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**FINANCIAL ANALYSIS OF THRESHERS IN RICE FARMING IN KASBA
UPAZILA OF BRAHMANBARIA DISTRICT**

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ABSTRACT

This study was conducted to examine the profitability of the investors of power thresher and pedal thresher in the Kasba Upazila in Brahmanbaria district. For this, sixty thresher owners in which 8 were closed drum power threshers, 17 open drum power threshers and 35 pedal threshers, were purposively selected for the study. The method of projects appraisal suggested by Gittinger (1994) was followed by applying three principal discounting measures such as: BCR, NPV and IRR to measure the profitability of the selected thresher owners. Only financial analyses were done. The discount rate selected for the study was only 13 per cent and 10 years life was considered for each of the selected threshers. It was evident from the study that the investment in closed drum power thresher was more profitable than both the open drum and pedal thresher from the viewpoints of individual investors. The results of sensitivity analyses suggested that the investment in pedal thresher was a bit risky business with 10 per cent increase in O& M costs or 10 per cent reduction in gross benefits, if other things remain the same.

I. INTRODUCTION

Agricultural mechanization has long been recognized as an important input to increase farm outputs and as a suitable strategy for overall agricultural development. The goals of mechanization are to increase the profitability of farming and remove drudgery associated with labour intensive agricultural systems. Machinery is a major capital item in mechanized farming and thus, the reduction of cost and maintenance of the environment are major challenges facing modern agricultural enterprises (Jannot and Cairol, 1994).

The total rice loss in Bangladesh from harvesting to milling is 14% out of which, the processing loss is about 7.5% (FAO, 1985). To minimize the loss of crop the use of modern harvesting and threshing equipment are important. Sickle (locally called Kanchi) is used for harvesting rice in traditional method and human and animal do threshing. At present, farmers are interested using pedal thresher and power operated threshers to reduce their burden and drudgery and minimizing loss of crop in traditional method. Therefore, local manufacturers are producing these types of implements. In farmers' level, use of thresher becomes popular and the demand is increasing and many local manufacturers are also interested to manufacture

it. In different zones, especially in Comilla and Bogra many manufacturers make it. So, it is important to know the actual condition about it. On the other hand a few governmental or organizational institutes are now being interested to use harvester in harvesting operation. The development of power thresher clearly has advantages over conventional methods and has reduced drudgery of work to a greater extent. Improved thresher would be needed to meet seasonal labor shortages, specifically during the short turn-around periods. Temporary labor shortage and reduced turn-around time have inevitably forced farmers to feel the necessity of an efficient threshing technique.

In a capital constraint situation of rural Bangladesh, farmers will not invest their scarce resource on power thresher if it is an unprofitable investment. Only a few study have so far been done on accepting power thresher as a sociable equipment for paddy threshing. The present study was, therefore, designed to address the above mentioned aspects for having information on economics of investing in power and pedal threshers for threshing of paddy under Kasba Upazila of Brahmanbaria district. The specific objective of the study is to assess the profitability of investing in power and pedal threshers from the viewpoint of individual investors. The hypothesis which was tested in the study was:

There is no difference in profitability whether farmers are investing in power thresher or pedal thresher'

The main purpose of the present study was to assess the relative profitability of using power thresher and manual (pedal) thresher for rice threshing.

II. DATA SOURCES AND METHODOLOGY

The present study was based on field level primary data collected from power and pedal thresher owners through farm survey method. The main purpose of the survey was to collect and analyze field level costs and returns data both in physical and monetary terms on the operation and maintenance of threshers by the individual thresher owners. These data were required to make future projections for the value of inflows and outflows over the life of the thresher and hence to assess the profitability of the thresher owners. Preliminary investigation showed that in Kasba Upazila of Brahmanbaria district, the use of power thresher was intensive although farmers in this area also used pedal thresher for rice threshing. Therefore, the aforementioned area was purposively chosen, where both power thresher and pedal threshers were widely used.

Using stratified random sampling technique, at first, a list of 40 power thresher owners and 85 pedal thresher owners was prepared from the selected four villages. Then, 25 of which 8 closed drum and 17 open drum power thresher owners and 35 from pedal thresher owners were randomly selected for interview with the help of a set of questionnaire. Data were collected through the period from May to July 2002.

The collected data were then coded, summarized and processed for the analysis. For achieving the objectives of the study the following three discounting methods of project appraisal technique were used.

