

Economics of GI (Galvanised Iron) Pipe Cage Manufacturing for Cage Aquaculture in Reservoirs of Jharkhand

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ABSTRACT

Potential of cage culture as a key technological intervention in open water bodies to enhance fish productivity is well known and which is also recognised by government for achieving blue revolution goals. The present study is an attempt to investigate the economics of GI pipe cage manufacturing in Jharkhand. The result revealed that GI pipe cage manufacturing was a capital oriented enterprise requiring high initial investment for the establishing cage manufacturing unit. The costs and return analysis showed total cost to be Rs.9.05 crores generating gross revenue of Rs.12 crores per annum. It was observed that variable cost contribute about 96.64 percent while fixed cost contribute only 3.36 percent of the total cost respectively. The procurement of raw materials was found to contribute the lion share in cost of production which was 90.64 percent (Rs.8.17 crores) of the total cost. Hence from the study it can be concluded that GI pipe cage manufacturing is capital intensive enterprise. However cage manufacturing was economically viable business indicated from BC ratio of 1.33. To further improve the economic performance of cage manufacturing there was need to minimise cost of production by finding locally available cheap raw material alternatives like Bamboo and increasing the demand for cage culture which was the major constraint encountered in cage manufacturing in Jharkhand.

Keywords: Cage Culture, Economics, GI Pipe, Jharkhand

INTRODUCTION

Indian fisheries has shown incredible growth in total fish production from 0.75 in 1950-51 to 12.59 million tonnes during 2017-18 which is almost about 17 fold increase in last 7 decades (DoF, MFAH&D, 2019). The marine sector has shown stagnation trend while inland

sector has been growing at staggering rate which is reflected from increase in its contribution to the total fish production from 29 percent (3.49 million tonnes) in 1950-51 to 70.69 percent (8.9 million tonnes) in the year 2017-18 which is mainly contributed by aquaculture (DoF, MFAH&D, 2019).

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In inland fisheries, aquaculture is the principle contributor with the share of 78 percent. Inland fisheries has vast potential which can be clearly seen from the available water resources in the form of 0.20 million kms stretch of rivers and canals 3.52 million hectare reservoirs, 2.48 million hectare pond and tanks, 1.16 million hectare brackish water, .42 million hectare of beels, 0.12 million hectare oxbow lakes, .23 million hectare derelict water and 0.30 million hectare other than river and canals (DoF, MFAH&D, 2019). It is very much evident that reservoirs forms the important part of inland water resource which are underutilized. Hence cage culture has immense potential to bring these underutilized open water bodies under the preview aquaculture management system for enhancing fish production in the country. In India, cage culture is till at nascent stage even though the first attempt was in early 1970s in which three different ecosystems like swamps (airbreathing cat fish), lotic waters of Ganga and Yamuna at Allahabad (using major carps) and lentic waters of Karnataka (common carp, catla, silver carp, rohu, snakeheads and tilapia respectively) (ICAR-CIFRI, 1970). ICAR institutes like CIFRI, CIFE and CMFRI pioneered cage culture research in different water ecosystems following which cage culture technology has been recognised as key catalyst in augmenting fish production manifold to meet the growing demand for animal protein by policy makers. Cage culture has shown great success throughout the world and it was tried on experimental basis in marine sector in India (Sarkar et al., 2015). Significant difference the monthly income was observed by Das et al., (2009) which was about Rs.1, 216.25 and Rs.854.25 for participant and non-participants of cage culture activity for fish seed rearing in reservoirs. Major breakthrough in cage culture in reservoirs was achieved when National Fisheries Development Board (NFDB) supported several initiatives in cage culture in reservoirs; first introduced in Jharkhand (Chandil Reservoir), later in Chhattisgarh (Kabirdham) and Assam (Samuguri Beel). It

proved to be highly successful in increasing fish production and productivity from open water bodies on one hand and improving income and livelihoods of local fishers on the other (NFDB, 2015). Even though the return from cage culture is looking promising, there is lack of systematic study on economic aspects of cage manufacturing for reservoirs . Hence the present study has been under taken with the objective to provide empirical evidences of economics involved in cage manufacturing in Jharkhand.

MATERIAL AND METHODS

During the study period (2017-18) it was observed that there was only 2 cage manufactures present in Jharkhand out of which one was interviewed with pre-tested open type interview schedule. It was reported that both the cage manufactures were of same capacity and had similar work profile. For investigating the economics involved in cage manufacturing farm business analysis was undertaken.

