

## Economic performance of cage fish farming

*Aswathy N*  
*Socio-Economic Evaluation and Technology*  
*Transfer Division, CMFRI*

### **Introduction**

Mariculture has the potential to augment production and incomes through coastal as well as open sea farming. The global aquaculture production increased by about 25 times in the last 30 years when compared to only seven times increase in capture fisheries production during the corresponding period. Mariculture systems include in-shore and off-shore and maintain a constant high saline water conditions. In-shore mariculture systems include clams, oysters and other molluscs, which are wild-caught or hatchery-reared seed grown on the sea floor or on suspended nets, ropes, or other structures. Off-shore mariculture refers to large intensive fisheries in off-shore fish pens.

India has vast areas of coastal waters, lagoons and bays which can be utilized for mariculture. Seed production and culture of marine finfishes has been expanding in the recent past in many parts of the world, but in India, it is only an emerging sector. The potential cultivable candidate finfishes are groupers, cobia, rabbitfish, seabass, pompano, snappers and sea bream. Lack of availability of hatchery-produced seed on a commercial scale is the major bottleneck for large-scale marine finfish farming and hence, development and standardization of seed production techniques for a few commercially important species is gaining importance.

### Indicators of Economic performance

The economic performance of any mariculture activity can be assessed by working out the following cost and return indicators and financial feasibility indicators (Narayanakumar, 2009, Sathiadhas&Narayanakumar, 2010).

**Table 1. Indicators of economic performance of a mariculture enterprise**

Sl.No.	Economic Indicators
1.	<b>Initial investment</b> a)Fixed installations b) Major accessories c) Minor Accessories d) Others
2.	<b>Total Investment</b>
3.	<b>Fixed cost</b> a)Depreciation b) Interest on Fixed capital (12%) c) Administrative expenses
4.	<b>Total Annual Fixed cost (A)</b>
5.	<b>Operating costs</b> a) Cost of seeds b) Cost of feeding and other labour charges c) Interest on working capital (6%)
6.	Total Operating or Variable cost (B)
7.	Total cost of production [Row(4)+Row(6)]
8.	Yield of the fish variety (in kg)
9.	Gross revenue [(8) * Price per kg]
10.	Net income [(9)-(7)]
11.	Net operating income [(9)-(6)]
12.	Cost of production (₹/kg)[ (7)/(8)]
13.	Price realized (₹/kg) (9)/(8)

The economic indicators of cage farming varies with cage size, species of fish, stocking density, quantity and cost of feed, expenses for cage maintenance, survival rate, yield and prices of fish. Based on the experimental cage farming demonstrations, CMFRI has recommended 6m dia HDPE cage for commercial cage farming in the maritime states of the country. The initial investment for 6m dia HDPE cage frame with mooring and accessories in the open sea is ₹3 lakhs. The annual fixed cost is calculated from depreciation and interest on fixed capital (Table 2).

CMFRI has standardised culture of Asian seabass, cobia and silver pompano in different types of cages in the marine, estuarine and brackishwater areas with good economic returns (Rao *et al.*, 2013). The indicative economics of cobia farming in 6m dia HDPE having an average yield of 2.4t realised a net profit of 3.44 lakh per cage. Sea cage farming of cobia proved to be an economically viable technology generating an internal rate of return of more than 60% and benefit -cost ratio of more than one calculated for a project period of 7 years with 15% discount rate. The culture of seabass in HDPE cages of 6m dia in the open sea yielded gross revenue of ₹10 lakhs and net profit of ₹5.59 lakhs within a culture period of 7 months. (Table 2).

**Table 2. Economic performance of open sea cage farming of cobia and seabass (in ₹)**

Cage dimension: 6 m dia x 5 m depth

Culture period: 7 months

	Particulars	Cobia	Seabass
<b>I.</b>	<b>Annual fixed cost (A)</b>	83429	83429
<b>II.</b>	<b>Operating costs</b>		
1.	Cost of 1000 numbers of cobia seeds @ ₹25/seed or 3000 no of seabass seeds@ ₹30/seed	25000	90000
2.	Feed cost	200000	200000
3.	Labour Charges	42000	42000
4.	Boat Hire & Fuel Charges	10000	10000
5.	Miscellaneous Expenses	15000	15000
6.	Total operating cost (B)	292000	357000
7.	Total cost(A+B)	375429	440429
<b>III.</b>	<b>Returns</b>		
8.	Production	2.4 tonnes	2.5 tonnes
9.	Gross revenue @₹300/kg for cobia and @₹400/kg for seabass	720000	1000000
10.	Net profit	344571	559571
11.	Cost/ kg of fish(₹)	156	176
12.	Price/ kg of fish(₹)	300	400

