

Impact of Land Tenure System on Boro Paddy Production: An Economic Analysis in a Selected Area of Mymensingh District

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Abstract

The study analyzes the impact of different land tenure systems on the profitability of Boro paddy production. Three land tenure systems, namely, owner operator, owner-cum-tenant operator and tenant operator are considered for the present study. In total 90 farmers of which 30 owner, 30 are owner-cum-tenant and 30 tenant farmers, were selected purposively to determine the costs, returns and profitability of MV Boro paddy. Data were collected in two selected villages, under Phulpur Upazila in Mymensingh district throughout the Boro season of the year 2007. It was found that farmers of all land tenure categories made profit from boro production. It is however, observed that owner operators are more efficient than owner-cum-tenant and tenant operators. Therefore, tenancy is found to be inefficient in resource use and contractual arrangement. This implies that there is an opportunity for agricultural improvement through reallocation of resources following a series of interrelated reform measures.

Key words: Boro paddy, Tenure system, Profitability

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I. Introduction

Agriculture sector in Bangladesh is dominated by paddy production. Rice cultivation is the major source of livelihood for the large majority of farmers of Bangladesh. About 74 per cent of the total cropped area is devoted to rice cultivation along with 83 percent of the total irrigated area and 88 percent of the total fertilizer consumption in the country (BBS, 2006). With the availability of high yielding varieties (HYVs) and modern varieties (MVs) rice has contributed significantly to the progress towards food security. Among all food crops, dietary habit of the people in the country demands that the highest priority should be given to the production of rice. The people of Bangladesh intake 2100 kilo-calories of which rice supplies 1580 kilo-calories per day representing 75 percent of the total kilo-calories (IRRI, 1995). At present, Bangladesh has about 14.11 million hectares of total cropped area of which total cultivable area is about 8.03 million hectares having a cropping intensity of 177 percent (BBS, 2006).

Not surprisingly, the most important issue in Bangladesh agriculture is to enhance and sustain growth of crop production to ensure food security. Therefore, the country put emphasis on replacing its traditional agricultural practices by applying modern inputs such as HYV and MV seeds, fertilizers, irrigation, pesticides, power tiller, etc. The success in accelerating rice production in the 1980s can be attributed almost entirely to the conversion of local varieties to modern varieties (MVs). Among different varieties of HYV rice cultivation, Boro occupies the highest percentage of land, which is 55 percent and the area under Boro increased by 1.13 times in 2006/07 as compared to 2000/01 whereas the production of Boro increased by 1.25 times in 2006/07 as compared to 2000/01 (BBS, 2006).

There are different types of tenure arrangement in Bangladesh. These arrangements influence the efficiency with which inputs are used. They also affect the degree of uncertainty encountered in the operation of a farm. Although innumerable breakdowns are possible, most tenure arrangements can be placed in one of the three main classes, namely owner operator, owner-cum-tenant operator and tenant operator (Bishop and Toussaint, 1958). Of the total households, 62 percent are owners, 35 percent are owner-cum-tenant operators and 3 percent are pure tenant operators in Bangladesh (BBS, 2005). Now a days a major policy issue in Bangladesh is to raise the income of the poor farmers. Economic development will be meaningless if it can not alleviate the poverty of rural people. In the present farming system in Bangladesh, tenancy systems occupy a considerable percentage of socioeconomic reasons, which turn a farmer to be

tenant. Many economists advocate the existing land tenure to be changed or replaced by implementing an effective land reform policy in order to achieve the objectives of the overall agricultural development of the country. The present study attempts to measure the relative efficiency of farming by owner, owner-cum-tenant and tenant operators. The specific objective of the study is to assess the profitability of growing MV Boro paddy in owner, owner-cum-tenant and tenant farmers. Accordingly, the following sections describe the research methods, research results and conclusion, respectively.

