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Input use pattern and profitability of improved mungbean varieties in coastal region of Bangladesh

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Abstract

The study was conducted in three mungbean growing districts namely Barisal, Patuakhali and Noakhali of Bangladesh during the period of 2010-11 to assess the extent of technology adoption, profitability, farmers' attitude, and constraints to mungbean. The study focuses the level of technology adoption for both input use and agronomic practices follow by most of the farmers were close to the recommendation which was very encouraging. All the farmers adopted improved mungben varieties and they were mostly influenced by DAE personnel and neighboring farmers. The yield of improved mungbean was found 824 kg/ha, which was more or less same with the national average of 820 kg/ha. The cultivation of improved mungbean was profitable since the net profit and BCR were Tk.38850 and 1.62 respectively. The variables such as experience, training, organizational membership, relation with different media, and mungbean suitable area had positive and significant influence in increasing the area under mungbean cultivation. Maximum number of farmers showed positive attitude towards improved mungbean cultivation of which 67% farmers wanted to increase its cultivation in the next year. The major constraints to improved mungbean production were; high price of insecticides, lack of labour and disease and insect infestation.

Keywords: Profitability, Mugbean, Factors, Inputs

Introduction

Pulses are the important protein source for the majority of the people of Bangladesh. It contains protein about twice as much 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). In the existing cropping systems, pulses fit well due to its short duration, low input, minimum care required and drought tolerant nature. Among the food legumes grown, lathyrus, lentil, chickpea, and mungbean are the major and they contribute more than 95% to the total pulses production in the country (Rahman, 1998).

Mungbean (*Vigna radiata*) is widely grown in Bangladesh. It contains 19.5% to 28.5% protein (AVRDC, 1988). Major area of mungbean is replaced by cereals (Abedin, *et al*., 1991). Now a day, it is being cultivated after harvesting of *Rabi* crops such as wheat, mustard, lentil, etc. As mungbean is a short duration crop, it can fit as a cash crop between major cropping seasons. It is grown three times in a year covering 21862 ha with an average yield of 0.82 t/ha (BBS, 2009). It provides grain for human consumption as well as the plant fix nitrogen 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 by Pulses Research Centre, BARI and disseminated these varieties throughout the countries along with the package of management technologies to the farmers for cultivation. Therefore, mungbean cultivation is gaining popularity day by day among the farmers. Now it is essential to know the present status of adoption of mungbean varieties and their production technologies in the southern region of Bangladesh. Besides, sustainability of any crop cultivation is mainly depends on its economic aspect but limited study was done on mungbean in this regard. In view of the discussion the present study was undertaken with the following objectives i) to know the adoption of improved mungbean varieties and their management technologies in the southern region ii) to estimate the profitability of improved mungbean cultivation at farm level iii) to find out the factors affecting the area under improved mungbean varieties iv) to know the socio-economic constraints and farmers attitudes towards mungbean cultivation

Materials and Methods

The study was conducted in three coastal districts namely Barisal, Patuakhali and Noakhali during January to March 2010. Sadar and Babugonj *Upazila* from Barishal district, Sadar and Dumki *Upazila* from Patuakhali district and Sadar and Subarnachar *Upazila* from Noakhali district were purposively selected for the study. A complete mungbean growers list was collected with the help of DAE personnel. A total of 150 mungbean farmers taking 25 from each Upazila i.e. 50 from each district were randomly selected for interview. The crop season under the study was late *Rabi* (January-May), 2010. Necessary information was collected through survey method with the help of a pre-tested interview schedule by field investigators in collaboration with DAE field staffs under direct supervision of the researchers.

Collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. Tabular method of analysis using different statistical tools like averages, percentages and ratios were used in presenting the results of the study. The profitability of mungbean production was examined on the basis of gross margin and benefit cost analysis. The opportunity cost of family supplied labour was taken into consideration in estimating total cost. In calculating gross margin, all operating costs were considered as variable cost. The improved mungbean cultivating farmers were classified into three categories for determining the adoption level of technologies in terms of agronomic practices, time of operation and input use. The categories were developed based on the mean index of the farmer with respect to each technology. A higher index indicates a higher level of adoption, while a lower index indicates a lower level of adoption of a technology. Adoption level was categorized for mean index>100 as over use: (70-100) as high, (50-69) as medium and <50 as low.

