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Economic Performance of BARImash-1 (Improved Variety of Blackgram) with Traditional Variety at Farmers' Field of Bangladesh

[1]M. Nazrul Islam, [2]Md. Rezaul Karim and [3]Q.M. Safiqul Islam
Agricultural Economics Division, Bangladesh Agriculture Research Institute, Gazipur, Bangladesh
[3]Pulse Research Centre, Ishurdi, Pabna, Bangladesh

Abstract: The study revealed that there was no significant difference in agronomic practice and input use for blackgram cultivation both for BARImash-1 and local variety. But significant difference was found incase of yield between BARImash-1 and local variety, and it was found 35% higher for improved variety than local variety of blackgram. Result of multiple regression model using dummy variable shows that BARImash-1 had a positive significant impact on production of blackgram in the farmers fields. It also implies that in existing situation, if the local variety could be replaced by BARImash-1, per hectare Tk.4542.00 would increase production in monetary term.

Key words: Economic performance, BARImash-1, production

INTRODUCTION

Pulses are important source of protein in the daily diet of the people of Bangladesh. These provide fodder for farm animals, either directly or grazing or as fodder after harvesting the grain. Pulses cover more than 5% of the total cropped area[1]. It covers an area of about 7.3 lakh ha[2]. Blackgram grain contains about 25% protein, 56% carbohydrate, 2% fat, 4% minerals and 0.4% vitamins. The present consumption of pulses in our country is about 12 g/day/person which is much lower than the FAO/WHO recommendation i.e. 80 g/day/person. Among the pulses, 10.5% comes from the blackgram[3].

There is little scope of horizontal expansion of pulse area in our country due to the limitation of cultivated area and also competition with other crops. Therefore, the productivity of pulses can be increased vertically through the adoption of location specific BARImash-1 technology and other pluses. Several block demonstration trails at farm level in different locations of the country have been conducted by Lentil, Blackgram and Mungbean Development Pilot Project (LBMDPP) as a massive drive to the improvement of pulses.

The trials showed that the yield performance of Black gram is quite high as compared to the yield of farmers' fields but in many cases it is still less than the yield potential. In general, the yields in farmers' fields are lower than the yields in demonstration plots. It is because that the farmers do not follow the package of the recommended technology. Usually they follow different levels of technology packages depending on their infrastructure facilities and socio-economic conditions, which ultimately result variability in yields. Thus there exists a yield gap among full adoption, partial adoption and non-adoption of different technology packages in different locations. Therefore, the present study was undertaken to assess the BARImash-1 technology and farmers' practices of Blackgram cultivation.

The specific objectives of the study were:

- To compare the economic performance of BARImash-1 and local variety at farm level;
- To asses the varietal impact of BARImash-1 in the farmers field;
- To evaluate the farmers' attitude towards BARImash-1 cultivation and
- To identify the constraints to the adoption of BARImash-1.

MATERIALS AND METHODS

Many demonstrations at farmers' fields were taken by LBMDPP in several districts of Bangladesh. Most of the districts were visited by the researchers and finally Nawbabganj district was selected for the study as a most potential area for blackgram production. Therefore, survey was carried out from this district. Two upazila from Nowabgonj district namely Nowabgonj Sadar and Shibgonj were finally selected for this study There were 16 demonstration blocks in two upazila of the district. Out of these 16 demonstration blocks, 6 blocks takting 3 from

Corresponding Author: M. Nazrul Islam, Scientific Officer, Agril. Economic Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur-1701, Bangladesh

each Upazila were selected for the study depending on convenient communication. A total of 49 farmers were interviewed from these 6 blocks. Besides 49 farmers from outside the demonstration plots were also surveyed. Data were collected during Kharif-II season, 2000-2001. Finally, a total of 98 farmers were surveyed to fulfill the objectives of the study. In the demonstration block, the farmers cultivated BARImash-1 whereas non-demonstration farmers cultivated local variety of blackgram.

Analytical techniques: Standard deviation and t-statistics were often used for this analysis. Moreover, to assess the varietal impact on blackgram production a Multiple Linear Regression Function was also used. Model was chosen on the basis of best fits.

