

# **Economic Analysis of Scampi (*Macrobrachium Rosenbergii*) Polyculture in Selected Ponds at Contai Subdivision in Purba Medinipur District of Coastal West Bengal During 2014**

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**ABSTRACT:** Prawn farming is an important part of the rural economy from social and economic point of view. Unlike shrimp production, the majority of prawns are sold for local consumption. The potential for higher farm income through remediation of currently idle ponds will provide a significant incentive for farmers to make them back on scampi farming. Factors encouraging prawn farming expansion are compatibility with agriculture, small farmers can practice in their own land, opportunities for women's involvement, no interference with mangrove or environment, safer i.e. not susceptible to SEMBV/WSSV disease or frequent tidal bores as in marine shrimp. This can be normally grown in salinity up to 10 ppt, having large potential areas all over the districts, increased demand in urban domestic market, subsidies from state and central agencies, higher market price & existing export demand. Technical constraints are related to the inability of scampi farmers to apply appropriate technology that determines the quantity and quality of scampi. Also the system is lacking to monitor water qualities which have significant impacts, Besides all these, Government's efforts in implementing a proper planning and management oriented marketing strategies are required for the sustainability of the industry which in turn accelerate the livelihood generation of the fisher.

**KEY WORDS:** Rural Economy, Prawn farming, Export marketing, Technological Back up, Livelihood generation.

## **I. INTRODUCTION**

Since 1995 there has been a rapid global expansion of freshwater prawn production (New, 2005). A large amount of that production has taken place in China and there has been rapid expansion in India and Bangladesh (New, 2005). Semi-intensive culture has been the most common production system for *M. rosenbergii* in Southeast Asia (Lee and Wickins, 1992). While environmental impacts of individual prawn farms are less than marine shrimp farms, high concentrations of farmers practicing semi-intensive to intensive culture can quickly degrade water quality within an area. Semi intensive is defined by stocking densities of 4-20 pcs/m<sup>2</sup>, incorporation of fertilization and feeding, and production of 500-5,000 kg ha<sup>-1</sup>year<sup>-1</sup> (Valenti and New 2000). This requires frequent water exchange to maintain suitable water quality (Siddique *et.al* 1999) and nutrient rich effluent discharged into public waterways results in eutrophication and poor water quality for multiple users (Derun *et al.* 2004). Alternative systems would isolate production from the surrounding environment and/or recycle nutrients produced in prawn culture to generate other crops which have market value and will retain nutrients and reduce nutrient discharge (Derun *et al.* 2004). Closed systems with zero to little water exchange cause less pollution and also reduce the risk of introducing external pollutants and pathogens into culture ponds (Derun *et al.* 2004). While these systems can reduce environmental impacts and associated effects, farmers must first recognize a problem and adopt the system. Attempts were also made to improve the nutritional quality of *M. rosenbergii* with different feeds with probiotics. In that regard the purpose of this survey was to address the following aspects of prawn culture: determine the types of production systems and

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management strategies utilized, to find out the relationship among different input variables associated with the economics of prawn farming and the level of production and net profits associated; describe the social framework of the industry and the availability of technical assistance and information for farmers; identify variables that have significant influences on production and net profits as these may provide insight into the economic viability of the recycling system as well as inform future research; in addition, determine if farmers perceive environmental effects of culture practices and recognize how they subsequently affect production; finally, assess the sustainability of the industry and feasibility for adoption of environmentally sound culture systems and to offer recommendations for future research.

## II. MATERIALS AND METHODS

The present study is based on traditional *Macrobrachium rosenbergii* polyculture with IMCs conducted in Khejuri I and Bhagbanpur-2 block of Purba Medinipur district, West Bengal during the months of February 2014 to July 2014. Before the commencement of fieldwork, a pilot survey was conducted during the month of January 2014. Purposive sampling method was used while selecting the study area. West Bengal ranks first in total area utilized in scampi farming and ranks second in production with respect to all the states of India. The bulk of the culture of giant freshwater (*Macrobrachium rosenbergii*) is mainly centered in Purba Medinipur. Purba Medinipur is characterized by ideal range of pH, salinity, low turbidity and low vegetative coverage. These characters are ideal for sustainable and economically profitable for *Macrobrachium rosenbergii* culture. The socio-economic composition of age, educational qualification, sex ratio, marital status and family size of the scampi farmers has play crucial effect on scampi production in this district. The demographic composition of the income earners such as: farm area, duration of farming and knowledge are affects on farming and result in one of the highest scampi producing district in West Bengal. This brings up very important issue of real wage in the district which determines the economic well being of the large number of agricultural labours in Purba Medinipur. All above reasons lead to the consideration of Contai Subdivision of Purba Medinipur district for its purposive selection at Stage- 1 of the sampling frame. The next step of this work is associated with selection of study villages of selected block. Four villages (2 Villages from each block) are scheduled for purposive sampling and collection of secondary data. The selected villages are Talla and Mukutshila of Khejuri-I and Betal-Khaital and Gurgram of Bhagbanpur-2 block. The present study is mainly associated with the prawn farmers by random sampling for collecting the raw data. A questionnaire was scheduled for collection of data from the respondents and the number of farmers are twenty (5 from each block).

