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Economics of Small Scale Capture Fishing in Dekhar Haor of Sunamganj District, Bangladesh

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Abstract
This study was aimed at estimating profitability and identifies determinants of profit at the small scale farm level of fishing community in some areas of *Dekhar haor* under Sunamganj district. Data were collected through structured questionnaire from 100 fishermen by using random sampling. Descriptive statistics was used to estimate the cost and returns while linear regression model was used to estimate the determinants of the profitability. The results showed that per season gross return and net profit were Tk. 79178.40 and Tk. 58833.64 respectively for small scale *haor* fishing. Results from regression shows that, among the variables profitability was affected by experience, net cost, boat ownership status, food cost and maintenance and miscellaneous cost.
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1. Introduction

Bangladesh is a tropical and most densely populated country which is located in the northeastern part of southern Asia. The country has the widest spectrum of inland water resources comprising floodplains, natural depressions, rivers, reservoirs, ponds, coastal and marine water bodies. Among them floodplains/wetlands are most important geographical features for Bangladesh. Graced by numerous floodplain and coastal water bodies, fishery in Bangladesh plays a very significant role in terms of nutrition, employment, foreign exchange earnings and food supply.

Fish supplements about 60% of Bangladeshi people's daily animal protein intake (DoF, 2016). The fisheries can broadly be classified into three categories: inland capture fisheries, inland aquaculture and marine fisheries (DoF, 2016).

Total fish production of the country is around 42,76,641 MT of which inland culture fisheries, inland capture fisheries and marine capture fisheries contribute about 56.25%, 28.45% and 15.30% respectively (DoF, 2018). Inland capture fisheries consist of marshy wetlands which are named as *haor.* It is a marshy wetland ecosystem which physically is a bowl or saucer shaped depression that looks like inland seas during the monsoon floods (Hasan *et al*., 2017). Haors are found mainly in the north eastern region of Bangladesh which is covering the parts of greater Sylhet and Mymensingh. In Sylhet district most important *haors* are *Hakaluki haor*, *Dekhar haor*, *Saneer Haor*, *Tanguar haor, Hail Haor, Maker haor*, *Chayer haor and Kawadighi haor* (Hossain, 2014). Among them, *Dekhar haor* is a resourceful wetland basin located in Sunmaganj district. The *haor* is composed of 36 small and large interconnecting beels, channels, rivers and crop lands and covers about 11514.6 hectares (CNRS, 2004). It is an important habitat for freshwater fish production, meeting local and national demand for fish protein and serve as a good source of fish seed supply for other

nearby water bodies. It also provides suitable areas for feeding, breeding, nursing and so on for thousands of indigenous fish. This qualities leads to high yield and leads to substantial increase in fish production. A large number of populations of the area depend upon catching fish from the *haor* open water body. So, it is necessary to analyze the economic performance of fish catching and identify the factors that influencing profitability in the study area. Therefore, this study was undertaken to achieve the following objectives:

i) To determine profitability of small scale capture fishing in *Dekhar haor*
ii) To identify the factors affecting profitability in the study area

2. Methods and materials

For this study the area selected was *Dekhar Haor* which is under Dakshin Sunamganj Upazila of Sunamganj district. The data were collected from three villages of Dakshin Sunamganj Upazila: Noagaon, Kaikkar par and Rabbanigor. Primary data were collected through simple random sampling. Both part time and full time fishermen were considered for the study. Data was collected during the period from 2018-2019 from 100 fishermen.

3. Analytical Technique

Data were analyzed with the combination of tabular and functional analysis to fulfill the objectives. Descriptive statistics, inferential statistics and econometric analysis were applied to analyze the data collected from fishermen. In this study the following techniques were used:

3.1 Descriptive Statistics

Descriptive Statistics was used to get the simple measures like average, percentage and ratio. The calculation procedure of the entire technique was based on weighted average to describe input use, cost and returns of the small scale *haor* fishermen.

3.1.1 Profitability of small scale fishing

Cost and returns analysis is the most common method for determining and comparing profitability of any enterprise. Profit, also called net return, is the difference between total return and total cost. The following equation was used to determine the fishermen profitability at small scale level (Dillon and Hardaker, 1993):

$$\pi = \sum_{i=1}^{n}(P_{Y_i} . Y_i) - \sum_{i=1}^{n}(P_{X_i} . X_i) - TFC \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where,
π = Profit,
P_{Y_i} = Price per unit of the i-th produces;
Y_i= Quantity of the i-th produces;
P_{X_i} =Price per unit of the i-th input;
X_i= Quantity of i-th input;
TFC=Total fixed cost; and
i =1, 2, 3……n (number of times)

