ISSN 0258-7122
Bangladesh J. Agril. Res. 38(1): 85-96, March 2013

ADOPTION OF BARI MUNG VARIETIES AND ITS CONSTRAINTS TO HIGHER PRODUCTION IN SOUTHERN REGION OF BANGLADESH

Q. M. SHAFIQUL ISLAM[1], M. A. MONAYEM MIAH[1]
M. S. RAHMAN[2] AND M. S. HOSSAIN[3]

Abstract

Mungbean is a popular and widely grown pulse in Bangladesh. Coastal farmers are cultivating BARI-Mung varieties, but many farmers are still reluctant to adopt these improved varieties that need to be identified. Therefore, the study was conducted in three mungbean growing coastal districts, namely Barisal, Patuakhali, and Noakhali of Bangladesh during 2010-2011 to assess the extent of technology adoption and constraints to BARI-Mungbean production. The study focused the level of technology adoption in terms of variety use, input use and agronomic practices. The study revealed that farmers followed the recommended practices which were very encouraging. All the farmers adopted improved mungben varieties of which 51% farmers adopted BARI Mung-5 variety. The level of adoption of seed rate, use of urea, and MoP was found to be high. The level of adoption of agronomic practices like ploughing, sowing time, weeding and insecticides use were also found to be high. The farmers were mostly influenced by DAE personnel and neighboring farmers in adopting improved mungbean technology. Multiple regression revealed that experience, training, organizational membership, relation with different media, and mungbean suitable area had positive and significant influence in increasing the area under mungbean cultivation. Most 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. Farmers required improved mungbean seeds and production technology which may increase the yield and income of the farmers.

Keywords: BARI Mung, adoption index, southern region, and constraints.

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

[1]Senior Scientific Officer,[2] Scientific Officer, and [3] Chief Scientific Officer, Agricultural Economics Division, Bangladesh Agricultural Research Inastitute (BARI), Joydebpur, Gazipur, Bangladesh.

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). It provides grain for human consumption and 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). Major area of mungbean is replaced by cereals (Abedin, *et al*., 1991). Now a days, it is being cultivated after harvesting of *Rabi* crops such as wheat, mustard, lentil, etc. As mungbean is a short duration crop, it can well fit as a cash crop between major cropping seasons. It is grown three times in a year covering 23264 ha with an average yield of 0.77 t/ha (BBS, 2010).

Analysis of secondary data for the last three decades shows that the overall growth rate of production and yield are positively significant. Again decade-wise analysis revealed that the growth rates of area and production were positive and highly significant, but growth rate of yield was negative. After this period, the growth rates of production and yield were observed positively significant due to adoption of improved mungbean technology instead of decreasing area. In the last decade (2000/01-2009/10), both area and production decreased to a greater extent (Table 1). The causes of such decreases need to be explored which is the ultimate goal of this study.

Table 1. Mean, coefficient of variation and growth rates of mungbean, 1981-2010.

Particulars	Area (ha)	Production (mt)	Yield (t/ha)
1980/81-1989/90			
Mean	34492	19046	0.558
CV (%)	66.3	65.4	6.0
GR (%)	22.6***	21.9***	-0.77^{ns}
1990/91-1999/00			
Mean	55043	32253	0.586
CV (%)	2.3	4.2	4.5
GR (%)	-0.11^{ns}	1.02**	1.13**
2000/01-2009/10			
Mean	33703	26080	0.801
CV (%)	37.5	29.9	20.8
GR (%)	-10.56***	-8.84***	1.72^{ns}
1980/81-2009/10			
Mean	40947	25743	0.652
CV (%)	42.8	37.4	22.7
GR (%)	0.55^{ns}	2.26**	1.70***

Note: Calculated using data from various issues of BBS
'***' and '**' indicate significant at 1% and 5% level

Six improved mungbean varieties along with their management technologies have been developed by Pulses Research Centre, BARI and disseminated these technologies throughout the country to the farmers for cultivation. Therefore, mungbean cultivation is gaining popularity day by day in many pocket areas of Bangladesh. But, national statistics shows a decreasing trend of area and production of mungbean. Now it is essential to know the present status of adoption of mungbean varieties and their constraints to production in the southern region of Bangladesh. With these information researcher and policy makers can take steps for the development of this crop. But limited study was done on mungbean in this regard. In view of the discussion the present study was undertaken with the following objectives:

1. To know the adoption of improved mungbean varieties and their management technologies in the southern region;
2. To find out the factors affecting the area under improved mungbean varieties, and
3. To know the socio-economic constraints to mungbean cultivation.

