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FINANCIAL PROFITABILITY AND RESOURCE USE EFFICIENCY OF BORO RICE PRODUCTION IN SOME SELECTED AREAS OF MYMENSINGH DISTRICT IN BANGLADESH

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ABSTRACT

Bangladesh is predominantly an agricultural country. Agriculture provides employment to nearly about 47.33 percent of its total labor forces (BER, 2015). Broad agriculture sector which includes crops, livestock, fisheries and forestry contributes 16 percent to the Gross Domestic Product (GDP) as a whole in the FY 2013-14 (BER, 2016). Mymensingh district was selected for the study to calculate the profitability and to assess the resource use efficiency of Boro rice production. Simple random sampling technique had been used for collecting data from 60 sample farmers through interview schedule. Both descriptive studies and functional analysis was done to achieve the objectives of the study. The findings of the study revealed that per hectare gross return, net return, and gross margin were found to be BTD110680.00, BTD 25208.94 and BTD 48158.95, respectively. Total costs of rice production were calculated at BTD 85471.06 per hectare. Benefit Cost Ratio (BCR) was found to be 1.29 for Boro rice production. Thus it was found that Boro rice production was profitable. Production function analysis suggested that, among the variables included in the model, quantity of seed, animal labor and power tiller cost, No. of human labor, quantity of fertilizer, cost of irrigation, had a positive and significant effect on the gross yield of Boro rice production, except for cost of manure and cost of pesticides had an insignificant effect on the gross yield of rice production. Efficiency analysis indicated that most of the farmers inefficiently used their inputs. This study also identified some problems associated with Boro rice production. Problems faced by the farmers were ranked on the basis of corresponding percentages. This study provides appropriate suggestion and policy recommendations which will help the development agencies and policy makers of the country for improving the livelihood of the people in the study area.

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INTRODUCTION

Bangladesh is an agro-based country. Agriculture occupies a key position in the overall economic sphere of the country in terms of its contribution to Gross Domestic Product (GDP). The most important issue in Bangladesh agriculture is to enhance and sustain growth in crops production. Bangladesh has made some progress in agriculture during the post-independence period. The rate of growth has, however, been low to enable the country to achieve self-sufficiency in food grains which has been the main objective of agricultural development for a long time of this country. In an agro-based country like Bangladesh, crop sub-sector is one of the most important and promising sub-sectors having vital contribution towards her economic development. The contribution of crop sub-sector in Gross Domestic Product was 10.74 percent in FY 2012-13 (BER, 2015). In 2013-14, crop sub-sector contributed about 55.82 percent to the broad agricultural sector Gross Domestic Product (BER, 2015). This sector plays a significant role in meeting the carbohydrate demand and socio-economic development of the rural poor by reducing poverty through employment generation.

Rice is the main cereal crop in Bangladesh. For meeting the food demand of our increasing population there is no alternative of rice cultivation. So importance of HYV variety rice production is growing day by day. In Bangladesh, food security of the vast population is associated with production of rice as it is the staple food of our country. According to BBS, in FY 2013-14, the food grains production stood at around 381.73lakh metric tons (MT) (Aus23.26 lakh MT, Aman 130.23 lakh MT, Boro 190.06 lakh MT) (BER,2015). Bangladesh possesses six positions among the paddy producing country in the world after China, India, Indonesia, Vietnam, and Thailand (World Top Ten, 2015.). Rice alone contributes 12.5 percent of total agricultural Gross Domestic Product (GDP) (BBS, 2014). There are three seasons of rice grown which are known as Aus, Aman and Boro. Boro is the most important and single crop in Bangladesh in respect of volume of production. Currently Boro occupies about 41 percent of total rice area and contributes 56 percent of total rice production in Bangladesh (BBS, 2014). Total area under Boro crop has been estimated 11837334 acres (4790305 ha) in 2013-14 as compared to 11762572 acres (4760055 ha) 0f the 2012-13. The harvested area has increased by 0.64 percent in the year 2013-14 (BBS, 2015). The development of high- yielding modern grain varieties of rice which are highly responsive to inorganic fertilizers and insecticides, effective soil management and water control helped the country to meet the increasing requirement of food grain (Hayami and Ruttan, 1985).

