Socioeconomic characteristics and constraints of participatory pond fish farmers in Mymensingh district, Bangladesh

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ABSTRACT

The study was conducted to determine the socioeconomic characteristics and constraints of participatory pond fish farmers in Muktagachha upazila (sub-district) under Mymensingh district of Bangladesh. Data were collected by using a structured interview schedule during 01 to 31 October 2018 from a sample of 100 fish farmers (50% of total population) who were selected randomly from a population of 200. Data were analyzed using descriptive statistics, rank order and coefficient of correlation. The majority of the participatory pond fish farmers (90%) faced medium to low constraints. Among 22 constraints, lack of training on aquaculture was identified as the most critical one, followed by high price of various inputs. The least important constraint of the farmers was crisis of water in dry season. It was revealed that fish farming experience, annual family income and training exposure were significantly associated with the constraints of participatory pond fish farmers. It is therefore recommended that the Department of Fisheries (DOF) and other related organizations can offer credit facilities, proper training and suitable extension services to minimize the constraints of participatory pond fish farmers and meet the increasing demand of fish in Bangladesh.

Keywords: Pond fish farmer, Characteristics, Constraints, Participatory, Bangladesh.

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Introduction

Bangladesh has favorable resources along with agro-climatic conditions, which makes it one of the more suitable countries for fish farming (Shamsuzzaman et al., 2020; Ahmed et al., 2012). Bangladesh is blessed with the world’s largest flooded wetland and considered as the third largest aquatic biodiversity in Asia after China and India (Shamsuzzaman et al., 2016).

Bangladesh is one of the world’s leading fish producing countries with a total farming of 42.77 lakh metric ton, where aquaculture farming contributes 56.24% of the total fish farming (DOF, 2018). Bangladesh ranked 3rd in inland open water capture production and 5th in world aquaculture production (FAO, 2018). Fish supplements about 60% of Bangladeshi people’s daily animal protein intake (DOF, 2018). Fish is a popular complement to rice in the national diet, giving rise to the adage Maache-Bhate Bangali (a Bengali is made of fish and rice) (Ghose, 2014).

Fish farming in Bangladesh is an essential agricultural sub-sector, which plays an important role in its national economy (FRSS, 2017). More than 11% of the population directly or indirectly dependent on the fisheries sector for continuing their livelihood (DOF, 2016). A large number of people have improved their socioeconomic conditions through fish farming activities in Bangladesh (Ara, 2005). The fisheries sector contributes 3.61% to the Gross Domestic Product (GDP) of the country and 24.41% to the agricultural GDP (DOF, 2017). Besides an economic contribution, fish farming contributes to food security as a major source of animal protein (DOF, 2018; Khan et al., 2018).

Over last two decades, to meet the increasing foreign demands of fish and fishery product, aquaculture has expanded tremendously (Rana, 2016). Ponds cover only 3.5% of the total inland water of Bangladesh whereas they contribute about 31% of the total inland fish production thus playing a vital role in fresh water fish production (DOF, 2017). About 52.92% of total fish production comes from inland culture. The areas...
of inland open water body, inland closed water body and pond are 3.92, 0.77 and 0.37 million hectares, respectively (DOF, 2017). But, the farming of inland open water is decreasing day by day (Sheheli et al., 2019). In this situation, to meet the increasing demand of fish in Bangladesh, improvement of participatory pond fish culture is essential.

Now-a-days, participatory pond fish farming has been proved a profitable and smart business comparing to the rice or other agricultural cultivations (Das et al., 2018). The production from participatory pond is increasing very sharply due to dissemination of adaptive technologies such as Tilapia, Koi, Magur, Shing, Pungas, Sarputi, Rui, Catla, Mrigel etc. through effective extension services by the Department of Fisheries, government and non-government organizations (Sheheli et al., 2019).

However, during participatory pond fish farming, the farmers of the study area usually face some constraints associated with it. Although, a large number of people are involved in participatory pond fish farming in that area, no specific study on the emerging constraints is reported yet. Therefore, the researchers undertook this research keeping in mind the following objectives: to describe the socioeconomic characteristics of the fish farmers; to determine the constraints of participatory pond fish farmers; and to explore the relationships between socioeconomic characteristics and constraints of participatory pond fish farmers.