## III. RESULT & DISCUSSION

The Concise Analytical Discussion for Average Economics (unit 1 bigha) in connection with all Cost for Scampi Farming considering all the involved parameters during 2014, over Contai Subdivision is narrated below in Table-1.

Table 01: Average Economics of Scampi polyculture at Bhagabanpur-II and Khejuri-I Block, Purba Medinipur during 2013: Schedule Depicted on Pond Size of 1333.33 m<sup>2</sup> (1 Bigha)

A	Capital Cost (C.C.)	Amount in Rs.
	Lease amount	3280.95
	Construction of ponds	5587.93
	Inlet and outlet structure of pond	212.36
	Pump house cum workshop	245.14
	Watchman shed	352.02
	Pumps	3190
	Electric installation with electrification	157.57
	Land and farm equipments (including maintenance charge for all machineries)	2120.24
	Miscellaneous	245.21
	<b>Total Capital Cost (TCC) (Rs.)</b>	<b>15391.43</b>
B	Variable Cost (V.C.)	

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	Chemicals and manure	871.71
	Cost of prawn seeds	15711.90
	Cost of IMC (fingerling/table size)	4626.67
	Cost of feed	21760.48
	Fuel charges	493.19
	Electricity charges	714
	Labour charges	2720
	Medicines	422.40
	Annual maintenance and repairing cost	1416.67
	Miscellaneous	361.10
	<b>Total Variable Cost (TVC) (Rs.)</b>	49098.12
<b>C</b>	<b>Fixed Cost (F.C.)</b>	
	Depreciation on capital cost @ 7%	1077.40
	Interest on capital cost @ 13.2%	2031.67
	Interest on variable cost @ 13.2%	6480.95
	<b>Total Fixed Cost (TFC) (Rs.)</b>	9590.02
<b>D</b>	<b>Income</b>	
	<b>A. Prawn</b>	
	Average stocking density (no/m <sup>2</sup> )	2.36
	Average survivability @	0.796
	Total number of species survive	2494.26
	Average body weight (gm)	56.4
	Total biomass (Kg)	139.37
	Average selling price (Rs.)	435.5
	Income (Rs.)	70276.6
	<b>B. IMC and Exotic carps</b>	
	Average stocking density (no/m <sup>2</sup> )	1.1
	Average survivability @	0.74
	Total number of species survive	1081.35
	Average body weight (gm)	303
	Total biomass (Kg)	327.42
	Average selling price (Rs.)	109
	Income (Rs.)	35789.53
<b>E</b>	<b>Total Income (A+B)</b>	106066.13
<b>F</b>	<b>Total Expenditure (TVC+TFC) (Rs.)</b>	58688.14
<b>G</b>	<b>Profit (Total Income - Total Expenditure)</b>	47377.98
	<b>Ratio of Income (Prawn : IMC)</b>	1.97
	<b>Contribution of Prawn in Profit</b>	31551.98
	<b>Contribution of IMC in Profit</b>	15826.01

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From (Table 02.03 & 04 ) it depicted the bivariate inter-correlation among all the variables of Total Capital Cost (TCC) (Rs.) (average value calculated for 1 bigha area, in all the cases) viz. lease amount, construction of pond, inlet and outlet structure, pump house cum workshop, watchman shed, pumps, electric installation, land and farm equipments, miscellaneous and capital cost under consideration.

