Comparative economic analysis of pond fish production in Mymensingh and Jessore Districts, Bangladesh

Nirmal Chandra Saha*, Jahangir Alam1, M. Al-Imran2 and M. Shahidul Islam
Bangladesh Fisheries Research Institute, Mymensingh 2201, Bangladesh
1Bangladesh Agricultural Research Council, Dhaka
2Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh
*Corresponding author

Abstract
The study was conducted to determine the cost, return and relative profitability of pond fish production of Mymensingh and Jessore districts. A total of 75 ponds were selected on the basis of purposive random sampling technique from 7 villages under 2 Upazila (Trishal and Gouripur) of Mymensingh districts and 8 villages under 4 Upazila (Monirumpur, Jhikorgacha, Chowgacha and Sadar) of Jessore district. It was found that per hectare per year gross cost of pond fish production in Mymensingh and Jessore were Tk 333457.75 and Tk 54327.74, while gross return were Tk 434131.16 and Tk. 96640.00 and net return were Tk 100673.41 and Tk. 42312.26, respectively. The findings of this study revealed that the pond fish production in Jessore district was more profitable than that of Mymensingh district. Cobb-Douglas production function was applied to realize the specific effect of the factors on pond fish production. Out of six variables included in the function three variables had positive impact on return from pond fish production, in Mymensingh district but five variables had positive impact on return from pond fish production in Jessore district.

Key words: Fish culture, Cost and return, Cob-Douglas production function

Introduction
Bangladesh is a developing country with a vast water resource. Fishery has been making special contribution to the economy of Bangladesh. It plays a vital role in the alleviation of poverty in Bangladesh. It meets up the nutritional requirement of the people, creates employment opportunity and earns foreign exchange for the country. Most of the people in this country depend on fish as main source of animal protein. It has been estimated that about 1.3 million people are directly employed in this sector. Another 1.2 million people indirectly earn their livelihood from fisheries related activities. Frozen shrimp, fish and fishery products occupy the third position in the country's exports (4.76% of total foreign exchange earning). In 2001-2002, fisheries sector contributed 5.24 percent to the total GDP of the country (DoF 2003). The country's total production of fish was 1890459 tones in 2001-2002 of which 1475039 tones were from inland sources and
415420 tones from the marine sources. The growth rate of the production during the last decade, on average, was 7.20 percent per year.

In Bangladesh, increased aquaculture production, mainly pond fish production can help to meet the increased domestic demand for fish (2.075 million tones; (FFYP 1997-2002). 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 (pond, haor, baor, beel etc.). In response to government’s initiative for augmenting fish production in the country, people have started to be occupied in different types of fish production activities. The two important activities are rising for fingerlings and production of table fish using different types of technologies popularized by various government and non-government agencies.

The main purpose of the present study was to generate information regarding the comparative profitability of pond fish production in different areas. It was also interesting to look at the efficiency of input use in the production process.

Materials and methods

The study was carried out from July’03 to June’04 in seven villages at Mymensingh district and eight villages at Jessore district. A set of interview schedules were pre-tested and developed. Data were collected from 7 villages under two Upazila (Trishal and Gouripur) of Mymensingh district and 8 villages under four Upazila (Monirumpur, Jhikorgacha, Chowgacha and Sadar) of Jessore district. A total of 150 producers were selected from the study areas on the basis of purposive random sampling technique. A simple tabular method was followed to illustrate the whole picture of analysis. The sum, mean, percentage, ratio, etc. were the simple statistical measures employed to show the comparative performance of pond fish. Relative profitability of pond fish and production was determined on the basis of net return analysis.