Multiple Linear Regression Function was as follows:

$Yj = b_0 + b_1X_1j + b_2X_{2j} + b_3X_{3j} + ...+ b_nX_{nj} + Uij$

where,

Yj = Yield of jth product;
b_0 = Intercept;
b_i = Co-efficient of explanatory variables; I=1,2,3,.....n
X_{ij} = ith variable inputs of jth product; I= 1,2,3,.....n .
U_{ij} = Error term

So, the empirical function would be

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$

where,

Y = Yield of blackgram (Tk ha^{-1})
b_0 = constant
X_1 = Animal power cost (Tk ha^{-1})
X_2 = Seed cost (Tk ha^{-1})
X_3 = Manure cost (Tk ha^{-1})
X_4 = Fertilizer cost (Tk ha^{-1})
X_5 = Human labour cost (Tk ha^{-1})
X_6 = Dummy variable, assuming that BARImash-1 = 1 and Local variety = 0
e = Error

RESULTS AND DISCUSSION

Agronomic practice and inputs use

Land preparation: From the study it was found that the farmers of Shibgonj upazila both in demonstration and non-demonstrations plots prepared their land by ploughing down the soil. Land preparation for blackgram production included ploughing, laddering and other activities needed to make soil suitable for sowing seeds. But the farmers of Sadar upazila cultivated blackgram without any tillage operation. Because after flood water went way, there was little time for sowing blackgram the farmers stated. Considering of land topography, area of Shibgonj is comparatively higher than the land of Nowabgonj Sadar. The farmers opined that they were almost reluctant about ploughing the land. It depends on the situation; if floodwater stands for a longer period they usually do not plough their land for cultivation of blackgram.

The average number of ploughing and laddering both for demonstration and non-demonstration were found one in the study area. The t-statistics showed that there were no significant difference between the number of ploughing and laddering in farmers' fields both for demonstration and non-demonstration plots in the study area. It might be mentioned that 49 and 47% of the demonstration and non-demonstration farmers respectively prepared their land by ploughing and laddering

Seed rate: Table 1 shows that seeds of blackgram were sown by the farmers at the rate of 26.12 and 25.43 kg ha^{-1} BARImash-1 and local variety of blackgram in the study areas, respectively. From the statistical analysis, it was found that t-value was 0.34. It implied that there was no significant difference in the use of seed between BARImash-1 and local variety of blackgram.

Weeding: Maximum one time weeding was done by the farmers in their plots and only 55 and 49% of the farmers weeded their blackgram plots for BARImash-1 and local variety in the study areas, respectively. From Table 1, it revealed that there was no significant difference between BARImash-1 and local variety for weeding in blackgram cultivation.

Cow dung use: From the study, it was found that the farmers used cow dung in the blackgram plots at the rate of 654.44 and 756.80 kg ha^{-1} for BARImash-1 and local variety, respectively (Table 1). It was found that only 22% of the demonstration farmers used cow dung in their plots whereas 15% of them used cow dung in their plots for local variety. It was observed that there were no significant difference in cow dung use for BARImash-1 and local variety in the areas (Table 1).

Fertilizer use: It was found that the farmers in Nowabgonj district used Urea, TSP and MP in the blackgram fields. The study showed that the farmers of the demonstration plots used, on average, 17.66 kg ha^{-1} urea, 10.20 kg ha^{-1} TSP and 3.90 kg ha^{-1} MP whereas the farmers of non-demonstration plots used 21.14 kg ha^{-1} urea, 4.83 kg ha^{-1} TSP and 2.08 kg ha^{-1} MP. The t-statistics showed, there was no significant difference in fertilizer use for BARImash-1 and local variety of blackgram in the study areas (Table 1).