Theoretical Framework

Benefit-Cost Ratio (BCR): The BCR obtained when the sum of the present worth of the benefit stream is divided by the sum of the present worth of the cost. Accept all projects when BCR is greater than 1 or more when discounted at the opportunity cost of capital.

Net Present Value (NPV): NPV may be computed by deducting the present worth of cost stream from the present worth of benefit stream. Accept all projects where NPV is greater than 0 (zero) when discounted at the opportunity cost of capital.

Internal Rate of Return (IRR): The IRR is defined as the average earning power of an investment over the project life (Kabir 1995, p. 19). Accept all projects with IRR greater than the opportunity cost of capital.

Mathematical terms of the selected discounted measures are as follows:

$$BCR = \frac{\sum_{t=1}^n \frac{B_t}{(1+i)^t}}{\sum_{t=1}^n \frac{C_t}{(1+i)^t}}$$

$$NPV = \sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t}$$

IRR = Lower discount rate + difference between the two discount rates

$$X \left(\frac{\text{Present worth of cashflow at the lower discount rate}}{\text{Absolute difference between the present worth of cash flow at two discount rates}} \right)$$

Where,

B_t = benefit in each year (Tk/year)

C_t = cost in each year (Tk/year)

$t = 1, 2, 3, \dots, n$.

n = number of years.

i = interest (discount) rate/opportunity cost of capital.

Only financial analysis was followed for this study. For this reason, all costs and benefits were determined in domestic currency (Taka) using either farm gate prices or the prices at the point for first sale. The financial analysis from thresher owner's point of view has been performed considering both cash cost and cost of family supplied inputs assuming that all inputs were purchased. The benefits of power and pedal threshers for threshing of rice included the following items: (a) charges for threshing of rice; and (b). salvage values. On the other hand, the cost of power thresher can broadly be classified under the following heads: (a) investment costs; and (b) operation and maintenance (O & M) costs. For choosing discount rate the available literatures (Miah and Hardaker, 1988 and Gittinger, 1994) suggest that in most developing countries the opportunity cost of capital varies between 8 to 15 per cent. According to the manager of Bangladesh Krishi (i.e., agriculture) Bank (BKB), BAU Branch, Mymensingh the lending rate of agriculture (production) loan was 13 per cent during the

study period (in 2002). Thus, a 13 per cent discount rate was chosen for the appraisal of thresher projects.

III. RESULTS AND DISCUSSION

Estimation of Costs of Power and Pedal Threshers

Investment cost

The investment costs of the selected power and pedal threshers included thresher purchasing cost, trolley cost and carrying cost. The average price of closed drum and open drum power threshers without engine were Tk 18,000 and Tk 6,500, respectively. The average per unit price of pedal thresher was Tk 2,300. When the thresher owners bought the power thresher, they also bought the trolley. It was found that the average price of trolley was Tk 3,500. No trolley was required for pedal thresher. Open and closed drum power threshers were not available at the door steps of farmers. So, its carrying costs were very high. The average carrying costs including other costs of closed and open power thresher were Tk 1,700 and Tk 1,200, respectively, where in case of pedal thresher this cost was Tk. 600 only (Table 1).

Table 1: Average Investment, Operation and Maintenance (O & M) Cost of Threshers

Cost items	Cost (Tk)		
	Power thresher		Pedal thresher (TK)
	Closed drum (Tk)	Open drum (Tk)	
Investment Cost (Tk)			
Purchasing cost of thresher	18,000	6,500	2,300
Cost of trolley	3,500	-	-
Carrying cost and other cost	1,700	1,200	600
Total Cost	23,200	7,700	2,900
O & M Costs (Tk/year)			
Diesel cost	2,160	2,052	-
Mobil cost	1,620	778	-
Cost of spare parts	600	400	125
Labour cost	4,200	6,300	7,875
Cost of mechanics	350	200	200
Engine charge (Rented)	4,500	4,500	-
Total cost	13,980	14,230	8,200

Source: Ferdous (2003, p. 61).

