10

MARKETING AND ECONOMIC FEASIBILITY OF OPEN SEA CAGE CULTURE

Ramkumar, S and V. D. Mhatre

Introduction

India is one of the largest fish producers in the world and contributes 5.43% to global fish production. India ranks second in fish production from aquaculture sector following China at top. Total fish production of India during 2010-11 was 8.42 million metric tones. Inland sector contributes about 5.2 million metric tones, whereas marine sector contributes 3.22 million metric tones. India has a long coastline of about 8,129 km and continental shelf area of 0.5 million km^2. Declining catch rates in marine capture fisheries consequently created serious unemployment issues in rural coastal areas. Issues faced by marine fisheries sector in India have focused the attention of policy makers and rural fishers towards development of mariculture and coastal aquaculture activities as alternative livelihood option.

Mariculture involves farming of marine animals and plants from marine environment in captive conditions. High value marine finfishes, crustaceans, oysters, mussels and clams can be cultured to meet increasing annual per capita fish demand from 9 kg to 16.7 kg by year 2015. In this view, Central Marine Fisheries Research Institute initiated open sea cage culture and developed mariculture technologies for cage farming of *Rachycentron canadum, Lates calcarifer, Panulirus polyphagus, Ponulirus homarus*, etc. successfully. The economic feasibility and marketing aspects of open sea cage culture attempts made by CMFRI are discussed.

Marketing

Commercial or any business activity started for economic benefits needs to be marketed strategically. Identification of markets and actual price for the harvested fish should be done well before actual fish harvest. Lack of better marketing strategies for healthy and marketable sized fish may impact economic viability of the culture activity. Harvested fishes can be sold in fresh live or dressed condition based on customers/market requirement. HACCP protocols should be followed while handling and processing the fishes for marketing to avoid health hazards.

Possible markets for cage harvest are as follows;

1. Processing plants
2. Local / domestic markets
3. Supply to local restaurants/retail stores
4. Farmers markets

It is better to opt for direct sales markets for less quantities fish harvest. Direct sales to consumer always fetch a better price and reduce middleman costs. Live sales at cage culture site can be also attempted through proper advertisement in domestic markets. Sales to processing plants assure fixed price for large fish harvests at a time but it is difficult to market the fish to processing plants in case of less quantity.

Economic Feasibility:

Successful fish culture in cages is not limited to daily monitoring and harvesting of healthy marketable size fishes. At the end, successful and profitable returns from fish culture are most important issues impacting endurance of culture activities making them popular and long lasting. Factors affecting profitability of culture operations must be studied carefully. Cost involved and possible benefits of any fish culture need to be known before participation in the business (FAO, 1966). For successful implementation of any project cost-benefit analysis and commodity market survey is important. Economic feasibility study reveals viability and successfulness of project or business (Awachie, 1968). Economic feasibility accounts involve capital investment, projected income, pay back and market survey (Awachie, 1968).

Economic viability of cage culture operations depends on many factor unique specific situations. Assessment of financial inputs include overall expenditures during culture operation. Following are some important sources of expenditure incurred during open sea cage culture activities.

1. Cost of Galvanised Iron (GI) /High Density Poly Ethylene (HDPE) cage frames with ballast rings
2. Cost of HDPE inner and outer nets
3. Cost of fish / lobster seed
4. Cost of fresh / formulated feed and feeding
5. Cost of boat hiring for installation and daily management activities
6. Cost of labour and security charges
7. Cost of maintenance
8. Cost of harvesting,marketing and transportation

Capital cost includes infrastructure facilities required for the cage culture *viz.* cost of cage frame, cost of mooring, etc. Operational or variable cost includes costs involved in day to day management of culture such as cost of seed, feed, labour charges, boat hiring charges, maintenance cost, harvesting and marketing expenses. Fixed costs include depreciation on capital cost, insurance charges, interest on capital cost (@ 12%) and administrative expenses. The economic performance is analysed by using annual fixed costs, variable costs and the annual total costs from the cost side. From the returns point of view, the harvest from the cage, the gross revenue from the sales of the harvest is worked out. Using the cost and returns figures, the following economic indicators are estimated to test the economic viability and financial feasibility of any enterprise. Feed and seed costs about 60 to 70% of total operational cost during culture period.

Cage culture activities in India started from year 2007 and economic feasibility studies of cage culture operations at different places in the country for different species culture were completed. Details of economic feasibility studies are as follows;

Table 1. **Economic analysis of a 15 m diameter HDPE cage implemented at Visakhapatnam**

Sl.No.	Item	Cost (in rupees)
Fixed Capital Cost		
1	HDPE cage frame (15 m dia)	4,00,000/-
2	HDPE nets	3,00,000/-
3	Galvanised Iron chains	80,000/-
4	Mooring equipments	60,000/-
5	Stone Anchors	1,50,000/-
6	Floats	1,50,000/-
7	Shock Absorbers	25,000/-
8	Ballast	35,000/-
9	HDPE ropes	35,000/-
10	Installation charges	2,40,000/-
A) Total capital Cost		**14,75,000/-**
Fixed Cost		
1	Depreciation	1,16,000/-
2	Insurance Premium (5% of investment)	73,750/-
3	Interest on fixed capital	1,77,000/-

4	Administrative expenses (@ 2%)	29,500/-
B) Total Fixed Cost		**3,96,250/-**
Annual Operational Cost		
1	Feed	2,24,000/-
2	Seed	1,50,000/-
3	Feed cost	9,00,000/-
4	Net cleaning	75,000/-
5	Underwater inspection	50,000/-
6	Net mending and maintenance	25,000/-
7	Post crop overhauling	20,000/-
8	Security	1,00,000/-
9	Interest on working capital @ 6% for a crop	54,040/-
C) Total Operational Cost		**15,98,040/-**
Annual total cost (B+C)		**19,94,290/-**
Gross Revenue from a crop		**37,50,000/-**
Net Income (Profit)		**17,55,710/-**