Table 02 : Correlations Matrix of Scampi polyculture at Contai Subdivision, Purba Medinipur during 2014: Schedule Depicted on Pond Size of 1333.33 m<sup>2</sup> (1 Bigha)

	Lease amount	Construction of ponds	Inlet and outlet structure of pond	Pump house cum workshop	Watchman shed	Pumps	Electric installation with electrification	Land and farm equipments	Miscellaneous	Total Capital Cost (TCC) (Rs.)
Lease amount	1									
Construction of ponds	.647	1								
Inlet and outlet structure of pond	-.436	-.849	1							
Pump house cum workshop	-.055	.274	-.010	1						
Watchman shed	-.663	-.851	.903(*)	.252	1					
Pumps	.111	-.283	.543	-.483	.153	1				
Electric installation with electrification	-.901(*)	-.855	.775	-.042	.859	.244	1			
Land and farm equipments	-.913(*)	-.723	.694	.278	.885(*)	.017	.945(*)	1		
Miscellaneous	-.597	-.211	-.286	-.420	-.091	-.379	.305	.226	1	
<b>Total Capital Cost (TCC) (Rs.)</b>	<b>.985(**)</b>	<b>.665</b>	<b>-.370</b>	<b>.036</b>	<b>-.611</b>	<b>.189</b>	<b>-.859</b>	<b>-.852</b>	<b>-.701</b>	<b>1</b>

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

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

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Table 03 : Correlations Matrix of Scampi polyculture at (Station- 1), Purba Medinipur during 2014: Schedule Depicted on Pond Size of 1333.33 m<sup>2</sup> (1 Bigha)

	Chemicals and manure	Cost of prawn seeds	Cost of IMC (fingerling/ta ble size)	Cost of feed	Fuel charges	Electricity charges	Labour charges	Medicines	Annual maintenance and repairing cost	Miscellaneous	Total Variable Cost (TVC) (Rs.)
Chemicals and manure	1										
Cost of prawn seeds	.327	1									
Cost of IMC (fingerling/t able size)	.270	-.708	1								
Cost of feed	-.870	-.328	-.268	1							
Fuel charges	-.567	-.579	.363	.171	1						
Electricity charges	.636	-.253	.763	-.803	.260	1					
Labour charges	-.894(*)	-.065	-.293	.809	.397	-.652	1				
Medicines	.017	-.091	.181	.413	-.501	-.309	.218	1			
Annual maintenance and repairing cost	-.911(*)	-.516	.049	.646	.852	-.262	.775	-.210	1		
Miscellaneous	-.834	-.674	.281	.624	.857	-.130	.713	-.061	.967(*)	1	
<b>Total Variable Cost (TVC) (Rs.)</b>	-.201	.831	-.797	.210	-.369	-.640	.489	.129	-.066	-.231	1

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

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

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Table 04: Correlations Matrix of Scampi polyculture at (Station- 1), Purba Medinipur during 2014: Schedule Depicted on Pond Size of 1333.33 m<sup>2</sup> (1 Bigha)

	Depreciation on capital cost @ 7%	Interest on capital cost @ 13.2%	Interest on variable cost @ 13.2%	Total Fixed Cost (TFC) (Rs.)	Total Expenditure (TVC+TFC) (Rs.)	Profit (Total Income - Total Expenditure)	Contribution of Prawn in Profit	Contribution of IMC in Profit
Depreciation on capital cost @ 7%	1							
Interest on capital cost @ 13.2%	1.000(**)	1						
Interest on variable cost @ 13.2%	.603	.603	1					
<b>Total Fixed Cost (TFC) (Rs.)</b>	.898(*)	.898(*)	.892(*)	1				
Total Expenditure (TVC+TFC) (Rs.)	.672	.672	.996(**)	.929(*)	1			
Profit (Total Income - Total Expenditure)	-.017	-.017	-.157	-.096	-.148	1		
Contribution of Prawn in Profit	-.029	-.029	-.056	-.047	-.056	.991(**)	1	
Contribution of IMC in Profit	.016	.016	-.399	-.211	-.369	.937(*)	.881(*)	1

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

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

Firstly, considering the correlation between Lease amount with other variables, there exist a significant moderate positive correlation with Construction of ponds, moderate negative correlation with Inlet and outlet structure of pond cost, low negative correlation with Pump house cum workshop, moderate negative correlation with Watchman shed, low positive correlation with Pumps, high negative correlation with Electric installation with electrification, high negative correlation with Land and farm equipments moderate negative correlation with Miscellaneous and a significant high positive correlation with Total Capital Cost (TCC) (Rs.). Secondly, considering the correlation between Construction of ponds with other variables, there exist a significant high negative correlation with Inlet and outlet structure of pond, Watchman shed and Electric installation with electrification, low positive correlation with Pump house cum workshop, low negative correlation with Pumps, and Miscellaneous, moderate positive correlation with Total Capital Cost (TCC) (Rs.). Thirdly, considering the correlation between Inlet and outlet structure of pond with other variables, there exist a significant high negative correlation with Watchman shed, moderate positive correlation