The government of Bangladesh has given priority to the agriculture sector to increase the production of rice by giving subsidy to the farmers on different inputs such as fertilizer, irrigation etc. The future of rice production in Bangladesh depends very much on the awareness of its profitability and how efficiently the farmers are using their resources. The costs of production of Boro paddy per hectare were BTD 25547, BTD 25857.73, and BTD 27548.07 for small, medium and large farmers respectively. Per hectare yield of Boro paddy under different farm categories were 2875.85 kg, 3230.95kg and 3152.50 kg respectively. The net returns per hectare were BTD 2075.09, BTD 4986.09 and BTD 2232.48 respectively (Nantu, 1998). BR-29 was profitable enterprise from the viewpoints of small medium and large farmers. Per hectare costs or BR-29 were calculated at BTD 3295.54, BTD 32485.63 and 33617.40 for small, medium and large farmers respectively. Per hectare Yield of BR-29 were 6290 kg, 6600 kg and 6100 kg, respectively. In general human labor, power tiller, seedling, fertilizers, Irrigations and insecticides emerged as the very crucial contributors to increased income from BR-29 Boro production (Rahman, 2000). Among the aromatic and fine rice varieties, Pajam had the maximum yield per hectare. But net returns per hectare for the aromatic varieties were higher due to the higher market prices and less production cost. Domestic resource cost (DRC) ratios showed that Bangladesh had comparative advantage in the production of aromatic and fine rice both from the point of view of export and import substitution, except the Nizershail variety which was marginally unprofitable under export proposition (Anik, 2003). Boro rice cultivation is profitable in the haor area. Boro-fallow- is the common land use pattern of the study area. The author also found that the technical efficiency of the study area was 87.27 %. Fertilizer and irrigation significantly increase the production level of Boro rice in the haor area (Khan et al., 2004). The farmers were in the second stages of production, which is, decreasing returns to scale (using the elasticities). The results of the efficiency computation indicated that land (6.63), fertilizer (1.76) and seed (10.84) were being underutilized and labor (0.000036) and chemicals were being highly over utilized (Nimoh et al., 2012). The present study was undertaken to calculate the financial profitability and assess the resource use efficiency of Boro rice production in the study area.

MATERIALS AND METHODS

To achieve the objectives of the present study, Phulpur upazila under Mymensingh district was selected. Data required for the present study were collected from primary and secondary sources. Simple random sampling technique was used to select the Boro rice farmers and a total of 60 year round Boro rice farmers were selected from the selected villages. Data collection period was 1st April to 31st May, 2012. For data entry and data analysis, the Microsoft Excel programs and SPSS programs was used. Both descriptive and statistical analysis was used for analyzing the data. Tabular technique of analysis was generally used to find out the socio-demographic profile of the respondent, to determine the cost, returns and profitability of rice farmers.

Profitability Analysis

Cost and return analysis is the most common method of determining and comparing the profitability of different farm household. In the present study, the profitability of Boro rice production is calculated by the following way-

The following conventional profit equation was applied to examine farmer's profitability level of the Boro rice producing farms in the study areas.

Net profit, $\pi = \Sigma P_m Q_m + \Sigma P_f Q_f - \Sigma (P_{xi} X_i) - TFC.$

Where, π = Net profit/Net return from Boro rice production (Tk/ha);

P_m = Per unit price of Boro rice (Tk/kg);

Q_m = Total quantity of the Boro rice production (kg/ha);

P_f = Per unit price of by products (Tk/kg);

Q_f = Total quantity of by products (kg/ha);

P_{xi} = Per unit price of i-th inputs (Tk);

X_i = Quantity of the i-th inputs (kg/ha);

TFC = Total fixed cost (Tk); and

i = 1, 2, 3,....., n (number of inputs).

Interest on Operating Capital

Interest on operating capital was determined on the basis of opportunity cost principle. The cost was incurred throughout the whole production period; hence, at the rate of 10 percent per annum interest on operating capital for six months was computed for rice production. Interest on operating capital was calculated by using the following standard formula (Miah, 1992).

Interest on Operating Capital (IOC) = Alit

Where,

Al= Total investment /2,

t = Total time period of a cycle

i= interest rate which was 10 percent per year during the study period.

Undiscounted Benefit Cost Ratio (BCR)

Average return to each taka spent on production is an important criterion for measuring profitability. Undiscounted BCR was estimated as the ratio of total return to total cost per hectare.

$$BCR = \frac{\text{Total Return}}{\text{Total Cost}}$$

Functional Analysis

The input-output relationship in Boro rice production was analyzed with the help of Cobb-Douglas production function approach. To determine the contribution of the most important variables in the production process of Boro rice, the following specification of the model was used.

