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Boosting Pulse Production by Adopting Short Duration Mungbean Varieties towards Food Security in Bangladesh

M.A. Islam

Abstract

The main objective of this study was to determine the yield performance of newly evolved mungbean variety *Binamoog-8* in traditional and non-traditional areas of Bangladesh. Data were collected from August to September, 2010 using interview schedule from randomly selected 90 cooperator farmers who grown this short duration mungbean variety in their fields during the summer season of 2010. The highest yield was obtained from the sadar upazila of Pabna district (1378 kg/ha) by triple pod picking. Although there were no significant yields differences between one and two picking of pods (for one picking yield was 1205 kg/ha and for two pickings yield was 1207 kg/ha), an additional 8.2% yield was added by third picking. March sowing had an average seed yield of 1271 kg/ha and this yield was decreased by 13% when it was sown in April. Thus, early sowing particularly, January for the southern districts and March for the northern districts will have more seed yield.

Keywords:*Binamoog-8, seed yield, pod, picking*

Introduction

Dahl (soup), a produce of pulse is almost a common item in everyday meal for the people of Bangladesh. For its nutritious value *dahl* is called poor men's meat in the country. But with its own production, the country can meet up only about 30% of pulse requirement by 5.24% of her total cultivable land. The major contributors to the present total pulse production (0.55 million tons) are lentil 38%, mungbean (*Vigna radiata*) 12% and black gram 5%, respectively. Similar to lentil, chickpea, black gram and grass pea, traditionally mungbean was grown mostly in the winter season due to prevailing favorable agro climatic conditions in the country. But with the technological development the growing season of mungbean has been shifted to summer season. It is grown after harvest of T. Aman and mustard as kharif-1 crop in the northern Bangladesh. In some cases mungbean is also grown after harvest of potato and wheat but yielded poor seed yield with heavy vegetation. The crop is grown slightly earlier in the southern part compare to northern districts of the country in the *Fallow - T. Aman* rice – *Mungbean* (71%) and *T. Aus- T. Aman – Mungbean* (27%) cropping patterns in the Patuakhali, Barisal, Bhola, Pirojpur and Jhlokathi districts. In these areas, the crop is sown in January- February and harvested in March-April. But in the northern districts, the crop is sown in March - April and harvested up to July in the *Mungbean – T. Aman – Fallow* (48%) and *Mungbean – T. Aman– Wheat* cropping patterns. However, the crop covers about 43,680 ha with an average yield of 0.68 t/ha (BBS, 2009). Like other pulse crops mungbean cultivation can improve soil aggregation, structure, permeability, fertility and infiltration rate (Yadav *et al.*, 1997). It can add up to 60 kg ha^{-1} residual N to the succeeding crop

[1]Department of Agricultural Extension Education, Sylhet Agricultural University, Sylhet-3100

(Kumar Rao *et al.*, 1998. Having all these immense prospects, both the area and production of mungbean is decreasing due to technological development in irrigation sector that favors horizontal increasing of rice–rice cereal mono cropping area in the country. In contrast, growers could not reap the benefits of modern mungbean varieties developed at the research institutes in the country. Although the recent developed varieties including *Binamoog-8* have many good traits, they are yet to be adopted by the large number of the mungbean growers. For any crop, generally an increase in production and productivity is brought about by the wider availability and adoption of improved variety. Rogers (1995) in this regard identified two major factors responsible for adoption rate of improved variety. Firstly, the characteristics, for example relative advantage, compatibility, complexity, triability and observability of that technology and secondly, how the client system perceived these characteristics at their own situations. Since *Binamoog-8* has the feature of short duration, synchronized pod maturity, high yield potential and insects and diseases tolerant nature, it is expected that the variety would be accepted by wide range of pulse growers across the country without disturbing the existing cropping patterns. So it was necessary to assess the performance of *Binamoog-8* in varying cropping pattern with the objectives i) to determine seed yield of *Binamoog-8* with its duration at field level, ii) to ascertain perception of the growers about the characteristics of *Binamoog-8*, and iii) to explore the relationship between some of the selected characteristics of the farmers and their perception about *Binamoog-8*.

