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## **Pond fish culture and needs for credit: A study in selected areas of Tangail district**

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### **Abstract**

This study examines the cost, returns, profitability of pond fish farm, requirements, adequacy, sources and utilization patterns of credit and problems associated with pond fish farming in Madhupur Upazila of Tangail district. A total of 60 farmers with small traditional types of ponds were randomly selected for this study. Both description and econometric analysis were used. Human labour was the most important and one of the largest inputs used for pond fish production. The average per acre human labour cost, fingerlings cost, feed cost, chemical fertilizers cost, manure cost, and lime cost were Tk. 9345, Tk. 18506, Tk.10476, Tk.3759, Tk. 329, and Tk.1605, respectively. Pond rental value was calculated at Tk. 11537 per acre for one year which shared 26.42 percent of total costs of pond fish production. Gross return was Tk. 70928 per acre. Gross margin and net return of the pond fish farm were Tk.38118 and Tk. 24081 per acre respectively. The BCR was 1.514. Out of 60 farmers, only 11 farmers received loans from different sources and 86.67 percent of applied amount received. About 83 percent of the loan used for operating expenditure of farming and rest 17 percent loan used for non-farm expenditure. There were some problems in fish farming, such as insufficient water, high feed cost etc. Government needs to provide subsidized feed, technical supports and credit facilities for the small scale fish farmers.

**Keywords:** Pond fish farming, Cost and Return, Profitability, Credit

### **Introduction**

Fisheries is one of the major sub-sector in the agricultural sectors and plays a vital role in the socio-economic development of rural area, fulfilling the animal protein demand, creating employment opportunity, alleviating poverty and earning foreign exchange for the country. About 1.2 million people are directly employed in this sector and another 12 million people indirectly earn their livelihood out of activity related to fisheries (Islam, 2010). The fisheries sector contributes 4.64% of the gross domestic product (GDP), 18.43% of agricultural GDP (BBS, 2011). Total inland fish production is 2381916 metric ton; total marine fish production is 517287 metric ton (BBS, 2011). Bangladesh situated in the north eastern part of the South Asian subcontinent. The country is blessed with about 4.047 million ha open inland water body, 0.528 million ha closed inland water body and marine water covers an area of 0.166 million ha. These water bodies are very rich in fisheries resources. Bangladesh has at least 260 freshwater fish species and over 475 marine species (DoF, 2009). Almost all Bangladeshi people rely on a wide variety of fish species to meet their protein needs. Fish supplies a valuable source of protein calcium, mineral, fatty acids, vitamins and oil containing poly-unsaturated fatty acids. Fish production could be expected to play an important role in supplying sufficient fish. Increased pond fish production in Bangladesh can help to meet the increased domestic demand. In order to meet the shortage of fish, the Department of Fisheries (DoF) and some non-government organizations (NGOs) are encouraging people to increase fish production in their surrounding water areas, such as pond, haor, baor, beel, etc. Generally, profitable pond fish production depends on the application of its inputs management and technologies etc. At present, some of the fish producers in our country understood the positive effect of scientific aquaculture and they already adopted a number of improved technologies for increasing fish production through pond fish culture. But most of them are facing acute problem of financing.

Increasing productivity of pond fish in a sustainable agricultural credit is a howling need of the nation to cater to the growing demand for the fish of the increasing population. The present study provides valuable information about pond fish culture, credit availability and utilization patterns. The results of analysis provide information about the cost and return of pond fish farming and credit requirements. It also indicates the inputs that provide relatively higher returns to total output. The information will be helpful to

the policy makers and the prospective producers in making decision on pond fish production. The result of the study also provides valuable information to the researchers who are interested to conduct similar type of research in future. So, the researcher attempts to undertake the study with the following objectives:

- (i) To identify the socioeconomic characteristics of the sample respondents;
- (ii) To estimate the cost, returns and profitability of pond fish culture in the study area;
- (iii) To assess the requirements, adequacy, sources and utilization patterns of credit; and
- (iv) To identify the nature of problems associated with pond fish culture.