3.1.2 Specification of empirical model

Regression analysis was used to identify the relationship between dependent variable which is net return at farm level and cost of inputs used to catch fish in the *haor* area as independent variables. The regression model can be written as:

$$Y_i = f(X_i) \ldots\ldots\ldots\ldots\ldots (2)$$

Where,
Y_i = Profit at the farm level;
X_i= Factors influencing the level of profit of fish catching.
The model could be written in explicit form as;

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + u_i \ldots\ldots\ldots\ldots (3)$$

Where,
Y_i= Amount of profit realized by fish farmer (Tk.)
$\beta_0 \ldots\ldots\ldots \beta_9$ = Parameters

$\boldsymbol{X_1}$= Age of the respondent (Years)
$\boldsymbol{X_2}$= Experience in fish catching (Years)
$\boldsymbol{X_3}$= Main occupation of the Respondent(1= Fishing,0= Otherwise)
$\boldsymbol{X_4}$= Family size (No.)
$\boldsymbol{X_5}$= Net cost (Tk.)
u_i = Error term
$\boldsymbol{X_6}$= Boat ownership status, 1= Yes, 0= otherwise
X_7= Bait cost (Tk.)
X_8= Food cost (Tk.)
X_9= Maintenance and miscellaneous cost (Tk.)

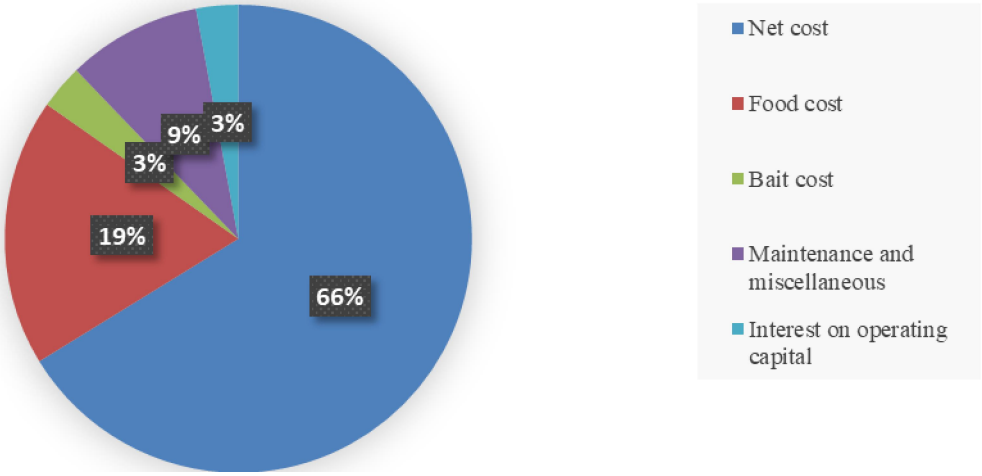
4. Results and discussion

4.1 Estimation of cost and returns associated with fish catch

In the study area fishermen catch fish six month in a year. So cost and returns were calculated for six month.

4.1.1 Total variable cost

From the study it was observed that, total variable cost of fish catching per season was BDT 15915.58 Tk. The highest portion of the total variable cost was contributed by cost of net which was about 66.23% of the total variable cost. This is followed by food cost of fishermen during fishing representing 18.49%. Food cost is those cost which was spent during fishing time for the fishermen. Maintenance and miscellaneous cost was 9.29% of the total variable cost. Bait was used as food on a hook to catch fish. The remaining group of variable cost which constitutes bait cost and interest on operating capital was 5.99%.



Source: Field survey, 2019

Figure 1. Variable cost incurred by fishermen for six months

4.1.2 Total fixed cost

Total fixed cost per season for the fishermen of *haor* fish catching was BDT Tk. 4429.18 of which boat cost constitutes about 50.33% and lease cost of the *beels* 49.57% of the total cost respectively.

Table 1. Fixed cost incurred by fishermen for six months

Item	Taka/ Season	% of total
Boat cost (Depreciation)	2229.18	50.33%
Lease value	2200.00	49.57%
Total		100%

4.1.3 Total cost

Total cost was calculated by summing up total variable cost and total fixed cost incurred by fishermen. Per season total cost of fish catching of the study area was BDT Tk.20344.76.

4.1.4 Economic returns of the fish catching per season

A large variety of known and unknown species were caught by fishermen. For profitability calculation small, medium and large size of small indigenous fish species were considered. The amount of fish catching depends on types of net used and the number of hours spent at *haor.* Table 2 shows that highest amount of fish catch by fishermen was *puti* which was 16.54 kg/month and the lowest amount was *baim* which was 5.59 kg/month. This result is found consistent with the findings of Muzahid *et al* 2017.

