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Factors Affecting Alternate Rice-Fish Production of Mymensingh District in Bangladesh

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Abstract: Cobb-Douglas production function has been used to measure the effect of various factors on alternate rice-fish production. The chosen factors were of fingerlings cost, cost of cow dung, cost of rice bran, cost of oil cake, cost of lime, cost of urea cost of human labour and cost of netting for fish production and for rice production the factors were human labour, animal labour. Cow dung, urea, TSP, MP, seed and irrigation cost. It was found that except cost of rice bran and lime for fish production all the factors were statistically significant and for the rice production animal labour, TSP and irrigation cost were the insignificant

Key words: Returns to scale, significant, explanatory variable

INTRODUCTION

Bangladesh is an agro based developing country. The future development of the country is very much related with agricultural sectors. As a sub sector of agriculture, fisheries second in rank. Fisheries play a significant role in nutrition, employment and foreign exchange earning. Agriculture contributes 32.4% to the GDP and of this 3.20% comes from fisheries sub sector[1]. The contribution of this sub sector to the national foreign exchange earning is about 9%[2]. Fishery industry in Bangladesh provides livelihood to 11.2 million full time fishermen and to 10 million part time fishermen.

Possibilities to expand marine fishery are very limited, due to marine fishery operation are very capital intensive and require skilled labour both of which are scare in Bangladesh. Also people of our country are less habituated to take marine fish in their diet. Therefore, inland water is the preferred source for increasing fish production there by minimizing the protein deficiency[3].

It is often argued that the future development of our country depends particularly on the agriculture sector. Fish also uses space more efficiency than many other domestic animals. A comparative study conducted in Hungary and Taiwan indicated that the production of fish cultivation fish was much lower than that of beef and poultry[4].

In this study important inputs and other related factors that affect the output of alternate rice-fish production have been assessed. The analysis is based on data for the year 2000-2001 of a sample of 80 alternate rice-fish farmers from different areas of Bhaluka thana of Mymensingh district.

MATERIALS AND METHODS

Cobb- Douglas form of production function was chosen on the basis of best fit and significant result of output. Eight inputs namely fingerlings, rice-brown, oil cake, salt, urea, lime, cowdung and human labour were used which were considered as A priori explanatory variables responsible for variation in fish Production. And for rice production also eight inputs namely human labour, animal labour, cowdung, urea, TSP, MP, seed and irrigation employed which are considered as A priori explanatory variables.

The models of the following forms for the analysis were used:

$$Y = a x_{1i}^{b1} x_{2i}^{b2} x_{3i}^{b3} x_{4i}^{b4} x_{5i}^{b5} x_{6i}^{b6} x_{7i}^{b7} x_{8i}^{b8} ui$$

$$\text{Or Log } Y = \log_a + b_1 \log x_{1i} + b_2 \log x_{2i} + b_3 \log x_{3i} + b_4 \log x_{4i} + b_5 \log x_{5i} + b_6 \log x_{6i} + b_7 \log x_{7i} + b_8 \log x_{8i} + ui$$

For fish production

Y = Gross income (Tk ha^{-1}),

x_1 = Cost of Fingerlings (Tk ha^{-1}),

x_2 = Cost of cowdung (Tk ha^{-1}),

x_3 = Cost of rice bran (Tk ha^{-1}),

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x_4 = Cost of oil cake (Tk ha^{-1}),
x_5 = Cost of lime (Tk ha^{-1}),
x_6 = Cost of urea (Tk ha^{-1}),
x_7 = Cost of human labour (Tk ha^{+}),
x_8 = Cost of netting (Tk ha^{-1}),
a = Constant or intercept,
b_1–b_9 = Co-efficient of the relevant variables and
ui = Disturbance term. And for rice production
Where,
Y = Gross income (Tk ha^{-1}),
x_1 = Cot of Human labour (Tk ha^{-1}),
x_2 = Cost of Animal labour (Tk ha^{-1}),
x_3 = Cost of Cowdung (Tk ha^{-1}),
x_4 = Cost of urea (Tk ha^{-1}),
x_5 = Cost of TSP (Tk ha^{-1}),
x_6 = Cost of MP (Tk ha^{-1}),
x_7 = Cost of seed (Tk ha^{-1}),
x_8 = Cost of irrigation (Tk ha^{-1}),
a = Constant or intercept,
b_1–b_8 = Co-efficient of the relevant variables and
ui = Disturbance term