## Materials and Methods

A sample of 60 pond fish farmers were selected randomly from Laufula, Bondarail, Chaparkona, Arailbari, Aralia, Gopath, Gaingair, Sivrambari, Kalamajee village under Madhupur Upazila of Tangail District. Primary data were collected personally from respondents through a sample survey with the help of a structured and pre-tested interview schedule. Focus group discussion and observation techniques were also used to get relevant information. The data and information were collected during the period from September to December 2012. A stratified random sampling technique was followed in this study. Simple statistical techniques such as percentage and arithmetic mean or average were employed to analyze the data. Activity budgets were calculated.

Activity budgets (Dillon and Hardaker, 1993) of the pond fish culture were prepared using the following algebraic equation:

$$\pi = P_y Y - \sum_{i=1}^n (P_{xi} X_i) - \text{TFC}$$

$\pi$  = Net return (Tk./acre);  
 $P_y$  = per unit price of the product (Tk./kg);  
 $Y$  = Quantity of the production per acre (Kg);  
 $P_{xi}$  = Per unit price of  $i^{\text{th}}$  inputs (Tk.);  
 $X_i$  = Quantity of the  $i^{\text{th}}$  inputs per acre (kg);  
 $\text{TFC}$  = Total fixed cost (Tk.);  
 $i$  = 1,2,3.....,n (number of inputs).

Apart from the profitability analysis, undiscounted benefit-cost ratio (BCR) was calculated dividing per hectare gross return by gross cost.

## Results and Discussion

### Income level of the respondents

Income level was one of the many variables to measure the socio-economic status of a household. Table 1 reveals that 8.33% of the farmers were included in annual income level of Tk. 25000-75000, 11.67% of farmers were Tk.75001-100000, 25% of farmers were Tk.100001-150000, 16.67% of farmers were Tk. 150001-200000, 6.67% of farmers were Tk. 200001-250000, 15% of farmers were Tk.250001-350000 and 16.67% of farmers were above Tk. 350000.

**Table 1. Level of income of the respondents**

Income Range	Number of respondents	Percentage
25000-75000	05	8.33
75001-100000	07	11.67
100001-150000	15	25
150001-200000	10	16.67
200001-250000	04	6.67
250001-350000	09	15
Above 350000	10	16.67
Total	60	100

Source: Field survey, 2012

### Age distribution

In this study, the pond fish farmers were classified into three age groups such as 20-40 years, 41-60 years and above 60 years. Age classification of sample pond fish farmers was presented in Table 2. It was found that 61.67% of the respondents belonged to the age group of 20-40 years. About 28.33% of the respondents were age group of 41-60 years and rest 10% of the respondents were age group of above 60 years. This information implies that the majority of the sample farmers were in active age group of 20-40 years indicating that they provided more physical efforts for fish farming.

**Table 2. Age distribution of sample farmers**

Age group (years)	Number	Percentage
20-40	37	61.67
41-60	17	28.33
Above 60	06	10
Total	60	100

Source: Field Survey, 2012

### Participation of male and female

A total 60 (Male 48 and Female 12) farmers were involved in the fish farming in the study area. That means 80% are male and 20% are female were involved in the fish farming in the study area (Table 3).

**Table 3. Existence of Male and female fish producers in the study area**

Sex	Number of pond fish producers	
	No.	Percentage
Male	48	80
Female	12	20
Total	60	100

Source: Field survey, 2012

### Level of education

Information on the education levels of the respondents is presented in table 4. It is observed from table 4 that 16.67% of pond fish producers did not have any formal education, 28.33% had primary level, 40% had S.S.C. level; 11.67% had H.S.C. level 3.33% had graduation and above level of education in the study areas. Overall fish farmers in general were literate persons.