II. Research Methods

Keeping in mind the main objective of the study, two villages namely Sahpur and Godariya under phulpur Upazila of Mymensingh district were purposively selected for the present study. Farm survey method was adopted for collecting data mainly interviewing the respondents. Repeated visits were made to minimize the drawbacks of survey method. A reasonable size of sample to achieve the objective of the study was followed in this study to collect relevant data and information. In total 90 farmers, of than 30 owners, 30 owner-cum-tenant and 30 tenant farmers were selected to interview considering 45 farmers from each of the villages. Data were collected during and after the Boro season 2007. In order to minimize errors, data were collected in local units and subsequently converted into standard international units. The collected data were then coded, summarized and processed for analysis. The tabulated data were analyzed and condensed by using arithmetic mean and percentage. In the study, statistical techniques were used to supplement the tabular technique. Cobb-Douglas production model was used to identify the contribution of the most important variables in the production process. The specification of the model is given below:

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

Where,

Y= Per hectare gross return of MV Boro paddy production (Tk/ha)

a=Intercept

X₁=Cost of seedling (Tk/ha)

X₂= Cost of human labour (Tk/ha)

X₃= Cost of power tiller (Tk/ha)

X₄= Cost of fertilizers(Tk/ha)

X_5 = Cost of irrigation(Tk/ha)

X_6 = Cost of pesticides(Tk/ha)

b_1, b_2, \dots, b_6 = Coefficients of related variables

U_i = Disturbance term,

III. Results and Discussion

Costs and returns were calculated to compare the income derived from MV Boro paddy production under different tenure categories, i.e. owner, owner-cum-tenant and tenant farmers. Production of MV Boro paddy involved the following costs; cost of human labour, power tiller, irrigation, seedling, fertilizers, insecticides and interest on operating capital.

Human labour was largely used in MV Boro paddy production. Farmers used human labour for land preparation, transplanting, weeding, fertilizer application, insecticide application, harvesting thrashing, cleaning and drying, etc. The cost of human labour was estimated at Tk. 15,800, Tk. 16,874 and Tk. 14,399 per hectare consisting 42.38, 42.24 and 39.36 percent of total costs for owner, owner-cum-tenant and tenant farmers, respectively. For quick land preparation particularly for Boro paddy, the use of power tiller is very important. The payment of power tiller involved rental charge and the driver's cost. It was used on hired basis. Cost of power tiller was Tk. 3261, Tk. 3260 and Tk. 3255 per hectare for owner, owner-cum-tenant and tenant farmers, respectively.

Material cost was also an important cost item which included the cost of seedlings, fertilizers, irrigation, insecticides, etc. In the study area, farmers used both home supplied and purchased seedlings. The costs of home supplied seedlings were determined at the on going market rate in the study area and costs of purchased seedlings were calculated on the basis of actual prices paid by the farmers. On the other hand the sample farmers used four kinds of fertilizers, namely Urea, Triple Super Phosphate (TSP), Muriate of Potash (MP) and Gypsum and the costs of fertilizers were calculated at prevailing market prices. For irrigation, all sample farmers had to depend on shallow tube-wells (STWs) and deep tube wells (DTWs), which were either diesel operated or electricity operated.

The cost of water was charged at fixed rate for per unit area of irrigated land. In the study area, Boro paddy farmers used different kinds of insecticides such as Basudin, Dimecron, Sumithion, Furadan, etc. Total per hectare material costs

were Tk. 16,223.16, Tk. 19,814.94 and Tk 18930.87 for owner, owner-cum-tenant and tenant farmers, respectively. Interest on operating capital was determined on the basis of the opportunity cost principle and charged on cash cost only. Interest on operating capital was charged for the crop season at the rate of 8 percent per annum. The interest on capital per hectare for MV Boro paddy for owner, owner-cum-tenant and tenant farmers were Tk. 746, Tk. 799 and Tk. 732, respectively.