**Methodology**

**Study area**

The study was carried out in Kheruajani union of Muktagachha upazila (sub-district) under Mymensingh district of Bangladesh (Fig. 1). The Upazila located between 24º75´ and 24º83´ North latitudes and between 90º26´ and 90º67´ East longitudes. A huge number of farmers are involved with fish farming and have received extension services from Department of Fisheries (Sheheli et al., 2013). Good communication facilities and consequently less expense for conducting the study and researchers’ perception about better cooperation from the fish farmers motivated the researchers to select the study area.
Method of data collection and analysis of data

A total of 100 fish farmers (50% of total population) were selected randomly from a population of 200 fish farmers which constituted the sample of this research. Data were collected by using a structured interview schedule through face to face interview with the selected fish farmers during 01 to 31 October 2018. Extent of constraints of participatory pond fish farmers was the focus variable and eleven socioeconomic characteristics of the fish farmers were selected as explanatory variables namely level of education, household size, farm size, area under fish farming, fish farming experience, annual family income, training exposure, extension media contact, organizational participation and knowledge on fish farming. The study identified 22 major constraints of participatory pond fish farmers.

The major constraints of participatory pond fish farmers were measured by using a 4-point rating scale (Islam et al., 2013). The respondents were asked to rate each problem as high, medium, low and not at all, with corresponding score of 3, 2, 1 and 0, respectively. Thus, the constraint scores ranged from 0 to 66, where 0 indicates no constraint and 66 indicates severe constraint. Moreover, a constraint facing score (CFS) was employed to identify the critical constraints in participatory pond fish farming (Equation 1). Other researchers (Amin et al., 2016; Pandit and Basak, 2013) also used similar formula to identify the critical constraints in their respective studies.

\[
CFS = (Ph \times 3) + (Pm \times 2) + (Pl \times 1) + (Pn \times 0)
\]  
\[
\text{Where, } CFS = \text{Constraint Facing Score, } Ph = \text{Number of responses with high constraints, } Pm = \text{Number of responses with medium constraints, } Pl = \text{Number of responses with low constraints and } Pn = \text{Number of responses with no constraint.}
\]

Thus, the CFS of individual constraint could range from 0 to 300, where 0 indicating no constraint and 300 indicating high constraint of participatory pond fish farmers.

The Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel version 13 was used for data management. Descriptive statistics, for instances, frequency, percentage, mean, standard deviation and rank order were used for categorization and describing the variables. Pearson’s Product Moment Correlation coefficient (r) was used for testing the relationship between the socioeconomic characteristics and constraints of participatory pond fish farmers (Equation 2).

\[
r_{xy} = \frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum(x_i-\bar{x})^2\sum(y_i-\bar{y})^2}}
\]  
\[
\text{Where, } r_{xy} = \text{Pearson’s product-moment correlation coefficient, } \bar{x} \text{ and } \bar{y} = \text{Means of the variables } x \text{ and } y, \text{ respectively.}
\]

Results and Discussion

Socioeconomic characteristics of the fish farmers

In this section, summary of the socioeconomic characteristics of the fish farmers have been presented in Table 1. The findings revealed that the majority (90%) of the fish farmers were young to middle aged and maximum of them (65%) had primary to secondary education. Fish culture requires technicalities regarding the use and management of instruments (Olaoye et al., 2013), where education can play a significant role in enabling farmers’ understanding of technicalities as well as constraints resolution. Most of the fish farmers (80%) were belong to medium to large sized family and the highest proportions (90%) of them had small to medium sized farm. The majority of the fish farmers (62%) mainly used their small sized farm area for fish culture and most of them (86%) had medium to high income. Maximum of the fish farmers (75%) had medium to high farming experience. Farmers with high experience can predict farm production and market situation (Olaoye et al., 2013). Majority of the farmers (59%) received no training on aquaculture, followed by short duration training (37%) and the highest proportions (86%) of them had low to medium extension contact. Access to extension providers renders good sources of information for diversified farm activities (Odini, 2014). The highest proportions of the farmers (85%) had low to medium organizational participation and most of them (98%) had high knowledge on fish farming for increasing their fish production level.
Table 1. Characteristics profile of the respondents (n=100).