4.1.4.1Gross return

Gross return consisting of revenue from fishing was calculated by multiplying the total catch by their respective prices. The highest amount of gross return was for *escha* and that was 3148.64 Tk/month and the lowest one for *taki* which was 923. 79 Tk/ month. In the study area per month average gross return from all species was found Tk. 13196.89 and per season it was Tk. 79178.40 respectively.

4.1.4.2 Net return and profitability of fish catching per season

Net return is the difference between gross return and total cost. Table 2 presents per season gross return, total cost and net return of fish catching. Per season net return earned by fishermen were Tk. 58833.64 under different fishing gears (Table 2).

Table 2: Economic returns of the *hoar* fish catching per season

Sl. No.	Name of the fish species	Quantity (Kg)	Price (Tk./Kg)	Total Return
1	Puti *(Putius ticto)*	16.54	102.04	1687.74
2	Tengra *(Mystus vittatus)*	11.13	246.55	2744.10
3	Baim *(Macrognathus aral)*	5.59	246.20	1376.25
4	Chela *(Chela bacaila)*	6.84	166.60	1139.54
5	Veda *(Nundus nundus)*	8.49	256.40	2176.83
6	Taki *(Channa punctate)*	11.13	83.00	923.79
7	Escha *(Macrobrachium indella)*	13.37	235.50	3148.64
Gross return per month	-	73.09	180.55	13196.89
Gross return per Season	-	438.09	180.55	79178.40
Total cost (TVC+TFC)	-	-	-	20344.76
Net return	-	-	-	58833.64

Source: Field survey, 2019

4.2 Factors affecting profitability at small scale farm level

The results of the regression model are presented in Table 3. The estimated measure of goodness of fit (R-square) which is value of 0.728 implies that about 72.8% of variations in the profitability of small scale fish farming are explained by the specified explanatory variables in the model. In case of the explanatory variables, the model revealed that five of the nine hypothesized variables were statistically significant at $p<0.05$ level.

Table 3: Factors affecting profitability at small scale farm level

Variables	Coefficient	Std Error	t-value	Level of significance
Intercept	8925.320	4739.903	1.883	0.063
Age of the fishermen	-120.406	77.503	-1.554	0.124
Experience in fish catching	1536.035**	197.006	7.797	0.000
Main occupation of the Respondent	-2253.455	1629.254	-1.383	0.170
Family size	142.416	255.170	0.558	0.578
Net cost	-0.329**	0.087	-3.775	0.000
Boat ownership status	5151.541*	1433.975	3.592	0.001
Bait cost	-5.212	5.426	-0.960	0.339
Food cost	-0.759*	0.339	-2.242	0.027
Maintenance and miscellaneous cost	-1.532*	0.669	-2.291	0.024

Here, ** Significant at 1% level; * Significant at 5% level. R Square = 0.728; Adjusted R Square = 0.701.
Source: Authors' computation, 2019

From the Table 3, it was observed that the years of experience in fish catching was significant with a positive coefficient, implying that the profit level increases as the fishermen's experience increases. This result is in line with other studies of Ugwumba and Chukwuji, (2010); Pius and Victor (2014). They also found that the effect of farming experience on profitability is positive and an increase in the experience leads to an increased output of fish by the fisherman. The cost variables (e.g. net cost, food cost, maintenance and miscellaneous cost) had negative and significant effect on profitability at small scale fish farming. The negative effect of different variable cost items implies that, increasing variable costs exerts downward pressure on expected farm profitability in the study area. The result is consistent with other studies which reveal that different costs has a direct relationship to fish output in small scale farming, indicating that more the cost, lower the profit. (Hyuha et. al. 2011; Olukunle 2017). In contrast, the effect of boat ownership is measured through a dummy variable and the estimated coefficient has the hypothesized positive effect. This can be due to the fact that, own boat of fisherman can help him to provide control over the renting and transportation cost. Apart from that, he had not to depend on others in case of scheduling his fishing time and length.

5. Conclusion

Capture fishing is profitable in the study area. It is a major source of income for most of the people of the *haor* area. It helps to create employment opportunity which also helps to improve their socio-economic conditions. Profitability of fish catching is positively influenced by years of experience in the fish catching and negatively influenced by most variable cost items such as net cost, bait cost and maintenance and miscellaneous cost. That means if cost increased profitability will be reduced. Findings suggest that agricultural policy should give emphasis on access of small scale *haor* fishermen to adequate inputs at reduced cost so that profitability can be increased.

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