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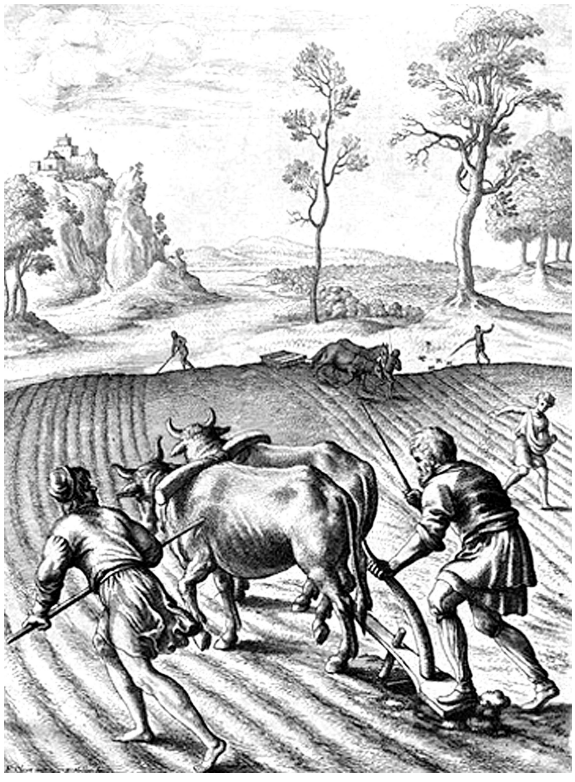

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Cost Requirements for Cultivation of Boro Rice (*Oriza sativa*) under Different Farming Systems

Md. Toufiq Iqbal
Department of Agronomy and Agricultural Extension,
University of Rajshahi, Rajshahi-6205, Bangladesh

Abstract: An investigation was conducted on farmer's field at four villages in Mymensingh district of Bangladesh. Twenty-five farmers were considered for the study and 57 plots were selected. Interviewing the farmers on specially designed and pre-tested questionnaire collected the data on cost requirements. Input cost per hectare varied from Tk.14877 to 18145 and output varied from Tk.25101 to 31647, respectively under different farmer's categories. The benefit cost-ratio found in landless, marginal, small, medium and large categories of farmers were 1.87, 1.4, 1.41, 1.83 and 1.64, respectively. The average total input and output costs per hectare in DA, PT and mixed farming methods were Tk.16855, 15750, 16924 and Tk.26525, 29400, 27454, respectively.

Key words: Boro rice, cost determination, farming systems

INTRODUCTION

Bangladesh is an agricultural country. More than 80% of population live in rural areas and about 74% directly or indirectly depends on agriculture. The agricultural sector in Bangladesh employs over 63% of the country's population, it produces about 30% of foreign exchange. Over 10 million farm households share the total cultivable area for their livelihood[1]. One of the GOB's national goals is to provide food security to the poorest sector. In the national perspective plan (July 1995-2010), the GOB reasserts its commitment to the development of agriculture to maintain food and fiber supplies to the growing population (over 123 million and growing at around 2% per annum). The key to sustain economic development of Bangladesh lies in raising the agricultural productivity through adopting modern input and methods. The demand for food from plant origin for the country's vast population is expected to reach 75 million tons by 2030[2]. To achieve this target Bangladesh has to go for vertical expansion of agricultural output, as cultivable land can not be increase. This would require in addition to biological and chemical inputs (like HYV seeds, fertilizer, irrigation, animal sources of energy), adoption of selective mechanization through the adoption of suitable machinery for agricultural operation. Kamrul conducted a study to determine the relative costs and return of growing HYV boro paddy by using animal, power tiller and combined animal and power tiller from the view point of the individual farmers and also to assess the profitably of multiple uses of power tiller from the viewpoint of the owners of tillers[3]. The village PRA study found that the cost of land preparation by country plough (bullock power), power tiller and tractor with laddering were Tk.2619 ha^{-1}, 2995 ha^{-1} and 1946 ha^{-1}, respectively. In this case Power Tiller (PT) were the most costly option. Other studies have shown that land preparation by PTs is cheaper than by DAP. In a comparative study of the economics of cultivation by bullocks and power tillers[4]. Main reported that the average cost of land preparation (pudding) was higher with bullocks than with a 7-9 hp PT[5]. Hasan conducted a study on the relative profitability of growing HYV Boro paddy by using DAP, PTs and a combination of the two power sources and found that PT produced higher profits than DAP or a combination of PTs and DAP. Also, per hectare gross benefit was the highest under the combined DAP/PT and was lowest for farms using animal power only[6]. Again, a study by Venkalaram[7] on the economics of power tiller versus bullock power in preparing paddy land indicated that it was cheapest to prepare paddy land by PT than by bullock power. Who also found the cost of paddy land preparation was about 87% higher for bullock power. Surendra Singh *et al.*[8] determined the cost of cultivation for rice-wheat rotation was Rs. 8600 ha^{-1} and for maize wheat Rs. 6166 ha^{-1}. Gross return from rice-wheat rotation was Rs. 19143 ha^{-1} and from maize-wheat Rs. 9874 ha^{-1}. The benefit-cost ratio (ratio of gross return

Corresponding Author: Md. Toufiq Iqbal, Department of Agronomy and Agricultural Extension, University of Rajshahi, Rajshahi-6205, Bangladesh

and cost of cultivation) was also found to be higher (2023) for rice-wheat rotation, compared with maize-wheat (1060). Though the economics of rice-wheat rotation was better in terms of cost, it was highly dependent on different crops in different ecosystems as influenced by landholding, level of agricultural inputs and other factors pertinent to crop production and to various household activities[8]. The present investigation was, therefore undertaken to establish cost determination for Boro rice production under different farming methods.