Methodology

During the Kharif-1 season of 2010, a total of 90 demonstration plots with *Binamoog-8* were set up at the farmers' fields in 12 districts (Bhola, Borguna, Jhalokathi, Pabna, Natore, Kustia, Magura, Jessore, Faridpur, Bogra, Dinajpur and Thakurgaon) across the country. Of which Bogra was non-traditional area for summer mungbean. In all cases, BARI mung-5 was used as a check variety. The Department of Agriculture Extension (DAE) was the main collaborator in making the demonstration plots successful. The area of each of the research plots was 33 decimal of which, 28 decimal was allocated for Binamoog-8 and rest 5 decimal for check variety BARI mung-5. The trials were conducted under farmers' own management in rain-fed condition. The seeds were sown from 24 January to 2 February in the southern districts and from 1 March to 6 April in the north-western districts. In all locations seed rate was 30 kg/ha. For supply of phosphorus and potassium, 100 kg TSP and 55 kg MoP/ha were applied during final land preparation. As a starter dose, 18 kg N/ha was also applied in the fields. The co-operator farmers totaling 90 were also interviewed about the performance in relation to seed yield and other adaptive features of *Binamoog-8*. The data were collected with the help of pre-designed, pre-tested interview schedule by the field investigators under direct supervision of the researchers from August to September, 2010.

Findings and Discussion

Like all other pulse crops a slight tendency of indeterminate flowering habits was observed in *Binamoog-8* which was evident by their opted several plucking habits in pod harvesting. Actually they followed one, two or three pickings of pods based on tradition, cost effectiveness and availability of labour. It is evident from the Table1 that farmers of the southern districts namely Borguna, Jhalokati and Bhola followed single picking of pods. Average seed yield of *Binamoog-8* for these southern districts was 1215 kg/ha for late January sowing and in case of early February sowing the yield was 1146 kg/ha. In both cases the variety had about 11% higher yield than that of the check variety BARI mung-5.

Unlike the southern districts, sowing of mungbean was started in the other districts in early March and continued up to early April. Multiple pods picking habits was observed in the farmers of Natore, Pabna, Magura, Faridpur, Jessore, Dinajpur and Thakurgaon districts. In case of double pods picking up to 1346 kg/ha seed yield was recorded at Dhunot upazila of Bogra district which was considered as the non-traditional area for mungbean cultivation. The highest yield was obtained from the sadar upazila of Pabna district (1378 kg/ha) by triple pod picking. Although there were no significant yields differences between one and two picking of pods (for one picking yield was 1205 kg/ha and for two pickings yield was 1207 kg/ha), an additional 8.2% yield was added by third picking. The similar yield (1352 kg/ha) was also observed at Lalpur of Natore district. This trend indicates the facts that more number of pod picking of *Binamoog-8* could produce more seed yield. But the lowest yield (1020 kg/ha) was recorded at Fulbari Upazila of Dinajpur district. The reasons behind this low yield might be the insect pressure and micro-nutrients deficiency, particularly Zinc (Zn) and Molybdenum (Mo) that caused less number of pods setting as well as the less number of seeds per pod.

Table1 Yields of *Binamoog-8* with harvest duration recorded at demonstration plots conducted different locations of the country during 2010.

Date of sowing	Location with number of demonstration plot	Seed yield (kg/ha) with days to first pod plucking	Seed yield (kg/ha) with days to 2nd pod plucking	Seed yield (kg/ha) with days to 3rd pod plucking	Total yield (kg/ha)	Yield of check variety BARImung-5 (kg/ha)	Yield increased over check (%)
Late January							
24/01/2010	Sadar, Borguna (3)	1154 (72)	-	-	1154	950	21
27/01/2010	Sadar, Jhalokathi (3)	1195 (74)	-	-	1195	1146	4
30/01/2010	Sadar, Bhola (3)	1297 (78)	-	-	1297	1250	4
Mean		1215 (75)			**1215**	**1115**	**10**
SD		(73.6) 3.1			**73.6**	**152.3**	

Table 1 (Contd.)

