, unemployed youth, etc. by providing self-employment, income and entrepreneurship opportunities.
- There would be overall development of backwater fisheries and this in turn will improve the standard of living of rural population in the coastal districts of the State.
- An additional 1000 tonnes of high-value fish is expected to be produced by each maritime State.

12. Further Reading

CMFRI, 2015. Training Programme on Brackishwater Farming. 16-22 December

2015. Training Manual, Mangalore Research Centre of Central Marine Fisheries Research Institute, Mangalore, Karnataka, pages 1-106.

NFDB, 2016. Economically Very Important Marine Fish with Wide Salinity Tolerance [Asian Seabass or Barramundi, *Lates calcarifer*]. NFDB Newsletter *Matsya Bharat*, Volume 8, Issue 2 and 3 June - September 2016, pages 13-17.