



Socio-economics of the *Penaeus vannamei* (Boone, 1931) farmers in West Bengal, India: A descriptive study

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ABSTRACT

Shrimp aquaculture has been practicing in India for centuries in a traditional manner in a certain coastal state, but it has made its presence felt by contributing to the socio-economic development of the country only in recent years. The practice of white-leg shrimp farming is gaining popularity in most of the areas of West Bengal, encompassing with different activities towards generating livelihood among the shrimp farmers. The area under *Penaeus vannamei* culture in West Bengal is reported to be 4,127 ha and production of the shrimp in the year 2017-18 is 22,191MT. In view of recent set back of brackish water shrimp farming and for overall development of aquaculture, it is necessary to study socio-economic profile of shrimp farmers. Thus, the present study was undertaken in Purba Medinipur district of West Bengal among randomly selected 200 shrimp farmers to study their socio-economic profile. Data were collected with the help of structured interview schedule with observation method. Results of the study showed that most of the vannamei shrimp farmers belonged to the age groups of 36-50 years (53.5%), while majority (56%) growers had education up to middle level (Class VIII standard). Most (60%) of the respondents belonged to nuclear family type and majority (65%) belonged to small family (up to 5 members). 85% of them had sole occupation of vannamei farming only whereas, majority (51.5%) of the vannamei farmers belonged to general caste. 83.5% per cent of respondents were holding up to 2 acres of land and 41 % of respondents had low level of social participation while majority (53.3%) had medium level of economic motivation. Proper training, scientific management, sufficient financial support by Government, infrastructural development for implementation of problem soothing rules at field level can help to increase the production which in turn uplift the socio-economic status of the *P. vannamei* farmers.

Keywords: Livelihoods, *Penaeus vannamei* farmers and socio-economics

Aquaculture is the fastest- growing sector of food production in the world and shrimp dominates the aquaculture production by value. Shrimp aquaculture is the fastest growing food area and its economic importance is increasing concurrently. It is an important sector in the majority of the countries of the world from the viewpoint of income and employment generation. Indian fisheries and aquaculture is an important sector of food production, providing nutritional security to the food basket, contributing to the agricultural exports besides engaging more than 14 million people in different activities. In India, shrimp farming areas are mostly located in the coastal states of Gujarat, Maharashtra, Karnataka, Goa, Kerala, Tamil Nadu, Andhra Pradesh, Odisha and West Bengal. Shrimp farming provides direct employment to about 0.3 million people and ancillary units provide employment for 0.6 to 0.7 million people in our country (Unnithan, 2006).

West Bengal is considered with the largest impounded brackish water area in the country and spreading over three districts namely Purba Medinipur, North 24 Parganas and South 24 Parganas. It has been estimated that there is about 200,000 ha of water area,

out of which 85,000 ha has been found suitable for shrimp culture (Anon., 2018). Due to the outbreak of White Spot Syndrome Virus and other associated problems, the *Penaeus vannamei* (Pacific white legged shrimp), an exotic species was introduced during 2009 as an alternative species to *Penaeus monodon*. *P. vannamei* (shrimp) farming has been playing a vital role in the socio-economic development of West Bengal as well as India. The area under *P. vannamei* culture of West Bengal is 4,127 ha and production of *P. vannamei* in the year 2017-18 is 22,191 MT (MPEDA, 2017).

Declining trends of employment in government and private sectors coupled with less income from agricultural crops has forced the unemployed youth to brackish water farming (Maiti *et al.*, 2019). Based on the outcomes of pilot study, it was found that among the three districts, Purba Medinipur has the highest concentration of *P. vannamei* farmers. Keeping in view the facts, the present study was designed with the following specific objectives, *i.e.*, to study the socioeconomic profile of fisher-folk community engaged in *P. vannamei* culture. As this sector is growing with good pace and the state is earning valuable foreign

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exchange, it is necessary to study socio-economic profile of shrimp farmers. The socioeconomic profile would be helpful in formulation of effective need based strategic programmes for development of sustainable livelihood of shrimp farmers through sustainable farming practices by utilizing the base line data information by different policy makers as per the needs of shrimp farmers in Purba Medinipur.