Labour employment: The utilization of labour per hectare of blackgram cultivation for BARImash-1 and local variety was 41.82 man-days and 34.81 man-days, respectively (Table 2). Among the different agronomic practices,

Table 1: Agronomic practices of blackgram production at farm level

Items	BARImash-1	Local Variety	t-value
Ploughing (no./farm)	0.68 (49%)	0.71 (47%)	-0.13
Range	0-3	0-3	
Laddering (no./farm)	0.88 (49%)	0.96 (47%)	-0.32
Range	0-3	0-3	
Seed Rate (kg ha^{-1})	26.12	25.42	0.34
Sowing Method	Broadcast	Broadcast	
Weeding (no/farm)	0.48 (55%)	0.45 (49%)	0.27
Range	0-1	0-1	
Manure (kg ha^{-1})	654.44 (22%)	756.8 (15%)	-0.19
Fertilizer (kg ha^{-1})			
Urea	17.66 (64%)	21.14 (62%)	-0.80
TSP	10.2 (31%)	4.38 (19%)	1.83
MP	5.90 (31%)	3.68 (15%)	1.7
Threshing (%of farmers) :			
by beating	22%	19%	
by machine	78%	81%	

Bracketed figures show the percentages of user farms

Table 2: Per hectare human labour and draft power use in blackgram cultivation at farm level

Items	BARImash-1		Local Variety	
	User's %	Unit	User's%	Unit
Human labour (man-day)				
Land preparation	100	No	100	No
Family				
Hired				
Total				
Seed sowing	100		100	
Family		1.80		0.97
Hired		0.02		0.09
Total		1.20		1.06
Cowdung	22		15	
Family		2.41		2.22
Hired		1.28		1.79
Total		3.69		4.01
Weeding	55		49	
Family		6.20		6.31
Hired		3.66		0.53
Total		9.86		6.84
Fertilizer	42		32	
Family		0.40		0.20
Hired		0.00		0.00
Total		0.40		0.20
Harvesting	100		100	
Family		10.98		10.83
Hired		3.90		3.36
Total		14.88		14.19
Cleaning & Drying	100		100	
Family		8.98		5.92
Hired		2.81		1.59
Total		11.79		8.51
Grand total				
Family		30.15		23.82
Hired		11.67		10.99
Total		41.82		34.81
Animal power (pair-day)				
Land preparation	49		47	
Own		4.16		4.13
Hired		0.00		0.29
Total		4.16		4.42
Threshing	19		22	
Own		0.97		1.39
Hired		0.17		0.00
Total		1.14		1.39
Contact threshing by machine	81		78	

higher number of labour was used for cleaning and drying purposes. Per hectare human labour used in cleaning and drying were found 11.79 and 7.51 man-days in blackgram cultivation for BARImash-1 and local variety plots, respectively. It constituted 28% for improved and 22% for local variety of the total labour utilization (Table 3).

Costs and return: It was found that per hectare gross cost of production for BARImash-1 and local variety of blackgram were Tk 5327 and Tk 4370, respectively (Table 4). Gross cost of BARImash-1 was found 22% higher than local variety of blackgram. Gross return was found higher for BARImash-1 than local variety and these were Tk 20642 and Tk 15956 per hectare, respectively. Hence, gross margin for BARImash-1 was found 37% higher over local variety.

Benefit cost ratio: Benefit cost ratio were found 2.88 and 2.55 for BARImash-1 and local variety, respectively. The benefit cost ratio was 12.44% higher for BARImash-1 over local variety. It indicated that both the varieties of blackgram were profitable to the farmers and BARImash-1 was better than local variety.

Yield performance: The study revealed that the average yield of BARImash-1 was 1088.00 kg ha^{-1} in demonstration plots and whereas the yield of local variety of blackgram was found 806.40 kg ha^{-1} in farmers plots (non-demonstration plots). The average yield of BARImash-1 was found about 35% higher than the local variety under almost same management practices in the study areas (Table 4). There was a significant difference between yield of BARImash-1 and local variety in the farmers' fields.

Multiple Linear Regression Model for assessing varietal impact: A multiple linear regression function was used to find out the varietal impact in blackgram production at farm level. The co-efficient of multiple determination (R^2) was found 0.902 and F-value was found highly significant at 1% level. The result reflected that the explanatory variables included in the model explain 90% variation in the yield of blackgram. The co-efficient of dummy variable was found positive and it was 4542.095. It was also found significant at 1% level. Thus the co-efficient of dummy variable revealed that BARImash-1 had a positive significant role for increasing blackgram production in the farmers' fields. The results implied that other things remaining the same, if farmers use only BARImash-1 seeds of blackgram instead of local variety in their fields, per hectare production would increased by Tk.4542 in monetary term (Table 5).