| Socio-economic characteristics          | Frequency | Percentage | Mean  | SD*  |
|------------------------------------------|-----------|------------|-------|------|
| **Age (year)**                           |           |            |       |      |
| Young (18-35)                            | 35        | 35         | 37.95 | 9.84 |
| Middle age (36-50)                       | 55        | 55         |       |      |
| Old (>50)                                | 10        | 10         |       |      |
| **Level of education (year)**            |           |            |       |      |
| Illiterate (0)                           | 08        | 08         |       |      |
| Can sign only (0.5)                      | 15        | 15         |       |      |
| Primary (1-5)                            | 30        | 30         | 8.05  | 3.65 |
| Secondary (6-10)                         | 35        | 35         |       |      |
| Higher secondary (>10)                   | 12        | 12         |       |      |
| **Household size (number)**              |           |            |       |      |
| Small (up to 4)                          | 20        | 20         | 6.37  | 1.76 |
| Medium (5-6)                             | 56        | 56         |       |      |
| Large (>6)                               | 24        | 24         |       |      |
| **Farm size (ha)**                       |           |            |       |      |
| Landless (0.02 ha)                       | 0         | 0          | 1.52  | 1.02 |
| Marginal (0.02-0.2 ha)                   | 0         | 0          |       |      |
| Small (0.21-1 ha)                        | 55        | 55         |       |      |
| Medium (1.01-3 ha)                       | 35        | 35         |       |      |
| Large (>3 ha)                            | 10        | 10         |       |      |
| **Area under fish farming (ha)**         |           |            |       |      |
| Small (up to 1 ha)                       | 62        | 62         | 1.13  | 0.88 |
| Medium (1.01-3 ha)                       | 33        | 33         |       |      |
| Large (>3.01 ha)                         | 5         | 5          |       |      |
| **Annual family income ("000" Tk.)**    |           |            | 249.72| 310.09|
| Low (up to 50)                           | 14        | 14         |       |      |
| Medium (51-80)                           | 56        | 56         |       |      |
| High (>80)                               | 30        | 30         |       |      |
| **Fish farming experience (year)**       |           |            |       |      |
| Low (up to 15)                           | 25        | 25         | 13.31 | 8.44 |
| Medium (16-30)                           | 45        | 45         |       |      |
| High (>30)                               | 30        | 30         |       |      |
| **Training exposure (days)**             |           |            |       |      |
| No training (0)                          | 59        | 59         | 16.42 | 16.24|
| Short duration (up to 5)                 | 37        | 37         |       |      |
| Long duration (> 5)                      | 04        | 04         |       |      |
| High (>9)                                | 15        | 15         |       |      |
| **Extension media contact (score)**      |           |            |       |      |
| Low (0-9)                                | 31        | 31         | 7.42  | 3.66 |
| Medium (10-18)                           | 55        | 55         |       |      |
| High (>18)                               | 14        | 14         |       |      |
| **Organizational participation (score)** |           |            |       |      |
| Low (up to 5)                            | 59        | 59         | 2.16  | 1.95 |
| Medium (5-8)                             | 31        | 31         |       |      |
| High (>10)                               | 10        | 10         |       |      |
| **Knowledge on fish farming (score)**    |           |            |       |      |
| Low (up to 10)                           | 00        | 00         | 25.22 | 2.44 |
| Medium (11-20)                           | 02        | 02         |       |      |
| High (>20)                               | 98        | 98         |       |      |

*SD* stands for Standard Deviation

**Extent of constraints of participatory pond fish farmers**

The extent of constraints of participatory pond fish farmers has been presented in the Fig. 2. The findings reveal that more than half of the respondents (68%) faced medium constraints, while 10% and 22% of them faced high and low constraints, respectively. The findings lead to illustrate that the majority of the participatory
pond fish farmers (90%) faced medium to low constraints. Our findings are supported by the findings of Rahman et al. (2014), who indicated that the farmers faced medium to low constraints (91.3%) in practicing small scale aquaculture in Thakurgaon district of Bangladesh.

Table 2. Constraints of participatory pond fish farmers (n = 100).

