

An Economic Appraisal of Composite Carp Culture in West Bengal

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ABSTRACT

Aquaculture sector is gaining momentum through its contribution towards Indian as well as world economy in terms of nutritional and livelihood security. Carp farming is one of the most widely adopted technologies in aquaculture sector. The study was carried out in randomly selected South 24 Parganas district of West Bengal. The study aims at assessing economic viability of composite carp culture through analyzing the cost and returns of the technology. Data were collected from 142 fish farmers through personal interview. The average pond area of the farmers was found to be 1.9 acre and mean fish yield was 3.6 t/ha/yr. Rate of return on total investment (ROI) and Benefit-Cost ratio (B: C ratio) for adopters and non-adopters were worked out as 85.84%; 1.86 and 63.03%; 1.63 respectively. Supplementary feed constituted the maximum share in cost of production of fish followed by lease value of pond and pond preparation cost. The study implies composite carp culture technology as economically feasible with impressive benefit-cost ratio.

Keywords: Composite carp culture; Economics; Benefit-Cost ratio; Constraints; West Bengal

INTRODUCTION

Fisheries and aquaculture are an important source of food, nutrition, income and employment in India. The sector provides livelihood to more than 25 million fishers and fish farmers at the primary level and twice the number along the value chain. At present, India is the second largest fish producing and second largest aquaculture nation in the world after China (DADF, 2019). The Gross Value Added (GVA) of fisheries sector in the national economy during 2018-19 was Rs 2,12,915 crore (current basic prices) which constituted

1.24% of the total National GVA and 7.28% share of Agricultural GVA (Anonymous, 2020). The sector has an immense potential in ushering economic prosperity of the country through doubling the income of the fishers and fish farmers. Foreseeing high potential, "Blue Revolution" has been initiated in the fisheries sector in order to focus mainly on increasing fisheries production and productivity from aquaculture and fisheries resources, both inland and marine with the objectives of ensuring food and nutritional security, generating employment and export

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earnings, ensuring inclusive development and empowering fishers and aquaculture farmers (DADF, 2019). The Union Government has also recently launched Pradhan Mantri Matsya Sampada Yojana with an investment of Rs 20050 Cr to turn India into a hot spot for fisheries and aquaculture product through appropriate policy, marketing and infrastructure support. Through implementation of this scheme the fish production is targeted at 22 MMT by 2024-25, while the current (2018-19) production is 13.75 MMT. To achieve this target freshwater aquaculture sector has to play a vital role through an additional fish production of 50 lakh tons. The national average productivity is also set at 5 t/ha. from the current productivity of 3 t/ha.

Inland fisheries and aquaculture contribute 71% of total fish being produced in the country. The freshwater aquaculture has also emerged as a major contributor towards inland fish production with a share of 80% (DADF, 2019). With a continuing increase in the world population and economic growth, it is anticipated that the demand for fish will increase to 30-50 MT by 2030 from the current level (Miao, 2013; Lekshmi et al. 2019). West Bengal is a state in the eastern region of India along the Bay of Bengal. The state has a total inland water bodies of 5.7 lakh ha in which tanks and ponds has the maximum share of 2.6 lakh ha followed by brackish water (2.1 lakh ha), beels (42082 ha), small, medium & large reservoir (28050 ha) and derelict water resources of 26925 ha (Anonymous, 2018). The inland fish production has gone up to 15.57 lakh tonnes in 2017-18 from 12.9 lakh tonnes in

2011-12. The state occupies second position after Andhra Pradesh in inland fish production among various states of India. The district South 24 Parganas has a freshwater resources area of 49237 ha constituting 8.63 percent towards the state inland resources and a production of 156111 tonnes i.e, 10 percent share of the state (Anonymous, 2018).

