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ECONOMETRIC MODELLING OF SHRIMP (Penaeus monodon, fabricius) FARMING AT NANDIGRAM-II BLOCK, PURBA MEDINIPUR DISTRICT (W.B.)

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Abstract: Aquaculture activities are the main livelihood for a large number of coastal populations. Various factors such as over uses of different chemicals, input of technical knowledge at the crisis time, quality control mechanism targeted to marketing strategy, sufficient supply of institutional credit and Government involvement in the export process, have caused the profit margin to a decline in 2012 with respect to previous years. An econometric modeling indicates and identifies the major factors. Assurance regarding an optimum output cannot be given even after taking the risk of huge investment. The export policy promotion and distinct quality measures are the major thrust area for the recent days. The requirement of Government's efforts in implementing a proper planning and management oriented marketing strategies is necessary for the sustainability of the industry. The adoption of such measures can revive the shrimp industry, livelihood of the farmers, associated persons and make it a major contributor in earning foreign exchange.

Key Words: Shrimp, Export Policy, Quality Measures, Training, Sustainable Development

I.INTRODUCTION

Shrimp becomes an important item in the world aquaculture scenario. Presently Now-a-days Taiwan, Indonesia, Thailand and India are known as global leaders in shrimp production. In order to fulfill the scarcity of the huge demand, shrimp farming (with intensive application of fertilizers and chemicals to boost the productivity) has been undertaken by many countries. Sustainability of shrimp farming is emerging as a major policy concern in the context of further development of shrimp farming as a money spinner. The Food and Agricultural Organization (FAO) predicts that in the 21st century, world consumption of aquatic proteins will increase to 150-160 million tons. High stocking density, inappropriate and excess use of chemicals, fertilizers and accumulation of excess feed in the pond bottom makes the soil acidic and unsuitable for any further use either for agriculture or other fish culture, at least in the short run. This leads to the problem of irreversibility of environmental damage created by a particular economic activity. On the other hand, farmers adopting high yielding intensive and semi-intensive shrimp farming (which are subject to degradation of the quality of land and water) are at a higher financial risk. The sustainability of shrimp culture systems refers to both the ecological sustainability and the economic sustainability, which is the capacity of the production system to produce a positive income in the long run. Even if a production system scores high in terms of ecological sustainability, it will not be adopted by farmers if it does not provide sufficient income. The necessity of procuring a stable return from shrimp farming in the long run assumes additional importance in the case of developing countries where the village households invest their scarce resources into shrimp culture and even convert their agricultural lands into shrimp ponds. Thus, an economic assessment of the shrimp culture systems must consider the financial risks associated with them. In this backdrop the present paper attempts to examine the economic viability of shrimp culture over last two years i.e. 2011 and 2012 by incorporating the costs incurred due to generation of negative externality and the risks The bulk of the culture of peneaid shrimp is mainly centered in three coastal districts in West Bengal, i.e. North 24 Parganas, South 24 Parganas, and Purba Medinipur. Among these districts Purba Medinipur holds a renouned position in the shrimp production (MPEDA/NACA, 2003). The farms are capable of producing 1-1.5 ton/ha/crop with proper water management, selective stocking of quality shrimps seeds, use of pellatized feed and use of artificial aeration system the. Purba Medinipur district which has 5618.22 ha of culturable brackish water area and this type of extensive system and semiintensive farming systems are mainly done here.Among this 3342 ha of potential areas are suitable for shrimp farming (Upadhyaya, A.S., 2001; Abraham et al 2004). Shrimp culture is now considered as one of the leading economic activities in this districts. Shrimp farming judiciously utilises the fallow, unproductive and marginally productive lands and also generates employment in rural areas. It is also responsible for increasing production to strengthen nutritional security and for increasing foreign exchange earnings.

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II.MATERIALS AND METHODS

The present study was carried out around the coastal belt of Purba Medinipur district particularly in Nandigram-II block in W.B. during June to September 2011 & 2012 to evaluate the present status and problems of shrimp (*P. monodon*) culture practices going on and to develop econometric model forprime factors and their relationship. A random sampling of ten villages (viz. Bhekutia, Manuchak, Sherkhanchak, Terapekhia, Asadtala, Sindurtia, Amratala, Basulichak, Mahammadpur and Durgapur) and from each village five numbers i.e. in total 50 nos of shrimp farmers were interviewed to fulfil the purpose. Two ways were used for Data collection; collection of existing data (secondary data) such as published literature, books, research articles and maps etc. of institutions. Literature survey provided information regarding the present status, current problems and related legislation. The collection of new data by filling of questionnaires was carried out. The collected data are later analyzed statistically through SPSS 13.0 software.

