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Socio-economic dimensions and their impacts upon productivity of composite fish farming in North 24 Parganas district, West Bengal

Banasree Biswas, SK Das and Amit Mandal

Abstract
The socio-economic dimensions of fish farmers towards composite fish farming and their impact upon the productivity status were studied in North 24 Parganas District, West Bengal during February to June, 2014. The study was done with a structured interview schedule encompassing six developmental blocks incorporating sixty farmers as respondents. The results indicated that higher productivity (>5 tonnes hectare^{-1} year^{-1}) was achieved by middle age group farmers. Productivity achieved by the farmers was fitted positively with formal education level ($y = 3.725e^{0.0654x}$; $R^2 = 0.8026$). Training and level of experience level impacted positively towards higher productivity in composite fish farming ($R^2 \geq 0.82$). More than 5 tonnes hectare^{-1} year^{-1} fish production was achieved where the average pond size was 0.6 to 1 hectare and productivity declined with increasing pond size ($y = -0.0123x^2 + 0.344x+5.216$; $R^2 = 0.988$).

Keywords: socio-economic profile, fish farmers, composite farming, West Bengal

1. Introduction
Fish has universal taste with persistent global market growth [7] and an inexpensive source of protein [23]. The world needs an extra 40-60x10^6 tonnes of food fish by 2020 [8]. India is a major producer of fish through aquaculture and ranks second in the world after China [12]. West Bengal is the second major fish producing state after Andhra Pradesh and the largest fish seed (carp) producing state [7] and the fourth highest fish consuming state with ever increasing demand [32]. The estimated total annual fish production in the year 2015-16 is 1.67 million tonnes of which 1.49 million tonnes from inland sector, while sustainable production or yield potentiality is 1.64 million tonnes and production growth rate has increased 13.52 per cent compare to annual fish production 1.47 million tonnes during 2011-12 [7]. Fresh water aquaculture is contributing over 95 % of the total aquaculture production [9]. The contribution of West Bengal to the total inland production of the country is about 21 to 23 percent [7] while the share in total consumption of fish food in the state is about 28.57 percent [11].
The socio-economic characteristics pertaining to demography, means of production and investment, income and expenditure pattern of people living in a particular location strongly influence their responses to technological changes and participation in development schemes. However lack of authentic information on the socio-economic condition of the target group is one of the serious impediments in the successful implementation of developmental programmes. In fisheries sector, several micro and macro level socio-economic surveys had been conducted by various agencies and research workers in different regions of our country to study one or the other problem of the fishermen community [26, 27, 20, 25, 21, 22, 24]. Composite fish culture in West Bengal is an age old practice and popular among fish farmers but the farmers altered the recommended culture packages of practice in most of the cases [4]. Available impounded culture area of West Bengal is 3.57 Lakh hectare, including ponds (2.88 Lakh hectare), beels and baors (0.42 Lakh hectare) and reservoir (0.27 Lakh hectare). Area under scientific or commercial culture or exploitation is around 1.26 Lakh hectare [6]. However potentialities of these resources have not fully tapped to fulfill the gap in domestic demand for fish and its supply [18]. The present study was an attempt to examine the socio-economic dimensions of fish farmers towards composite fish farming in North 24 Parganas district, West Bengal.

2. Materials and Methods

2.1 Plan of work

The present study was conducted during February to June, 2014 in the purposively selected North 24 Parganas District of West Bengal as composite carp farming is very popular there and it has vast and diverse inland fishery resources. Moreover, the study area was easily accessible for collection of data through personal interview with the farmers.

Among twenty two Development Blocks in North 24-Parganas, six blocks namely Bagdah, Barasat-1, Bongaon, Gaighata, Habra-1 and Swarupnagar were selected for the present study in the consideration of the preponderance of composite carp farmers among the population. From each of the six selected blocks, two villages each were selected by simple random sampling technique. Therefore, twelve villages served as the representing unit for the study. Five fish farmers from each village were selected by using proportionate stratified random sampling technique thereby attaining a sample size of 60 fish farmers as respondents for the study.