Date of sowing	Location with number of demonstration plot	Seed yield (kg/ha) with days to first pod plucking	Seed yield (kg/ha) with days to 2nd pod plucking	Seed yield (kg/ha) with days to 3rd pod plucking	Total yield (kg/ha)	Yield of check variety BARImung-5 (kg/ha)	Yield increa-sed over check (%)
Early February							
01/02/2010	Sadar, Borguna (3)	1206(77)	-	-	1206	1088	11
02/02/2010	Lalmohan, Bhola (3)	1066 (67)			1066	1020	5
02/02/2010	Sadar, Jhalokathi (3)	1167 (72)			1167	1000	17
Mean		1146 (72)			**1146**	**1036**	**11**
SD		72.3 (5.0)			**72.3**	**46.1**	
Early March							
01/03/2010	Boraigram, Natore (3)	875(63)	375(78)		1250	1220	2
02/03/2010	Sadarpur, Faridpur (3)	648 (63)	352(87)	224(99)	1224	1180	4
04/03/2010	Chougacha, Jessore (3)	856 (70)	438(91)		1294	1050	23
08/03/2010	Ranisankail,Thakurgaon (3)	770 (70)	467(100)		1237	1150	8
09/03/2010	Sadar, Jessore (3)	791(72)	487(92)		1278	988	29
10/03/2010	Sadar, Faridpur (3)	634(65)	400(85)	286 (100)	1320	1320	0
10/03/2010	Lalpur, Natore (3)	715 (65)	332(80)	305 (94)	1352	1230	10
Mean		756 (67)	407 (88)	272 (98)	**1279**	**1163**	
SD		94.7 (3.7)	58.7 (7.5)	42.4 (3.2)	**46.3**	**112.7**	
Mid March							
11/03/2010	Baliadangi, Thakurgaon (3)	795 (73)	525(98)		1320	940	40
15/03/2010	Sherpur, Bogra (3)	683 (68)	542(83)		1225	850	44
16/03/2010	Daulatpur, Kustia (3)	752 (72)	468(98)		1220	1200	2
17/03/2010	Sadar, Pabna (3)	737 (62)	384(78)	257 (91)	1378	1200	15
20/03/2010	Atgharia, Pabna (3)	660 (64)	362(76)	240 (92)	1262	1148	10
Mean		725 (68)	456 (87)	249 (92)	**1281**	**1068**	
SD		54.2 (4.8)	31.1 (10.7)	12 (0.7)	**67.4**	**162.1**	
Late March							
22/03/2010	Sadar, Magura (6)	772 (62)	514(92)		1286	1164	10
27/03/2010	Sadar, Magura (6)	690 (60)	452(90)		1142	864	32
Mean		731 (61)	483 (91)		**1214**	**1014**	
SD		58 (1.4)	43.8 (1.4)		**101.8**	**212.1**	
Early April							
02/04/2010	Dhunot, Bogra (6)	807 (70)	539(85)		1346	1246	8
04/04/2010	Fulbari, Dinajpur (6)	540 (64)	480(96)		1020	1020	0
05/04/2010	Sadar, kustia (6)	620 (65)	430(80)		1050	1000	5
06/04/2010	Birampur, Dinajpur (6)	680 (74)	346(96)		1026	850	21
Mean		662 (68)	449 (89)		**1111**	**1029**	**9**
SD		112.5 (4.6)	81.7 (8.1)		**157.5**	**163.4**	
Over all	**Mean**				**1221**	**1086**	**14**
	SD				**103.1**	**137.3**	

However, the average seed yield of this variety across the locations was 1221 kg/ha with standard deviation of 103.1. This was 14% higher yield than the check variety BARI mung-5.

Compared to single picking, harvesting started 6 and 10 days earlier in case of two and three pickings, respectively. It is also evident from the Table1 that sowing time of *Binamoog-8* was at least two months earlier in the southern districts like Borguna, Bhola and Jhalokathi compared to the northern districts. The reason was due to the spell of winter varied with the locations. The existing cropping pattern was also reported as one of the vital causes of the delayed sowing in the northern districts.