**Table 4. Educational status of sample respondents**

Level of education	Number of respondents	% of total respondent
Illiterate	10	16.67
Primary	17	28.33
S.S.C	24	40
H.S.C	7	11.67
Graduate and above	2	3.33
Total	60	100

Source: Field Survey, 2012

### Occupation of the fish farmers

The pond fish owners were engaged in various types of occupation. The main occupation of farm family considered in the present study was the occupation from which most of the income was earned. The occupations of fishpond owners are presented in Table 5. It appears that farming, business, service, fish farming and others represented main occupation for 65%, 6.67%, 5%, , 21.67%, 1.67% respectively of the pond fish farmers. On the other hand, 23.33%, 11.67%, 1.67%, 6.67%, 41.67%, 15% of the total fishpond owners had farming, business, service, day labour, fish farming and others are respectively as their subsidiary occupation.

**Table 5. Distribution of sample pond fish farmers by types of occupation**

Occupations	Number	Percentage
<b>Main</b>		
Farming	39	65
Business	4	6.67
Service	3	5
Fish farming	13	21.67
Others	1	1.67
All groups	60	100
<b>Subsidiary</b>		
Farming	14	23.33
Business	7	11.67
Service	1	1.67
Day labour	4	6.67
Fish farming	25	41.67
Others	9	15
All groups	60	100

Source: Field Survey, 2012

### Distribution of sample ponds according to size

Pond size may vary in different locations on the basis of physical and socioeconomic conditions. A suitable pond size was required to minimize the production cost and maximize the production. Table 6 shows distribution of areas of the 85% of pond fish farms were from 0.05 to 0.5 acres. There are no fish ponds occupying below 0.05 acres to above 5 acres.

**Table 6. Distribution of sample ponds according to size**

Size of pond (acre)	Pond fish producers	
	Number	Percentage
0.05-0.5	51	85
0.51-1	7	11.67
1.01-5	2	3.33

Source: Field Survey, 2012

### Estimation of costs and returns

Cost and returns were calculated from farmer's point of view. Costs were calculated for all the family supplied and purchased inputs used in producing pond fish. The market prices of inputs and output were used. The cost of pond fish production included the costs of human labour and material input (feed, fertilizer, manure and fingerlings), land use cost and cost on operating capital. The items have been described below:

**Cost of human labour:** Human labour was required in different operations and managements, such as reconstruction, feed application, fertilizer application, compost making and its application, application of cow dung, Stocking of fingerlings, making feeding ring, weeding and fish harvesting and marketing. Both family and hired labour were used in the pond fish culture. Family labour included the farm operator himself/ herself and other members of his family i.e., brothers and children etc. Labour was measured in terms of man-day which usually consisted of 8 hours. For women and children, man equivalent hours were estimated. This was computed by converting all women and children hours into man-equivalent hours assuming 1 adult male = 1.5 women = 2 children. The average human labour cost per acre was Tk. 9345.

**Cost of fingerlings:** Per unit price of fingerlings depends on their sizes as well as the concerned fish species. The stocking rate of fingerlings varies with the fertility of pond. Pond fish farmers in the study area used purchased fingerlings and the cost was calculated on the basis of farm-gate price. The selected species of fingerlings were Rui, Catla, Mrigal, karfu, Silver carp, Grass carp, Mirror carp, Shrimp, Chetol, Tilapia, Pangus, Kalabous and Sharpunti used for fish culture. The average unit price of fingerlings was 3Tk. /piece. The purchasing cost of fingerlings per acre for pond fish production was Tk. 18506.

**Cost of feed:** It was found that almost all the farmers applied supplementary feed such as both rice-bran and oil-cake. It varied according to the intensity of cultivation. Farmers normally do not use pellet feed because it is costly and not available. In the study area, farmers applied rice bran 503 kg per acre and oil cake 148 kg per acre. Rice bran costs Tk. 6031 per acre and oil-cake costs Tk. 4434 per acre. The average feed cost per acre was Tk.10476.