2.2 Statistical analyses

Primary data were collected with the help of structured and pre tested interview schedule developed for this purpose from the respondents on spot through personal interview. The data were analyzed in terms of percentage and frequency against each variable. Appropriate statistical relationship between two variables was fitted for prediction of degree of relationship between them with R^2 values.

3. Results and Discussion

Majority of the fish farmers (88.33 %) under the present study were middle aged (31 to 60 years) group and mostly from nuclear (63.33 %) and large family (58.33 %) (Table 1). However in a similar study in south western Bangladesh, Moni and Khan [16] observed only 40% farmers belonged to nuclear family in Batiaghata upazila, Bangladesh. Average higher productivity (>5 tonnes hectare^{-1} year^{-1}) was achieved by middle age group farmers. In a similar study in Maninjau, Indonesia, Silviyunan *et al*. [28] reported that 35-44 years age group farmers were the most productive (39.36 %). However, Syandri *et al*. [31] observed young farmers to be productive and innovative; also brave to investment more.

Table 1: Socio-personal profile of the respondents

Socio-personal characteristics	Frequency (n=60)	Percentage (%
Age (Years)		
Young age (≤30)	3	5
Middle age (>30 to 60)	53	88.37
Old age (>60)	4	6.67
Family size		
Small family (<5 members)	25	41.67
Large family (>5 members)	35	58.33
Nature of family		
Nuclear family	22	63.33
Joint family	38	36.67

Though formal education level among majority (59.76 %) of the surveyed fish farmers was medium upto primary and upper primary standards (Fig. 1A), the farmers have gathered adequate technical experience in composite fish farming through the ages. Mkoka [15] stated that the business potentiality alone cannot result in successful harvest if the farmer has limited technical skills. In an earlier study in Punjab it was observed that, education levels of aqua-farmers were university graduate (26 %), senior high school graduates (38 %), and junior high school graduates (22 %) [29].

Productivity achieved by the farmers was fitted positively with formal education level (Fig. 1B) and the highest productivity as recorded in the present study (6.57 tonnes hectare^{-1} year^{-1}) was achieved by the farmer with highest formal education (graduate). Majority of the farmers (66.4%) were formally untrained (Table 2). Moreover, productivity was also positively fitted with the number training on fish farming completed by the farmers (Fig. 2). Das and Sahoo [5] also stated that relationship between level of farmers' education and level of productivity is positive, continuous and significant. This is because educated fish farmers could easily adopt innovations [31]. However the observation of the present study was not in tune with the earlier study of Moni and Khan [16] in Bangladesh where the preponderance of untrained farmers was less (56.67%).

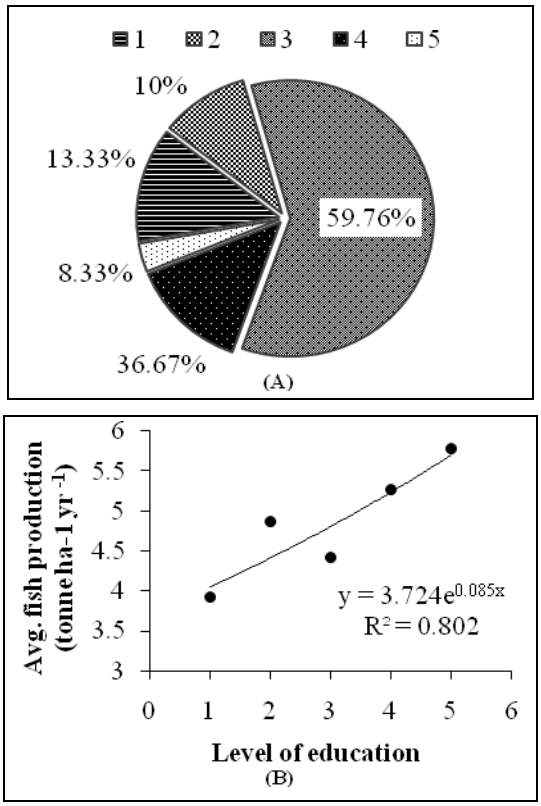

Fig 1: Level of eduacation of farmers(A); illiterate (1), functinally literate (2), primary and upper primary school (3), upto higher secondary (4), graduates and above (5) and fitted retionship between education and average fish production(B); illiterate (1), functinally literate (2), primary and upper primary school (3), upto higher secondary (4), graduates and above (5)