Analytical Model

Multiple regression model was used to identify the factors influencing the area allocation for mungbean cultivation. The area allocation for mungbean is likely to be influenced by different factors such as education, experience, training, organizational membership, relation with different media, and mungbean suitable area etc. The functional form of the multiple regression equation was as follows:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + u_i$$

Where,
Y = Area allocation for mungbean (decimal)
X_1 = Education (Year of schooling)
X_2 = Experience in farming (years)
X_3= Training (if yes=1, Otherwise=0)
X_4 = Organization membership (if yes=1, Otherwise=0)
X_5 = Media contact (Score)
X_6 = Suitable mungbean area (decimal)
$\beta_1, \beta_2 \ldots \beta_6$ = Co-efficient of the relevant variables and
U_i= disturbance term / error term.

Results and Discussion

Socio-economic profile of the farmers

Table 1 depicts the socio-economic profile of the sample farmers in the study area. It was observed that the highest percent of farmers were in the age group of 41-60 years followed by age group of 20-40 years. On an average, 11% of the mungbean farmers were illiterate. Among the educated farmers, 43% of farmers had primary level, 35% had SSC and 11% had above SSC level of education. Overall literacy rate was found to be 86% and it was more than 1.5 times higher than the national average of 53% (BBS, 2009). On an average 35% farmers received training which was found highest in Barisal and lowest in Patuakhali. Seventy six percent farmers engaged purely on agriculture and it was higher in Barisal. The responded farmers also involved in other occupations like agriculture and business, agriculture and

service. About 45% of the farmers cultivated improved mungbean for the last 5 years and about 27% farmers were found to cultivate this crop during the period of 6-10 years. Average family size was 6.34 person per farm, where as the national average was only 4.90 person per farm (BBS, 2009). Higher family size was found in Patuakhali (6.61 person per farm) compared to Noakhali (6.56) and Barisal (6.02).

Table 1. Socio-economic profile of sample mungbean farmers in the study areas

Items	Barisal	Patuakhali	Noakhali	All
a. Age (% of farmers)				
20-40 year	32	24	40	32
41-60 year	44	58	36	46
above 60 year	24	18	24	22
b. Literacy level (%)				
Illiterate	18	11	14	14
Primary	34	41	44	40
Up to SSC	40	38	26	35
Above SSC	8	10	16	11
c. Training received (%)	42	30	34	35
d. Occupation (%)				
Agriculture	86	80	66	76
Agriculture + business	16	12	4	11
Agriculture + service	-	8	30	13
e. Experience of cultivation (year)				
Upto 5 yrs	38	46	50	45
6-10 yrs	30	24	28	27
11-15 yrs	12	20	16	16
16 and above	20	10	6	12
f. Family size (person/farm)	6.02	6.61	6.56	6.34

Area under mungbean variety

On an average, total cultivated area per farm was 1.58 hectare. The highest farm size was found in Noakhali (1.88 ha) and the lowest in Barisal (1.16 ha). Average mungbean cultivated area was found to be 0.44 ha which was about 28% of the total cultivated land. On the other hand, suitable area for mungbean cultivation was found to be 0.92 ha and it was about 58% of the total cultivated area (Table 2).

Table 2. Average farm size and acreage under improved mungbean varieties in the studied farmers

Farm size and mungbean area	Barisal	Patuakhali	Noakhali	All
Average cultivated area (ha)	1.16	1.68	1.88	1.58
Suitable area for mungbean (ha)	0.64 (55)	0.84 (50)	1.29 (69)	0.92 (58)
Mungbean cultivated area (ha)	0.22 (19)	0.56 (33)	0.55 (29)	0.44 (28)

Figures in parentheses indicate the percent of total cultivated area

Influencing personnel for adoption: The study revealed that persons from different organizations mainly influedced farmers to cultivate improved mungbean in the study area. The highest percent of (71%) farmers were influenced by the Sub-Assistant Agriculture Officer (SAAO) to adopt improved mungbean. The level of influence of both family member and neighboring farmers in adopting improved mungbean was more or less equal. BARI scientists and agriculture officer played an important role to cultivate improved mungbean (Table 3).