**Cost of fertilizers:** Fertilizer was generally used in the fishpond to create condition, which facilitates an increase in production of good quality natural fish feed, thereby increasing fish production. Farmers used three kinds of chemical fertilizers namely, Urea, Triple super phosphate (TSP) and Manure in the study area. The cost of fertilizer was charged at the prevailing market rate in the study area during pond fish culture season. Farmers applied Urea 122 kg per acre and TSP 51 kg per acre. Urea and TSP costs were Tk. 1467 and Tk. 2291 per acre, respectively. The average fertilizer cost per acre was Tk.3759. Manure was important for fish production. It was observed that, farmers used cow-dung in fish ponds as manure in the study area. Cow-dung was home supplied and purchased. The cost of cow-dung was calculated Tk.0.50/kg. It observed that farmers used 657 kg manure per acre per year. So, the average cost of manure per acre was Tk. 329.

**Cost of lime:** Lime application was an important factor for pond fish pond production. Lime was used mainly to neutralize acidity in the soil and water of pond. Lime assists in release of nutrient from the soil and promotes the bacterial breakdown of water material including green manure. The average quantity of lime used by fish farmers was 115 kg/acre per year. Average cost incurred for lime was Tk.1605 (Table 7).

**Table 7. Per acre material inputs costs for fish farmers**

Items of cost	Quantity (Kg)	Price/Kg	Total cost (Tk.)	% of total cost
Feed				
Rice bran	503	12	6036	37.32
Oil cake	148	30	4440	27.45
Fertilizer				
Urea	122	12	1464	9.05
TSP	51	45	2295	14.19
Manure	657	0.5	329	2.03
Chemical Cost				
Lime	115	14	1610	9.95
Total			161734	100

Source: Field Survey, 2012

**Land use cost:** Lease value of pond was consisted as land use cost. It was calculated at the rate of prevailing cash rental value of per acre pond land in the study area. Pond rental value was calculated at Tk. 11537 per acre for one year which shared 26.42 percent of total costs of pond fish production. This was treated as fixed cost in this study.

**Cost on operating capital (IOC):** Interest on operating capital was calculated by taking into account the costs incurred on all field operations but excluding those items for those interest was already been calculated. On an average, the cost was estimated at Tk. 7349.67. It constituted 5.34 percent of gross costs (Table 8).

**Table 8. Average gross costs of pond fish**

Cost items	Cost (Tk/acre)	Percentage
<b>Variable cost</b>		
Human labour	9345	19.95
Fingerlings	6605	14.09
Feed	10476	22.36
Fertilizer	3759	8.02
Manure	329	0.70
Lime	1610	3.44
Electricity cost	686	1.46
<b>Fixed cost</b>		
Land use cost	11537	24.63
Interest on operating capital	2500	5.34
Total	46847	100

Source: Field Survey, 2012

### Gross Return

Gross return was the value of fish produced in money terms. This was calculated by multiplying the total amount of production by their respective market prices. Gross return from pond fish production was estimated at Tk. 70928 (Table 9).

**Table 9. Average returns from pond fish production per acre per year**

Yield	Quantity (Kg)	Price/Kg	Value (Tk.)	Percentage
Gift and consumption	29	143	4147	5.85
Sale	467	143	66781	94.15
Total	496	143	70928	100

Source: Field Survey, 2012

### Gross Margin

Producers generally want to gain maximum return over variable cost of production. Gross margin was the difference between the gross return and total variable cost. The gross margin of pond fish production was estimated at Tk. 38118 (Table 10).

### Net Return

Per acre net returns from pond fish production was calculated by deducting gross costs from gross returns. It can be noted from (Table 10) that per acre net return was Tk.24081.

