Brief Communication

Empowering the Mavilan tribes of Kasaragod, Kerala: A success story in cage farming

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The Mavilan tribe, one of Kerala's many indigenous tribal communities known for their unique customs and traditions, resides mainly in the hilly and forested areas of the northern Kasaragod district, contributes significantly to the region's rich cultural heritage. Their residing areas include Manjeshwaram, Kanhangad, and parts of the Sullia region neighboring Karnataka. They mostly depend on agricultural labour and forest-based activities for their livelihood. Despite their rich cultural heritage, they are facing socio-economic challenges such as limited access to healthcare, education and land rights. Recognizing the need to preserve their heritage while improving their quality of life, a targeted initiative was undertaken to empower the Mavilan tribes through cage farming. This initiative, under the Tribal Sub-Plan (TSP) program by the Calicut Regional Station of ICAR-CMFRI, introduced marine fish cage culture to the Mavilan tribal families of Kasaragod district.

The Cage farming initiative

Mavilan tribes of Kurichikunnu colony of Pariyaram Grama Panchayath, Bekal, Kasaragod, were selected to participate in the cage culture initiative in 2019, aimed to empower the community through aquaculture. Based on the information provided by the local Pallikkara Grama Panchayat of Kasaragod district, 22 beneficiaries (14 males and 8 females) were selected. Three tribal Self-Help Groups were formed, Navodaya SHG-10 beneficiaries (6 males and 4 females); Sangamithra SHG- 7 beneficiaries (5 males and 2 females); Udhayam SHG- 5 beneficiaries (3 males and 2 females) to facilitate joint efforts in aquaculture and ensure active participation of the tribal community. Prior to this, most of the selected persons were engaged in labour-intensive occupations such as painting and masonry, while a few women participated in local, government employment schemes such as MGNREGA programmes and none had any earlier experience in aquaculture. The selected groups were provided with technical training, farm inputs, and on-site training and demonstrations to enable them to undertake cage culture activities. The Calicut Regional Station of ICAR-CMFRI initiated these efforts by offering a comprehensive "Hands-on training and on-field demonstration programmes on cage culture of marine fishes". The training-cum-demonstration included:

Theoretical knowledge

Lectures were delivered on key aspects of aquaculture such as site selection, species selection, feed management, water quality management, disease management, stocking of fingerlings, and integrated multi-trophic aquaculture techniques.

Hands-on training

Practical sessions on cage fabrication, installation, and maintenance were also provided to all beneficiaries.

Lecture on cage farming to TSP beneficiaries

Fabrication of cage frame

Preparation of floatation system for cages

Attaching floats to cage frame by beneficiary

Fabrication of PVC ballast

Field exposure

A visit to a local cage farming site in Payyanur, Kannur, was organized for selected beneficiaries to gain more knowledge on cage farming culture practices. The combination of hands-on training, demonstrations, and exposure visits helped enhance the technical capacity of the beneficiaries, preparing them for sustainable cage aquaculture practices.

These initiatives enabled participants to gain practical and theoretical knowledge on:

- Selecting suitable sites for cage culture.
- Identifying appropriate fish species and acclimatizing them for farming.
- Setting up and managing cages, including feeding and disease control.

Implementation

The Bekal River (12°24′23.76″N, 75°1′58.908″E) near the Kurichikunnu tribal colony was identified as an ideal location for cage farming, meeting criteria like suitable water depth (3 meters) and clean water, free from industrial or domestic waste.The program introduced grow-out culture of marine finfishes in galvanized iron (GI) cages. Five units of 4x4x3m cages were fabricated and installed, along with an 8-meter-long catwalk for easy access. Inputs provided included fingerlings of Asian seabass (*Lates calcarifer*) and Pearlspot (*Etroplus suratensis*), high-quality floating pellet feed, infrastructure such as cages, GI catwalk, nets, hapa, floats, and anchors and equipments such as freezer and weighing balances. Initially, five cages (4x4x3m, 48 m^3) were used, with Asian seabass fingerlings (8-10 cm; 600 individuals) stocked in three cages and Pearlspot fingerlings (3-4 cm; 2000 individuals) in the rest. The fingerlings were transported from Kumta, Karnataka, in insulated trucks and they were stocked after acclimatisation.

Fishes were fed with nutrilla floating pellet feed (45% protein and 10% crude fat). During the culture period, the fishes were fed with pellet feed initially at 12 percent of the body weight, then reduced to 3 percent of the body

weight as the culture progressed. In case of seabass, low-value fishes were also provided along with the pellet feed. After 8-9 months of culture, seabass reached an average weight of 1-1.5 kg individual weight, while Pearlspot attained 200-250 g. A 48 m^3 cage stocked with 600 numbers of seabass yielded a gross revenue of ₹1.8 lakhs and a net profit of ₹86,200, achieving an internal rate of return (IRR) of 88.5% and a benefit-cost ratio (BCR) of 2.29 (Table 1). A 48 m^3 cage with 2000 numbers of Pearlspot generated ₹1.75 lakhs in gross revenue and ₹55,900 in net profit. The IRR was 86.9%, and the BCR was 4.25. Pearlspot commanded a high market price (₹500-600/kg locally). The initiative proved economically beneficial, especially through partial harvests, providing significant support to the Mavilan tribal community.