Table 3. Influence of different personnel regarding cultivation of improved mungbean varieties in all areas

Personnel	Barisal	Patuakhali	Noakhali	Total
Sample size (n)	*50*	*50*	*50*	*150*
Family member	30	20	20	72 (48)
Neighboring farmer	23	27	30	80 (53)
Sub-Assistant Agril. Officer	39	43	25	107 (71)
BARI Scientist/ Others	12	10	8	30 (20)

Figures within parentheses are percentages of total

Input use pattern: The pattern of input use is presented in Table 4. On an average, responded farmers used 65 may-days of human labour per hectare of which only 40% were family supplied. More or less same amount of human labour were used by the farmers of different districts. On an average, 24 kg of seed was used per hectare which was found slightly higher in Barisal than Patuakhali and Noakhali. The farmers used 75% seed from their own sources. Farmers used on an average 907 kg manures/ha. Farmers in the study areas also used chemical fertilizers like urea, TSP and MP at the rate of 21 kg, 27 kg and 12 kg per hectare respectively. It was much lower than the recommended doses i.e. urea (40-50) kg/ha, TSP (80-85)kg/ha and MP (30-35) kg/ha (Annoymous, 2006). The farmers of Barisal used slightly more fertilizers than other areas.

Table 4. Level of input use per hectare for mungbean cultivation in the study areas

Type of input	Barisal	Patuakhali	Noakhali	All
Human labour (man-days)	65	63	66	65
Own	30	28	20	26
Hired	35	35	46	39(40)
Seed(kg/ha):	26	24	23	24
Own	19	20	15	18 (75)
Purchased	7	4	8	6
Manures (kg/ha)	855	688	542	907
Fertilizers:				
Urea	24	22	16	21
TSP	32	26	27	27
MP	24	15	6	12

Figures in the parentheses indicate the percentage of total

Profitability of Improved Mungbean Production

Profitability is one of the major criteria for determination of acceptance of a crop. The cost of mungbean production, gross return, gross margin, net return and the rate of return (BCR) for mungbean cultivation have been discussed below.

Cost of production: Costs are the expenses for organizing and carrying out the production process. The cost of production included different variable cost items like land preparation, human labour, seed, manure, fertilizer, insecticides etc. Both cash expenditure and imputed value of family supplied inputs were included in the analysis. Besides, interest on operating capital was also considered for the estimation of cost of mungbean production. Total cost consists of variable and fixed cost that covered 52.3% and 47.7% of the total cost respectively for improved mungbean cultivation (Table 5). The average cost of improved mungbean cultivation per hectare was Tk. 39978. Slightly higher cost was observed in Barisal followed by Patuakhali and Noakhali. It might be due to the high use of manures, fertilizers and pesticides. It revealed from the Table 5 that the highest cost was incurred for human labour (41.2%) followed by land use cost (31.8%), land preparation cost (9.4%) and seed cost (4.9%).

Table 5. Cost of mungbean cultivation in the study areas

Items	Barisal	Patuakhali	Noakhali	All	% of total cost
A. Variable cost	21279	19830	20652	20895	52.3
Hired labour	8631	8661	11388	10093	25.2
Land preparation	3873	4080	3202	3759	9.4
Seed	1937	2068	1775	1974	4.9
Fertilizers:					
Urea	300	262	207	272	0.7
TSP	989	796	821	834	2.0
MoP	852	532	205	434	1.0
Manures	641	516	407	688	1.7
Pesticides	1350	1127	942	1100	2.8
Irrigation	199	151	-	98	0.2
Int. on operating capital	1757	1637	1705	1725	4.3
B. Fixed cost	20373	19809	17555	19083	47.7
Family labour	7588	6958	5078	6379	16.0
Land use cost	12785	12851	12477	12704	31.8
C. Total cost (A+B)	41652	39639	38207	39978	100

Profitability of mungbean production: The average return of mungbean production in different locations is shown in Table 6. The average yield of improved mungbean was 824 kg/ha, which was higher than national average of 782 kg/ha (BBS, 2009). Islam *et. al.* observed yield of mungbean as 946 kg/ha in 2009. In this year farmers did not get desired yield due to severe infestation of insects. The farmers applied insecticides but not controlled. The reason was that the insecticides not work properly. The highest yield (973 kg/ha) was found in Barisal and the lowest yield was found in Patuakhali (748 kg/ha). The highest yield was found in Barisal might be due to less attack of insects and better management (i.e. use of manures and weeding their land). The average gross return and gross margin from improved mungbean production was found to be Tk.64915/ha and Tk. 57933/ha respectively. Average net return was Tk. 38850/ha. The benefit cost ratio was estimated at 3.11 and 1.62 on cash cost and full cost basis respectively.