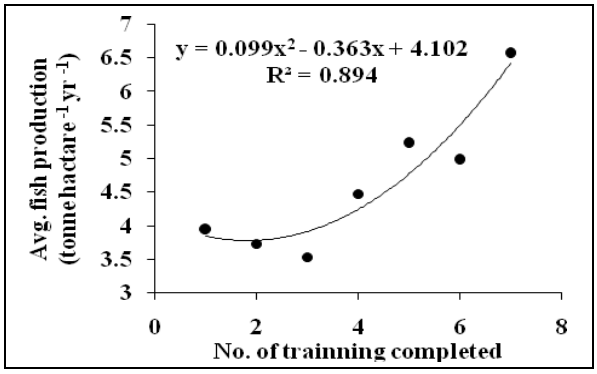

Fig 2: Fitted retionship between no. of trainning completed and average fish production

Though 68.33 % of the farmers were exposed to television (Table 2), they have extremely poor media exposure on fishery and agriculture related programmes. Syandri *et* al. [31] also observed such low level (29.19%) of mass media exposure of fish farmers on aquaculture. However, with meager social participation (5 %) and even less monthly contact (4.8 %) with extension agencies like State Fishery Department, Govt. of West Bengal in sharing scientific knowledge, they have achieved an average productivity level of more than 5 tonnes hectare^{-1} year^{-1} which was above the national average production (3 tonnes hectare^{-1} year^{-1}) in inland aquaculture [6].

Table 2: Communicational characteristics of the respondents

Communicational characteristics	Frequency (n=60)	Percentage (%)	Avg. fish production (tonnes hectare $^{-1}$ yr $^{-1}$)
A)Mass media exposure			
Low	41	68.33	5.38
Medium	17	28.34	4.48
High	2	3.33	4.62
B)Social participation			
Low	39	65	4.72
Medium	18	30	4.98
High	3	5	5.73
C)Interaction with fishery extension agency personnel			
No	21	33.6	5.65
Yearly	24	38.4	4.48
Monthly	3	4.8	4.62
Only at necessary	12	19.2	4.44
D)Formal Training	20	33.6	5.21

Majority of farmers (60%) were having experience of more than 15 years (Fig. 3A) in fish farming and such experience level impacted positively towards higher productivity in composite fish farming (Fig. 3B). This is in sharp contrast with the findings of Adewuyi *et al*. [2] where only 3.7% of farmers had fish farming experience above 15 years.

The size of the pond plays a major role in aquaculture. It influences the input use, technology adoption, level of production and the income generation for the farmers [29]. In the present study, the average pond size of 60 % of the farmers was within 1 hectare (Fig. 4A) and more than 5 tonnes hectare^{-1} year^{-1} fish production was achieved where the average pond size was 0.6 to 1 hectare. In general, productivity declined with increasing pond size (Fig. 4B). This might be because of the better managerial intervention possible with the small to medium sized ponds of carp culture. Therefore, the result of the present study was in tune with the findings of FAO where it was stated that small pond increased the possibility of effective management [10].