Methodology

Data sources and collection period*:* The study was conducted in three coastal districts, namely Barisal, Patuakhali, and Noakhali. The crop season was late *Rabi* (January-May), 2010. Data were collected from January to March 2010.

Sampling technique*:* 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 list of mungbean growers was prepared 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. Field investigators collected primary data through household survey using a pre-tested interview schedule in collaboration with DAE field staffs under direct supervision of the researchers.

Analytical technique: 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 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.

***The 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)

$\beta_1, \beta_2 \ldots\ldots\ldots\ldots\ldots \beta_6$ = Co-efficients of the relevant variables and

U_i= disturbance term / error term.

$$Adoption\ index = \frac{Used\ techno\log y}{\mathrm{Re}commended\ techno\log y} \times 100$$

Results and Discussion

Socio-economic profile of the farmers

Table 2 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 2. 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
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 cultivation

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).

Table 3. 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

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 3).

Technology used and their level of adoption

Appropriate input use and time of operation were essential for achieving higher yield and economic benefit. Therefore, it is important to know the existing level of technology in terms of agronomic practices, time of operation and input use.

Adoption level of different varieties

The level of adoption of mungbean varieties was mostly dependent on the dissemination process used by BARI and association with the DAE. The scientists of BARI have developed and disseminated 6 mungbean varieties to the farmers since 1982. BINA-Mung and BAU-Mung were also developed by BINA and BSMRAU. All the farmers adopted improved mungbean varieties, such as BARI-Mung-2 (27%), BARI-Mung-5 (45%) and BARI-Mung-6 (22%). The farmers of Noakhali district mostly adopted BARI-Mung-5 and BARI-Mung-2. On the other hand, the highest 74% of the farmers of Patuakhali adopted BARI-Mung-5 (Table 4). It was observed that BINA-Mung and BAU-Mung cultivating farmers were not found within the sample farmers. Adopted farmers opined that they preferred BARI-Mung varieties mainly due to higher yield along with their seed availability compared to BINA-Mung and BAU-Mung varieties.

Table 4. Adoption of improved mungbean varieties by the sample farmers.

Variety	Barisal	Patuakhali	Noakhali	All
BARI Mung-2	26	14	40	27
BARI Mung-5	20	74	60	51
BARI Mung-6	54	12	-	22
All variety	100	100	100	100

Land preparation: It includes ploughing, laddering and other operations needed to make the soil suitable for sowing seeds. The mungbean farmers mostly ploughed their lands by power tiller. The number of ploughing varied from land to land and location to location. On an average, 59% of the total farmers ploughed their land three times, while 31% and 10% ploughed 2 and 4 times, respectively (Table 5). Three to four times ploughing is recommended for mungbean cultivation. Based on the mean index, land preparation scores the highest level of adoption.

Sowing of seeds: In the study area, broadcast method of sowing was mostly followed by the farmers. Sowing was started from 3rd week of February and continued up to the 2nd week of March. It is revealed that from the Table 4 that 65% of the total farmers sown seeds during the month of February.

Table 5. Adoption of improved mungbean technology by the sample farmers.