### Economics of coastal cage farming

The major species suitable for culture in the brackish water are Asian seabass (*Latescalcarifer*), pearlspot (*Etroplussuratensis*), tilapia(*Oreochromis sp.*), mullet (*Mugilcephalus.*), red snapper and caranx. The economic performance of cage farming for different cage dimensions and species of fishes were calculated for comparing the profitability. Composite farming of seabass along with pearlspot was found to be more profitable than farming of

single species. Based on economic feasibility, CMFRI has recommended square GI cage of 4x4x3m<sup>3</sup>(48m<sup>3</sup>) for the coastal waters. However cage dimensions adopted by the farmers varied depending on the depth of water, ease of operations and resource availability. A standard 48 m<sup>3</sup> cage with a recommended stocking density of 1500 numbers of seabass along with 500 numbers of pearl spot yielded gross revenue of ₹6.27 lakhs and net profit of ₹3.28 lakhs in a 7 months culture period (Table 3).

**Table 3. Economics of composite culture Sea bass with Pearl spot**  
(Cage Dimension 4x4x3 m<sup>3</sup> (48m<sup>3</sup>)  
Culture period: 7 months

Particulars	Amount(₹)
<b>Capital investment</b>	85000
<b>Operational costs</b>	
License fee	1500
1400 seabass seeds @ ₹30/seed	42000
Pearlspot seed @500nos@₹15/seed	7500
Nursery rearing (Hapa)	2000
Feed(Trash fish/ floating feed)	156700
Labour	42000
Harvesting and miscellaneous expenses	20000
Total operational cost(B)	271700
Total cost(A+B)	298900
<b>Returns</b>	
Production( (kg)	1567kg
Gross revenue(@₹400/ kg of fish)	627000
Net profit	328100
Cost/ kg of fish(₹)	191
Price/ kg of fish(₹)	400

### **Marketing & challenges for cage farming**

The cage farmed fishes are marketed either directly at farm gates, through local markets, fish harvest melas, live fish sales or online sales. With limited supply of fish and huge demand for quality fishes, at present there are no marketing constraints. However with more and more farmers adopting cage fish farming may lead to decline in prices. The farmers can be trained for developing entrepreneurial skills or form co-operatives or farmer producer companies to initiate the exports or undertake domestic marketing on a commercial scale. The major constraints faced by cage farmers include poor water quality, changes in water currents due to flood or extreme climatic events, water pollution, damage to nets by rodents and mussels, financial constraints and non-availability of quality seeds. With adequate policy back up for the establishment of mariculture enterprises in the open waters, the sea cage farming is expected to contribute substantially for increasing fish production and generating income and employment to the coastal population.

### **References**

- <sup>0</sup> CMFRI, 2015. Annual Report 2014-15. Central Marine Fisheries Research Institute, Cochin, 320pp.
- <sup>0</sup> Narayanakumar, R. 2009. *Economic analysis of cage culture of sea bass*. In: Course manual: National training on cage culture of seabass. Imelda, Joseph and Joseph, V. Edwin and Susmitha, V (eds.) CMFRI & NFDB, Kochi, p. 120-122.
- <sup>0</sup> Rao, G Syda and Narayanakumar, R and Imelda, Joseph 2009. Successful open sea cage culture demonstration at Balasore, Orissa: A new horizon in mariculture. *CMFRI Newsletter* (123). pp. 3-6.

- <sup>0</sup> Sathiadhas, R. and R.Narayanakumar, 2010. Economic analysis of Open sea cage farming. In Course Manual. Training Programme on Sea cage farming of seabass and lobsters CMFRI, 2010.
- <sup>0</sup> Rao, G.S., Imelda Joseph, Philipose, K.K and Mojjada, S. 2013. Cage Aquaculture in India, Central Marine Fisheries Research Institute, Kochi.