Composite carp culture is the stocking of different carp species viz., catla, rohu and mrigal (Indian major carps) together with three other exotic carps viz., silver carp, grass carp and common carp having different feeding habits. It has the potential to attract rural youth and stop migration for, it creates self-employment besides generating employment opportunities for others. Martin et al., (2013) suggested that fishing is a supplementary activity that will strengthen the livelihood of small-scale fish farmers and plays a significant role in poverty eradication through an increase in income, employment, and food security among the households having limited and poor quality of farmland. Right from seed production to harvest, freshwater fish farming offers number of enterprises for farmers in West Bengal in general and South 24 Parganas in particular. Hence this study was conducted with the following objectives *i.* To estimate cost structure and returns of freshwater fish culture in South 24 Parganas district and *ii.* To identify the constraints perceived by the fish farmers.

METHODOLOGY

The study was conducted in randomly selected South 24 Parganas district of West Bengal. The total geographical area of the

district is 9,960 sq. km with a total population of 81, 61,961 as per 2011 census. Multistage simple random sampling was adopted for the study. From the district, 4 blocks were selected randomly viz., Mathurapur, Sonarpur, Kultali and Jayanagar. Subsequently, 3 villages were selected from each selected block making the total no of villages to 12. From each village twelve fish farmers were chosen to make the total sample size 142. Both primary and secondary data were collected for the study. Primary data were collected from 142 fish farmers through personal interview using the pre tested structured schedule. Secondary data were collected through reviewing various literature, from Directorate of fishery, West Bengal and District Fishery Office, South 24 Parganas. The tabulated data were analyzed using suitable statistical tools viz., frequency and percentage.

Measurement and Scoring pattern

A total number of 13 practices that constitute composite carp culture technology were selected. The farmers were asked to respond whether they adopt or do not adopt the practices. Score of 1 and 0 were assigned to adoption and non-adoption of the technology respectively. Therefore, maximum possible score was 13 for each respondent. The respondents who scored 6 and above (i.e.,

farmers who adopted at least 50% of scientific practices), are considered as adopters and those who scored below 6 are marked as non-adopters of the technology. Among 142 respondents, 81 fish farmers were adopters and the rest 61 were non-adopters.

Economic Model

This study has employed Gross Margin Analysis (GMA) tool to measure the profitability from the practice of composite carp culture. GMA is a vital tool in measuring the level of farm profitability. A Gross margin (GM) is the difference between Gross income (Total Revenue) earned by the fish farm and the total variable costs required to produce the output (Firth, 2002). The total revenue is the total output multiplied by price per unit of fish. Fixed cost includes the lease value of ponds and interest on fixed capital. The variable costs are those costs that vary in direct proportion to the level of production. The total variable cost includes costs on inputs such as: fertilizers, transportation, labour cost, feeding cost and cost of other inputs like fingerlings etc. The above discussion can be represented in the following equation as follows:

Gross Margin = Total Revenue – Total Variable Cost

Let us suppose, GM = Gross Margin;
TR = Total Revenue;

Table 1.
Frequency Distribution of Respondents According to Adoption of Recommended Technology
(n=142)

Sl. No.	No. of practice adopted	Category	Frequency
1	≥6	Adopter	81
2	<6	Non-adopter	61

TVC = Total Variable Cost; TFC = Total Fixed Cost; S = Selling Price per unit; Q = Quantity Produced & Sold; V = Variable cost/unit

The rate of return on total investment can also be calculated to know the profitability of the proposed scheme as follows:

$$\text{ROI} = (\text{Net Margin} / \text{Total Cost}) * 100$$

Where Net Margin = Gross Margin - Non-operating Expenses

In the above formula Net margin is determined after paying non-operating expenses like interest on loan etc.

Identification of Constraints to Composite carp culture

Responses from the farmers were recorded on the basis of their agreement or disagreement towards a particular constraint with a score of 1 or 0 respectively. Frequency and percentage for each constraint were worked out, on the basis of which, the constraints were given rank order.

FINDINGS AND DISCUSSION

Comparison between the Economics of Composite Carp Culture of Adopter and Non-adopters (1 ha of pond area)

Economics appraisal of composite carp culture technology becomes essential in order to assess the profitability. This would enable the development functionaries to encourage and attract more fish farmers and rural youth towards the technology. A comparative study of input use and net profit was carried out between adopters and non-adopters. The costs, returns and profit in composite carp

culture were computed on per hectare basis and presented in Table 2.