Farm business Analysis:

To understand and investigate the costs and return involved in cage manufacturing farm business analysis was carried out using following accounting methodology.

Fixed cost:

A cost that doesn't change with an increase or decrease in the level of production. Fixed costs are the expenses that have to be paid by a farm, independent of any business activity. It is one of the two components of the total cost, along with variable cost. Fixed cost includes following items:

- Depreciation on fixed assets: calculated using straight line method.
- Interest on fixed capital: It was calculated @ 12% per annum on fixed capital.
- Expenses on repair and maintenance of fixed assets: estimated based on the information collected from sample households.
- Salary of permanent human labour.

Variable cost:

Variable cost is that part of the total cost which changes with change in output level.

The daily expenses incurred are termed as operating cost or variable cost. It includes the following items:

- a) Raw Materials
- b) Electricity
- c) Fuel
- d) Communication
- e) Casual labour
- f) Transportation
- g) Miscellaneous cost
- h) Interest on working capital (It has been calculated at 8.75% interest rate for a period of 6 months)

Gross income:

It was worked out by multiplying the quantity of produce with respective prices.

$$\text{Gross income} = Q * P$$

Where,

Q= quantity

P = Selling price

Net income:

The return left after deducting all the expenditure such as fixed cost and variable cost from gross income.

$$\text{Net income} = \text{GI} - \text{TC}$$

Where,

GI = Gross income

TC = Total cost

$$\text{TC} = \text{TFC} + \text{TVC}$$

Where,

TFC = Total fixed cost

TVC = Total variable cost

RESULTS AND DISCUSSIONS

Cage manufacturing was a capital intensive enterprise and fixed inventories for cage manufacturer and supplier have been studied and the details have been presented in the table 1.

Table 1: fixed capital inventory of cage manufacturer

Fixed inventory	Rs/firm ('00000Rs.)	Share
Office	5.6	4.74
Factory	28.8	24.37
Equipment	26.8	22.67
Generator	40.0	33.84
Vehicles	17.0	14.38
Total	118.2	100

Results showed that total investment of about Rs.1.82 crore was incurred for the establishment of cage manufacturing unit. Since sometimes cages need to assembled at site in remote areas which lacks electricity therefore the major investment was incurred for purchasing generator sets accounting 33.84 percent of the total investment which was about Rs.40 lakhs. The next major investment item was factory building followed by equipment's which accounted 24.37 (Rs.28.80 lakh) and 22.67 percent

(Rs.26.80 lakhs) of the total investment, respectively. Other investments were for office and vehicles which accounted 14.38 and 4.74 percent to the total investment respectively. Hence from this study it validates that cage manufacturing was a capital oriented enterprise and high initial investment is required for the establishment for GI pipe cage manufacturing unit.

The Cost and return analysis for cage manufacturing was attempted and the results obtained has been presented in the table 2

Table 2: Costs and return in cage manufacturing

Particulars	Cost (Rs./ cage manufacturer)	share
Variable cost		
Raw Materials	81700000	90.30
Electricity	192000	0.21
Fuel	962000	1.06
Communication	12000	0.01
Casual labour	700000	0.77
Transportation	150000	0.17
Miscellaneous	50000	0.06
Interest on working capital	3664763	4.05
Total Variable cost	87430763	96.64
Fixed cost		
Depreciation	425520	0.47
Interest on fixed	1418400	1.57
Permanent labour	1200000	1.33
Total Fixed cost	3043920	3.36
Total Cost	90474683	100
Gross Revenue	120000000	
Net Revenue	29525318	
BC Ratio	1.33	

The investigation into the costs and return involved in GI pipe cage manufacturing revealed that total cost incurred in a year was Rs.8.68 crores while the gross revenue was Rs.12 crore resulting into net revenue of Rs.3.32 crore in a year. Since cage manufacturer has to procure raw material for the fabrication of cages which contribute to huge chunk of cost accounting for about 90.30 percent (Rs.8.17 crores) while the fixed cost contribute merely 3.51 percent (Rs.3.04 lakhs) of total cost of production, respectively. Apart from procurement of raw materials which is single most important factor in deciding cost of production, all other cost has insignificant not more than 2 % contribution in the total cost. Apart from interest on fixed cost (1.63%), permanent labour (1.38%) and fuel (1.11%) no other cost contributes more than 1% in the total cost. Outcome of this result reveals and validates that cage manufacturing

is a capital intensive enterprise. Das et al.,(2009) in their comprehensive study on cage culture using locally available material like Bamboo for cage fabrication for fish seed rearing was found it to be economically and environmentally feasible. Hence there was a need to find alternative cost effective raw material for cage fabrication which will significantly reduce cost of production making cages economically affordable for resources poor communities residing along the periphery of the reservoirs who were the main beneficiaries of cage culture in Jharkhand.