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}Xe^{u_i}$$

The Cobb-Douglas production function was transformed into following logarithmic form so that it could be solved by ordinary least squares (OLS) method.

$$\ln Y = \ln a + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + b_6\ln X_6 + b_7\ln X_7 + b_8\ln X_8 + \ldots\ldots + b_n\ln X_n + u_i$$

Where, Y= Per hectare yield of Boro rice (Kg/ha); a = Constant or Intercept of the function, X_1= Quantity of Seed (Kg/ha); X_2= Cost of Animal Labor and Power Tiller (BTD/ha); X_3= Human labor (Man days/ha); X_4= Quantity of Fertilizer (Kg/ha) X_5=Quantity of Manure (Kg/ha); X_6= Cost of Irrigation (BTD/ha); X_7= Cost of Pesticides (BTD/ha).

Measurement of Resource Use Efficiency

In order to test the efficiency, the ratio of Marginal Value Product (MVP) to the Marginal Factor Cost (MFC) for each input were computed and tested for its equality to 1. i.e., MVP/MFC = 1.

In this study the MPP and the corresponding values of MVP were obtained as follows:
Thus, when resource-use efficiency (RUE) =1, resources are optimally used, When RUE <1, resources are over utilized, when RUE >1, resources are underutilized.

RESULTS AND DISCUSSION

Financial Profitability of Boro Rice Production

The average yields of Boro rice was 6415.00 kg. The average gross return per hectare was BTD 110680.00. From the Table 1 it was observed that per hectare net return was BTD 25208.94. Table 1 revealed that BCR was 1.29 which means that farmers get higher profit. The results of profitability analysis clearly indicated that Boro rice production was profitable for farmers.

Factors Affecting Production of Boro Rice

Cobb-Douglas production function was chosen to determine the contribution of key variables on the production process of Boro rice. It was evident from table 2 that the explanatory variables like seed/seedling (X_1), animal labor and power tiller (X_2), human labor (X_3), fertilizer (X_4), and irrigation (X_6) were found to have significant effect on the production of Boro rice. On the other hand, manure (X_5) and pesticides (x_7) were found to have insignificant effect on the production of Boro rice.

The value of coefficients of multiple determinations R^2 was 0.77 which indicates that 77 percent of the total variations in returns were explained by the independent variables included in the model. The F-value was 18.30 highly significant implying that all the included explanatory variables were important for explaining the variation of income of farmers in Boro rice production. Cobb-Douglas production function fitted well for Boro rice growing farms as indicated by F-values and R. Stage of production was estimated by returns to scale which was the summation of all the production elasticity of various inputs. The result from the summation of all production co-efficient was 1.003 which implied that production function for farmers presents increasing returns to scale. This means that, if all the variables specified in the model were increased by 1 percent, gross yield would also be increased by 1.003 percent (Table 2). It was evident from table 3 that all the farmers in the study areas inefficiently used their resources for Boro rice production.

Table 1. Per Hectare Costs, Returns and other Parameters for Boro Rice Producing Farmers

Particulars	Quantity	Rate (BTD/unit)	Cost (BTD/ha)	% of Total Cost
Seed (Kg/ha)	58.75	85.00	4993.75	5.84
Animal labor/Power tiller Cost (BTD/ha)			8450.00	9.89
Human labor cost (No. of Man-days/ha)	135.00	225.00	30375.00	35.54
Urea (Kg/ha)	250.00	18.00	4500.00	5.26
TSP (Kg/ha)	138.00	22.00	3036.00	3.55
MoP (Kg/ha)	65.00	15.00	975.00	1.14
Gypsum (Kg/ha)	50.55	10.00	505.50	0.59
Zinc Sulphate (Kg/ha)	13.48	48.50	653.76	0.76
Manure (Kg/ha)	6154.00	0.50	3077.00	3.60
Cost of irrigation			3890.00	4.55
Cost of pesticides			2075.00	2.43
A. Total Variable Cost (TVC)			62521.01	73.15
Interest on operating capital @ of 10% for 6 months			3126.05	3.66
Rental Value of land			19824.00	23.19
B. Total Fixed cost (TFC)			22950.05	26.85
C. Total cost (A+B)			85471.06	100.00
Main product value	6415.00	16.00	102640.00	
By product value			8040.00	
D. Gross Return (BTD/ha) i.e. (GR)			110680.00	
Total variable cost (BTD/ha) i.e. (TVC)			62521.01	
Total cost (BTD/ha) i.e. (FC+TVC)			85471.06	
E. Gross Margin (BTD/ha) i.e. (D-A)			48158.95	
F. Net Return (BTD/ha) i.e. (D-C)			25208.94	
G. BCR (undiscounted) i.e. (D/C)			1.29	

Source: Field Survey, 2012.