MATERIALS AND METHODS

The study was undertaken to assess the socio-economic status of the *P. vannamei* shrimp farmers using ex-post facto research design in the purposively selected district *i.e.*, Purba Medinipur out of 23 districts of West Bengal in 2019. A total of four blocks out of 25 blocks, *i.e.*, Chandipur, Contai-I, Deshopran, Contai- III were selected for the study considering the preponderance of shrimp farmers. From each block, two gram panchayats (GP) were selected with the help of simple random sampling method without replacement technique. Thus a total of eight gram panchayats were selected as the representing unit for this study. Twenty five farmers engaged in shrimp farming having experience in minimum of 3 years were selected from each gram panchayat by simple random sampling method without replacement technique. Thus a total of 200 shrimp farmers were constituted as sample of the present study.

All the listed variables in the below were empirically measured using various scheduled developed for the study. The interview schedule, consisting with the questions on socio-economic profile like age, sex, family size, family type, caste, educational qualification, family education status, dependency ratio, economically active family labour, annual income, credit seeking behavior etc was administered to the respondents. All the collected information was accumulated and analyzed by MS Excel 2007 and then presented in textual, tabular and graphical forms to understand the socio-economic status of the *P. vannamei* shrimp farmers in the study area.

RESULTS AND DISCUSSION

Shrimp farmers' profile is studied and findings are presented in the table 1. A critical observation from the table indicated that a considerable percentage of the *P. vannamei* farmers were in middle age (53.5%). This finding was in conformity with the findings reported by Ogunmefun and Achike (2017), Babu *et al.* (2015). The plausible reason for the above trend might be that the middle aged farmers comparatively have free hand in financial affairs and more responsibility than younger ones. They can take up independent decisions to implement their ideas. Further, the middle aged farmers are enthusiastic, possess more physical vigor and have

more work efficiency than older and younger farmers (Chittem and Kunda, 2018). Thus, it might be the reason for majority of respondents falling under the middle age group category.

The present study revealed that majority *i.e.* 65 per cent of the shrimp farmers had up to 5 members in their family followed by 35 per cent had above 5 members in their family. The size of the family has a direct influence on the expenditure and income patterns of the family and thereby influenced production. Similar findings were reported by Tammaroopa *et al.* (2016), Srinivas and Venkatrayalu (2016). It was found that the majority (60%) of shrimp farmers belonged to the nuclear family and 40 per cent belonged to the joint family. Similar findings were reported by Tammaroopa *et al.* (2016), Srinivas and Venkatrayalu (2016). The results showed the general inclination among the sampled farmers towards having nuclear family where decision making would be quick and easy in comparison with joint family. The family size has considerable influence on the income and expenditure of the family (Pandey and Upadhayay, 2012).

Contextual to caste categories, while large majority of respondents (51.5 %) were observed to be from General caste, 29.5 per cent of their counterparts was belonged to Other Backward Classes, 16 per cent with Scheduled Caste community and remaining only 3% from the Scheduled Tribe community (Table 2). The involvement of SC/ST communities in *P. vannamei* culture was found to be low in the present study area as it might be due to poor financial resources as well as lack of awareness about beneficial aspects of *P. vannamei* culture. These outcomes could be utilized by Govt. extension personnel for popularization of *P. vannamei* farming enterprise among the backward communities like scheduled caste or scheduled tribe.