Functional analysis

To find the effects of variable inputs both linear and Cobb-Douglas production function models were estimated initially. Data were converted to per farm basis to facilitate the analysis. The results of the Cobb-Douglas models appeared to be superior on theoretical and econometric grounds. So, the Cobb-Douglas model was accepted for interpretation. Six independent variables were employed to explain the gross returns from pond fish production in Mymensingh and Jessore districts. Regression analysis (ordinary least squares) method was used to determine the effect of these inputs. A series of regression procedures were carried out to be sure that serious multicollinearity problem did not exist. The function was specified as:

\[ Y = aX_1 + b_1X_2 + b_2X_3 + b_3X_4 + b_4X_5 + b_5X_6 + b_{U1} \]

The function was linearised by transforming it into the following double log or log linear form:

152
Comparative economic analysis of pond fish production

\[ \ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_6 + U_i \]

Where,
\( Y \) = Gross return from fish/fingerlings production (Tk), \( X_1 \) = fingerlings cost (Tk), \( X_2 \) = Fertilizer cost (Tk), \( X_3 \) = Lime cost, \( X_4 \) = Feed cost per farm, \( X_5 \) = Poison cost per farm, \( X_6 \) = Labour cost (Tk), \( \ln \) = Natural logarithm, \( a \) = Intercept, \( b_i \) = Production coefficients, and \( U_i \) = Error term.

Few important variables like pond keeping, pond area, number of ponds, duration of water etc., which might affect pond fish production could not be included in the model due to non-availability of appropriate data for the model.

Results and discussion

Costs and returns

Among the different cost items, cost of feed appeared to be the highest and represented 68.70 percent of total cost of pond fish production in Mymensingh district. In Jessore district the cost of fingerlings was highest and represented 22.72 percent of the total cost of production. The average per hectare gross cost per year amounted to Tk. 333457.75 and Tk. 54327.74 for pond fish production in Mymensingh and Jessore districts, respectively (Table 1). Gross returns from pond fish production of Mymensingh and Jessore districts amounted to Tk. 434131.16 and Tk. 96640.00, respectively. The net returns from pond fish production in Mymensingh and Jessore were computed at Tk. 100673.30 and Tk. 42312.26 per hectare, respectively. The benefit cost ratio (BCR undiscounted) of pond fish production in Mymensingh and Jessore were 1.30 and 1.78, respectively. It indicates that the production of fish in pond was more profitable in Jessore than in Mymensingh. Ahmed (2003) studied yield the gap, production loss and profitability of pond fish culture in Netrokona district. He observed that the gross cost was Tk. 77496.00, gross return was Tk. 233250.00 and net return was Tk. 155754.00 per hectare of pond fish production. Haque (2000) conducted a comparative economic analysis of pond fish production in Pabna district. He found the gross cost of Tk. 65917.52, gross return of Tk. 91706.61 and net return of Tk. 25789.09 from the same study. Islam (2000) studied fish farmers and fishermen and gender role in fisheries development in Mymensingh, Tangail, Chandpur, Cox’s Bazar and Khulna districts. He found that BFRI contract farmers gross cost was Tk. 9758.00 and gross return was Tk. 20247.80 and net return was Tk. 10489.00 per hectare from fish production. Sultana (2001) studied the adoption of BFRI evolved polyculture and carp nursery technologies in Mymensingh district. She found that the gross cost was Tk. 70953.00, gross return was Tk. 120974.00 and net return was Tk. 50021.00 from per hectare of pond fish production. Results of the present study were comparable to those studies.
Factors affecting pond fish production

The effect of the various inputs used in the process of fish production was analyzed. Inputs used in production was classified broadly into material inputs (fingerlings, feed, lime and fertilizer, etc.) and labour. Furthermore, there were some inherent characteristics of pond environment and factors that could affect its production such as pond area, be employed to explain the variation in output of ponds. Accordingly, some crucial inputs were identified and included in the model to explain the variation of productivity of fish in ponds.

Interpretation of results

Estimated values of coefficients and related statistics of the Cobb-Douglas production function for pond fish production are given in Table 2. The function fitted well for pond fish production of Mymensingh and Jessore districts as indicated by F-values and R². The coefficients of multiple determination, R² were 0.885 for Mymensingh and 0.912 for Jessore district. It indicated that the variables included in the model succeeded in explaining about 88.50 % and 91.20% of the total variations in the value of pond fish production of Mymensingh and Jessore districts, respectively. The F-values were highly significant at 1% levels implying that all the included explanatory variables was important for explaining the variations in pond fish production. The sum of all the production coefficients (production elasticity) of the equations for pond fish production were 0.57 and 0.965 indicating that the production function exhibited
Comparative economic analysis of pond fish production

increasing returns to scale for pond fish production of Mymensingh and Jessore districts, respectively.