Table 2. Cobb-Douglas Regression Estimates for Boro Rice Production

Explanatory Variable	Estimated Coefficient		
	Co-efficient	**Standard Error**	**t-value**
Intercept	1.686	1.067	1.58
Quantity of seed/seedling (X_1)	0.156**	0.072	2.160
Animal labor/ Power tiller cost (X_2)	0.457***	0.108	4.298
Human labor (X_3)	0.235**	0.088	2.615
Quantity of Fertilizer (X_4)	0.095*	0.052	1.975
Quantity of Manure (X_5)	-0.061	0.045	-1.311
Irrigation cost (X_6)	0.102*	0.031	3.095
Pesticide cost (X_7)	0.019	0.040	0.425
R^2	0.77		
Adjusted R^2	0.76		
F value	18.30***		
Returns to scale	1.003		

Source: Field Survey, 2012. Note: *** Significant at 1 percent level; ** Significant at 5 percent level; * Significant at 10 percent level; and NS: Not Significant.

Table 3. Resource Use Efficiency of Boro Rice Production.

Variables	GM	MVP	MFC	MVP/MFC	Comments
Seed	54.09	314.115	85.00	3.69	Underutilized
Animal labor and Power tiller	1	51703.9	8450.00	6.12	Underutilized
Human labor	138.67	185.776	225.00	0.83	Over utilized
Fertilizer	510.87	21.64	22.70	0.95	Over utilized
Manure	6374.30	-1.0688	0.50	-2.14	Over utilized
Irrigation	1	11385.8	3890.00	2.93	Underutilized
Insecticides	1	2015.93	2075.00	0.97	Over utilized

Source: Field Survey, 2012.

Problems of Boro Rice Production

Although Boro rice production was profitable in the study area, but there are several problems faced by the farmers to its higher production. The problems were broadly classified under three categories such as economic, technical, and marketing. Thereafter, the problems were ranked on the basis of their percentages. High price of input (71.67%) ranked first as a problem of Boro rice production. Besides this, lack of capital (68.33%), low price of output (63.33%), and shortage of quality seed (58.33) etc. were ranked as 2nd, 3rd, and 4th major problems of Boro rice production faced by the farmers. Shortage of electricity (13.33%) was the least important problem faced by the farmers

Table 4. Major problems faced by the sample farmers

Problems and constraints	No. of respondent	Type of problems	Percent (%)	Rank
Higher input price	43	Economic	71.67	1st
Lack of capital	41	Economic	68.33	2nd
Low price of output	38	Economic	63.33	3rd
Shortage of quality seed	35	Technical	58.33	4th
Lack of machinery support in proper time	34	Technical	56.67	5th
High wage rate	30	Economic	50.00	6th
Shortage of labor in peak period	28	Technical	46.67	7th
Lack of extension services	27	Technical	45.00	8th
High irrigation cost	25	Economic	41.67	9th
Problems of harvesting and drying	20	Technical	33.33	9th
Lack of technological knowledge	23	Technical	38.33	10th
Selling problem	15	Marketing	25.00	11th
Storage problem	10	Marketing	16.67	12th
Shortage of electricity	8	Economic	13.33	13th

Source: Field survey, 2012. Note: one farmer reported more than one problem, so addition of percentage will not necessarily equal to 100.

CONCLUSION AND POLICY RECOMMENDATIONS

Bangladesh is predominantly an agriculture based country. At present agricultural sector are largely dominated by the rice production. Rice is the staple food of Bangladesh and basically rice cultivation is the major source of livelihood of the people of Bangladesh. An attempt has been made in the study to examine the profitability and resource use efficiency of Boro rice producing farms. It may be concluded that Boro rice production is profitable. If modern inputs and production technology can be made available to farmers in time, yield and production will be increased which can help farmers to increase income and improve livelihood standards. It can help in improving the nutritional status of rural people.

To enhance the productivity, efficiency and effectiveness of Boro rice production, the following recommendations are made as a part of present study which acts as a formulating strategy for enhancing Boro rice production in Mymensingh district.

- Though the government is already given subsidy on fertilizer like urea and other inputs required for rice cultivation but fair prices of inputs should be ensured so that the farmers can get the inputs at a reasonable price.
- Bank loan and institutional credit should be made available on easy term and conditions to the Boro rice farmers.
- Government procurement program should ensure that farmers will get fair prices of their output by purchasing the output directly from the farmers not from the middlemen or rice stockholders.

- Scientific method of cultivation should be introduced to increase production. The farmers should be provided with training, adequate services, information and necessary facilities to cope with new and changed situation.
- Attention should be given to improve storage and marketing facilities of the study area.
- Bangladesh Power Development board should be given attention on the irrigation season of Boro rice production so that the farmers get available electricity at a reasonable cost.

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