The comparative economics of adopters and non-adopters is presented in Table 2. The average area of the non-adopter category was 1.84 ha and for adopter category it was 0.79 ha. A difference of Rs.223.72 only was found between lease values of both the categories. The average pond preparation cost for adopter category was Rs. 31734.73 whereas, it was Rs 28265.11 for non-adopter category making a difference of Rs. 3469.62. A difference of Rs.2378.62 and Rs. 3698.53 was observed in application of inorganic fertilizer and organic fertilizer respectively between the adopters and non-adopters. Maximum difference *i.e.*, Rs 17,608.30 was observed in feed cost between the two categories of farmers. In the case of adopters the cost of production per hectare was Rs 301173.18 whereas in the case of non-adopters it was Rs 275095.97 indicating a difference of Rs 26,077.21. The adopters are getting an average production of 3.9 t/ha/yr. against 3.2 t/ha/yr. that of non-adopters. The net margin of the adopters from 1 ha. of pond was around 1.5 times higher than that of non-adopters. The ROI for adopters and non-adopters were found 85.84% and 63.03% respectively. The B: C ratio was worked out and found 1.86 and 1.63 for adopters and non-adopters respectively. Hussain et al., (2013) in their study observed an increment of fish harvest up to 114% by adopting Composite Fish Culture. Gross profit to the tune of Rs. 2, 62,233 and Rs. 1, 25,500 per hectare were recorded from CFC and local practice with a net profit of Rs. 1, 44,067

Table 2.
Comparison between the Economics of Composite Carp Culture of Adopters and Non-Adopter (1 ha of pond area)

Sl. No.	Particulars	Non-Adopters (n=61)	Adopters (n=81)	
1.	No. of respondents	61	81	
2.	Total area (ha)	112.01	64.18	
3.	Average area (ha)	1.84	0.79	
4.	Leave value (Rs)	34464.33	34688.05	
5.	Pond prep. (Rs)	28265.11	31734.73	
6.	Seed cost (Rs)	19484.42	19906.51	
7.	Lime (Rs)	7098.47	7650.09	
8.	Inorganic fertilizers (Rs)	8945.41	6566.79	
9.	Organic fertilizer (Cow dung) (Rs)	10269.62	13968.15	
10.	Feed	Pelleted feed (Rs)	118114.45	132790.45
		Rice bran + oil cake (Rs)	3426.03	5994.45
		Others (Rs)	446.39	810.27
11.	Disease	354.88	942.72	
	Cost of harvesting (Rs)	10044.64	10028.05	
	Cost of labour, maintenance & misc (Rs)	34182.22	36092.93	
	Total variable cost (Rs)	240695.00	266485.14	
	Cost of production (Rs)	275095.97	301173.18	
	Total production (Kg/ha)	3203.96	3998.05	
	Total revenue (Rs)	448554.40	559727.00	
	Gross margin (Rs)	207859.40	293241.86	
	Net margin (Rs)	173395.07	258553.81	
12.	Rate of return on total investment (ROI)	63.03%	85.84%	
13.	B:C ratio	1.63	1.86	

and Rs. 61,700 per hectare and benefit-cost ratio of 2.21 and 1.96 respectively. The result reflects that production of fishes and profitability is more than double in CFC over the local practice which is because of adoption of good management practices.

Percentage share of inputs in Cost of Production (n=142)

The percentage share of various inputs in the cost of production was estimated. It is observed that supplementary feed (51%) constituted the maximum share towards the

cost of production of fish. Other inputs in decreasing order of % share were lease value of pond (13%), Pond preparation cost and cost of seed have a share of 11% and 7% respectively towards the cost of production. Cost of organic manure, cost of harvesting and cost of labour, maintenance & miscellaneous contributed 4 % each towards the cost of production. Whereas, cost of inorganic fertilizer and cost of lime contributed 3 % each towards the cost of production.

