

ECONOMICS OF AQUACULTURE IN SOUTH 24 PARGANAS DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT : Globally, ornamental fish production is a multibillion-dollar industry. The study was carried out to examine the economics of aquaculture in the selected farms in South 24 Parganas district of West Bengal during the culture period of 2017-2018. This was carried out through primary economic data from thirty farms, and then these raw data is thereby transformed to a unit of 5 Decimals, i.e. 202.3 mt² towards comparison and analysis purpose. Study reveals that average gross revenue was Rs. 223404 and average net revenue Rs. 107826. In input-output analysis average net operating income calculated as Rs. 92335 and operating ratio was 44.92%. The study revealed that the aquaculture industry can make a major contributor in earning foreign exchange and at the same time play a crucial role to the employment generation and socio-economic upliftment of rural people.

Key words : Aquaculture, economic analysis, prospects.

INTRODUCTION

According to Froese and Pauly (2014) fishes are the most diverse group of vertebrates, with 32,447 species. These fishes can be utilised to meet protein security and used as an instrument for recreational fascination by treating it as a pet. The varied enthralling beauty and shape of those fishes are attracting people from time immemorial; they were named as “Ornamental Fish” or “Aquarium Fish”. Aquarium as a hobby in India is nearly 70 years old and dates back to the pre-independence era (Rani *et al*, 2014). Overall ornamental fish trade in India was about 1.06 million US\$ during the year 2009 (Rani *et al*, 2014). India possesses diversified rich resources abound with attractive ornamental fishes in Andaman and Nicobar islands, Lakshadweep and Minicoy islands, Gulf of Kutch complex, Coast of Kerala, Gulf of Mannar and Palk bay. India has documented 150 economically important ornamental fishes and trade mainly indigenous freshwater species collected from rivers (Rani *et al*, 2014). In India, prominent among freshwater Indian ornamentals are Loaches, Eels, Barbs, Catfish, and Goby. About 90% of ornamental fish is traded from Kolkata port followed by 8% from Mumbai and 2% from Chennai

(Rani *et al*, 2014). Centuries back in many countries, aquarium fish keeping which started as a hobby, has now taken the shape of the multi-billion-dollar ornamental fish industry. Ornamental fish keeping is the second most popular hobby next to photography (Das *et al*, 2005; Singh and Ahmed, 2005). West Bengal is also sanctified with a wide range of indigenous ornamental fishes of biological as well as commercial importance. West Bengal is one of important state of ornamental fish trade in India (Mukherjee *et al*, 2000; Ghosh *et al*, 2003; Singh and Ahmed, 2005). Among the wild catch fishes exported from the country, West Bengal and the North-Eastern states are the major contributors (Mahapatra *et al*, 2006; Mandal *et al*, 2007). Most of the ornamental fish farms are located in North 24 Parganas, South 24 Parganas, Nadia, Hoogly and Howrah districts around Kolkata, so it is easy for the farmers to market their fish. The largest wholesale ornamental fish market in India is located here. The maximum amount of the fish are distributed to different states of India via train, bus or air. Some are sent abroad also. In this juncture, the present study was carried out to examine the economics of aquaculture in South 24 Parganas with a view to promote the trade

towards employment generation and livelihood enhancement.

MATERIALS AND METHODS

Sampling frame : To assess the economics of aquaculture of Bishnupur-II CD Block from Alipore Sadar sub-division was purposively selected as representative from the district of South 24 Parganas. A list of 150 families connected with aquaculture, who are living in the surrounding area of the selected block were prepared, and 30 families who are associated with this practice were randomly selected for questionnaire and interview. Similarly, ten wholesalers and ten retailers were also randomly selected for marketing analysis through interview and questionnaires.

Questionnaires and data collection : The questionnaire was developed in a logical sequence of that the target group could answer chronologically. For this study, a combination of the questionnaire, interview, Participatory Rural Appraisal (PRA) tool such as Focus Group Discussion (FGD) and cross-check interviews with key informants were used.

Data collection

Secondary data were collected from the available sources. Primary data were collected in 2017-18 using

pre-tested structured questionnaires and interview schedule. Collected data were suitably categorised, tabulated for interpretations, generalisations and implications.