Operation and Maintenance Costs of Threshers

The different components of O & M costs for power and pedal threshers are presented in Table 1. It was found that the costs of diesel for closed and open drum on an average were Tk 2,160 and Tk 2,052 per year, respectively. It was also learned from the operators of closed drum and open drum threshers that 1 liter and 0.95 liter diesel were required for threshing of rice per hour, respectively and per unit price of diesel was Tk 18 per liter during the study

period. The mobil costs of closed and open drum power thresher were Tk. 1620 and Tk. 778 per year, respectively. Here, the thresher was used 120 hours per year and the owners operated in the leisure period. It was learned that 0.25 liter and 0.12 liter were required for threshing of rice per hour, respectively and per unit price of mobil was Tk 54 per liter during the study period. It was found that the average spare parts cost per year of closed drum and open drum power thresher were Tk 600 and Tk 400, respectively. It is estimated that the average price of spare parts was Tk 125 per year. In the study area, the average wage rate was Tk 70 per man-day. The average costs of labour for closed and open drum were found Tk 4,200 and Tk 6,300, respectively. On an average, 8 operators were required to operate a pedal thresher. In this case, the thresher was used 15 days (120 hours) per year. The average cost of labour was found Tk 7,875. Most of the owners had a contractual arrangement with the private mechanics and they paid in cash. The costs of mechanics per year for closed drum, open drum and pedal thresher were Tk 350, Tk 200 and Tk 200, respectively. Most of the power thresher owners had engine and the engine was mainly used to operate power tiller. The engine was used to operate power thresher for 12-18 days a year. A few farmers sometimes, rented out the engine, charging Tk 300 per day. Considering above situation, the engine charge was counted as Tk 300 per day. The average annual engine charge of close drum and open drum were found Tk 4,500 each (Table 1).

Estimation of Benefits of Power and Pedal Threshers

Per year benefits of power and pedal thresher mainly depend on amount of paddy threshed. In total benefits, total amount of thresher charges was included with the salvage values of the concerned projects. The owners of power thresher charge 40 kg paddy for 600 kg of threshed paddy. On the other hand, the owners of pedal thresher charge 40 kg paddy for 800 kg of threshed paddy. The owners bore all the costs such as labour cost, fuel, oil, etc. For threshing Boro paddy, owners of closed drum, open drum and pedal thresher got on an average 2,600 kg, 2,000 kg and 1,140 kg of paddy, respectively; and for threshing Aman paddy, the corresponding figures were 1,400 kg, 920 kg and 488 kg. Returns from operation of thresher were estimated by multiplying the total quantity of paddy collected to per unit price in the study area. As reported by the respondents, per unit prices of Boro and Aman paddy were Tk 5.50/kg and Tk 6.00/kg, respectively. Total benefits from threshing paddy were estimated at Tk 22,700, Tk 16,520 and Tk 9,200 for closed drum, open drum and pedal thresher, respectively (Table 2).

Salvage value was estimated at 10 per cent on the initial value of threshers and shown as benefit to the respective projects in the last year of the project. After consulting the most experienced researchers of the Department of Farm Power and Machinery, Bangladesh Agricultural University (BAU) and also taking into account the opinions of traders of threshers as well as its users/owners, ten years was considered as the effective life of a thresher.

Table 2: Estimation of Benefits Derived from Power and Pedal Threshers (per year)

Thresher	Total collection from threshing (kg)		Average price (Tk/kg)		Total benefit from threshing (Tk)			Salvage value
	Boro	Aman	Boro	Aman	Boro	Aman	Total	
Power thresher								
Closed drum	2,600	1,400	5.50	6.00	14,300	8,400	22,700	2,320
Open drum	2,000	920	5.50	6.00	11,000	5,520	16,520	770
Pedal thresher	1,140	488	5.50	6.00	6,270	2,928	9,200	290

Source: Ferdous (2003, p. 67).

Results of Financial Analyses

Financial analyses of threshers are based on certain assumptions. The assumptions are as follows:

- All the power thresher and pedal thresher were purchased with cash.
- The project life has been assumed 10 years for threshers.
- Salvage values were assumed at 10 per cent of initial investment of threshers.
- Production technology will remain unchanged throughout the project life.
- Per unit prices of the concerned inputs and outputs are given and constant during the whole project life.

It can be assumed null hypothesis to be true, be written as:

H_0 : BCR of thresher is less than unity, or NPV of the thresher is less than zero, or IRR is less than the opportunity cost of capital.

H_1 : H_0 is not true.

Table 3: Summary Results of Financial Analyses of Threshers from the View point of Individual Investors

Discount measures	Power threshers		Pedal thresher
	Closed drum	Open drum	
BCR at 13%	1.28	1.11	1.06
NPV at 13% (Tk)	27469	8552	2945
IRR (per cent)	59	56	52

Source: Ferdous (2003, p. 70).