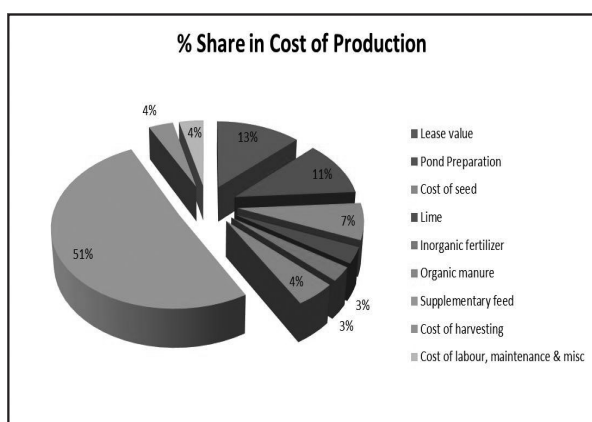


Figure 1. Percentage Share of Inputs in Cost of Production

Constraints perceived by the Fish farmers

Identification of constraints is an important aspect of any study in order to rework on those weak areas. An attempt was made to identify the constraints perceived by the respondent farmers that act as impediments affecting the growth of carp farming in the study area. Constraints were identified and presented in Table 3.

From Table 3 it is depicted that "High cost of supplementary feed" was the major problem perceived by 77.46 % of the respondent fish farmers. The reason is also

obvious because around 50 percent of their cost of production is incurred towards the cost of feed, hence, high cost of feed is a challenge for them. The second most severe constraint perceived by the fellow farmers (72.53%) was "disease outbreak". "Lack of access to credit facilities" and "High lease value of pond" were indicated by 69.01% and 64.78% of the respondent farmers respectively. High cost of feed, lack of financial support, high lease value of ponds and high cost of net hiring charges were among the constraints in freshwater aquaculture reported by Sahoo et al., (2016), Bhuyan et al., (2017), Pandey and Dewan (2006), Nisar et al., (2017) and Chidambaram et al., (2016). Sixty-eight per cent of the respondents perceived "Lack of need based training" as a barrier towards adoption of improved practices of carp farming. Inadequate training to scale up adoption of innovations and technologies was among the potential barriers faced by the fish farmers as reported by Solomon et al., (2009), Ifejika and Ayanda (2012) in their study observed that institutional training in aquaculture has boosted participants' knowledge to develop positive attitude to invest in fish farming. "Lack of exposure to mass media" and "Poaching" were among other constraints as perceived by 52.81% and 46.47% of the fish farmers respectively. Poaching of fish was one of the constraints in composite carp culture technology reported by Ananth et al., (2014) and Bhuyan et al., (2017). "Non-availability of bigger size fingerling" was the least perceived constraint by the respondent farmers (30.28%). Seed is not a major problem for them because of its easy availability in the area.

Table 3.
Constraints Perceived by the Fish Farmers (n=142)

Sl. No.	Constraints	Frequency	Percentage	Rank order
1	High cost of supplementary feed	110	77.46	I
2	Disease outbreak	103	72.53	II
3	Lack of access to credit facilities	98	69.01	III
4	Lack of need based training	89	67.64	IV
5	High lease value of pond	92	64.78	V
6	Lack of exposure to mass media	75	52.81	VI
7	Poaching	66	46.47	VII
8	Non-availability of bigger size fingerlings	43	30.28	VIII

CONCLUSION

Adoption of any technology depends on the economics and rate of returns on investment from it. The B:C ratio of the adopter fish farmers was found to be much higher than control farmers. Carp culture has been proven to be profitable by this empirical study with net margin of adopters found to be 1.5 times than that of non-adopters. It signifies that the improved fish farming technology can be a driver in enhancing socio-economic status of the farmers. Kolkata city being in close proximity, the rural youth are increasingly getting engaged in fish farming as well as other nodes in fish value chain. The Government is also emphasizing on formulating district level fishery plan and a coordinated development of this sector involving all stakeholders in order to bring out the best from the available water resources. The constraints like "High cost of supplementary feed" and "Disease outbreak" act as barriers for the fish farmers of South 24 Parganas which needs to be addressed by concerned stakeholders.

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