RESULTS AND DISCUSSION

The results indicate that Cobb-Douglas production function fitted well as considering R^2 and F value. The co-efficient of multiple determination for fish production R^2 was 0.95 and adjusted R^2 was 0.92 which means that explanatory variables included in the model explained 95% of the variation of fish production. The F-value of fish production was 25.367 which is highly significant at 1% level. The return to scale of all production co-efficient of sample farmers for fish production was 0.77 which indicates that the production exhibit decreasing return to scale. In other words, if all the inputs specified in the function were increased by 1%, output would have increase by 0.77%. It is evident from Table 1 that the 8 variable of fish production were taken for interpretation of results. The level of significance used 1, 5 and 10%. Of all these variable cost of Urea and netting cost were significant at 1% level. Cost of fingerlings, oil cake, human labour were significant at 5% level; cost of cowdung was significant at 10% level and cost of rice bran and lime were insignificant.

The estimated production co-efficient for stocking fingerlings, cowdung, oil cake, Urea, human labour and netting were significant and had positive effect upon gross return which implies that for every 1% increase in the significant variable gross return will be increased, assuming that other inputs were held constant. On the other hand, the estimated production co-efficient for rice bran and lime were insignificant which indicates that there was a chance to decrease the gross return per hectare by spending additional amount for cost of rice bran and lime. An increase of 1% in the cost of rice bran and lime keeping other factors constant, would result in a decrease of gross return.

The results indicate that Cobb-Douglas production function fitted well as indicated by R^2 and R^2.The co-efficient of multiple determinations R^2 is 0.874 for rice production which means that the explanatory variables included in the model explained 87.4% of the variation of rice production. The F-value of rice production was 4.339 which was highly significant at 1% level. The return to scale of all production co-efficient of sample farmers for rice was 1.22. This indicates that the production exhibits increasing return to scale. In other words, if all the inputs specified in the function were increased by 1 percent output would have increased by 1.22%.

It is evident from the Table 1 that 8 variables of rice production were taken for interpretation of results. The level of significance used 1, 5 and 10%. Of all these, variable costs of Urea, MP and seed were significant at 1% level. Cost of human labour was significant at 5% of level, cost of cowdung was significant at 10% level and costs of animal power, TSP and irrigation were insignificant. The estimated production co-efficient for human labour, cowdung, Urea, MP and seed were significant and had positive effect upon gross return which implies that for every 1% increase in the significant variable gross return will be increased, assuming that other inputs were held constant. On the other hand, the estimated production co-efficient for animal power, TSP and irrigation were insignificant which indicates that there was a chance to decrease the gross return per hectare by spending additional amount for animal power, TSP and irrigation. An increase of 1% in the cost of animal power, TSP and irrigation keeping other factors constant would result in a decrease of gross return.

In addition to regression analysis, tabular method is also used here to show cost, yield and profitability of alternate rice-fish culture (Table 2). For the purpose of this study, size of farm is specified as follows: Small farmers holding land between 0.02 to 1.01 ha (0.05 to 2.49 acres), medium farmers 1.02 to 3.03 ha (2.5 to 7.49 acres) and those of large farmers owned land between 3.03 ha and above (above 7.5 acres). Most of the alternate rice-fish farms are in medium size category and represent 55 percent of total farms. The numbers of small and large farms are 30 and 15%, respectively.

