

## **PROFITABILITY LEVEL OF MUNGBEAN CULTIVATION IN SOME SELECTED SITES OF BANGLADESH**

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### **Abstract**

The study was conducted at Barisal and Jhalokati districts during 2007 to estimate the profitability and resource use efficiency of mungbean production. The study was confined to randomly selected 100 mungbean farmers. It revealed that mungbean production is profitable to the farmers. The productivity of mungbean at farm level was 928 kg/ha, which was higher than national average of 680 kg/ha. Mungbean farmers received Tk. 24236 as gross margin per hectare. The net benefit received per kilogram of mungbean was Tk. 26.45. Benefit cost ratios were estimated at 2.53 and 3.56 on variable and cash cost basis. Functional analysis showed that human labour, urea and insecticides had positive significant contribution to mungbean cultivation. Mungbean farmers encountered various problems like untimely rainfall, lack of quality seed and disease and insect infestation, and needs immediate attention to reduce these problems.

Key Words: Profitability, mungbean, resource use efficiency.

### **Introduction**

Pulses are the most important protein in the diet of the majority of the people in Bangladesh. It contains about twice as much protein as cereals. It also contains amino acid lysine, which is generally deficit in food grains (Elias, 1986). Pulse bran is also used as quality feed for animals. Apart from these, the ability to fix nitrogen and addition of organic matter to the soil are important factors in maintaining soil fertility (Senanayake *et al.*, 1987; Zapata *et al.*, 1987). Pulse fits well in the existing cropping systems, due to its short duration, low input, minimum care required and drought tolerant nature. A large number of pulse crops are grown in Bangladesh in respect of area and production (BBS, 2004).

Mungbean (*Vigna radiata*) is one of the most important pulse crops in Bangladesh in both area and production. Much area of mungbean is planted to cereals (Abedin. *et al.*, 1991). Now a days, it is cultivated after harvesting of *Rabi* crops (i.e., wheat mustard, lentil, etc.). Due to its short duration, mungbean can fit in as a cash crop between major cropping seasons. The national statistics

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of mungbean shows fluctuating trend in area and production and registered increasing trend in productivity due to introduction of HYV mungbean (see Appendix Table 1). It is grown three seasons a year covering 43,680 ha with an average yield of 0.68 t/ha (BBS, 2004). It provides grain for human consumption and the plants fix nitrogen addition of organic matter to the soil. It supplies a substantial amount of nitrogen to the succeeding non-legume crops (i.e., rice) grown in rotation (Sharma and Prasad, 1999). Six varieties of mungbean have been developed and disseminated with the package of management technologies to the farmers' for cultivation. Therefore, mungbean cultivation is gaining popularity day after day among the farmers. Limited study was done on mungbean in Bangladesh. For this reason, the present stud was undertaken to:

- (i) know farmers' practice to grow mungbean;
- (ii) know the productivity and profitability of mungbean cultivation at farm level;
- (iii) examine the resource use efficiency in mungbean production; and
- (iv) identify the constraints to mungbean cultivation in Bangladesh.

### **Methodology**

The study was conducted in two districts, namely Barisal and Jhalokati during April 2007. Uzirpur *Upuzilu* from Barisal district and Sadar *Upuzilu* from Jhalokati district were purposively selected for the study. A total of 100 mungbean farmers taking 50 farmers from each *Upuzilu* were randomly selected with the help of DAE personnel for interview. The crop season under the study was late *ruhi* (January-May). Field investigators under the direct supervision of the researchers collected field level cross sectional data using pre-tested interview schedule.

Collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. Tabular method of analysis using different statistical tools was used in presenting the results of the study. Profitability of mungbean production was examined on the basis of gross margin, net return and benefit cost analysis. Cobb-Douglas function was used to estimate the contribution of factors to mungbean yield. The analysis did not consider different fixed costs like rental value of land, depreciation on farm equipment, etc. as gross margin worked out in this paper. Besides, the opportunity cost of family supplied labour was taken into consideration in estimating total cost or full cost. In calculating gross margin, all operating costs were considered as variable cost.