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with Pumps, Electric installation with electrification and Land and farm equipments, low negative correlation with Pump house cum workshop, Miscellaneous and Total Capital Cost (TCC) (Rs.). Fourthly, considering the correlation between Pump house cum workshop with other variables, there exist a significant low positive correlation with Watchman shed, Land and farm equipments and Total Capital Cost (TCC) (Rs.), low negative correlation with Pumps, Electric installation with electrification and Miscellaneous cost. Fifthly, considering the correlation between Watchman shed with other variables, there exist a significant high positive correlation with Land and farm equipments and Electric installation with electrification, low positive correlation with Pumps, low negative correlation with Miscellaneous moderate negative correlation with Total Capital Cost (TCC) (Rs.). Sixthly, considering the correlation between Pumps with other variables, there exists a significant moderate positive correlation with Electric installation with electrification, Land and farm equipments and Total Capital Cost (TCC) (Rs.), moderate negative correlation with Miscellaneous. Seventhly, considering the correlation between Electric installations with electrification with other variables, there exists a significant high positive correlation with Land and farm equipments, moderate positive correlation with Miscellaneous, high negative correlation with Total Capital Cost (TCC) (Rs.). Eighthly, considering the correlation between Land and farm equipments with other variables, there exists a low positive correlation with Miscellaneous, high negative correlation with Total Capital Cost (TCC) (Rs.). Finally, considering the correlation between Miscellaneous with other variables, there exists a moderate negative correlation with Total Capital Cost (TCC) (Rs.).

The linear regression equation taking capital cost as dependent variable and other variables viz. lease amount, construction of pond, inlet and outlet structure, pump house cum workshop, watchman shed, pumps, electric installation, land and farm equipments, miscellaneous and capital cost as independent variables. The equation revealed as below:

$$\text{Total Capital Cost (TCC) (Rs.)} = 67152.748 + (-62.169 \times \text{Pump house cum workshop}) + (-5.377 \times \text{Watchman shed}) + (-2.983 \times \text{Pumps}) + (-102.406 \times \text{Miscellaneous})$$

The equation clearly indicates that the most important variables (average value calculated for 1 bigha area, in all the cases) are Miscellaneous and Pump house cum workshop. Both of them have negative impact upon Total Capital Cost (TCC) (Rs.). All the other independent variables have negative impact upon Total Capital Cost (TCC) (Rs.). The 95% Confidence Interval i.e. the lower and the Upper boundaries are depicted as: Pump house cum workshop (-62.169, -62.169), Watchman shed (-5.377, -5.377), Pumps (-2.983, -2.983), Miscellaneous (-102.406, -102.406).

## IV. CONCLUSION

Prawn farming is predominantly a cooperative and lucrative venture and does not necessitate higher education and specialized training but proper management and monitoring inclusive of prawn survival, daily monitoring of prawn behaviour, on-farm and off-farm prawn-health checks, pond water-quality monitoring parameters included pH, salinity, dissolved oxygen, nutrients (N and/or P), water colour and turbidity, sediment condition and quality of influent and effluent waters. Farmers work together holding local management meetings, sharing information with neighbours. Despite the risk involved, prawn farming yields higher net profits than most other occupations and farmers rarely subsidize their income with other activities. The majority of surveyed farmers preferred prawn farming to previous activities viz. agriculture, goat farming etc., planned to improve their operations and would like more information about prawn farming. In spite of all the major constraints, still prawn culture can give miracles towards socio-economic development for a large number of rural people. But the only factor that is pulling them back is low growth rate and mortality. The distinct quality measures, application of scientific method, export policy promotion, proper quality control mechanism targeted to marketing strategy and product promotion, and presence of recent day technology, sustainable market price, insufficient supply of institutional credit and such other ancillary facilities are the crucial factors, for sustainability and long term viability of prawn farming industry. The adoption of such measures can revive the scampi industry and make it a major contributor in earning foreign exchange for our country and at the same time play a crucial role to the employment generation and socio-economic upliftment of a major portion of coastal rural fisher folk.



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## BIOGRAPHY



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