It is evident from the results presented in Table 3 that investment in thresher is highly profitable. It is also evident from the table that BCRs of both the threshers are more than unity and NPVs are also positive at the selected 13 per cent discount rate. It is found that BCR, NPV and IRR of closed drum power thresher were 1.28, Tk 27,469 and 59 per cent, respectively, whereas the corresponding figures of open drum power thresher and pedal thresher were 1.11, Tk 8,552 and 56 per cent, and 1.06, Tk 2,945 and 52 per cent. It implies that all the power threshers yield much higher IRR than the possible opportunity costs of capital. The null hypothesis is, therefore, rejected. It is also evident from the results that the

closed drum power thresher project showed a higher profit than the open drum power thresher as well as pedal thresher project.

The above mentioned findings of the financial analysis from the view point of thresher owners based on certain assumptions are not free from criticisms. Before making any confirm generalizations, it is, therefore, felt necessary to conduct sensitivity analyses, which have been done for the present study.

Effects of Sensitivity Analysis on Power and Pedal Threshers

Sensitivity analysis was done based on the assumptions that all costs and salvage value would remain the same, then what would happen in the profitability if benefits would decrease by 10 per cent. Therefore, two factors were taken into consideration in this respect such as: (i) reducing existing benefits at the rate of 10 per cent; and (ii) O & M cost increase at the rate of 10 per cent.

Under the changed circumstances, sensitivity analysis of power and pedal threshers from the viewpoints of owners considering the above mentioned factors are presented in Table 4.

Sensitivity analyses of power and pedal thresher considering 10 per cent increase in O & M cost

It is evident from Table 4 that BCR of closed drum power thresher is greater than unity, NPV is positive and IRR is higher than the opportunity cost of capital (i.e., 13 per cent). This implies that if O & M cost would increase at the rate of 10 per cent while benefits and other costs would remain the same, investment in closed drum power thresher would still be profitable.

Table 4. Results of Sensitivity Analyses of All Power and Pedal Thresher Considering 10 Per cent Increase in O & M Costs

Discount measure	Power thresher		Pedal thresher
	Closed drum	Open drum	
BCR at 13%	1.19	0.98	0.97
NPV at 13% (Tk)	19883	-1883	-1504
IRR (per cent)	45	4	-6

Source: Ferdous (2003, p. 74).

On the other hand, the open drum power thresher and the pedal thresher projects under the changed circumstances were not profitable in terms of BCR, NPV and IRR. This implies that if the O & M cost of open drum power thresher and the pedal thresher projects increase by 10 per cent then there is a chance of making loss. It is revealed in Table 4 that closed drum power thresher is more profitable than the both open drum and pedal threshers at the rate of 10 per cent cost increase.

Sensitivity analyses of power and pedal thresher considering 10 per cent decrease in benefits

Sensitivity analysis has also been done considering 10 per cent decrease in benefits while all other costs would remain the same. It is evident from Table 5 that BCR of closed drum power thresher is greater than unity, NPV is positive and IRR is higher than the opportunity cost of capital while open drum power thresher and pedal thresher are making a loss at 13 per cent discount rate. This implies that if benefits would decrease at the rate of 10 per cent, while all costs would remain the same, investment in closed drum power thresher projects would still be profitable. But, BCR, NPV and IRR are highly sensitive to change in benefits. Therefore, in the changed circumstances, open drum power thresher and pedal thresher owners are making a loss at 13 per cent discount rate.

Table 5: Results of Sensitivity Analyses of Power and Pedal Thresher Considering 10 Per cent Decrease in Gross Benefits

Discounted measures	Power thresher		Pedal thresher
	Closed drum	Open drum	
BCR at 13%	1.16	0.96	0.96
NPV at 13% (Tk)	15152	-3125	-2047
IRR (per cent)	36	-1	-14.19

Source: Ferdous (2003, p. 75).

IV. CONCLUSIONS

Although the selected threshers are found highly profitable considering the real world situation, but the results of sensitivity analyses clearly indicate that O & M costs and gross benefits; as expected, have a strong influence on the profitability of closed drum, open drum and pedal thresher owners. Profitability of open drum power thresher and pedal threshers are negatively correlated with cost increase and benefit decrease. This negative correlation is higher in case of pedal thresher. Investment in pedal thresher is, therefore, risky and even they make a great loss. On the other hand, closed drum power thresher project requires a substantial amount of money to invest, but at the same time, investment in this project is profitable.

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