Majority (56 %) of the shrimp farmers were found to be having their educational attainment up to middle level (*i.e.* Class VIII standard), 20.5 per cent respondents were found to be having their educational attainment up to secondary level (*i.e.* Class X standard), 15 per cent respondents up to primary level (*i.e.* Class IV standard), 7 per cent respondents up to higher secondary level (*i.e.* Class XII standard) and only 1.5 per cent respondents were in possession of graduate degree (Table 3). The *P. vannamei* is an exotic species and the culture practices of this species has been undergoing scientific updating at regular intervals. Therefore, the *P. vannamei* culturists need to gather knowledge on improved culture techniques of grow out pond culture. If the farmers have some institutional educational background; they can easily understand the farming system. Literacy rate of pond shrimp farmers can play a vital role in efficient

management and operation as well as in successful production of shrimp. Education and farming efficiency are closely related and education generally has a positive effect on farm productivity. An educated farmer is more likely to adopt new technology than an uneducated one (Meena *et al.*, 2002). However, education of the respondents scarcely guarantees employment. They are generally found to be unemployed after finishing

schooling. They can adopt farming as an entrepreneur by way of self-employment and thereby, high unemployment rate will be reduced. It is also found from the study that majority of the respondents (64%) belonged to the medium level of family education status followed by 28.5% belonged to the low level of family education status. The remaining 7.5% of the respondents belonged to the high level of family education status.

Table 1: Socio-economic profile of shrimp farmers (N=200)

Sl. No.	Variables	Category	Frequency(f)	Percentage (%)
1.	Age	Young (18-35 year)	41	20.5
		Middle (More than 36-50)	107	53.5
		Old (More than 50)	52	26.0
2.	Family Size	Small	130	65.0
		Large	70	35.0
3.	Family Type	Nuclear	120	60.0
		Joint	80	40.0
4.	Caste	General	103	51.5
		Other Backward Classes (OBC)	59	29.5
		Scheduled Caste (SC)	32	16.0
		Scheduled Tribe (ST)	6	3.0
5.	Educational qualification	Upto Primary	30	15.0
		Upto middle level	112	56.0
		Upto secondary level	41	20.5
		Up to higher secondary level	14	7.0
		Graduate	3	1.5
6.	Family education status	Low (<13)	57	28.5
		Medium(13-21)	128	64.0
		High(>21)	15	7.5
7.	Dependency ratio	Low(Less than 1)	19	9.5
		Medium(1)	42	21.0
		High(More than 1)	139	69.5
8.	Economically active family labour	Low (<3)	22	11.0
		Medium(3-6)	160	80.0
		High(>6)	18	9.0
9.	Training attended regarding shrimp culture	Yes	152	76.0
		No	48	24.0
10.	Occupational status	Primary	170	85.0
		Secondary	30	15.0
11.	Land holding	Marginal(Up to 2 acres)	167	83.5
		Small (2 to 5 acres)	30	15.0
		Big (More than 5 acres)	3	1.5
12.	Ownership of pond	Own	118	59.0
		Lease	32	16.0
		Both own and lease	50	25.0
13.	Reason for practicing <i>Penaeusvannamei</i>	Produce shrimp to eat	12	6.0
		Produce shrimp to trade	168	84.0
		Produce shrimp both to eat and to trade	20	10.0
14.	Farming experience	Up to 5 years	117	58.5
		Above 5 to 10 years	83	41.5
15.	Annual income	Low (Up to 10 lakhs)	83	41.5
		Medium (Above 10-20 lakhs)	62	31.0
		High (Above 20-30 lakhs)	43	21.5
		Very high (Above 30 lakhs)	12	6.0

Sl. No.	Variables	Category	Frequency(f)	Percentage (%)
16.	Social participation	Low (<1)	82	41.0
		Medium(1-3)	74	37.0
		High(>3)	44	22.0
17.	Economic Motivation	Low (<21)	38	19.0
		Medium(21-26)	108	54.0
		High(>26)	54	27.0
18.	Credit seeking behavior- a) Access to credit (Taking credit for enterprise)	Yes	188	94.0
		No	12	6.0
	Credit seeking behavior- b) Credit utilization behaviour (Utilization of loan)	Yes	178	94.68
		No	10	5.32