Constraints faced in cage manufacturing

The cage manufacturers mainly caters cages to public sectors which provide cages to resource poor communities embedded with 90 percent subsidy making it affordable. The major constraints faced by cage manufacturer are listed in table 3 and discussed below.

Table 3: Constraints faced by cage manufacturers

Sl.no	Particulars
1	Low demand
2	Lack of government support
3	Delay in sanctioning tenders and releasing of payments
4	Non accessibility to remote areas of Jharkhand due lack of transportation infrastructure
5	Insurgency
6	Lack of stable government
7	Lack of skill labour
8	High cost on raw material
9	Difficulty in assembling the cage especially during monsoon
10	Risk of encountering wild animal

1.Low demand: Cage culture on commercial scale in reservoirs is new concept and its was just at the nascent stage of its growth India. At present cage culture in reservoirs in Jharkhand is being developed as rehabilitation strategy and only displaced communities who economically weak are encourage for cage culture and entry private players are restricted. The cages are annually allotted to different reservoirs under different central and state schemes based on the budget allocation under respective schemes. Hence all these reason contribute to low demand and restriction of private players for cage culture in reservoirs is the major factor contributing low demand.

2.Lack of Government support: Under the present arrangement for cage culture under different schemes both state and central there was no provision of any financial assistance or capacity building framework by government. Lack such supports from government has hindered the cage manufacturer to scale up the capacity and enhance the quality of cage manufactured making it more durable.

3. Delay in sanctioning tenders and releasing of payments: Since cage culture in reservoirs of Jharkhand is carried out on centrally and state sponsored schemes and lack of private players results in monopoly of government in deciding number of cages being installed in a particular reservoirs. So, the cage manufacturer has depend on government to make tender for cage requirement which is a very slow process. The delay in release of payment causes leads cash crunch and stress in

the repayment of loans. Therefore there is need to make the process of sanctioning of tenders and repayment swift and more simplified for ease of doing business with government to encourage more private players in cage manufacturing business as the demand for cage is expected to increase has government has recognised cage culture instrumental in meeting the blue revolution goals.

4.Non-accessibility to remote areas of Jharkhand due to scarcity transportation infrastructure: Remoteness and non-accessibility due to scarcity of transportation infrastructure is a major constraint met by cage manufacturers since cages needs to be assembled near the site, hence transportation of cage material to the site for assembling is met with great difficulty due remoteness and lack for of proper transportation infrastructure. Since Jharkhand state has one of the lowest stretch of road connectivity in the nation and government need to focus more on road connectivity which can act as stimulus in state GDP.

5.Insurgency: Jharkhand is one of the worst Naxalite affected state in India which poses immense risk of collateral and economic damage while carrying out any economic activity in those infected areas. As most of reservoirs are located in remote areas of Jharkhand, hence of risk of encountering with Naxalite is very high which poses immense risk of collateral and economics loss to cage manufacturers.

6.Lack of stable government: Jharkhand state since its inception of on 15th November 2000

until last government under Raghubar Das has never completed its term. This has caused lots of instability in the state and also hindered the execution and implementation of various state and centre schemes effectively due to frequent transfers of executives with the change in government which is a common and normalised practised in Indian politics. However this practise of transfers of executives with the change in the government cause delay and inefficiency in the implementation which in turn result in loss of exchequers money. Therefore existence of stable government is essential for implementation of schemes effectively and it also saves leakage of exchequers money in unproductive activities.

7.Lack of skill labour: As commercial cage culture is new concept in reservoirs and hence there is lack of skill labour which can be employed for manufacturing cage culture. As while construction of cage culture lots of aspects like tension, buoyance and safety while operating cage culture has to be taken care of, skilled and experience labour is an essential requirement is not available. There is need for short term vocational training programme in cage fabrication and manufacturing as employment opportunity which can also be embedded with some schemes to make it attractive for unemployed youth as livelihood option.