III.RESULTS AND DISCUSSION

The main reason for adopting shrimp farming is for its huge return within a very short period of time. There is a huge risk in culturing and marketing the *P. monodon*, still they are practicing this system for the above reason. 73% of the farmers adopted shrimp farming as their major source of income, while 17% of them adopted this as their side income followed by10% with agriculture and horticulture. Among the farmers, 25% constructed their farms in their own land and rest 75% either in leased land or in their relative's land. As it is a capital-intensive farming, all are not that of well equipped to do the trade. Most of the shrimp farmers (74%) come from middle class family having annual income ranging from Rs.70,000 to Rs.1,20,000. 12% of the farmers are very rich having annual income above Rs. 1,20,000. Another 14% having annual income below Rs.50,000. There was a drastically change in the income profile of the shrimp farmers in 2012 as 80% farmers losses ranging between Rs. 4,00,000 to Rs. 7,00,000. No farmer makes profit. Remaining 20% farmer losses between Rs. 1,00,000 to 4,00,000. The farmers usually have no specialized training organized by different government institutes. But the level of awareness among the farmers regarding the techno-feasibility of shrimp culture is moderate. This is because they get the operational feedback from the feed company's representative and some sort of instructor on contractual basis. Few have obtained training from BFDA (Brackish Water Fish Farmers Development Agency) and MPEDA (Marine Product Export Development Authority). There are 40% small size farms ranging from 1,000 to 2,000 m^2. Most of the surveyed farms (53%) ranges from 2,000 to 5,000 m^2 and rest of the 7 % are more than 5,000 m^2. The number of ponds in a farm ranged from 1-6 in number. It was observed that 62% of the farms had 1-2 ponds, 21% with 3-4 ponds and 17% more than 4 ponds. 12% farms are almost 7 or more than 7 years old. Most of the farms (86%) are around 3 years old and very few (2%) are newly constructed farms. Most of the farms (80%) introduced hatchery raised seed from A.P. and W.B. followed by both hatchery born and wild seed (12%) and others (8%) incorporated seed from wild sources. Stocking density adopted by the farmers are varied from @ 3/m^2 to 18/m^2. Max nos of the farms were stocked with @ 11-14/m^2 (51%) followed by @ 7-10/m^2 (24%) and @ 15-18/m^2 (23%). Only 2% of the ponds stocked with @ 3-6 /m^2. The survey revealed that most of the farms used formulated commercial feed (C.P. Aqua, Water base, Avanti, Godgrej or Wockhart), while very few farms used local feed. The feeding rate was followed by the farmers as per the prescribed form of the feed company, which were of different sizes and grades. Feeding frequencies adopted by 52% of the farms are 4 times day^{-1}. Other 38% of the farms adopted 3 times in a day. Remaining 10% of adopted 2 times feeding day^{-1}. Three different types of feed are available in the market like starter, grower, and finisher. The avg. production recorded in the farms varied from <5,000 kg/ha in 12% of the farm to >6,900 kg/ha in 9% of the farms. Most of the farms (79%) recorded the average production in the range of 2301-2600 kg/ha/crop.From the observed data the correlation matrix (Table 2 & 4) depicts that for 2011 there is high significant negative correlation between (net profit, capital cost) and high positive correlation between(variable cost, fixed cost). Moreover for 2012 it depicts that there is high significant positive correlation between (Variable Cost , Capital cost), (net profit, fixed cost).The fitted regression equation considering net profit as dependent variable and fixed cost, variable cost and capital cost as independent variable, for 2011 it shows that the fixed cost and variable cost have negative impacton on net profit, whereas the capital cost has positive impact. The fitted equation is as follows:

$$\textit{Net Profit} = 854.747 + .987X \textit{ Capital Cost} - 3.817 X \textit{ Variable Cost} - 1.023 X \textit{ Fixed cost}$$

From the regression equation for 2012, it depicts that the fixed cost and variable cost have negative impacton on net profit, whereas the capital cost has positive impact. The fitted equation is as follows:

$$\textit{Net Profit} = 8263.500 + 12.500X \textit{ Capital Cost} - 15.000X \textit{ Variable Cost} - 8.000X \textit{ Fixed cost}$$

From the Principal Component Analysis (Extraction Method) among different costs and Net Profit for both 2011 and 2012, it depicts that the major factors are Capital cost and Variable cost to explain the variation for net profit (Table 3 & 5).

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TABLE 1: ECONOMICS(AVERAGE) OF P.MONODON PRODUCTION FOR THE YEAR 2011 & 2012(5000M2 POND) AT NANDIGRAM-II BLOCK