Alternate rice-fish culture comprises two components namely fish and rice. The average per hectare yield of fish was 1105.93 kg. Per hectare returns from fish was Tk 47764.48. For rice components average per hectare yield was 4444 Kg. Moreover, the alternate rice-fish farmers

Table 1: Estimated values of co-efficient and related statistics of fish and rice production

Fish production		Rice production	
Explanatory variables	Co-efficient	Explanatory variables	Co-efficient
Intercept	3.747 (.543)	Intercept	2.133 (2.047)
Fingerlings (x_1)	0.082** (.034)	Human labour (x_1)	0.719** (0.223)
Cowdung (x_2)	0.068*** (.034)	Animal labour (x_2)	-0.353 (0.116)
Rice bran (x_3)	-0.064 (.021)	Cowdung (x_3)	0.086*** (0.050)
Oil cake (x_4)	0.024** (.016)	Urea (x_4)	0.258* (0.071)
Lime (x_5)	-0.113 (.033)	TSP (x_5)	-0.365 (0.096)
Urea (x_6)	0.144* (.049)	MP (x_6)	0.340* (0.840)
Human labour (x_7)	0.051** (.023)	Seed (x_7)	0.799* (0.196)
Netting (x_8)	0.517* (.087)	Irrigation (x_8)	-0.264 (0.095)
R^2	0.95	R^2	0.874
Adjusted R^2	0.92	Adjusted R^2	0.673
Return to scale (Σbi)	0.77	Returns to scale (Σbi)	1.22
F value	25.367	F-value	4.339

Note : * Significant at 1% level. ** Significant at 5% level. *** Significant at 10% level Figures within the parentheses indicate standard error.

Table 2: Cost and economic return of rice and fish under alternate rice-fish culture

	Farm sizes							
	Small farms		Medium farms		Large farms		All farms	
Items	Qunty. (unit)	Return (Tk)	Qunty. (unit)	Return (Tk)	Qunty. (unit)	Return (Tk)	Qunty. (unit)	Return (Tk)
Returns								
Fish (kg)	1123.85	46830.83	1076.2	46016.79	1179.80	56040.50	1105.93	47764.48
Rice (Kg)	4323	25848.08	4491	27813.66	4512	28011.85	4444	27253.72
By-product (straw)	-	1440.83	-	1475.14	-	1235.00	-	1428.83
Gross return		74119.74		75305.59		85287.35		76447.03
Costs (Tk)								
Fish production	-	33439.33	-	32025.326	-	39520.13	-	33322.81
Rice production		13216..91		15053.93		14293.61		14388.78
Gross cost (Tk)		46656.24		47079.26		54268.74		48031.13
Net benefit (Tk)		27463.5		28226.33		31018.61		28415.90

obtained a large volume of rice plant stand as by-products. The weight of by-products was difficult to estimate but it was valued according to estimates provided by the alternate rice-fish farmers. The average per hectare return from the by-products of rice was Tk. 1428.83. The average gross return from alternate rice-fish culture was Tk 76447.03. The total returns from alternate rice-fish culture were Tk 74119.74, 75305.59 and 85287.35, respectively for small, medium and large farms. The average net return from alternate rice-fish culture was Tk. 27463.50, 28226.33, 31018.61 and 28415.90 for small, medium, large and all farms, respectively.

The result of this study indicates that both the fish and rice production can be increased by using of modern and scientific production technology. In the study areas, the survey data have shown that the average yield of fish is only 1106 kg ha^{-1} and per hectare rice production is 4444 kg. It can be easily increased more than 3 times by using proper dozes of fertilizer and modern production technology. Therefore, there is enough possibilities to increase yield per hectare through intensive methods of cultivations. On the other hand, all cultivable of alternate rice-fish farms should be brought under scientific method to extend the farming area and to increase productions.

REFERENCES

1. BBS, 1997. Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka, Bangladesh.
2. BBS, 1996. Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka, Bangladesh.
3. Islam, M.S. and S. Dewan, 1987. An Economic Analysis of Pond Fish Production in Some Areas of Bangladesh Research Report No. 11, Bureau of Scio-Economic Research and Training, BAU, Mymensingh, Bangladesh.
4. Shang, Y.C., 1973. Comparison of the Economic Potential of Aquaculture, Land, Animal Husbandry and Ocean Fisheries. The case of Taiwan Aquaculture, Scientific publishing company, Amsterdam, Netherlands, 2: 187-195.