Table 1 : Per Hectare Profitability of MV Boro Paddy Production for Different Tenure Systems

Cost and Return Items	Owner operator	Owner-cum-tenant operator	Tenant operator
Human labour cost	15800.40	16874.20	14399.00
Power tiller cost	3261.04	3259.74	3255.41
Fertilizer cost	4414.20	6579.70	5149.14
Irrigation cost	9376.09	10621.33	11313.91
Seedling cost	1168.44	1178.84	1170.00
Insecticides cost	1264.43	1435.07	1297.82
Total variable cost	35284.60	39948.88	36585.28
Total fixed cost	745.69	798.98	731.72
Total cost	36030.29	40747.86	37317.00
Gross return	71853.38	62849.09	58282.52
Gross margin	36568.78	22900.21	21697.24
Net return	35823.09	22101.23	20965.52
BCR (Undiscounted)	1.99	1.54	1.56

Source: Field Survey, 2007.

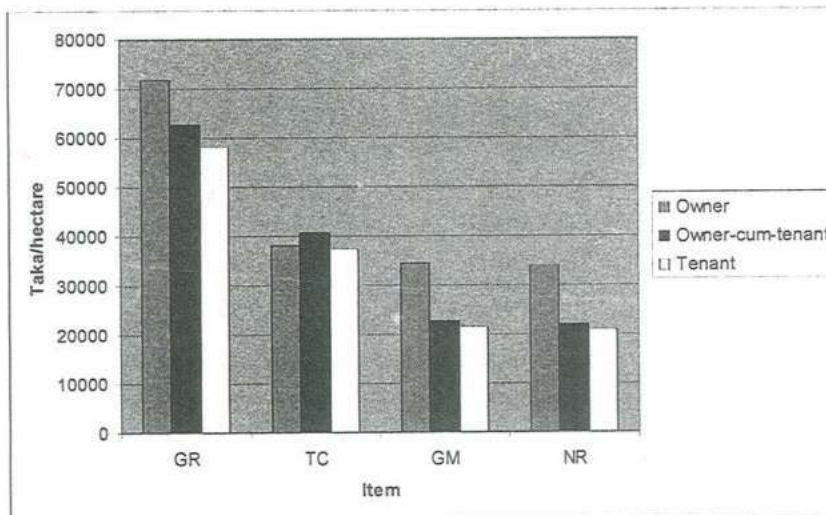
Per hectare gross cost of MV Boro paddy production was estimated on the basis of full costs, that is, variable costs plus fixed costs. It was observed from the study that per hectare gross costs of MV Boro paddy production were Tk. 36030.29, Tk. 40747.86 and tk. 37,317 for owner, owner-cum-tenant and tenant farmers, respectively (Table 1). In this case, owner-cum-tenant farmers were in the highest position and tenant farmers were the lowest (Figure 1).

The study reveals that owner, owner-cum-tenant and tenant farmers received average yield of 6053.98 kg, 5234.49 kg and 4846.75 kg per hectare, respectively (see appendices 1, 2 and 3). Gross return was estimated by multiplying per hectare total amount of paddy with its market price. Gross return thus obtained

were Tk. 71835.38, Tk. 62849.09 and Tk. 58280.52 for owner, owner-cum-tenant and tenant farmers, respectively. It is observed that gross return per hectare was highest for owner farmers than that for owner-cum-tenant and tenant farmers (Figure 1). Per hectare gross margin of MV Boro paddy was calculated by deducting total variable costs from the gross return. Per hectare gross margins of MV Boro paddy were Tk. 36568.78, Tk. 22900.21 and Tk. 21697.24 for owner, owner-cum-tenant and tenant farmers, respectively.

Net return of MV Boro paddy was calculated by deducting the gross costs from the gross returns. Table 1 shows that per hectare net returns of MV Boro paddy production were Tk. 35,823, Tk. 22,101 and Tk. 20,965 for owner, owner-cum-tenant and tenant farmers, respectively. The results reveal that the owner farmers earned the highest amount of net return among the three categories of farmers (Figure 1).

