Original Research Article

PROFITABILITY ANALYSIS OF BRRI DHAN 29 IN SOME SELECTED AREAS OF BANGLADESH

ABSTRACT

This study was conducted to analyseis profitability of HYV Boro during the 2016 Boro season. BR-29 variety was selected for analysis as this variety is dominated among all Boro varieties in the study area. A total of 75 farmers were randomly selected from seven villages of Islampur Upazilla under Jamalpur district who produced BR-29 boro variety. Primary data were collected from the selected farmers. Cost and return analysis as well as functional analysis were performed in this study. Cobb-Douglas production function was also usedapplied to determine the effects of individual inputs on production of BR-29. Human labor, land cultivation, seed, fertilizer, manure, irrigation and pesticides were considered as seven variables used. It was observed from the result that most of the included variables had significant impact on BR-29 Boro production. This study also identified some problems faced by the farmers in producing BR-29 Boro rice. These were low price of output, scarcity and high wage rate of human labour, high irrigation cost, Lack of credit facilities etc. Therefore, more research and extension is suggested to solveing the farmer's problems in order to increase production of Boro rice and to ensure food security in Bangladesh.

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Keywords: BR-29, Cobb-Douglas production function, Profitability, Food security

1. INTRODUCTION

Bangladesh is a developing country with an estimated 2019 population of nearly 168.07 million in an area of 147,570 square kilometers. The density of population is the highest (1,115.62/square kilometer) in the world (World Population Review, 2019). Bangladesh is mainly an agricultural country and its economy is substantially agro based. Agriculture is the well-recognized driving force of the economy of Bangladesh. The importance of agriculture, esspecially the crop sector, to the economy of Bangladesh needs no emphasizing. There are three types of rice namely Aus, Aman and Boro covering 1.15, 5.51 and 4.68 million hectares of land in Bangaldesh respectively (Mia, 2009). Rice is the staple food of 155.8 million people in Bangladesh (BER, 2015); itrice supplies 69.8% of the total caloric intake and more than 58% of the protein intake (FAO, 2015). Rice production is the largest contributor to farm income, while related trade and commerce are important sources of rural non-farm income (Ahmed, 2001). Bangladesh is the fourth largest rice producer in the world (FAO, 2010).

In the past, the country was largely dependent on importation of food grains with its deficit production. This was due to pressure of increasing population. But in recent years a remarkable change in rice production has already been observed in Bangladesh after introducing of HYV varieties of rice which has made remarkable progress in achieving its food security. Bangladesh Rice Research Institute (BRRI) has

developed and released 46 Modern Varieties (MVS) having potential to produce 2.0 or more times yield than those of traditional varieties. Among the varieties Boro HYV BRRI dhan 29, released in 1994 has high performance in respect of yield, quality, insect and disease resistance and this Boro rice grown during November to February where seedling are raised in a seedbed and transplanted in the main field (Islam, 2007). The variety is Moderately resistance to leaf blight, sheath blight and has an average yield of 7.5 ton/ha (BRRI, 2019).

Boro is the ~~mainly~~ common rice crop in Bangladesh. Structural change in input and output prices of rice in Bangladesh and more dependence on Boro season has made rice production a function of input supply and prices of both inputs and outputs rather than vagaries of nature. As Boro is the main rice crop in Bangladesh, stability of farm income is largely dependent on profitability from Boro production. Therefore, main focus of this study is to analyse~~is~~ profitability of Boro production in 2016 ~~Boro~~ season.

The objectives of this study is to analyze~~present study was undertaken to analysis~~ profitability of BR-29 in 2016 Boro season, to identify major problems faced by BR-29 producing farmer and to suggest some recommendations for policy makers. The paper is organized as follows: data and data collection procedure, analytical technique are discussed in section II, the results are analyzed in section III and the concluding remarks are set down in section IV.

2. METHODOLOGY

Researchers follow a set of tools and techniques in order to fulfill the aims and objectives of the study. Researchers further try to find unbiased results of their studies within limited time, money and personnel. Farm management research by its very nature essentially involves primary data collected from the farmers. The type of primary data to be collected depends upon the nature of the study and its objectives. The present study was based on a field survey where primary data were collected from BR-29 growers. Methodology mainly covers selection of the study area, selection of the samples, preparation of the survey questionnaire, and collection of the data, tabulation, analysis and interpretation of the data.

2.1 Sampling Technique

It was impossible to interview all the BR-29 growers in the study area due to limitations of time and resources. Considering time, availability of fund and manpower, a limited number of farmers were selected randomly. For sampling, at first a list of BR-29 growers in a village was prepared. From a list of farmers of a village, 10-12 farmers were randomly selected. Thus, 75 farmers were selected from the seven villages of Islampur Upazilla of Jamalpur district. Profitability of any enterprise varies due to managerial capacities of different farmers. To control the management factor, farmers who produced BR-29 in 2016 Boro season were chosen for this study.