(**Source**: Narayanakumar 2009)

Table 2: **Economic analysis of a 6 m diameter HDPE cage implemented at Balasore**

Sl. No.	**Item**	**Cost (in rupees)**
A) Initial investment for 6 m dia HDPE cage		**3,00,000**
Fixed Cost		
1	Depreciation	30,000/-
2	Insurance Premium (2% of investment)	3,000/-
3	Interest on fixed capital (@ 12%)	18,000/-
4	Administrative expenses (@ 2%)	3,000/-
B) Total Fixed Cost		**54,000/-**
Annual Operational Cost		
1	Cost of feeding and labour charges	1,75,000/-
2	Seed (5000 nos. *Latescalcarifer*)	50,000/-
3	Interest on working capital @ 6% for a crop	6,750/-
C) Total Operational Cost		**2,31,750/-**
Annual total cost (B+C)		**2,85,750/-**

Gross Revenue from a crop (3032 Kg sea bass)	**5,75,760/-**
Net Income (Profit)	**2,90,010/-**
Cost of Production (rupees per kg)	**94.24/-**

(**Source:** Syda Rao *et. al*. 2009)

Table 3: **Economic analysis of a 6 m diameter HDPE cage implemented at Karwar**

Sl. No.	**Item**	**Cost (in rupees)**
A) Initial investment for 6 m dia GI cage		**1,00,000**
Fixed Cost		
1	Depreciation	20,000/-
2	Insurance Premium (2% of investment)	---
3	Interest on fixed capital (@ 12%)	12,000/-
4	Administrative expenses	3,000/-
B) Total Fixed Cost		**35,000/-**
Operational Cost		
1	Cost of feeding and labour charges	48,000/-
2	Cost of Seed (2500 nos. *Latescalcarifer*)	35,000/-
3	Interest on working capital @ 6%	4,980/-
C) Total Operational Cost		**87,980/-**
D) Annual total cost (B+C)		**1,22,980/-**
E) Gross Revenue from a crop (1764 Kg sea bass) @ Rs. 250/kg		**4,41,000/-**
F) Net Income (Profit)		**3,18,020/-**
G) Cost of Production (Rupees per kg)		**69.72/-**

(**Source:** Philipose *et al*. 2013)

Table 4: **Economic analysis of a 6 m diameter HDPE cage implemented at Karwar**

Sl. No.	**Item**	**Cost (in rupees)**
Capital Cost		
1	Cage (6 m dia) made of 'C' class GI pipe of 1.5 inch dia	50,000/-
2	Mooring	15,000/-
3	Nets (2 inner and one outer net with ballast pipe)	60,000/-
A) Total Capital cost		**1,25,000/-**
Operational Cost		
1	Cost of feeding (fresh low value fishes 12.82 t)	3,20,500/-

2	Cost of Seed (750 nos. *Rachycentroncanadum*)	7,500/-
3	Labour charges	14,000/-
4	Boat hiring and fuel charges	10,000/-
5	Transportation charges	5,000/-
6	Harvesting charges	5,000/-
7	Miscellaneous expenses	10,000/-
B) Total Operational Cost		**3,72,000/-**
C) Total cost (A+B)		**4,97,000/-**
D) Gross Revenue from a crop (2136 Kg of cobia) @ Rs. 280/kg		**5,98,080/-**
E) Cost of Production (Rupees per kg)		**174.16/-**
Fixed Cost:		
1	Repayment of capital expenditure per year (Rs. 1,25,000 – Rs. 50,000 subsidy= Rs. 75,000)	**25,000/-**
2	H) Interest on total cost @ 11%	**52,800/-**
F) Total Fixed Cost		**77,800/-**
G) Net Income/Profit (D-(B+F))		**1,48,280/-**

(Source : Nazar *et al*. 2013**)**

Table 5: **Economic analysis of a 3 m diameter GI cage implemented at Kalamb, Maharashtra**

Sl. No.	**Item**	**Cost (in rupees)**
Capital Cost		
1.	Cage Frame	11,500/-
2.	HDPE nets	21,300/-
A) Total Capital Cost		**32,800/-**
Operational Cost		
1.	Lobster Seed (200 nos @ Rs 35/- per no)	7,000/-
2.	Feed	1,500/-
3.	Labour charges	500/-
B) Total Operational Cost		**9,000/-**
C) Gross Revenue from a crop (24.6 Kg of lobsters) @ Rs. 900/kg		**22,140/-**
D) Profit (C-B)		**13,140/-**

References

1. FAO, 1966. Agricultural development in Nigeria 1965-1980. Rome, FAO, Food and Agricultural Organisation(FAO) 2006, Year Book of Fishery Statistics-Summary Table, Retrieved from: www,fao.org/fi/statist. asp.
2. Awachie, J.B.E., 1968. Fish culture trials with natural stock and ponds on the lower Niger floodplain near Atani. Umudike: Report of the Fisheries Investigation Unit (Unpublished).
3. Awachie, J.B.E., 1969. A report on fish production trials in kraals in selected rivers and lakes of Eastern Nigeria.Umudike: Report of the Fisheries Investigation Unit.
4. Nazar abdul, A. K., Jayakumar, R., Tamilmani, G. and Sakthivel, M., 2013. Sea cage farming of cobia. *In*: CMFRI manual.

*****