| Constraints                                              | Extent of constraints | CFS* | Rank order |
|----------------------------------------------------------|-----------------------|------|------------|
| Lack of training on aquaculture                        | High 60 Medium 30 Low 10 Not at all 00 | 250  | 1          |
| High price of various inputs                           | High 65 Medium 21 Low 11 Not at all 03 | 248  | 2          |
| Fear to start participatory farming                     | High 60 Medium 30 Low 05 Not at all 05 | 245  | 3          |
| Lack of preservation technology                         | High 55 Medium 30 Low 05 Not at all 10 | 230  | 4          |
| Poor transportation facilities                          | High 45 Medium 40 Low 10 Not at all 05 | 225  | 5          |
| Lack of marketing facilities                            | High 55 Medium 20 Low 15 Not at all 10 | 220  | 6          |
| Lack of skilled labor                                  | High 45 Medium 35 Low 15 Not at all 05 | 220  | 6          |
| Lack of scientific and technical knowledge              | High 55 Medium 20 Low 12 Not at all 13 | 217  | 7          |
| Security constraints (theft and animosity)              | High 50 Medium 25 Low 15 Not at all 10 | 215  | 8          |
| Low profitability                                       | High 42 Medium 38 Low 12 Not at all 08 | 214  | 9          |
| Adulteration of feed                                    | High 49 Medium 26 Low 15 Not at all 10 | 214  | 9          |
| Lack of enough capital to invest                        | High 40 Medium 40 Low 10 Not at all 10 | 210  | 10         |
| Natural calamities (flood, drought)                    | High 33 Medium 47 Low 15 Not at all 05 | 208  | 11         |
| High interest on credit                                 | High 45 Medium 28 Low 05 Not at all 22 | 196  | 12         |
| Fluctuation of market price                            | High 35 Medium 35 Low 20 Not at all 10 | 195  | 13         |
| Unavailability of quality fry                           | High 36 Medium 34 Low 18 Not at all 12 | 194  | 14         |
| Poor extension service                                  | High 35 Medium 35 Low 15 Not at all 15 | 190  | 15         |
| Lack of credit facilities                               | High 40 Medium 25 Low 15 Not at all 20 | 185  | 16         |
| Land unavailability                                     | High 20 Medium 50 Low 20 Not at all 10 | 180  | 17         |
| Disease occurrence                                      | High 40 Medium 20 Low 20 Not at all 20 | 180  | 17         |
| Inbreeding constraint                                   | High 30 Medium 20 Low 26 Not at all 24 | 156  | 18         |
| Crisis of water in dry season                           | High 25 Medium 25 Low 30 Not at all 20 | 155  | 19         |

CFS*: Constraint Facing Score

For determining the extent of individual constraint, a Constraint Facing Score (CFS) was computed and represented in Table 2. The findings show that lack of training on aquaculture was the most important constraints of fish farmers in participatory pond fish farming (CFS = 250). Training enhances fish farmers' ability to manage farms and contribute maximum productivity of the farms efficiently and effectively (Ituma and Ukah, 2017). Training makes the trainee more qualified and fit to perform a task more effectively but in the study area, more than half of the fish farmers (59%) received no training (Table 1). As a result, they faced many constraints in participatory pond fish farming.
The high price of various inputs (CFS = 248) was the second important constraints reported by the respondents. The farmers of the study area faced constraints of various inputs such as high price of fish feeds, chemicals and drugs for disease control, etc. Islam et al. (2013) found high price of fish feed as third ranked constraint in their research constraints as faced by the fish farmers in practicing semi-intensive climbing perch farming. Onemolease and Oriakhi (2011) and Rahman et al., (2014) reported high cost of fishing inputs as a major problem in fishing activities. The participatory pond fish farmers of various inputs and fear to start participatory pond fish farming, Most of the fish farmers of the study area were afraid of starting participatory pond fish farming because of illiteracy, lack of experience, personal conflict, lack of motivation by the extension personnel, etc.

**Correlation between socioeconomic characteristics and constraints of participatory pond fish farmers**

The negative significant correlation \( r = -0.288 \) of annual family income with the constraints of participatory pond fish farmers clearly pointed out that the fish farmers having high income can minimize the undesirable loss during participatory pond fish farming. Azad et al. (2014) and Rahman (2011) found similar relationship between the concerned variables.

The training exposure had significant and negative relationship \( r = -0.237 \) with the constraints of participatory pond fish farmers, indicating that training exposure enables farmers to manage their fish farming activities effectively. Islam et al. (2013), Rahman (2011) and Uddin et al. (2020) reported similar findings in their respective research.

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**Table 3. Result of correlation analysis between explanatory variables and focus variable.**

| Focus variable                        | Explanatory variables | Correlation coefficient \( (r) \) with 98 df |
|---------------------------------------|-----------------------|---------------------------------------------|
| Constraints of participatory pond fish farmers | Age                   | -0.158                                      |
|                                       | Level of education    | 0.005                                       |
|                                       | Household size        | 0.115                                       |
|                                       | Farm size             | -0.132                                      |
|                                       | Area under fish farming | -0.113                                         |
|                                       | Fish farming experience | -0.358**                                   |
|                                       | Annual family income  | -0.288**                                   |
|                                       | Training exposure     | -0.237*                                     |
|                                       | Extension media contact | 0.018                                      |
|                                       | Organizational participation | -0.037                                     |
|                                       | Knowledge on fish farming | -0.112                                  |

Notes: **: Significant at 1% level of probability; *: Significant at 5% level of probability, df: Degrees of freedom
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