2.2 ~~Statistical~~ Analytical Technique

In the present study the statistical techniques were also used to supplement the tabular technique. Simple descriptive statistics ~~Some statistical measures~~ like frequency, arithmetic mean, percentages and ratios were used ~~calculated as these were simple to understand and easy to calculate.~~ land interpretation and discussion of the findings were presented in simple terms. Further, Cobb-Douglas production function model was also used to identify the effect of key factors on production of BR-29.

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Comment [SF3]: You could have describe the study area in terms of its climate-rainfall, temperature, humidity as well as its geographical location-longitudes and latitutes.

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The analysis was done for the production of BR-29 in 2016 Boro season. The specification of the Cobb-Douglas production function is as follows;

$$Y= a X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} X_6^{b6} X_7^{b7} e^{ui}$$

In the linear form it can be written as follows:

$$Ln\ Y= lna+ b_1 lnX_1+b_2\ lnX_2+ b_3 ln\ X_3+ b_4 lnX_4+b_5 lnX_5+b_6 lnX_6+b_7 lnX_7.....+ U_i$$

Where,

Y= Gross return of BR-29 Boro rice production (Tk/acre)
a= Constant or intercept
X_1= Cost of human labour (Tk/acre)
X_2= Cost of land cultivation (Tk/acre)
X_3= Cost of seed (Tk/acre)
X_4=Cost of fertilizer (Tk/acre)
X_5= Cost of manure (Tk/acre)
X_6= Cost of irrigation (Tk/acre)
X_7= Cost of pesticide (Tk/acre)
In= Natural logarithm
b_1, b_2 ...b_7 are co-efficient of respective variables

3. RESULTS AND DISCUSSION

3.1 Profitability Analysis

This section mainly deals with the pricing procedures for items of costs and returns of BR-29 Boro production. In calculating profit or loss of an enterprise or relative profitability of different crops costing of inputs and valuation of output is essential. Farmers in the study area used both purchased and home supplied inputs for the production of BR-29 Boro rice, which were valued at the prevailing market rate during survey period or at the price paid by the farmers. The output was also valued at the prevailing market price. Purchased input such as seed, fertilizer, irrigation, pesticides, hired labour etc. involved direct expenses and therefore, pricing of these inputs was easy. Since no cash payment was made for the home supplied inputs, the costs of these inputs were estimated by using the opportunity cost principle. For analytical advantage, the cost items were classified under the following headings; human labour, animal labour, power tiller, seed, fertilizer, manure, pesticides, irrigation, land use cost and interest on operating capital.

Table 1. Per acre cost and returns of BR-29 in the study area

Particulars	Unit	Results
Gross Cost (GC)	Tk.	45875.00
Main product (paddy)	kg.	3000.00
Per unit price of paddy	Tk./kg	16.00
Value of product	Tk.	48000.00
Value of by- product	Tk.	8750.00
Gross Return (GR)	Tk.	56750.00
Net Return (NR)	Tk.	10875.00
Benefit Cost Ratio (BCR)	-	1.23

Source: Field Survey, 2016

Table 1 shows that average yield of BR-29 in Jamalpur district was 3 ton/acre. The gross returns (including by product) from BR-29 were estimated Tk. 56750.00. The average net returns per acre was found to be Tk. 10875.00 for BR-29.

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On the basis of gross costs per hectare, production cost of BR-29 was estimated at Tk. 45875.00. Results in Table 1 shows that BCR of BR-29 rice production ~~was emerged as~~showed 1.23 that Tk 1.23 would be earned by spending each Tk 1.00 investing in the rice production. From the above, it was clear that BR-29 rice production is profitable in the study area.

Comment [SF7]: To qualify the use of BCR, there is need to clearly present it under analytical technique and adequately described just like how cobb-douglas function was described.

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Factors affecting gross return of selected rice production

To determine the effects of the explanatory variables, linear and Cobb-Douglas model were initially estimated for BR-29 rice production. Some of the key variables are explained below.

Human labor cost (X_1): The coefficient for human labor cost was 0.410 which was positive and significant at five percent level of significance. The coefficient indicates that keeping other factors constant, 1 percent increase in human labor cost would increase the gross return by 0.337 percent (Table 2).

Land cultivation cost (X_2): The regression coefficient for land cultivation cost was positive at five percent level of significance (Table 2). It revealed that 1 percent increase in the land cultivation cost, holding other factors constant would increase gross return by 0.333 percent.

Seed cost (X_3): The regression coefficient of seed cost was positive for BR-29 rice and significant at five percent levels. It indicated that 1 percent increase in seed cost, keeping other factors constant would increase gross returns by 0.554 (Table 2).

Fertilizer cost (X_4): For BR-29, the coefficient was positive and significant at one percent levels of significance which indicated that 1 percent increase in the cost of fertilizer, keeping other factors constant, would increase gross return by 0.061 percent (Table 2).

Manure cost (X_5): Regression coefficient of manure cost was found to be positive and statistically insignificant. It indicated that 1 percent increase in manure cost, keeping other factors constant would increase gross returns by 0.010 percent (Table 2).

Irrigation cost (X_6): Regression coefficient of irrigation cost was found to be negative and statistically insignificant. It indicated that 1 percent increase in irrigation cost, keeping other factors constant would decrease gross returns by 0.345 percent (Table 2).