Figure 1 : Gross Return, Total Cost, Gross Margin and Net Return for Different Categories of Tenure Arrangements



The BCR (undiscounted) is a relative measure which is used to compare benefits per unit of cost. The BCR of MV Boro paddy was calculated as a ratio of gross returns and gross costs. Undiscounted BCRs of MV Boro paddy were 1.99, 1.54 and 1.56 in case of owner, owner-cum-tenant and tenant farmers, respectively. From the above discussion it may be suggested that MV Boro paddy production is more profitable in case of owner farmers than that of owner-cum-tenant and tenant farmers in the study area and the three tenure categories have significant difference in input use and output produced

The relative contribution of key inputs effecting productivity of farmers can be seen from the estimates of regression equation. The value of the production coefficient of seedling (X_1) was 0.74 , which indicates that an increase of 1 percent in cost of this input, keeping other factors constant , would result in an increase of gross return by 0.74 percent. The value of the production coefficient of human labour (X_2) was 1.34, which indicates that an increase of 1 percent in cost of this input, keeping other factors constant, would result in an increase of gross return by 1.34 percent. The coefficient of power tiller (X_3) was 0.45, indicating that an increase of 1 percent in cost of this input, keeping other factors constant, would result in an increase of gross return by 0.45 percent. The value of the production coefficient of fertilizers (X_4) was 0.05, which indicates that an increase of 1 percent in cost of this input, keeping other factors constant, would result in an increase of gross return by 0.05 percent. The value of the production coefficient of irrigation (X_5) was 0.15, indicating that an increase of 1 percent in cost of this input, keeping other factors constant, would result in an increase of gross return by 0.15 percent (Table 2).

It may be suggested that the overall performances of the model are good as indicated by estimated R^2 and F-value. The coefficient of multiple determinations, R^2 was 0.71, which indicated that about 71 per cent of return from Boro paddy was explained by explanatory variables, which were included

Table 2 : Estimated Values of Coefficients for All Farmers and Their Related Statistics of Cobb-Douglas Production Function

Explanatory Variables	Estimated coefficients
Intercept (a)	-12.79 (3.89)
Seedling (X_1)	0.74** (0.36)
Human labour (X_2)	1.34* (0.29)
Power tiller (X_3)	0.45**(0.22)
Fertilizer (X_4)	0.05*(0.01)
Irrigation (X_5)	0.15*(0.03)
Insecticide (X_6)	0.01(0.01)
R^2	0.71
F-value	16.19
Returns to scale (?bi)	2.73

Source: Field Survey, 2007.

Note: Figures in the parentheses indicate standard error of the coefficients

*= Significant at 1 percent level

**= Significant at 5 percent level

in the model. The F-value of the equation is 16.19, which was highly significant implying that all the included explanatory variables were important for explaining the variation in pond fish production. Therefore, the inclusion of independent variables was reasonable. Returns to scale are the summation of estimated coefficient (input coefficient) of accepted explanatory variables ($\sum b_i$). The sum total of all the production coefficients (production elasticities) of the equation was 2.73. This indicated that the production function exhibited increasing returns to scale (Table 2).

IV. Conclusion

From the paper it may be concluded that MV Boro paddy production is a profitable business. Considering the tenure arrangement, owner operators were found more profitable than owner-cum-tenant and tenant operator. In Bangladesh, the existing land tenurial arrangements are the major determinant of mode of production, which is a vital constraint for achieving the higher level of production efficiency in Bangladesh agriculture. Based on the findings of the present research, the following recommendations are put forward:

- i. The cost sharing between land owner and tenant should be 50:50 in the case of all inputs except land and labour
- ii. Measures should be taken to ensure more equitable distribution of resources in rented land of owner-cum-tenant farmers
- iii. Measures should be taken to provide micro credit so that, even very small farmers can get the credit facilities

The appropriate land reform measures can be given some intermediate solution to the whole problem of attaining higher level efficiency in agricultural production.