**Table 10. Per acre Costs and Economic Returns of Pond Fish**

Particulars	Cost and Economic Returns(Tk./acre)
Yield (Y) kg	496
Gross Return (GR) Tk.	70928
Total variable cost (TVC) TK.	32810
Total fixed cost (TFC) Tk.	14037
Total cost/Gross cost TC=(TVC+TFC) Tk.	46847
Gross Margin GM= (GR-TVC) Tk.	38118
Net Return NR=(GR-TC) Tk.	24081
Return over per Tk. investment (NR/TC)	0.51
BCR (GR/TC)	1.51

Source: Field Survey, 2012

### Return over per taka investment

Net return per taka invested was the ratio between net return and total cost. Table 10 shows that net return per taka investment in pond fish farming was 0.514. It means that by spending Tk.100 net return of Tk. 51 was obtained.

### Benefit cost Ratio (BCR)

Benefit cost ratio for pond fish culture was determined as ratio of gross return to gross cost. Table 10 reveals that benefit cost ratio (undiscounted) of pond fish farming was 1.51 indicating that production of pond fish was profitable. The finding justifies that benefit cost ratio was higher than one, Suggesting that there was a potential for pond development in study area.

### Requirements, adequacy, sources and utilization patterns of credit

The farmers of Taingal district are not so solvent. Although they do not want to take loan easily, they somehow try to manage continue farming without taking loan. Eleven farmers among 60 took loan from different sources (Table 11).

**Table 11. Sources of received loans**

Sources	Number of respondents	Percentage
Grameen Bank	02	18.18
Bangladesh Krishi Bank	04	36.36
Mahajan	02	18.18
Relatives	02	18.18
Friends	01	9.09
Total	11	100

Source: Field Survey, 2012

Table 12 shows that the farmers who applied loan amount between Tk. 2000-Tk. 5000 received almost 50% of the applied amount. The farmers who applied Tk. 5001 - Tk. 8000 and Tk. 8001-Tk. 1200 received 100% of the applied amount.

**Table 12. Amount of loan applied for and loan received by the borrower farmers**

Farmers category according to loan size	Number of respondents	Total amount applied for (Tk.)	Average Amount received(Tk.)	Amount received in % of amount applied
Tk.2000-Tk.5000	05	20000	10000	50
Tk.5001-Tk.8000	02	15000	15000	100
Tk.8001-Tk.12000	04	40000	40000	100
<b>Total</b>	<b>11</b>	<b>75000</b>	<b>65000</b>	<b>86.67</b>

Source: Field Survey, 2012

Credit plays an important role in farm business. Many people cannot start a business without taking loan. It helps people to be self employed. It increases farm productivity and income if it properly utilized. So, the pattern of credit utilization is very important in farming. To make profit, bank or NGO must ensure that the borrowed funds are used for productive purposes. Proper use of credit promotes increased production and benefits the borrowers involved. Use of credit for unproductive purposes very often results in overdue of loans and weakens the financial viability of the concerned financial institution. Table 13 shows the pattern of utilization of their loan money.

**Table 13. Percentage of utilization of loan in different purposes**

Item of expenditure	Percentage amount of loan used(Tk.)			
	Loan amount (2000-5000)	Loan amount (5001-8000)	Loan amount (8001-12000)	All
A. Capital expenditure				
i) Pond excavation	10.18	10.90	10.00	10.36
ii) Pond re-excavation	5.00	2.05	10.65	5.9
B. Operating expenditure				
i) purchase of fingerlings	23.81	28.47	17.49	23.26
ii) Purchase of fertilizer	32.65	29.05	31.93	31.21
iii)Purchase of feed	2.19	25.16	10.14	12.50
Total operating expenditure of farming	73.83	95.63	80.21	83.23
C. Non-farm expenditure				
i) Purchase of food	20.03	-	4.97	8.33
ii) Investment in business	6.14	1.44	3.38	3.65
iii)Repayment of old debt	-	2.93	11.44	4.79
Total non-farm expenditure	26.17	4.37	19.79	16.77
Grand total	100	100	100	100