Galvanized iron (GI) cages at Bekal

Fabrication of GI catwalk

Table 1. Economic performance of Seabass cage culture

Particulars	Amount (₹)
I. Capital Investment	
1. Cost of cage frame (1.25-inch B class pipe)	30,000.00
2. Cost of nets	30,000.00
3. Cost of floats (8 numbers for each cage)	10,000.00
4. Mooring (20 kg GI anchors- 2 nos.) & installation	5,000.00
Total fixed cost (1+2+3+4)	75,000.00
5. Depreciation (20%)	15,000.00
6. Interest on fixed capital (12%)	9,000.00
Annual Fixed cost (5+6) (A)	24,000.00
II. Operating costs	
7. Seed (Cost of 600 seabass seeds @ ₹35/seed)	21,000.00
8. Feed (low-value fish) 1500 kg@ 20/kg and 60 kg pellet feed	37,200.00
9. Labour 2 hours/day @ ₹1200/month for 8 months	9,600.00
10. Harvesting & Miscellaneous Expenses	2,000.00
Total operating cost (B)	69,800.00
Total cost (A+B)	93,800.00
III. Returns	
11. Production	400 kg
12. Gross revenue @ ₹400/kg for 450 kg	1,80,000
13. Net profit	86,200
14. Cost/ kg of fish (₹)	234
15. Price/ kg of fish (₹)	450
16. NPV	1,99,410
17. BCR	2.29
18. IRR	88.5%

Fish seed transportation acclimatization and stocking

Harvest of seabass from cages by Mavilan tribes of Kasaragod

Harvest of Pearlspot

Table 2. Economic performance of Pearlspot cage culture

Particulars	Amount (₹)
I. Capital Investment	
1. Cost of cage frame (1.25 inch B class pipe)	30,000.00
2. Cost of nets	30,000.00
3. Cost of floats (8 numbers for each cage)	10,000.00
4. Mooring (20 kg GI anchors- 2 nos.) & installation	5,000.00
Total fixed cost (1+2+3+4)	75,000.00
5. Depreciation (20%)	15,000.00
6. Interest on fixed capital (12%)	9,000.00
Annual Fixed cost (5+6) (A)	24,000.00
II. Operating costs	
7. Seed (Cost of 2000 Pearlspot seeds @ ₹10/seed & Transportation charges)	20,000.00
8. Feed (pellet feed) 500 kg	63,500.00
9. Labour 2 hours/day @ ₹1200/month for 8 months	9,600.00
10. Harvesting & Miscellaneous Expenses	2,000.00
Total operating cost (7+8+9) (B)	95,100.00
Total cost (A+B)	1,19,100.00
III. Returns	
11. Production (89 % survival)	350 kg
12. Gross revenue @ ₹500/kg for 350 kg	1,75,000
13. Net profit	55,900
14. Cost/ kg of fish (₹)	340
15. Price/ kg of fish (₹)	500
16. Operating ratio	0.54
17. NPV	1,71,967
18. BCR	4.25
19. IRR	86.9%

A harvest mela was also organized through which ICAR-CMFRI actively supported the Mavilan tribal community by empowering them to market their produce through social media platforms, local restaurants, and wholesale distributors. Empowering the Mavilan tribal community in aquaculture required addressing a range of socio-economic, environmental, and technical challenges.

Challenges addressed when implementing the programme included

Technical knowledge gap: Training was provided to bridge the gap in aquaculture skills such as site selection, cage fabrication, species selection, cage installation, feed management, water quality management, disease control, and cage maintenance.

Financial barriers: The initiative provided financial support in a phased manner, starting with 100% coverage in the initial years and gradually reducing assistance to encourage self-reliance.

Cultural and traditional hesitancy: Awareness programmes and consistent engagement helped address resistance to adopting new practices.

Infrastructure limitations: Support included supply of cages, nets, seeds, feed, and storage equipment.

Market access: Assistance was provided to connect the Mavilans with wholesalers, restaurants, and local markets, ensuring fair prices for their produce.

The project significantly improved the living standards of the participating tribal families involved by enabling construction of new houses or renovation of existing houses, purchase of household items like refrigerators, televisions, and mobile phones and investment in children's education and clearing existing debts. During the first four years of fish farming, beneficiaries received comprehensive support from ICAR-CMFRI, including both technical guidance and financial assistance. In subsequent farming seasons, this support transitioned to technical guidance alone. The Mavilan tribes gradually transitioned to self-reliant cage farmers, with some families adding more cage units independently.

Harvest Mela

The successful demonstration of high-value marine finfish culture in low-cost estuarine cages significantly improved livelihoods and empowered the Mavilan tribes of Kasaragod to sustain cage culture independently without financial aid. This success story highlights how targeted interventions can empower marginalized communities while ensuring sustainable development.This model of integrating aquaculture with tribal upliftment can serve as a blueprint for similar communities across India, combining economic viability with cultural preservation.