Pesticides cost (X_7): For BR-29 rice, the coefficient was negative and statistically significant at 1% level. It implies that 1 percent increase in the cost of pesticide, holding other factors constant, would decrease gross return by 0.047 percent for BR-29 rice (Table 2).

The coefficients of multiple determinations, R^2 value of the model was 0.976 indicating that about 97.6 percent of variations in gross return have been explained by the explanatory variables, which were included in the model. The value of adjusted R^2 was 0.974 indicating that after taking into account the degrees of freedom (df) adjusted R^2, explanatory variables in the model still explain about 97.4 percent of the total variations in gross returns from BR-29 (Table 2).

The F-values of the equation derived for BR-29 was 393.67 implying that all the explanatory variables were important for explaining the variations in gross returns of BR-29 in the study area (Table 2).

The summation of all the regression coefficients of the estimated production functions of BR-29 and Hybrid Hira was 0.98 found to be less than 1 which indicated that the selected rice growers allocated their resources in the rational stage of production (Stage II) respectively, where diminishing returns to scale exists.

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Table 2. Estimated values of co-efficient and related statistics of Cobb-Douglas production function model for BR-29 Boro production

Explanatory variables	Results
Constant	3.499
Cost of Human labour (X_1)	0.410** (0.201)
Cost of Land cultivation (X_2)	0.333** (0.162)
Cost of Seed (X_3)	0.554** (0.226)
Cost of Fertilizer (X_4)	0.061* (0.031)
Cost of Manure (X_5)	0.010 (0.009)
Cost of Irrigation (X_6)	-0.347 (0.275)
Cost of Pesticides (X_7)	-0.047* (0.027)
R^2	0.976
R^2 (Adjusted)	0.974
F- value	393.67
Return to scale	0.98

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

3.2 Problems and constraints of BR-29 Boro production

Farmers faced a lot of problems and constrains in producing BR-29 Boro rice. In the present study, an effort has been made to identify and analyze the major problems and constraints faced by the farmers in producing BR-29 Boro rice in the study area. Some major problems and constraints which the farmers emphasized upon are discussed below:

Table 2. Problems faced by BR-29 growers

Problems and Constraints	Number of farmers	% of total farmers
i. Low output price	70	93
ii. Scarcity of human labour	60	80
iii. High irrigation cost	52	69
iv. Load shading of electricity	40	53
v. Scarcity of animal labour	44	58
vi. Lack of capital	45	60
vii. Lack of manure	45	40

Source: Field Survey, 2016

4. CONCLUSION AND RECOMMENDATIONS

Bangladesh agriculture is dominated by production of rice. In this scenario rice dominates the crop sector by occupying nearly 75 percent of the total cropped area as well as contributing about 70 percent of the value of the crop output. Farmers were facing some problems which need attention from government. On the basis of the findings of the study the following recommendations are made for the improvement of existing BR-29 Boro rice production.

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i. The policy makers should think to introduce agricultural mechanization in the study area.
ii. During the harvest time farmers get very low prices for their product so proper price should be ensured in harvesting time.
iii. There is a price support programme for paddy in this country. It must be implemented effectively during the harvesting period of paddy.
iv. Credit facility should be provided to the farmers for applying recommended doses of seed, fertilizer, irrigation etc. So that yield of BR-29 Boro rice can be increased.

v. Extension services and its linkage with farmers should be improved to make available knowledge to the farmers.

COMPETING INTEREST

Authors have declared that no competing interests exist.

REFERENCES

1. Mia, MS. Impact of Differential Input and Output Prices on Comparative Profitability of HYV Boro During 2007 To 2009: A Study in a Selected Area of Jamalpur. MS Thesis, submitted to the Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh. 2009.
2. BER. Bangladesh Economic Review. Ministry of Finance, Government of the People's Republic of Bangladesh. Dhaka, Bangladesh. 2015.
3. Bangladesh Population. (2018-09-25).

   Retrieved 2019-02-26, from http://worldpopulationreview.com/countries/bangladesh/
4. Ahmed, R. Retrospect and prospects of the rice economy of Bangladesh. The University Press Limited, Dhaka. 2001.
5. FAO. Food and Agriculture Organization of the United Nations. Food Outlook: Global Market Analysis, Global Information and Early Warning System, An internet version. 2010.
6. FAOSTAT. 2013 Food Balance Sheets for 42 Selected Countries (and Updated Regional Aggregates). Food and Agriculture Organization of the United Nations, Statistics Division (FAOSTAT). Rome, Italy. 2015.
7. Islam, MZ. Adoption of Brri Dhan 29 Production Technologies by the Farmers. MS Thesis, submitted to the Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka. 2007.
8. BRRI. Rice Production Training Module, Session 02, Module 02, Fact sheet 09, Bangladesh Rice Research Institute, Gazipur. 2019. Retrieved 2019-08-03, from

   http://brri.portal.gov.bd/sites/default/files/files/brri.portal.gov.bd/page/de67726d_689e_4b72_b8c4_89c90635842f/Factsheet9-BRRI%20dhan29_.pdf