The average days required for one, two and three pickings of harvest were 74, 91 and 95, respectively. Days needed to first harvest for two and three pickings were 68 and 64 respectively, after sowing of seeds. In case of two pickings, the second one was done after 23 days of first pods picking. But in case of three pickings, second one was done 17 days after first picking, and third one was done after 14 days of second picking. The similar harvest interval and duration were observed in case of check variety, BARImung-5.

It is also observed that the yield of *Binamoog-8* was greatly influenced by the sowing time. The average yield of January sowing research plots was 1215 kg/ha in the southern districts Borguna, Jhalokathi and Bhola. This yield was decreased on an average 69 kg/ha when it was sown in February of 2010. Like wise the yield obtained in the southern districts, the similar yield trend was found in northern districts. March sowing research plots had an average seed yield of 1271 kg/ha and this yield was decreased by 13% when it was sown in April. Thus, it can be concluded that early sowing particularly, January for the southern districts and March for the northern districts will have more seed yield.

Sowing of seed is often delayed due existing cropping pattern and shortage of soil moisture, and where irrigation facilities were available, farmers shifted to predominantly rice-rice or rice-wheat cropping systems ignoring pulse crops. This tendency increases concern about the long term sustainability of cereal mono cropping systems. It cannot be expected to indefinitely continue with these systems. In contrast, mungbean is considered as ameliorative crop from the point of view of sustainability to break continuous cropping with cereal. Soil aggregation, soil structure, permeability, fertility and infiltration rate are reported to be improved with the inclusion of pulses in the cropping systems (Yadav *et al.*, 1997). Pulses can add 20-60 kg ha^{-1} residual N to the succeeding crop (Kumar Rao *et al.*, 1998). Moreover, pulse fits well in the existing cropping systems, due to its short duration, low input, minimum care required and drought tolerant nature. Even, due to its short duration mung bean can fit in as a cash crop between the major cropping seasons. Therefore, pulse in general and mung bean in particular can play a vital role in sustainability of agro-ecosystems.

Perception Index of *Binamoog-8* characteristics

Perception of the cooperator farmers about the characteristics of *Binamoog-8* was examined on the basis of the attributes of an innovation (relative advantages, compatibility, complexity, trialibility and observability).The extent of perception towards the specific items of the characteristics of *Binamoog-8* was measured by computing a perception index (PI).

The PIs value of 19 characteristics ranged from 27 to 263 against the possible rage of 0 to 300 (Table 2). As regards to relative advantages, farmers preferred *Binamoog-8* because of its higher seed yield that ranked top among the 19 selected characteristics. Short crop duration is another important advantage in growing this variety as catch and cash crop. Synchronized pod maturity was perceived as a unique character of the crop which would reinforce the farmers towards positive decision for its cultivation. The compatibility to grow in the rain-fed condition perceived by the respondents ensures that the crop could be grown well in low soil moisture condition prevails in char land. On the other hand, farmers opined that for its shorter duration the crop would not hampering transplantation of Aman rice.

Table 2 Rank order of the characteristics of *Binamoog-8* according to perception index (PI)

Characteristics	Perception Index (PI)	Rank order
a). Relative advantage:		
i) Higher seed yield	263	1
ii) Low requirement of fertilizer	231	4
iii) Capacity of improving soil organic matter	215	6
iv) Short duration	251	2
v) Synchronized maturity	182	9
vi) Can grow in low fertile soil	166	12
b). Compatibility:		
vii) Well suited in the existing cropping patterns	176	11
viii) Catch crop for its shorter duration	166	12
ix) Can be grown in rain-fed condition	200	8
c). Complexity:		
x) Susceptible to YMV	79	14
xi) Heavy growth reduced yield	57	15
xii) Pod plucking	202	7
xiii) Labour intensive	55	16
xiv) Require especial skill to cultivate	33	17
xv) Requirement of micro-nutrient like Zn, Bo and Mo	27	18
d). Trialability:		
xvi) Experimental yield lead to large scale cultivation	172	10
e). Observability:		
xvii) Bold seeded	226	5
xviii) Shinny green seed color	238	3
xix) Tolerant to cercospora disease	110	13