### **Analytical Model**

The production of mungbean is likely to be influenced by different factors, such as human labour, seed, chemical fertilizer, insecticide, etc. The following Cobb-

Douglas type production function was used to estimate the parameters. The functional form of the Cobb- Douglas multiple regression equation was as follows:

$$Y = AX_1^{b_1} X_2^{b_2} \dots X_n^{b_n} e^{u_i}$$

The production function was converted to logarithmic form so that it could be solved by least square method i.e.

$$\text{Log } Y = \text{Log } a + b_1 \text{ log } X_1 + \dots + b_n \text{ Log } X_n + e^{u_i}$$

The empirical production function was the following:

$$\text{Log } Y = \text{Log } a + b_1 \text{ Log } X_1 + b_2 \text{ Log } X_2 + b_3 \text{ Log } X_3 + b_4 \text{ Log } X_4 + b_5 \text{ Log } X_5 + b_6 \text{ Log } X_6 + U_i$$

- Where, Y= Yield (kg/ha)
- X<sub>1</sub> = No. of human labour (man-day/ha)
- X<sub>2</sub> = Amount of seed (kg/ha)
- X<sub>3</sub>- Amount of urea (kg/ha)
- X<sub>4</sub> Amount of TSP (kg/ha)
- X<sub>5</sub>= Amount of MP (kg/ha)
- X<sub>6</sub>= Cost of insecticides (Tk/ha)
- a= constant value
- b<sub>1</sub> b<sub>2</sub> ..... b<sub>6</sub> = Co-efficient of the respective variables and
- U<sub>i</sub>= E.rror term.

The efficiency of inputs used in mungbean production was measured by the following equation:

$$\frac{MVP_x}{MFC_x} = 1$$

Where, MVP is the marginal value product of x input and MFC is the

marginal factor cost of x input. When the ratio of MVP and MFC is equal to unity indicates that the resource is efficiently used. When, the ratio is more than unity implying the resource is under utilized. In that case, there are ample opportunity to increase total production by increasing the use of specific input in the production process keeping other resources constant. When, the ratio is less than unity implying the resource is over used. In that case, it is possible to reduce production cost remains total production unchanged by decreasing the use of specific input.

**Results and Discussion**

**Agronomic practices**

The farmers prepared their land using country plough 0.90 nos. of ploughing and by power tiller 2.12 nos. of ploughing (Table 1). It was observed that the farmers

of Barisal used higher number of power tiller. It was also observed that 60% farmers completed their sowing within the month of January. Sowing period ranged from 2<sup>nd</sup> week of January to 3<sup>rd</sup> week of February. All the farmers followed broadcast method for seed sowing. On an average, 52% farmers weeded their land once during vegetative growth period. Weeding was found more (67%) in Barisal than Jhalokati (37%). Seventy two percent farmers were found to apply insecticides to their crops, which is identical in both the areas. After picking the pod, all the farmers threshed their crops by hand beating.

**Table 1 Agronomic practices of mungbean cultivation in the study areas.**

Components name	Barisal	Jhalokati	All
No. of ploughings			
Country plough	0.50	1.03	0.90
Power tiller	2.27	1.97	2.12
No. of laddering	1.03	2.07	1.55
Time of sowing (%):			
Within Januar	47	70	60
Within February	53	30	40
Insecticide use (%)	70	73	72
Weeding (%)	67	37	52

### Pattern of input use

The pattern of input use is shown in Table 2. Irrespective of area, a mungbean farmer used 47 man-days of human labour per hectare of which 72% were family supplied and the rest were hired. Barisal farmers used higher human labour (50/ha) compared to Jhalokati farmers (45/ha) due to more labour used in manuring and weeding. In most cases, power tiller was used for land preparation. A few farmers were also found to use country plough for land preparation. On an average, 24 kg of improved seed was used per hectare, which was more or less same for both areas. The farmers mostly used purchased seed (71%). Farmers used BARImung-2, BARImung-5 and BINAmung-5 varieties of mungbean. The sample farmers applied 1.6 tons of home supplied manures. The farmers of Barisal used higher amount of manures than that of Jhalokati farmers. They used chemical fertilizers like urea, TSP and MP at the rate of 27 kg, 25 kg and 15 kg per hectare, respectively, which were much lower than the recommended doses of urea 40 kg/ha, TSP 100 kg/ha and MP 55 kg/ha. Barisal farmers used higher amount of fertilizers except DAP. Majority of the sample farmers applied insecticides, but a small number of farmers used irrigation during cultivation of mungbean.