Source: Field Survey, 2012

### Problems and constraints of pond fish culture

Water is essential for pond fish culture. Bangladesh belongs to the monsoon region that represents sufficient water was in the monsoon season but insufficient water was in the dry season. Table 14 reveals that 23.33% of the pond fish farmers complained the insufficient water as the problem, 80% of the respondents claimed that diseases of the fish was the major problem in pond fish culture. Agricultural extension workers and Upazila Fisheries Officers can help the farmers for solving this problem. High feed cost was the main problem of the respondents. As a result of high feed cost, farmers' cost of production was increased and profitability decreased. Table 14 also shows that most (91.67%) of the respondents claimed high feed cost as their big problem. Government should take appropriate policies to overcome this problem. Predators were another minor problem in the selected area. Only 3.33% of the respondents claimed predators as the fourth problem (Table 14). About 7% of the respondents claimed theft as a problem where 'Night Guard' was not available. Sometimes neighbored were doing that job just for enemies. Table 14 shows that 63.33% of the respondents claimed unexplained mortality of fish as their major problem due to lack of proper knowledge on the relevant technology. Farmers were not able to find

the causes of mortality of the fish. Fisheries expert could help to solve this problem. The lack of fingerlings was found as another problem for the farmers. About 18.33% of the respondents claimed non-availability of seed fish as their problem. Fingerlings are the most important material input in pond fish culture method. But proper stocking size is not always available in the culture time because of lack of fingerlings nursery in Bangladesh. Government, private organisation and Non Government Organisations could establish new nurseries to solve this problem. Higher demand for labour was another problem for 11.67% of the respondents especially in the harvesting period. This problem could be solved by exchanging their labour with other farmers. Higher costs in general were another major problem in pond fish culture technology. Farmers need more operating capital specially to buy fingerlings. About one third of the respondents complained higher cost as a major problem. In the pond fish culture, technology is needed to prepare pond excavation. Normally, pond excavation takes a proportion of the total costs of the pond fish culture. Nearly 70% of the respondents claimed higher cost of pond excavation for pond fish culture as their problem.

**Table 14. Constraints of pond fish culture as ranked by farmers (Percentages are in parentheses)**

Problem	Number of times problem was ranked				
	First	Second	Third	Fourth	Total (n = 60)
Insufficient water	04	02	05	03	14(23.33)
Diseases	13	14	11	10	48(80 )
High feed cost	24	15	10	06	55(91.67)
Predators	00	00	00	02	02 (3.33)
Theft	00	00	02	02	04 (6.67)
Unexplained mortalities	10	16	07	05	38(63.33)
Non availability of seed fish	00	00	04	07	11(18.33)
High labour demand	00	00	02	05	07 (11.67)
High costs in general	03	04	07	06	20(33.33)
High cost of pond excavation	06	09	12	14	41(69.01)

Source: Field Survey, 2012

## Conclusion

Fisheries are an extensive economic activity in Bangladesh. Fish constitutes a common item of the diet of the population and a major source of protein supply. The bulk of the fish catches comes from inland fishery resources of which ponds constitute an important source. In most of the ponds, fish culture is practiced mostly by traditional ways. The government of Bangladesh is disbursing a considerable amount of credit each year for development of pond fish culture through proper management. The cereal crops can satisfy hunger temporarily, but can hardly fulfill the nutritional requirements which are most essential for human body. But the present level of animal protein production in Bangladesh fails to satisfy the demand of increasing population. For increasing the production of fish, it is obvious that number of fish must be increased. Credit can play important roles of pond fish farming but all farmers were not interested to borrow money from different financial institutions. There were some problems in the study area in pond fish farming, such as insufficient water, diseases, theft, high feed cost etc. Most of the producers face these problems. Therefore the findings suggested that in order to increase area under culture fish as well as its more rapid expansion the above problems should be solved as far as possible.

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