In contrast, although almost all pods (about 80 percent) of *Binamoog-8* mature at a time, about 20 percent remain green due to indeterminate flowering nature of munbean for which respondents perceived multiple pod plucking (ranked 2nd) as complexity to grow the variety. This is not only problem for the char dweller but also for the non-traditional farmers of the other mungbean areas. The most observable perceived characteristics were shinny green color and bold seed of *Binamoog-8* indicate consumers' preferences and higher market price of this variety.

Based on PI scores, these characteristic items were classified into three groups: low, medium and high favourable and presented in Table 3.

Personal profiles of cooperator farmers of *Binamoog-8*

Personal profile of the cooperator farmers' cultivating *Binamoog-8* was analyzed and was classified by following a standard rule. The details of personal profile of the cooperator farmers are presented in Table 4.

Table 3 Categorization of characteristics of *Binamoog-8* based on PI score

Low favourable	Medium Favorable	High favourable
i. Heavy growth reduced yield	i) Low requirement of fertilizer	i) Higher seed yield
ii. Require multiple plucking	ii) Added brown manure to the soil	ii) Low requirement of fertilizer
iii. Labour intensive	iii) Short duration	iii) Short duration
iv. Require especial skill to cultivate	iv) Synchrony in maturity	
	v) Can grow in low fertile soil	
	vi) Well suited in the existing cropping patterns	
	vii) Catch crop for its shorter duration	
	viii) Can be grown in rain-fed condition	
	ix) Susceptible to YMV	
	x) Heavy growth reduced yield	
	xi) pod plucking	

Table 4 Personal profiles of cooperator farmers of *Binamoog-8*

Farmers characteristics	Categorization with frequency and percentage			Mean	Standard deviation	Correlation coefficient (r)	
						Seed Yield	Percep-tion
1. Age (22.0 to 63.0)	Young (26.0 %)	Middle (54.0 %)	Old (20.0%)	43.30	10.64	0.139	0.047
2. Level of education (0.0 to 12.0)	illiterate (37.0%)	Primary (54.0%)	High school (9.0%)	3.05	1.97	0.217*	0.133
3. Family size (2.0 to 10.0)	Small (32.0%)	Medium (49.0%)	Large (19.0%)	5.06	1.69	0.046	0.237*
4. Farm size (0.09 to 9.4 ha)	Small (40.0%)	Medium (46.0%)	Large (14.0%)	1.70	1.42	0.150	0.197*
5. Family labour (1.0 to 7.0)	Himself (26%)	Extra up to 2 (51%)	Huge (23%)	2.30	1.05	0.385**	0.412**
6. Organizational Participation (0.0 to 18.0)	No (56.0%)	Low (38.0%)	Medium (6.0%)	2.19	3.24	-0.037	0.185
7. Cosmopoliteness (0.0 to 8.0)	Low (9.0%)	Medium (87.0%)	High (4.0%)	10.83	2.67	0.119	0.145
8. Innovativeness (10.0 to 28.0)	Low (41.0%)	Moderate (50.0%)	High (9.0%)	40.94	6.5	0.298*	0.167

*= Significant at 0.05 level of probability with 88 d.f.
**= Significant at 0.01 level of probability with 88 d.f.

The Table 4 reveals that 80% of the farmers belong to young to middle aged category. In case of level of education of the farmers, it was observed that 54% of the farmers had primary education followed by 37% illiterate and only few (9%) had high school level of education. More than 80% of the farm families had small to medium family size. As regards to farm size of the farmers it was observed that most of the farmers (86.0%) had small to medium farm. In respect to family labour, it was found that more than half of the farmers had extra two working force excluding farmer himself while almost equal number having single and more than two working labour force which is vital for adoption of labour intensive crop culture like mungbean. More than half (56.0%) of the respondent had no organizational participation. In case of cosmopoliteness, majority of the respondents fall in medium category. Most of the respondents (91.0%) had low to moderate innovativeness.