**Table 2. Level of input use per hectare for mungbean cultivation in the study areas.**

Type of input	Barisal	Jhalokati	All
Human labour (man-days):	50	45	47
Own	38	30	34 (72)
Hired	12	15	13 (28)
Seed (kg)	25	23	24
Own	11	4	7 (29)
Purchased	14	19	17 (71)
Manures (kg)	2970	238	1604
Fertilizers (kg):			
Urea	28	26	27
TSP	36	14	25
MP	22	7	15
DAP	2	17	9
Irrigation (Tk)	124	122	123
Insecticides (Tk)	477	517	497

Note: Figures within parentheses are the percent of total

### Cost of production

The cost of production included different variable cost items like human labour, power tdlr, seed, manure, fertilizer, insecticide, irrigation, etc. Both cash expenditure and imputed value of family supplied inputs ere included in the analysis and shown in Table 3. It revealed that the highest cost was incurred for crop harvesting (35.8% of the total cost) followed by labour (23.6%) and land preparation (16.4%). When family supplied inputs were valued at market rate, the average cost of production in full cost basis was found to be Tk. 16004/ha. The slightly higher cost of production was found in Barisal (Tk. 16,336/ha) compared to Jhaiokati due to higher mandays labour, manures and fertilizers. Average land preparation cost was Tk. 2622/ha and it was more in Jhalokati due to more ploughings and ladderings. Higher cost was incurred for manures and fertilizers in Barisal areas.

**Table 3. Cost of mungbean cultivation by the sample farmers in the study areas.**

Type of input	Barisal	Jhalokati	All
Land preparation	2381 (14.6)	2865 (18.3)	2622 (16.4)
Own	215	724	469
Hired	2166	2141	2153
Human labour (man-days)	4021 (24.6)	3544 (22.6)	3783 (23.6)
Own	3067	2376	2721
Hired	954	1168	1061
Seed	1223 (7.5)	1292 (8.2)	1258 (7.9)
Own	538	1 99	368
Purchased	686	1093	890
Manures	1114(6.4)	89 (0.6)	601 (3.8)
Fertilizers	1107(6.8)	776 (5.0)	941 (5.9)
Urea	196	168	182
TSP	574	280	427
MP	317	155	236
DAP	20	173	96
Irrigation	124 (0.8)	122 (0.8)	123 (0.8)
Insecticides	477 (2.9)	517 (3.3)	497 (3.1)
Crop harvesting	5450 (33.4)	5996 (38.3)	5723 (35.8)
Int. on operating capital*	439 (2.7)	473 (3.0)	456 (2.8)
Total variable cost	16336 (100)	15674 (100)	16004 (100)
Total cash cost	10964	11813	11388

\*Note. assumed 8% interest rate for 6 months

### Productivity and profitability of mungbean

The sample farmers received, on an average, 928 kg/ha of mungbean, which was higher than the national average of 771 kg/ha (BBS, 2004). The productivity of mungbean found in Barisal and Jhalokati were mostly similar to the average yield (Table 4).

**Table 4. Profitability of mungbean cultivation in the study areas.**

Type of input	Barisal	Jhalokati	All
1. Yield (kg/ha)	933	924	928
2. Gross return (Tk/ha)	40572	40531	40552
3. Total cost (Tk/ha):			
Total cash cost	10964	11813	11388
Total variable cost	16336	15676	16003
4. Gross margin (Tk/ha)	24236	24857	24549
5. Benefit cost ratio:			
Cash cost basis	3.70	3.43	3.56
Variable cost basis	2.48	2.59	2.53
6. Cost of grain (Tk/kg):			
Cash cost basis	11.75	12.78	12.27
Variable cost basis	17.51	16.96	17.24
7. Benefit from grain (Tk/kg)	25.98	26.90	26.45

The average gross return from mungbean production was found to be Tk. 40552/ha and gross margin on full cost basis Tk. 24,549/ha. The benefit cost ratios was estimated at 3.56 on cash cost basis and 2.53 on full cost basis, implying that one taka investment in mungbean production could generate Tk.3.56 and Tk. 2.53, respectively. The cost of grain was Tk. 12.27 on cash cost basis and Tk 17.24 on full cost basis. Benefit from per kilogram mungbean production was Tk. 26.45.