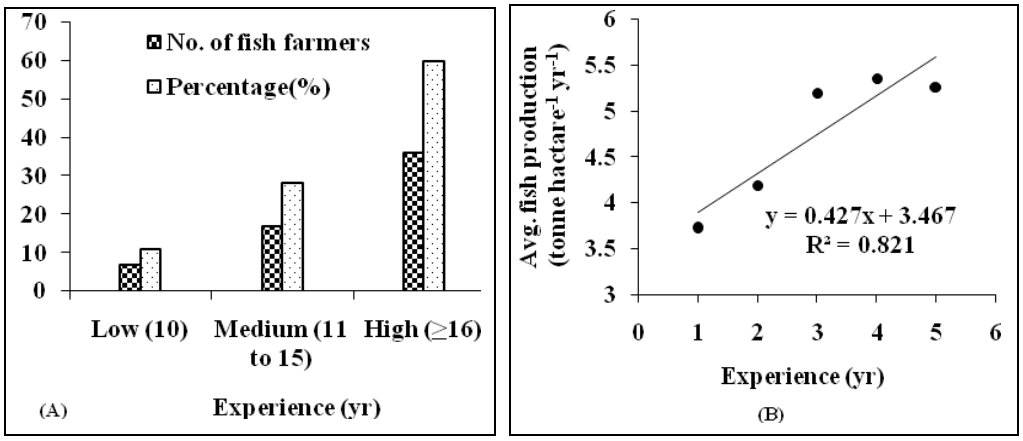

Fig 3: Experience in composite fish farming of surveyed farmers (A); and fitted retionship between experience in composite fish farming and average fish production(B); <5 years (1), <10 years(2), <15 years(3), <20 years(4), <25 years(5), <30 years(6)

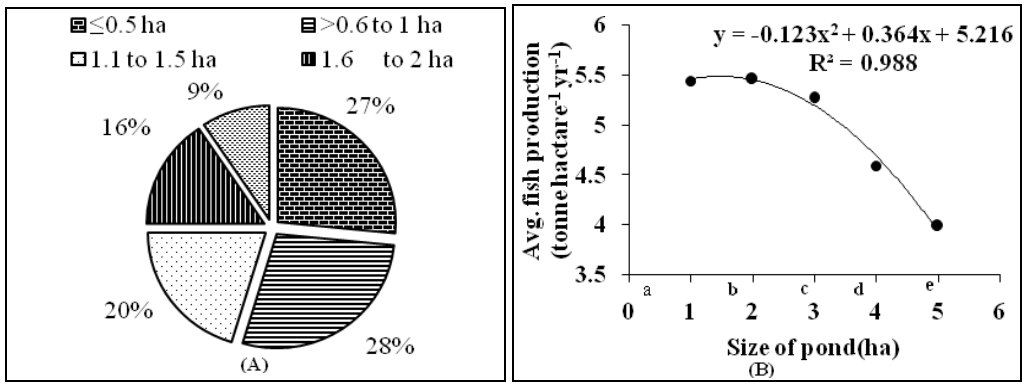

Fig 4: Size of pond (A) and fitted retionship between size of pond and average fish production (B); ≤0.5 ha(a), ≥0.6-1 ha (b), 1.1-1.5 ha (c), 1.6-2 ha (d), >2 ha (e)

Composite fish farming was the major source of livelihood of more than 91.67 % of the fish farmers and the rest depend either upon allied fish culture activities like raising carp seed as fry and fingerlings from spawn and/or agriculture, animal husbandry practices, handicrafts and others in addition to composite fish farming (Table 3). This was parallel with the findings of Syandri *et al.* [31] who stated that the main occupation of respondents in his study area was full-time fish farmers in majority (71.66 %).

Table 3: Socio-economic characteristics of the respondents

Socio-economic characteristics	Frequency (n=60)	Percentage (%)
A)Occupation		
Main	55	91.67
Secondary	5	8.33
B)Pond ownership		
Own	26	43.33
Full leased in	12	20
Both own and leased in	22	36.67
C)Annual income (Rs.)		
≤1 lakh	11	18.33
>1-2 lakh	39	65
>2 lakh	10	16.67

With regards to farm ownership, less than 50 % fish farmers practice in their own ponds and around 37 % culture fish both in their own as well as leased in ponds and 20 % practice composite fish farming solely in leased pond (Table 3). In Batiaghata upazila, Bangladesh, Moni and Khan [16] found similar thing that only 56.67% had their own ponds.