8.High cost on raw material: Apart from PVC drums which are discarded oil containers used as buoys in cages, rest all the materials are collected from market at the prevailing market prices which are quite expensive due to non-availability subsidy or tax relaxation. Hence in order to minimise the cost of construction government should exempt tax or provide subsidy on raw material which are used for cage construction.

9.Difficulty in assembling the cage especially during monsoon: Since cages need to be assembly at the site where it has to be installed which are mostly located in remote area which lack proper shelter poses immense hardship during monsoon. Therefore while planning for cage installation suitable site and

time should be selected wise to avoid or minimise such hardship.

10.Risk of encountering wild animal: Most of the reservoirs in Jharkhand are located in the remote areas hence risk of encountering with wild animals was high. Sometime such encounters with wild animal has high risk of economic and collateral damage. Due to this labourers sometime show unwillingness to work in such areas and demand higher wages which further increased the cost of construction. In order minimise the risk of economic and collateral damage site selection and safety measures from wild animal should be especially taken care of while planning for cage installation.

Recommendation and Policy measures

1.Recommended to shift from subsidy to low interest credit based scheme : Since the cages are embedded with subsidy and fisheries department base of budget procure cages from cage manufacturer and lack of private buyers there is lack of demand for cages. To increase the demand government should also allow private players enter into cage culture with the condition that the employees will from the displaced communities. This will serve two purposes that increasing the fish production and involving more displaced communities into cage culture and fisheries department in spite of spending money in subsidy will rather earn some revenue from private player by leaving some cess or lease amount which at the moment is almost negligible as lease policy for reservoir is yet to be finalised for the state.

2.Need to incentivise cage manufacturing through public support under MSME scheme: At the moment there is no centre or state loan or subsidy scheme for cage manufacturer in specific hence there is very few player in this business which are producing low cost cages. Therefore if government introduce some monetary incentive in cage manufacturing will attract some more player and this will also increase competition in cage manufacturing which may even bring down the cost of cages.

3. Required to find cost effective locally available raw material for cage manufacturing :

The cages were made of GI pipes and HDPE and cage manufacturers feel the cost of these raw material are high which finally decides the cost of cage. Therefore there is need to look for locally available cheap material as in reservoir the cages need not to be fabricated in way that have absorb high pressure and tension due to waves as in marine environment. In some south east Asian countries like Thailand cages are made from bamboo similar model can also be adopted to reduce the cost of production of cage.

CONCLUSION

The study concludes that manufacturing GI pipe cages was a capital oriented enterprise requiring high initial investment of Rs. Rs.8.68 per unit firm. From the cost and return analysis which was revealed that variable cost contribute about 96.64 percent in which raw material for the fabrication of contribute lion share in the total cost which was about 90.30 percent of the total cost with Rs.8.17 crores. This shows in order to make the cages more affordable there was need to find solution for cage fabrication from cheap locally available material like Bamboo which is practise in South East Asian countries like Thailand and Indonesia. Though cage culture was highly capital intensive it was found to be economically viable with BC ratio of 1.33. The cage manufacturer encounters some bottle necks like low demand, lack of government support and delay in sanctioning of tenders etc. which need to be addressed for ease of doing business.

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REFERENCES

- DoF, MFAH&D, (2019). Handbook on Fisheries Statistics 2018. Department of fisheries, Ministry of fisheries, Animal Husbandry & Dairying Government of India, Krishi Bhavan, New Delhi. p.167
- Sarkar, U.K., Sharma, J and Mahapatra, B. (2015). A Review on the Fish Communities in the Indian Reservoirs and Enhancement of Fisheries and Aquatic Environment. *Journal of Aquaculture Research Development.*, 06(01), pp.1–7.
- NFDB. (2015) .INFISH, National Fisheries Development Board Newsletter. Volume 6, Issue 4., January-March 2015
- Das, A.K., Vass, K.K., Shrivastava, N.P. and Katiha, P.K., (2009). Cage Culture in Reservoirs in India. (A Handbook) WorldFish Center Technical Manual No. 1948.
- ICAR-CIFRI. (1970). Annual Report 1970. ICAR-Central Inland Fisheries Research Institute, Barrackpore, pp.101.