#### **Factors affecting and resource use efficiency in mungbean production**

The coefficient of adjusted R is 0.806 implying that the explanatory variables included in the model explained 81% variation in the yield of mungbean. The F-value of the equation is significant at 100 level implying that the variation in yield of mungbean depends mainly upon the explanatory variables included in the model. The contribution of specified factors affecting production of mungbean can be seen from the estimation of regression equation (Table 5). Very few farmers used manure and irrigation, so this was not included in the equation. The result showed that only one coefficient does not have the expected sign. However, the coefficients for human labour, seed and urea were found to be positively significant at 1%, 5% and 5% level, respectively. The positive sign indicated that using more of these three inputs in mungbean production could increase yield to some extent. The estimated coefficients revealed that 1% increase in the amount of human labour, seed and urea keeping all other factors constant, would uplift the yield of mungbean by 0.445, 0.371 and 0.022%, respectively. On the other hand, the coefficient of TSP is negatively significant at 10% level, implying that 1% increase in the amount of TSP keeping all other factors constant, would decrease the yield of mungbean by 0.01% (Table 5).

Table 5 also shows that the ratios of MVP and MFC for labour, seed and urea are greater than one and positive indicating inefficient use of these inputs. Therefore, the farmers in the study areas had potentially ample opportunities to increase mungbean production by using more of these inputs. On the other hand, the ratios are less than one and negative and positive respectively for TSP and MP implying an inefficient use of these inputs. In these cases, the farmers can easily decrease production cost, keeping mungbean production constant, by decreasing the use of TSP and MP.

**Table 5. Estimated values of coefficients and related statistics of Cobb-Douglas production function model.**

Item	All areas			MVII MFC
	Coefficient	t-value	P-value	
Intercept	3.809***	11.332	0.0000	
Human labour (X <sub>1</sub> )	0.445***	6.071	0.0000	4.77
Seed (X <sub>2</sub> )	0.371**	2.147	0.0362	11.96
Urea (X <sub>3</sub> )	0.022**	2.394	0.0201	4.90
TSP (X <sub>4</sub> )	0.014*	-1.718	0.0913	-1.33
MP (X <sub>5</sub> )	0.005	0.744	0.4595	0.86
Adjusted R <sup>2</sup>	0.806			
F-value	50.035***			

Note: ‘\*’ ‘\*\*’ and ‘\*\*\*’ indicate significant at 10%, 5% and 1% level.

### Constraints to mungbean production

The sample farmers encountered different constraints to cultivating mungbean. The major constraints were found to be untimely rainfall (67%), incidence of diseases (65%), lack of quality seed (50%), insect infestation (15%) and lack of suitable land for cultivation (Table 6). Farmers opined that they could not attain expected yield due to these constraints.

**Table 6. Constraints to mungbean cultivation in the study areas.**

Items	Percent farmers'		
	Barisal	Jhalokati	All
Untimely rainfall	70	66	67
Incidence of diseases	68	64	65
Lack of quality seed	48	52	50
Lack of suitable land	6	5	5
Others*	3	4	4

\* Higher price of seed and fertilizers

### Conclusion

It is concluded from the aforesaid discussion that the yield performance of mungbean is higher than national average. The mungbean production in the study areas is profitable. Mungbean farmers received higher return on their investment. Analysis of resource use efficiency indicates that more profit can be obtained by increasing investment in crop management and application of urea and insecticide for mungbean cultivation. Although mungbean is a profitable crop, farmers could not harvest expected benefit due to various problems.

The quality seed of the existing improved variety should be made available to the farmer for greater extension of this crop. Nevertheless, due efforts should



be made to develop disease free and insect tolerant variety for getting higher return from mungbean production in near future.

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### Appendix table 1. Area, production and yield of mungbean in Bangladesh.

Year	Area (ha)	Production ('000' ton)	Yield (t/ha)
1990-91	57.9	32.0	0.55
1991-92	55.4	32.0	0.58
1992-93	53.4	31.0	0.58
1993-94	53.7	30.3	0.56
1994-95	53.8	32.0	0.59
1995-96	55.0	32.0	0.58
2003-04	43.6	29.6	0.68

Source: BBS. 2004