MATERIALS AND METHODS

Four villages were selected randomly in Mymensingh district of Bangladesh during the year 2004. A total of 25 farmers and 57 individual Boro plots were selected. The selected farmers practiced traditional and mechanized system in various farming operations. Farmers were selected randomly from the selected study areas covering various economic groups such as landless (≤50 dec.), Marginal (51-150 dec.), Small (151-247 dec.), Medium (247-494 dec.) and large (>494 dec.). Interviewing the farmers on specially designed and pre-tested questionnaire for 1 year collected the data on cost requirements. The proforma included all kinds of inputs like fertilizers, chemicals and farmyard manure, power sources (human, animal and prime movers) and agricultural machinery (Power tiller, thresher). The proforma also included yield of main and by-products. The data were analyzed for operation-wise and source-wise consumption. The price index used in the calculations is given in Table 1.

Table 1: Price index for various inputs and outputs of agricultural goods in observed areas

Items	Price rate
Seed	15.00 Tk kg^{-1}
Human labour	50.00 Tk/man-day or 6.25 Tk h^{-1}
DA/pair	90.00 Tk/day or Tk h^{-1}
Power tiller	110.00 Tk kg^{-1}
Fertilizer	
Urea	6.00 Tk kg^{-1}
DAP/TSP	15.00 Tk kg^{-1}
MP	15.00 Tk kg^{-1}
Other	10.00 Tk kg^{-1}
Manure (cowdung)	0.50 Tk kg^{-1}
Pesticide (average)	96.00 Tk kg^{-1}
Fuel (Diesel)	13.25 Tk kg^{-1}
Electricity (KW-h)	3.25 Tk k^{-1}W-h
Rice grain	6.50 Tk kg^{-1}
Rice straw	1.25 Tk kg^{-1}

RESULTS AND DISCUSSION

The total farming operations input costs per hectare of cultivable land in landless, marginal, small, medium and large categories of farmers were Tk.9576, 10662, 10466, 9876 and 10531, respectively. The average total energy inputs of all categories was Tk.10298 (Table 2). It was also shown that input cost per hectare varied from Tk.14877 to 18145 and output returns varied from Tk.25101 to 31647, respectively under different farmer's categories (Table 2). Category wise farmer input costs and output returns were statistically significant ($p<0.05$ to $p<0.01$, respectively).

Return was calculated by multiplying the total production with market unit price (Tk kg^{-1}) of rice and straw. In this study benefit-cost ratio was found in landless, marginal, small, medium and large categories of

Table 2: Input costs and output returns per hectare under different categories of farmers

Items	Landless (Tk kg^{-1})	Marginal (Tk kg^{-1})	Small (Tk kg^{-1})	Medium (Tk kg^{-1})	Large (Tk kg^{-1})	Average (Tk kg^{-1})
Input costs						
Farm operations	9576	10662	10466	9876	10531	10298
Seed, fertilizer, pesticide	4014	5075	5779	5738	5982	5318
Irrigation	1287	1466	1663	1719	1632	1553
Total input costs	14877	17203	17908	17333	18145	17169
Output return						
Grain	26472	23931	23930	30030	28419	26401
Straw	1366	1170	1383	1117	1383	1384
Total output returns	27838	25101	25313	31647	29803	27785
Benefit-cost ratio	1.87	1.40	1.41	1.83	1.64	1.63

Table 3: Input costs and output returns per hectare under different farming methods

Items	Draft animal farming (Tk ha^{-1})	Power tiller farming (Tk ha^{-1})	Mixed farming (Tk ha^{-1})
Input cost			
Farm operations	9414	9400	9898
Seed, fertilizer, pesticide	5860	4934	5514
Irrigation	1581	1416	1512
Total input costs	16855	15750	16924
Output return			
Grain	25240	27931	25981
Straw	1285	1469	1474
Total output returns	26525	29400	27454
Benefit-cost ratio	1.57	1.86	1.62

farmers were 1.87, 1.4, 1.41, 1.83 and 1.64, respectively (Table 2). The average benefit-cost ratio of those categories was 1.63. It varied from 1.4 to 1.87 for the various categories of farmers. The highest return indicated the profitability of rice production.

Out of 57 observed plots, draft animals were used only in 5 number of plots, both draft animal and power tillers were used in 13 number of plots and power tiller were used in rest 37 numbers of plots for land cultivation. The average farming operations input costs per hectare in DA, PT and mixed farming methods were Tk.9414, 9400 and 9898, respectively. The average seed fertilizer and pesticide total input costs per hectare in DA, PT and mixed farming methods were Tk.5860, 4934 and 5514, respectively. The average irrigation input costs per hectare in DA, PT and mixed farming methods were Tk.1581, 1416 and 1512, respectively. The average total input costs per hectare in DA, PT and mixed farming methods were Tk.16855, 15750 and 16924, respectively. The results showed that the cost of land preparation by power tillers were the cheapest option. It was found that the average total output returns per hectare in DA, PT and mixed farming methods were Tk.26525, 29420 and 27454, respectively. The average per hectare benefit-cost ratio was highest in PT farming followed by mixed and DA farming methods and these were 1.86, 1.62 and 1.57, respectively (Table 3). The benefit-cost ratio indicated the profitably of the PT farming methods.

From the results, it may be concluded that output return in the power tiller farming is higher. Because due to mechanization, less time involved for ploughing. So, our experiment indicates for economic cultivation mechanization is needed. Although introduction of power tiller makes chances to cultivate more area of land by a single farmer that reduces the opportunities of mixed farming. Power tiller also opens door for farmers to be engaged in off farming job by finishing their farming job early. But power tiller is making some problems for farm labourers as they are getting fewer jobs from operations were maintained.

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