Technology	% Farmers responded and adoption score				Overall adoption level
	Barisal	Patuakhali	Noakhali	All	
Sample size (n)	50	50	50	150	
Ploughing					
One	34	30	28	31	
Three	46	70	62	59	
Four	20	-	10	10	
Adoption index	83	85	86	85	High
Sowing time					
Within February	46	68	82	65	
Within March	54	32	18	35	
Adoption index	95	73	82	83	High
Weeding					
Zero	86	76	44	69	
One	10	18	28	19	
Two	4	6	28	12	
Adoption index	59	65	90	71	High
Pest control					
Do not use pesticides	38	20	24	27	
Use pesticides	62	80	76	73	
Adoption index	81	90	88	86	High

The time of seed sowing was highly adopted because farmers found it convenient to sow during the available range of time.

Weeding: On an average 69% of the farmers not weeded their land and it was found to be the highest in Barisal followed by Patuakhali and Noakhali. Weeding was done by utilizing human labour. Only 19% of the total farmers performed weeding once and 12% provided weeding twice. The highest level of adoption was occurred in providing weeding to mungbean (Table 5).

Insect-pest control: On an average 76% of the farmers used pesticides. The highest number of users was found in Patuakhali (80%) and the lowest in Barisal (62%). According to adoption index, the higher level of adoption occurred in applying pesticides to control insect-pest infestation (Table 5).

Influencing personnel for adoption: The study revealed that persons from different organizations mainly influenced 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 6).

Table 6. Influence of different personnel regarding cultivation of improved mungbean varieties. ***(figure in no.)***

Personnel	Barisal	Patuakhali	Noakhali	Total
Sample size (n)	50	50	50	150
Family member	30	20	20	70 (47)
Neighboring farmer	23	27	30	80 (53)
Sub-Assistant Agril. Officer	39	43	25	107 (71)
BARI Scientist/ Agril. Officer	12	10	8	30 (20)

Figures within parentheses are percentages of total

Table 7. Seed rate, manure and fertilizers use and their farm level adoption in improved mungbean varieties. ***(Figure in kg/ha)***

Manure & Fertilizer	Barisal	Patuakhali	Noakhali	All	Adoption level
Seed	28	24	22	25	
Adoption index	93	80	73	83	High
Manure	2087 (23)	771 (7)	645 (10)	1055 (40)	
Urea	27 (22)	23 (29)	16 (20)	21 (71)	
Adoption index	109	80	128	108	High
TSP	33 (32)	15 (19)	30 (32)	26 (83)	
Adoption index	64	47	73	64	Medium
MoP	25 (27)	9 (15)	6 (14)	12 (56)	
Adoption index	109	89	88	98	High

Note: (i) Recommended average fertilizer dose (kg/ha) for mungbean: Urea-40-50, TSP-80-85 and MP-30-35. (ii) Adoption level was categorized for mean index > 100 as over use, (70-100) as high, (50-69) as medium and < 50 as low. (iii) Figures within parentheses are the number of fertilizers-using farmers.

Seed, manure and fertilizers: Use of seed, manure and fertilizers by the farmers varied from location to location. On an average, farmers in the study area used 25

kg seed per hectare and the highest amount of seed were used by the farmers of Barisal. The recommended rate of seed was 25-30 kg/ha and the sample farmers used seed rete near to recommendation. Therefore, the level of adoption of seed rate was found to be high. Farmers used 1055 kg manures per hectare for improved mungbean cultivation. The study revealed that farmers applied recommended doses of urea and MoP. But in the case of TSP, farmers used below the recommended doses (Table 7). The uses of urea and MoP tend to its optimum level resulting the adoption level to be high for these fertilizers. On the other hand, the adoption index of TSP found to be in medium.

Factors affecting the allocation of mungbean area: The Coefficient of multiple determinations (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 8). All the variables, except education, were found positive and significant, implying that, if farmer experience increases one 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. It means that, the farmers of more experienced, trained, engaged in different organizations, contact with different media and suitable mungbean area had trend to allocate more area under mungbean production.

Table 8. Estimated values of coefficients and the 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

Farmers' attitudes toward mungbean cultivation

Willingness to increase mungbean cultivation: The farmers were asked to mention the possibility of expanding their cultivated area for improved

mungbean production. About 75% farmers reported that they will increase improved mungbean area for the next year. Among all responded farmers, Barisal farmers showed the highest and Patuakhali farmers showed the lowest level of interest in increasing their mungbean area (Table 9).