Table 6. Profitability of mungbean cultivation in the study areas

Items	Barisal	Patuakhali	Noakhali	All
A. Total cost	41652	39639	38207	39978
Variable cost (VC)	21279	19830	20652	20895
Fixed cost (FC)	20373	19809	17555	19083
B.Yield (kg/ha)	973	748	783	824
C. Total return	76918	60837	59028	64915
D. Gross margin (B-VC)	55639	41007	38376	57933
E. Net return (B-A)	35266	21198	20821	38850
F. Rate of return (BCR)				
BCR on full cost	1.85	1.53	1.54	1.62
BCR on variable cost	3.61	3.07	2.86	3.11

Factors affecting the allocation of mungbean area: The Coefficient of multiple determination (R^2) was 0.52 which meant that the explanatory variables included in the model explained 52% of the variation in mungbean area allocation (Table 7). All the variables, except education, were found positive and significant, implying that, if farmer experience increases 1 unit, keeping other variables remaining constant, allocation of mungbean area cultivation would increase by 0.224 decimal. Similarly other factors like training, organizational membership, relation with different media, and mungbean suitable area increases 1 unit, keeping other things remaining constant, mungbean area would increase by 0.784, 0.167, 0.160 and 0.465 decimal respectively.

Table 7. Estimated values of coefficients and related statistics of regression model.

Explanatory Variables	Coefficient	Standard error	t-value
Intercept	0.375	0.516	0.727
Education	0.149	0.148	1.009
Experience	0.224**	0.086	2.624
Training	0.784***	0.171	4.586
Membership	0.167*	0.093	1.793
Media contact	0.160*	0.085	1.891
Suitable mungbean area	0.465***	0.075	6.180
R^2	0.52		
F-value	21.604		

Note: ***'; '**' and '*' represent 1%, 5% and 10% level of significance
Total observation (N) =150, Dependent variable- mungbean area

Constraints to mungbean cultivation

Although improved mungbean is a profitable crop in the study areas, there are several constraints to its higher production. The first and the foremost constraint for adoption of improved mungbean in all areas was insect infestation (89%) (Table 8). They mentioned that due to severe infestation of insect improved mungbean yield was drastically reduced and it leads to heavy loss to the growers. So they faced uncertainty about this crop. The second highest constraint was insecticides not working properly (67%) might be due to adulterations. For this reason farmers were not interested to apply insecticides in their infested mungbean field. The 3rd constraint was lack of training (65%) about improved mungbean cultivation and it was major constraint in Patuakhali compared to other districts. The 4th constraint was high price of insecticides (63%). Lack of labour (54%), lack of optimum moisture (44%), lack of good seed (42%) and diseases infestation (30%) were also opined to be the constraints to mungbean cultivation.

Table 8. Constraints to mungbean cultivation encountered by the sample farmers in the study areas

Constraints	% farmers responded			
	Barisal	Patuakhali	Noakhali	All
Insects infestation	92	86	90	89
Insecticides not work properly	60	80	62	67
Lack of training	57	75	62	65
High price of insecticides	56	72	60	63
Lack of labour	32	66	64	54
Lack of optimum moisture	56	42	34	44
Lack of good seed	28	48	50	42
Disease infestation	28	42	20	30
Others*	36	64	38	46

*Others indicate lack of capital, low yield and high price of seed.

Conclusion and Recommendations

The study assesses the input use pattern and profitability of improved mungbean varieties at farm level. The adopters are mostly influenced by family member, neighboring farmers, sub-assistant agriculture officer, and BARI scientist to adopt improved mungbean. The average yield of mungbean is much lower than its potential yields. The improved mungbean cultivation at farm level is profitable.

Although improved mungbean is a profitable crop, due to some setbacks few farmers have showed negative attitudes toward its production. They have experienced different constraints to improved mungbean production such as diseases and insect infestation; insecticides were not working properly,

high price of insecticides, lack of training, labour, optimum moisture and good seed. They require quality insecticides at reasonable price. If seeds of improved mungbean variety and production technology can be made available to the farmers, yield of improved mungbean can be increased which may help to increase farmers' income as well as nutritional status.

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