Relationship between selected characteristics of the farmers and their perception about the characteristics features of *Binamoog-8*

Pearson Product Moment Co-efficient of correlation (r) was used concerning the relationship between two variables. The findings indicate that innovative farmers having higher level of education and more

family labor force could harvest higher seed yield of *Binamoog-8*. On the other hand, large family contains more family labor forces are more prone to adopt *Binamoog-8* as it was evident by 'r' values of their perception about the performance of *Binamoog-8* at their own situations. It indicates that, these characteristics of the farmers play a vital role in obtaining expected seed yield from *Binamoog-8*. Thus, the involvement of large farmers in group approach could be an effective extension strategy for *Binamoog-8* in the Bangladesh. But age, level of education, innovativeness and cosmopoliteness had no significant relationship with the perception made by them.

Conclusion

The average achievable yield of *Binamoog-8* is almost double (1221 kg/ha) of present national yield level (only 680 kg/ha, (BBS, 2004). It indicates the fact the present production level of mungbean could be doubled if the variety is adopted by the mungbean farmers of the country. Multiple pod plucking, the main barrier of mungbean farming to the both traditional and non-traditional growers was substantially solved through the development of this variety because of its synchronized pod maturity trait. Due its short duration the crop can be well suited to all major cropping patterns prevail in the country. Farmers are usually anxious to adopt the improved cultivars once they are convinced that the new cultivars are better than what they currently grow. The progressive farmers in general adopt the improved cultivars and provide necessary inputs to reap the higher yield potential. It is worthy to mention here that tangible results of improved variety of mungbean can be achieved through effective training and demonstration conducted at the farmers fields. Farmers would be convinced about the importance of this modern variety for boosting the production of the pulse crop. The study further indicated that *Binamoog-8* was the best cultivar for the northern districts as well as in southern districts though the sowing time is varied.

It could be inferred that the major objectives of the 15% additional pulse production mission of Bangladesh Government i.e. 'Horizontal' (area) and vertical (Yield) increase of pulses was achieved through effective implementation of training and setting of demonstration at the farmers fields to show the worth of improved technology during initial stage of adoption.

References

BBS (Bangladesh Bureau of Statistics).2002. Statistical Year Book of Bangladesh for 2002. Dhaka, Bangladesh: Statistics Division, Ministry of Planning, Government of Peoples Republic of Bangladesh.

BBS (Bangladesh Bureau of Statistics).2004. Statistical Year Book of Bangladesh for 2004. Dhaka, Bangladesh: Statistics Division, Ministry of Planning, Government of Peoples Republic of Bangladesh.

Hossain, M.Z. 2001. Farmers view on soil organic matter depletion and its management in Bangladesh. nutrient Cycling in Agro-systems 61:197-204.

Kumar Rao, J. V. D. K., C. Johansen and T. J. Rego (Eds). 1998. Residual effects of legumes in rice and wheat cropping systems of the Indo-Gangetic Plain. Patancheru: International Crops

Research Institute for the Semi-Arid Tropics, and New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

Rahman, M.M., M.A. Bakr, M.F. Mia, C.L.L. Gowda, Jagdish Kumar, U.K. Deb, M.A. Malek and A. Sobhan. 2000. *Legumes in Bangladesh*. In:Johansen, C., J.M. Duxbury, S.M. Virmini, C.L.L. Gowda, S.Pande and P.K. Joshi (eds). Legumes in rice and wheat cropping systems of the Indo-Gangetic plain – constraints and opportunities. International Crop research Institute for Semi-Arid tropics (ICRISAT), Pathancheru, Hyderabad, India and Cornell University, USA. 5-34.

Rogers EM (1995). Diffusion of Innovations. Fourth Edition. New York: The Free Press.

Yadav, N.K. 1997. Varietal Improvement Works on Chickpea in Nepal Report on NARC/CLAN Winter Grain Legumes Research Status & ICRISAT Works on Varietal Improvement on Lentil and Chickpea in Nepal 1996/97 Presented at Winter Crops Workshop Sept. 10-1.