Sl. No.	Particulars	2011	2012	% Increases
A.	Capital Cost	Amount (Rs.)	Amount (Rs.)	
1.	Construction of ponds	1,25,000	1,50,000	120
2.	Inlet and outlet structure of pond, 2 Nos.	27,000	32,000	118
3.	Pump house cum workshop	23,000	25,000	108
4.	Watchman shed	14,000	16,000	114
5.	Pumps (15 HP)	40,000	44,000	110
6.	Aerators (1 HP) with accessories, 4 Nos.	78,000	86,000	110
7.	Electric installation with electrification	25,000	28,000	112
8.	Land and farm equipments	23,000	27,000	117
9.	Miscellaneous	16,000	18,000	112
	Total	3,71,000	4,26,000	115
B.	Variable Cost	Amount (Rs.)	Amount (Rs.)	% Increases
1.	Lease amount	90,000	1,10,000	122
2.	Water accumulation cost	8,000	10,000	125
3.	Chemicals and manure	19,000	23,000	121
4.	Cost of seeds	75,000	1,00,000	133
5.	Cost of feed	3,70,000	4,00,000	108
6.	Fuel charges	45,000	47,000	104
7.	Electricity charges	35,000	40,000	114
8.	Labour charges	92,000	1,16,000	126
9.	Medicines	50,000	60,000	120
10.	Annual maintenance and repairing cost	10,000	12,000	120
11.	Miscellaneous	30,000	40,000	133
	Total	8,24,000	9,58,000	116
C.	Fixed Cost	Amount (Rs.)	Amount (Rs.)	% Increases
1.	Depreciation on capital cost @ 10%	37,100	42,600	115
2.	Interest on capital cost @ 11%	40,810	46,860	115
3.	Interest on variable cost @ 11%	90,640	1,05,380	116
	Total	1,68,550	1,94,840	116
D.	Total Expenditure 5000m2 area for one crop	Amount (Rs.)	Amount (Rs.)	% Increases
1.	Variable cost	8,24,000	9,58,000	116
2.	Fixed cost	1,68,550	1,94,840	116
	Total Expenditure	9,92,550	11,52,840	116
E.	Total Income			
	Selling price @ Rs. 350/kg in 2011 and @ Rs. 170/kg in 2012 Note: Stocking density 28 Nos. Seed/m^2 = 28 X 5,000 =1,40,000, Survival @ 65%= 91,000 and Total biomass = 91,000 X 35 gm = 3185 kg	11,14,750	5,41,450	49
F.	Profit/Loss (Revenue – Total Expenditure)	Amount (Rs.)	Amount (Rs.)	
	Total	1,22,200	-6,11,390	
Average Net LOSS over 5000m2 area for one crop on 2012 = 6,11,390				

TABLE 2: CORRELATIONS MATRIX FOR DIFFERENT COSTS AT NANDIGRAM-II I REGION ON 2011

	Capital Cost	Variable Cost	Fixed Cost	Net Profit
Capital Cost	1			
Variable Cost	.610	1		
Fixed Cost	.086	.781	1	
Net Profit	-.890(*)	-.238	.186	1

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Table 3: Principal Component Analysis (Extraction Method) among different costs and Net Profit atNandigram-II for 2011

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
Capital Cost	2.298	57.459	57.459
Variable Cost	1.563	39.078	96.537
Fixed Cost	.139	3.463	100.000
Net Profit	1.47E-016	3.68E-015	100.000

Extraction Method: Principal Component Analysis.

Table 4: Correlations matrix for different costs at Nandigram-II region on 2012

	Capital Cost	Variable Cost	Fixed Cost	Net Profit
Capital Cost	1			
Variable Cost	.985(**)	1		
Fixed Cost	.317	.473	1	
Net Profit	.192	.333	.926(*)	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 5: Principal Component Analysis (Extraction Method) among different costs and Net Profit at Nandigram-II for 2012

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
Capital Cost	2.621	65.536	65.536
Variable Cost	1.313	32.829	98.365
Fixed Cost	.065	1.635	100.000
Net Profit	5.92E-017	1.48E-015	100.000

IV.CONCLUSION

In shrimp farming, an optimum output can not be assiured even after taking the risk of huge investment Besides controlling distinct quality measures, application of scientific method, proper quality control mechanism and presence of modern technology, the export policy may corrupt the total system and targetted outout. for sustainability and long term viability of the industry. It is essential that extensive training programme be conducted for farmers, in order to develop confidence to practice shrimp culture for maintaining the sustainability of this industry. Crop insurance facilities should be introduced so that the farmers would not bury them under debt burden if there is a loss. The motto should be to practice an economically and ecologically viable shrimp culture. Besides all these, the requirement of Government's efforts in implementing a proper planning and management oriented marketing strategies is necessary for the sustainability of the industry. The adoption of such measures can revive the shrimp industry, livelihood of the farmers, associated persons and make it a major contributor in earning foreign exchange.

REFERENCES

[1] FAO yearbook 1992. Fishery statistics, catches and landings.FAO Fish. Ser. (38).FAO stat. ser. 70: (105)
[2] Upadhyay, A.S. (2001): Shrimp and prawn farming development in West Bengal: Present status constrains and strategy. Fishing Chimes, 20:91-98.
[3] MPEDA/NACA, (2003): Shrimp Health Management Extension Manual. Prepared by Network of Aquaculture Centres in Asia-Pacific (NACA) and Marine Product Export Development Authority (MPEDA),Cochin,India.

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Biography

Dr. Somen Sahu is an Associate Professor and Head in the Department of Fishery Economics and Statistics, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences,W.B. He had an experience of more than 12 years in this field. He had a background of M.Sc. in Statistics, M.B.A. and Ph.D. He organised more than 5000 fish farmers at Purba Medinipur district for transferring of technology through networking model targeted to their socio-economic upliftment.