The farmers in the study areas mentioned that they will expand their mungbean areas for the next year because, mungbean is a profitable crop (49%), easy cultivation method (39%), short duration (35%), and production requires less cost (32%).

Table 9. Reasons for increasing mungbean cultivation for the next year.

Items	Barisal	Patuakhali	Noakhali	All
Sample size	50	50	50	150
A. Willingness to:				
Increase	75	60	65	37
Not increase	25	40	35	33
B. Reasons for increasing				
Profitable crop	57	48	42	49
Short duration crop	35	37	33	35
Less production cost	39	25	28	32
Easy cultivation	37	41	38	39
Meeting household demand	26	22	25	24
Others (residual effect,)	30	32	27	30
B. Reasons for not increasing				
Lack of enough land for mungbean cultivation	22	35	30	29
Low yield	18	28	32	26
Insect infestation	24	32	25	27
Natural calamities	21	23	17	20

A good number of farmers also wanted to increase mungbean area for the next year to meet up their household demand and for its multi-purpose uses. Some of the farmers mentioned that after mungbean cultivation the yield of the next crop is found to be good due to its residual effect.

Few farmers (25%) also mentioned various reasons for not expanding their improved mungbean areas for the next year. The important reasons were lack of enough land for mungbean cultivation as they need to grow other crops. Besides,

low yield, insect infestation and due to natural calamities were also mentioned by the farmers (Table 9).

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%). 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 10).

Table 10. 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 level of adoption in terms of agronomic practice and input use is very encouraging because most farmers have used inputs following agronomic practices close to the recommendation. The highly adopted variety was BARImung-5. The overall adoption situation indicates the wider scope of

dissemination BARImung varieties in the study areas. Estimation shows that experience, training, organizational membership, relation with different media, and mungbean suitable area are found to be positive and significant. The adopters are mostly sub-assistant agriculture officer to adopt improved mungbean. 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.

References

Abedin, M. Z. and M. Anwarul. 1991. Prospects of Increasing Pulse Production Through Improved Cropping Systems. In: Proceedings of the 2nd National Workshop on Pulses. BARI, Joydebpur, Gazipur. 65-73.

AVRDC (Assian Vegetable Research and Development Centre). 1988. Mungbean Procedings of the First International Mungbean Symposium Shanhua, Taiwan.

Annoymous (2006), 'Krishi Projukti Hathboy (Handbook on Agric-technology)', Fourth Edition, Vol. (1), BARI, Joydebpur, Gazipur.

BBS. 2009. Bangladesh Bureau of Statistics, Statistical Yearbook of Bangladesh, Statistics Division, Ministry of Planning, GOB.

Elias, S. M., M. S. Hossain, Sikder, F.S, Mr. Juber Ahmed and Mr. M. Rezaul Karim, 1986. Identification of constraints to pulse production with special reference to present farming systems. Annual Report of the Agricultural Economics Division, BARI, Joydebpur, p-1.

Rahman M, M. 1998. Technology Information on Lentil, Mungbean and Mungbean , Lecture note, Training Workshop on Lentil, Mungbean and Mungbean at BARI, Joydebpur, Gazipur, February 22-23.

Senanayake, L., Knievel, D. P. Stevena, S.E. 1987. Nodulation and symbiotic nitrogen fixation of cowpea (*Vigna unguiculata L.*). *Plant Soil* **99:** 435-439.

Sharma, S.N. and Prasad, R., 1999. Effects of sesbania green manuring and mungbean residue incorporation of productivity and nitrogen uptake of a rice-wheat cropping system. *Bioresource Technology* **67**(2): 171-175.

Zapata, F., Danso, S.K.A., Hardarson, G., Fried, M. 1987. Nitrogen fixation and translocation in field-grown fababean. *Agronomy Journal* **79:** 505-509.