Among several problems faced by the respondents during composite fish farming of carps, majority of the farmers (61.42 %) pointed out inadequate support from Govt. organizations and non-availability of bank loan; 24.9 % farmers faced problems in obtaining good quality seed (fingerling) and 28.22 %. Climate change, low quality feed, lack of disease diagnostics, transportation problems were cited as major problems by 16.6 %, 11.62 %, 33.2 % and 33.2 % of the farmers respectively (Fig 5A). Abraham *et al.* [1] stated that among the different problems faced by West Bengal freshwater fish farmers, disease (82 %), inundation due to floods (51 %), financial problem (50 %), poaching (48%) and market price fluctuation (30 %) were the major ones. Farmer's problem was in same line with Moni and Khan [16] in Batiaghata upazila, Bangladesh, that lack of quality fish fry and fingerlings and high price of fish seed, bank loan with high interest, prevalence of fish disease and high cost of transportation were major problems in the area and 63% of the farmers opined that extension service of government and information regarding fish farming from the NGOs both were poor. Syandri *et al*. [31] found that high price of input (88.33%), high cost of feeds (83.33%), diseases, and inadequate infrastructure (68.33%) were the main constraints faced by the farmers.

Regarding the needs, 61.47 % farmers opined that bank finance could help in better growth and productivity enhancement; 53.12 % farmers expressed need for more governmental support as beneficiaries under different fishery schemes. Besides, 38.18 %, 24.9 %, 18.26 %, 11.62 % and 8.3 % of farmers opted for insurance, good quality seed, advanced training, disease diagnostics and management, and marketing channel respectively (Fig. 5B).

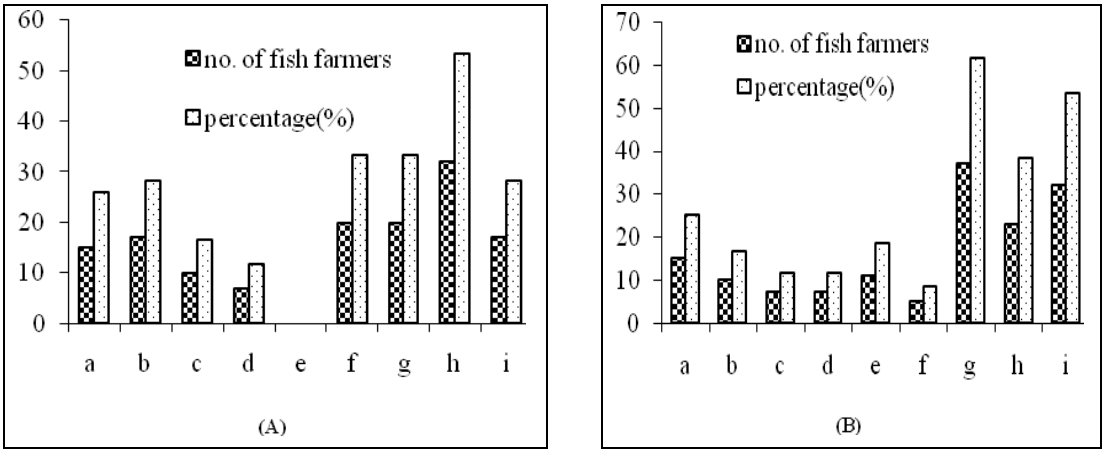

Fig 5: Profile on farmers' problem (A); good quality seed (a), weather change (b), feed (c), disease diagnosis (d), soil (e), bank loan (f), transportation (g), help of local govt. organization (h), weather change (i) and farmers' need (B); good quality seed (a), good quality feed (b), water and soil quality analysis (c), disease diagnosis and management (d), advanced training (e), marketing channel (f), bank loan (g), insurance (h) during fish culture

4. Conclusion

The present study indicated that though the farmers were poorly educated with little financial and other technical supports from outside agencies, through their age old experience they have been able to attain productivity of 5 tonnes hectare^{-1} year^{-1}. As the study was limited with limited coverage area with moderate sample size, there is further scope of elaborating the study incorporating more areas with higher participation of respondents.

5. Acknowledgement

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