Data analysis

The data were analysed statistically using the statistical package SPSS 20.0 computer program (SPSS Inc. Chicago, Illinois, USA). Microsoft Excel was used for the representation of data and results. To estimate the various cost and income (Shyam and Biradar, 2001) and to obtain profitability measures (Dhondyal, 1989) available standard procedures were followed.

RESULTS AND DISCUSSION

Capital cost

Capital cost for aerators, filtration units, water hose, miscellaneous, costs for equipments, small glass tanks, cement tanks were Rs. 326±36, Rs. 154±8, Rs. 24±0.5, Rs. 19±1, Rs. 524±40, Rs. 211 ±23, Rs. 4456±942 respectively, while total capital costs were Rs. 21344±1174.

In Table 2 when considering correlations of the capital cost of farms in South 24 Parganas, it is seen that there is significantly (1% level) high positive correlation between land lease and cost of fencing, small glass tanks

Table 1 : Average economics of aquaculture of South 24 Parganas (Unit: Rs.).

Particulars	Average raw value for 7.8 decimals (in Rs.)	Average converted value for 5 decimals (in Rs.)
Land (Lease amount)	23497.0	15002.7
Cost of fencing	1712.7	1094.3
Aerators	510.0	324.3
Filtration units	240.0	153.0
Water hose	37.0	23.3
Miscellaneous	30.0	19.0
Total	820.0	522.3
Small glass tanks	330.0	209.7
Cement tanks	7000.0	4438.0
Total capital costs	33357.0	21265.0
Electricity	29148.0	18589.3
Feed	39407.7	25183.3
Seed	57666.7	36740.7
Salary	30000.0	19209.7
Total variable costs	156222.3	99723.0
Interest on variable costs @ 11%	17184.0	10969.7
Depreciation @ 10%	3335.3	2126.3
Interest on capital costs @ 11%	3669.0	2339.0
Total fixed cost	24189.3	15435.3
Total Input (TFC + TVC)	180411	115158.3
OUTPUT	349458	222550.3
Total revenue	169046	107392.0
Productivity Index (PI)= OP/IP x 100	193.70	193.2

Table 2 : Correlation Matrix for Average Economics (unit 5 decimals) in connection with Capital Cost of aquaculture considering all the involved parameters in South 24 Parganas.

	Land (Lease amount)	Cost of fencing	Aerators	Filtration units	Water hose	Miscellaneous	Small glass tanks	Cement tanks	Total capital costs
Land (Lease amount)	1.000								
Cost of fencing	1.000**	1.000							
Aerators	0.959	0.962	1.000						
Filtration units	0.262	0.275	0.526	1.000					
Water hose	-0.980	-0.977	-0.882	-0.064	1.000				
Miscellaneous	-0.836	-0.844	-0.958	-0.748	0.710	1.000			
Small glass tanks	0.959	0.962	1.000**	0.526	-0.883	-0.958	1.000		
Cement tanks	.999*	1.000*	0.968	0.294	-0.973	-0.854	0.968	1.000	
Total capital costs	.999*	.999*	0.971	0.308	-0.969	-0.862	0.971	1.000**	1.000

*Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

and aerators and total capital cost and cement tanks. Also, a significantly (5% level) high positive correlation between cement tanks and land lease, total capital cost and land lease, cement tanks and cost of fencing, total capital cost and cost of fencing was observed.

Revealed with enter method of regression

Total Capital Cost (T.C.C) = 15496.38 + 2.085 X filtration units + 1.240 X cement tanks

The equation indicates that the most important variables (average value calculated for five decimals area, in all the cases) are filtration units and cement tanks which showed positive impact upon the capital cost.

By observing adjusted R² value (1.0), it can be concluded that electric both parameters explain 100% variability in total capital cost.

Variable cost

The analysis depicted the variable cost value (unit: 5 decimals) for the electricity cost, feed cost, seed cost and salary cost were Rs. 18658 ± 955, Rs. 25271 ± 672, Rs. 36881 ± 2234 and Rs. 19274 ± 1113, respectively. The total variable cost was Rs. 100085 ± 1587.

From Table 3, when considering correlations of the variable cost of farms in South 24 Parganas, it is seen that there is no significant (1% level) high positive correlation between any parameters. Beside this, there was no significant (5% level) high positive correlation between any parameters.