**Interpretation of Coefficients for Individual Variables**

The regression coefficients of feed cost was positive and significant at 1% level of significance, which indicated that 1 percent increase in feed cost, keeping other factors constant, would increase gross return 0.466 percent in the Mymensingh districts but in Jessore district fingerlings and feed cost were positive and significant at 1% level of significance, which indicated that 1 percent increase in cost of fingerlings and feed cost, keeping other factors at their same level, would increase the gross return 0.719 and 0.104 percent, respectively. The coefficients of fertilizer cost, lime cost and poison cost were negative and insignificant at Mymensingh district and lime cost at Jessore district was negative and insignificant, which indicated the over use of these inputs. Cost of fingerlings and labour cost were positive and had no significant impact on pond fish production of Mymensingh and cost of fertilizer, poison and labour cost were positive and had no significant impact on pond fish production of Jessore district.

Table 2. Estimated values of coefficient and related statistics of Cobb-Douglas production function model

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Mymensingh</th>
<th>Jessore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.56</td>
<td>2.45</td>
</tr>
<tr>
<td>Cost of fingerlings (X1)</td>
<td>0.154</td>
<td>0.719*</td>
</tr>
<tr>
<td></td>
<td>(0.121)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Fertilizer cost (X2)</td>
<td>-0.016</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.099)</td>
</tr>
<tr>
<td>Lime cost (X3)</td>
<td>-0.0354</td>
<td>-0.034</td>
</tr>
<tr>
<td></td>
<td>(0.065)</td>
<td>(0.051)</td>
</tr>
<tr>
<td>Feed cost (X4)</td>
<td>0.466*</td>
<td>0.104*</td>
</tr>
<tr>
<td></td>
<td>(0.069)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Poison cost (X5)</td>
<td>-0.0009</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Labour cost (X6)</td>
<td>0.0115</td>
<td>0.108</td>
</tr>
<tr>
<td></td>
<td>(0.082)</td>
<td>(0.174)</td>
</tr>
<tr>
<td>R²</td>
<td>0.885</td>
<td>0.912</td>
</tr>
<tr>
<td>F value</td>
<td>87.103*</td>
<td>117.328*</td>
</tr>
<tr>
<td>Returns to scale (Σb.)</td>
<td>0.58</td>
<td>0.965</td>
</tr>
</tbody>
</table>

Note: Figures in the parentheses indicate standard error
*Significant at 1% level

**Conclusions**

The production of fish in ponds was higher in Mymensingh than in Jessore. The cost was significantly lower (Table 1) in Jessore district than Mymensingh district. The cost of fish production was minimum but the net return was maximum in Jessore than
Mymensingh. The study reveals that the Benefit-cost ratio was higher in Jessore than in Mymensingh. In the functional analysis, it was found that the some of factors of fish production (fingerlings, fertilizer, feed, poison and labour) were positive in Jessore district, whereas three factors (fingerlings, feed and labour) were positive in Mymensingh district. The results of the study indicate that the pond fish production can be increased and made more profitable by efficient reallocation resources in the production process.

Acknowledgement
The present study was carried out under financial support by the Ministry of Science and Information & Communication Technology, GOB.

References
Ahmed, M.U., 2003. An economic study of yield gaps, production losses and profitability of pond fish culture under different types of management in some selected areas of Netrokona District. M.S. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.
Haque, M.M., 2000. A comparative economics analysis of pond fish production and fish nursery operation in some selected areas of Pabna District. M.S. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.
Sultana, S., 2001. Socio-economic impact of the adoption of BFRI evolved polyculture and carp nursery technologies in some selected areas of Trishal Upazila in Mymensingh District. M.S. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.

(Manuscript received 5 September 2004)