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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 Bangali 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 24°75' and 24°83' North latitudes and between 90°26' and 90°67' 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.

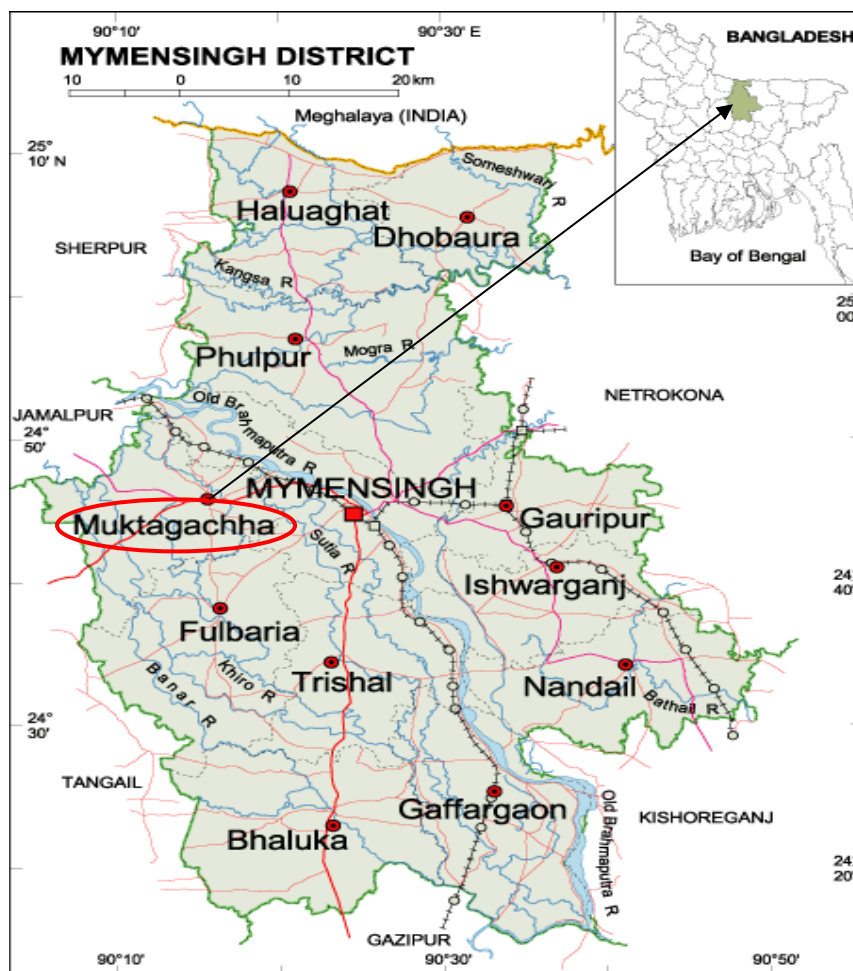


Fig. 1. Map showing the study area.

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 age, 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.

$$CFS = (Ph \times 3) + (Pm \times 2) + (Pl \times 1) + (Pn \times 0) \dots \dots \dots (1)$$

Where, CFS = Constraint Facing Score, Ph = Number of responses with high constraints, Pm = Number of responses with medium constraints, Pl = Number of responses with low constraints and Pn = 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).

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}} \dots \dots \dots (2)$$

Where,

r_{xy} = Pearson's product-moment correlation coefficient

\bar{x} and \bar{y} = Means of the variables x and y, 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	8.05	3.65
Can sign only (0.5)	15	15		
Primary (1-5)	30	30		
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(.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.)				
Low (up to 50)	14	14	249.72	310.09
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 to10)	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.

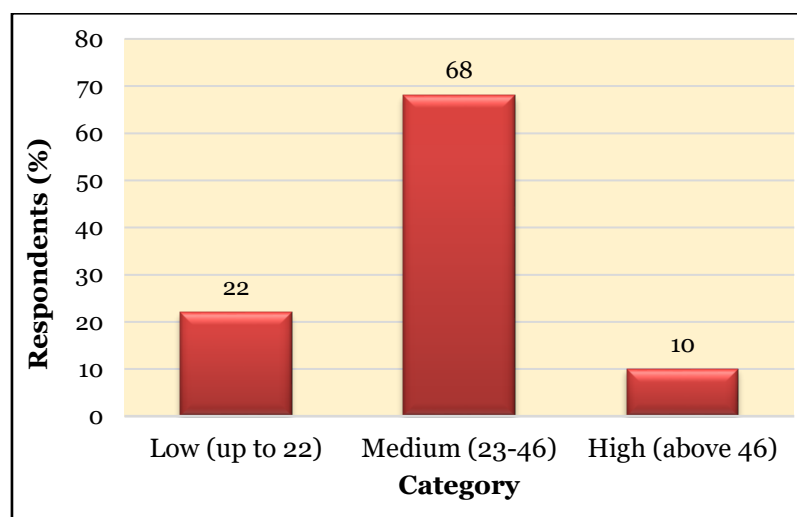


Fig. 2. Extent of constraints of participatory pond fish farmers (n=100).

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

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

Fear to start participatory farming with a CFS score of 245 was reported as the third important constraints of fish farmers in 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

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

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.

Conclusions

The participatory pond fish farmers in the study area experience a number of constraints, of which, lack of training on aquaculture, high price of various inputs and fear to start participatory farming were significant. The degree of constraints is further determined by the socioeconomic characteristics of the farmers. Several factors such as fish farming experience, annual family income and training exposure of the fish farmers were found more influential to the constraints. This indicates an opportunity to work on those features to minimize the degree of constraints that lead to profitability in

participatory pond fish farming. Therefore, it is highly recommended that the respective authority like Department of Fisheries should provide better interventions, like training and extension services, to the farmers in regard to participatory pond fish farming that would improve the profitability of fish production. Moreover, different credit organizations (both GOs and NGOs) should provide easily accessible credits to increase participatory pond fish farming within the study area.

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