Dependency ratio referred to the ratio of dependents to producers within a household. Table 1 revealed that majority (69.5%) of the respondents had high level of dependency ratio in their family, 21 per cent of their counterparts had medium and only 9.5 per cent of them had low level of dependency ratio. Economically active family labour referred to the family members of 18 years age and above can do manual work. As per the table - 1, majority of the respondents (80%) belonged to the medium level of economically active family labour followed by 11 per cent belonged to the low level of economically active family labour. Training plays a very important role for human resource development. It is essential to induce motivation, create confidence and inculcate efficiency in an individual. Training is also inevitable for imparting new knowledge and updating the skills of the trainees. Therefore, training of shrimp farmers of *P. vannamei* farming practices had assumed utmost importance in the context of the new technologies and efficient business management. Distributions of the shrimp farmers based on different training programme attended are depicted through table 1 revealed that majority of the shrimp farmers (76%) attended training on different aspect of vannamei shrimp farming practices and 24% of them did not attend the same.

The results pertaining to occupational status of vannamei farmers showed that majority (85%) of the respondents had vannamei farming as a primary source of occupation whereas, only 15 per cent were involved in both vannamei culture as well as agriculture or both shrimp and fish farming as their secondary source of occupation. With respect to land holding category as depicted in table 1, majority (83.5%) of the respondents were found to be placed under marginal land holding category with their holding size up to 2 acres of land, 15 per cent respondents were under small land holding category (more than 2 to 5 acres land under possession) and 1.5 per cent of their counterparts were under big land holding category (more than 5 acres land under

possession). The involvement of small-scale as well marginal scale farmers has made it confirmed that the *P. vannamei* culture is practiced by more number of small or marginal scale farmers of rural areas. It was also found from table 1 that majority of the respondents *i.e.* 59% had own pond for shrimp culture followed by 16% used to take lease and only 25% of their counterparts had own land along with water body on lease.

Through this study, an effort was made to understand the perception on different factors influenced the farmers to undertake vannamei farming as their livelihood options. In accordance with the table 1, it was observed that around 84 per cent of the shrimp farmers were expressive of their inquisitiveness in producing shrimp to trade, 10 per cent indicated that they became inclined to produce shrimp for both to eat and to trade. Still further, 6 per cent of the respondents were communicative that this could help them to eat shrimp. According to the pattern of distribution of the respondents with their farming experience related to *P. vannamei* farming as presented in table 1, it was found that 58.5% of the respondents had low level of the farming experience of up to 5 years, 41.5 per cent of their counterparts had medium level of vannamei farming experiences between 5 to 10 years. Age, economic condition and interest over farming may contribute to the years of *P. vannamei* farming experience. The high level of experience of *P. vannamei* farmers was a result of involvement of farmers in tiger prawn aquaculture occupation since ages and is the main occupation and livelihood for the farmers.

Whereas the pattern of distribution of the respondents in accordance with their annual family income (Table 1), 41.5 per cent respondents were observed to be belonged to the income range up to Rs.10,00,000/- per annum from shrimp culture, 31 per cent respondents were found to be in the income range category between Rs.10,00,000 - Rs.20,00,000/- and

21.5% respondents were between Rs.20,00,000 - Rs.30,00,000/-. These apart, it also got unveiled that 6 per cent of the respondents were having their annual family income more than Rs.30, 00,000/-. According to the results from table 1 also indicated that the social participation of shrimp farmers is low. The plausible reason for this trend might be due to several factors such as lack of interest and time, non-attractiveness of work undertaken by the organization, lack of perceived benefits, lack of awareness about various social organization and their activities and local political hindrances to participate actively in different social organizations. It can also be attributed to lack of time due to *P. vannamei* culture activities and could not find appropriate space for the same.