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Appendix 1: Per Hectare Profitability of MV Boro Paddy Production for Owner Operators

Cost Item	Quantity	Per Unit	Total Value Price(Tk)	Percent of (Tk)
Cost (%)				
Returns				
Main product (kg)	6038	11.84	71481.21	-
By product (Tk)	-	-	372.17	-
A. Gross Return			71853.38	
Costs				
Human labour (man-days)	112.86	140.00	15800.40	42.38
Power tiller (Tk)	-	-	3261.04	8.75
Seedling (kg)	52.00	22.47	1168.44	3.11
Fertilizers (kg)				
i. Urea (kg)	310.95	6.44	2002.32	5.37
ii. TSP (kg)	118.13	24.09	846.44	7.63
iii. MP (kg)	76.55	18.71	1432.49	3.84
iv. Gypsum (kg)	25.12	5.29	132.95	0.36
Irrigation (Tk)	-	-	9376.09	25.15
Insecticides (kg)	-	-	1264.43	3.39
B. Variable Cost	-	-	35284.60	100
C. Fixed Cost				
Interest on OC	-	-	745.69	-
D. Total Cost (B+C)	-	-	36030.29	-
E. Gross Margin (A-B)	-	-	36568.78	-
F. Net Return (A-D)	-	-	35823.09	-
G. BCR (Undiscounted)	-	-	1.99	-

Source: Field Survey, 2007.

Appendix 2 : Per Hectare Profitability of MV Boro Paddy Production for Owner-cum-tenant Operators

Cost Item	Quantity	Per Unit Price(Tk)	Total Value (Tk)	Percent of Cost (%)
Returns				
Main product (kg)	5234.49	11.83	61913.04	-
By product (Tk)	-	-	918.05	-
A. Gross Return	-	-	62849.09	-
Costs				
Human labour (man-days)	120.53	140.00	16874.20	42.24
Power tiller (Tk)	-	-	3259.74	8.16
Seedling (kg)	52.00	22.67	1178.84	2.95
Fertilizers (kg)	-	-	-	-
i. Urea (kg)	321.51	6.76	2173.75	5.44
ii. TSP (kg)	117.55	24.84	2920.59	7.31
iii. MP (kg)	68.43	19.45	1331.39	3.33
iv. Gypsum (kg)	28.99	5.31	153.97	0.39
Irrigation (Tk)	-	-	10621.33	26.07
Insecticides (kg)	-	-	1435.07	6.72
B. Variable Cost	-	-	39948.88	100
C. Fixed Cost				
Interest on OC	-	-	798.98	-
D. Total Cost (B+C)	-	-	40747.86	-
E. Gross Margin (A-B)	-	-	22900.21	-
F. Net Return (A-D)	-	-	22101.23	-
G. BCR (Undiscounted)	-	-	1.54	-

Source: Field Survey, 2007.

Appendix 3 : Per Hectare Profitability of MV Boro Paddy Production for Tenant Operator

Cost Item	Quantity	Per Unit Price(Tk)	Total Value (Tk)	Percent of Cost (%)
Returns				
Main product (kg)	4846.75	11.84	57387.01	-
By product (Tk)	-	-	893.51	-
A. Gross Return	-	-	58282.52	-
Costs				
Human labour (man-days)	102.85	140.00	14399.00	40.58
Power tiller (Tk)	-	-	3255.41	9.17
Seedling (kg)	52.00	22.50	1170.00	3.19
Fertilizers (kg)	-	-	-	-
i. Urea (kg)	307.92	6.50	2001.52	5.21
ii. TSP (kg)	110.39	17.71	1954.55	5.34
iii. MP (kg)	64.07	15.58	998.27	2.50
iv. Gypsum (kg)	38.96	5.00	194.80	0.53
Irrigation (Tk)	-	-	11313.91	30.10
Insecticides (kg)	-	-	1297.82	3.55
B. Variable Cost	-	-	36585.28	100
C. Fixed Cost				
Interest on OC	-	-	731.72	-
D. Total Cost (B+C)	-	-	37317.00	-
E. Gross Margin (A-B)	-	-	21697.24	-
F. Net Return (A-D)	-	-	20965.52	-
G. BCR (Undiscounted)	-	-	1.56	-

Source: Field Survey, 2007.