Table 3: Per hectare cost of production of blackgram at farm level

Items		BARImash-1	Local Variety
Human Labour :	Owned	1507.5	1191.00
	Hired	583.50	549.50
	Total	2091.00	1740.50
Animal Power :	Owned	646.50	482.50
	Hired	8.50	29.00
	Total	474.00	511.50
Seed :	Owned	0.00	552.38
	Hired/ Supplied	760.35	0.00
Total		760.35	552.38
Manures		322.72	378.4
Fertilizer		297.56	226.54
Threshing cost:	Animal power	57.00	69.50
	Machine	1324.12	891.04
	Total	1381.12	960.54
Total cost	Full cost basis	5326.75	4369.86
	Cash cost basis	2974.03	1696.08

Table 4: Yield and economic performance of BARImash-1 and local variety blackgram in the farmers' field

Item	BARImash-1	Local Variety	Percent over LV
Yield (kg ha^{-1})	1088.00	806.40	35
	(188.33)	(207.11)	
Value of Yield (Tk ha^{-1})	19616.55	14958.77	35
By product (Tk ha^{-1})	1025.28	996.86	3
Gross Return (Tk ha^{-1})	20641.83	15955.68	33
Gross cost (Tk ha^{-1})	5326.75	4369.86	22
Gross Margin (Tk ha^{-1})	15315.08	11585.77	37
Benefit Cost Ratio	2.88	2.65	12.44

Figures in the parentheses are standard deviations.
t-value for yield of BARImash-1 and Local variety =5.500

Table 5: Results of multiple linear production function for assessing varietal impact using dummy variable.

Variables	Co-efficient	Standard Error	Significance
Intercept	18407.90	3228.05	
Animal Power	-7.29	3.91	s (10%)
Seed	-1.00	3.15	ns
Manure/Cowdung	0.39	1.31	ns
Fertilizer	-5.16	2.15	s (5%)
Human Labour	3.02	2.70	ns
Dummy Variable	4542.09	1260.29	s (1%)
R^2	0.90		
F	13.73		s (1%)

Table 6: Farmers attitude towards blackgram cultivation

	Percent of Farmers		
Item	Sadar	Shibgonj	All Areas
Higher yield	98	100	99
Larger grain size	95	98	97
More by product	95	96	96
Areas increase in the next year	100	100	100

Appendix-1

Labour wage	=	Tk 50/man-day
Animal power rate land preparation	=	Tk.100/pairday
For threshing	=	Tk.50/pair-day
Seed price:		
BARImash-1	=	Tk.29.11 kg^{-1}
Local Variety	=	Tk.21.73 kg^{-1}
Cowdung price assumed	=	Tk.0.50 kg^{-1}
Fertilizer price: Urea	=	Tk.6.00 kg^{-1}
TSP	=	Tk.13.00 kg^{-1}
MP	=	Tk.10.00 kg^{-1}
Product price	=	Tk.18.03 kg^{-1}

Farmers attitude: The farmers reported that they will increase their blackgram (BARImash-1) area in the next year. Their perception towards BARImash-1 was found very good due to higher yields and larger size of the grain. The prices of both improved and local variety of blackgram were almost the same as reported by the farmers (Table 6).

Constraints of blackgram cultivation: Nowabnonj distirct is a flood plain area. If the floodwater exists for longer period, it was difficult for sowing blackgram seed as the farmers reported and they have to sow the seed within the month of September. They wanted a variety, which might be sown in the middle of October.

The farmers were found very much interested to grow BARImash-1 due to higher yield potential, larger size of the grain and higher economic return. They needed late sowing variety especially for the flood-affected areas. Therefore, it is necessary to evolve late sowing high yielding varieties of blackgram. Potential area for blackgram cultivation should be identified and RRA method is suggested for the purpose.

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