The results (Table 1) pertained to economic motivation showed that majority (54%) of *P. vannamei* farmers had medium level of economic motivation in terms of profit making and relative value placed on economic ends whereas, 27 per cent respondents had high and 19 per cent respondents had low economic motivation. Better exposure and close interaction with extension personnel about economically sound production technologies might have helped the *P. vannamei* farmers to orient towards medium and high economic motivation. Unless one is not exactly motivated, one cannot make sincere efforts and exert interest in their profession. The reason for above fact might be due to majority of farmers had moderate land holding with middle school education. Farmers having high economic motivation were willing to take calculated risk for their field operations and were dare enough to invest huge capital on farming, whereas, poor economic motivation (13%) was also found and it might be due to poor credit orientation and less exposure to modern aquaculture technologies. The reasons for this might be due to the fact that respondents are properly guided, appraised and provided with information on economic viability of shrimp farming enterprise by extension officials and they have been convinced of the fact that is encouraging. While the result obtained from the study showed that most of the shrimp farmers (94%) were taking credit for their enterprise from bank, cooperatives, money lenders, friends and relatives. where only 6 per cent of the shrimp farmers did not take credit for their enterprise because they invested all their money from their own. The study also implied that most of the shrimp farmers (94.68%) did utilize credit for their enterprise where only 5.32 per cent of the shrimp farmers did not utilize credit for their enterprise because they invested those for other purposes.

Implications

- Upliftment of socio-economic condition of shrimp farmers to give them social status in the village is the important aspects for their development. It is urgently needed to give social recognition of shrimp farmers.
- The educational status and experience of the respondents are good and can be better utilized by organizing and conducting intensive awareness programmes to convince them regarding the importance of better management practices in long term basis.
- There are no shrimp hatcheries established by the state Government in the coastal districts of West Bengal. In shrimp culture, good quality shrimp seeds play a vital role in determining the total productivity. The production and the supply of good quality shrimp seeds by the Government owned hatcheries could solve the problems of disease outbreaks and ensure high survival rate leading to high production per hectare.
- Control on supplementary feed rates by the Government could reduce the input cost and increase the returns in shrimp farming and so the shrimp farmers' socio economic status could be improved.
- Production credit should be made available by the financial institutions as well as by State Government with subsidies which would give the needed thrust to shrimp farming.
- The state Government should provide the technical guidance to the shrimp farmers frequently by recruiting the professional graduates. This would help the farmers to prevent from the various risks and increases the employment opportunities.
- Coastal Aquaculture Authority (CAA) can facilitate to provide the necessary license for *P. vannamei* shrimp farming to the new farmers or the renewal for the existing farmers. This would encourage the shrimp farmers.
- Training should be given to the shrimp farmers regarding cultural practices and marketing techniques, so that it may help them to take good decision and to improve their knowledge and skills. For proper economic development, need-based training programme should be conducted for the shrimp farmers where necessary information should be provided on demand in overseas market.

Conclusion

From the present study it could be concluded that *P. vannamei* farming has contributed significantly in employment generation and infrastructure development

of the fisher folk community. Resources like human, water, land can be utilized in a sustainable ways for better improvement of socio-economic status and livelihood of fisher folk community associated with *P. vannamei* farming in West Bengal. Thus, effective socio-economic awareness and policies can help the farmers to raise their income as well as increase their standard of living and live a better life with decent income. Enlistment in the insurance scheme like agricultural insurance can be beneficial to encourage and support their socio-economic condition and upliftment of family status.

However, the results of the present investigation will help in planning, development and fishery extension activities carried out by the different fishery extension personnel in a more meaningful and scientific way. Information on Socio-economic and livelihood profile of shrimp farmers can be useful for Government Organizations (GOs) and Non-Government Organizations (NGOs) as well as researchers, extension workers and scientists for ensuring more effective livelihood development interventions for shrimp farmers as per their need. As brackish water shrimp farming sector growing rapidly, it will be interesting to also record the dynamics and changes in the shrimp farmers' profile. In this respect similar studies after certain time period are of need.

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