Revealed with enter method of regression

Total Variable Cost (T.V.C) = 105515.1 + 0.952716 X Feed + (-1.53084) X Salary

The equation indicates that the most important variables (average value calculated for five decimals area, in all the cases) are feed and salary, which showed positive and negative impact upon variable cost,

respectively.

By observing adjusted R² value (1.0), it can be concluded that electric both parameters explain 100% variability in total capital cost.

Fixed costs

The fixed cost for aquaculture includes interest on variable costs (@ 11%), depreciation (@ 10%) and interest on capital costs (@ 11%). The values were Rs. 11009±175, Rs. 2134±117 and Rs. 2348±129, respectively.

In case of total fixed cost the average value is Rs. 15492±420. From Table 4, when considering correlations of fixed costs of farms in South 24 Parganas, it is seen that there is a significant (1% level) high positive correlation between interest on capital costs and depreciation. Also, there was observed a significant (5% level) high positive correlation between depreciation and total fixed costs and total fixed costs and interest on fixed costs.

Revealed with enter method of regression

Total Fixed Cost (T.F.C) = -82199.5 + (-1.010) X Total capital costs + 0.947183 X Gross revenue

The equation clearly indicates that the most important variables (average value calculated for five decimals area, in all the cases) are total capital costs and gross revenue which showed negative and positive impact upon fixed cost respectively. By observing adjusted R² value (1.0) it can be concluded that electric both parameters explains 100% variability in total fixed cost.

Total Profit (T.P) = -82199.5+ (-1.010) X Total capital costs + 0.947 X Gross revenue

The equation indicates that the most important variables (average value calculated for 5 decimals area, in all the cases) are total capital costs and gross revenue which showed negative and positive impact upon profit

Table 3 : Correlation Matrix for average economics (unit 5 decimals) in connection with variable cost of aquaculture considering all the involved parameters in South 24 Parganas.

	Electricity	Feed	Seed	Salary	Total variable costs
Electricity	1.000				
Feed	0.365	1.000			
Seed	0.493	-0.630	1.000		
Salary	-0.734	0.365	-0.953	1.000	
Total variable costs	0.935	0.012	0.769	-0.927	1.000

Table 4 : Correlation Matrix for average economics (unit 5 decimals) in connection with Fixed Cost of aquaculture considering all the involved parameters in South 24 Parganas

	Interest on variable costs @ 11%	Depreciation @ 10%	Interest on capital costs @ 11%	Total fixed cost
Interest on variable costs @ 11%	1.000			
Depreciation @ 10%	0.989	1.000		
Interest on capital costs @ 11%	0.989	1.000**	1.000	
Total fixed cost	0.996	.998*	.998*	1.000

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

respectively. By observing adjusted R^2 value (1.0), it can be concluded that electric both parameters explains 100% variability in total capital cost.

In South 24 Parganas average T.C.C involved was Rs. 21344 with most important variables were cost involved for filtration units and cement tanks (100% variability explained), average T.V.C. in South 24 Parganas was Rs. 100085 with most important variables were cost involved for seed (positive impact) and salary (negative impact) (100% variability explained), average T.F.C in South 24 Parganas recorded was Rs. 15491 with most important variables were gross revenue (positive impact) and total capital cost (negative impact) (100% variability observed). From analysis, it was found that average operating income over South 24 Parganas was Rs. 123318.

CONCLUSION

Future landscape of any trade can be judged on the basis of the economic analysis, market viability along with the demand of the product on the basis of its present status. Costs and returns involved in any trade are very essential to throw light towards formulating the appropriate management strategies for its sustainability and profitability. West Bengal has a great potentiality in ornamental fish culture with high economic aspect. Aquaculture shows a powerful reflection of women empowerment. From the standpoint of the country's export promotion and foreign exchange earnings this field may be emerged as a dark horse in the coming days if cared with importance, where it requires the attention of the government towards the industry. These fishes are mostly collected from the wild, so continuous and unscrupulous collection from the wild will result the

population declination and even complete disappearance of these species from nature in near future, so to keep the sustainable supply, captive breeding and rearing of these fishes should be promoted.

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