Asian J. Med. Biol. Res. 2016, 2 (4), 685-688; doi: 10.3329/ajmbr.v2i4.31015

Asian Journal of Medical and Biological Research
ISSN 2411-4472 (Print) 2412-5571 (Online)
www.ebupress.com/journal/ajmbr

Article

Profitability and yield gap between research station and farm level of Binamoog-8

Syful Islam[1*], Mangal Chandra Chanda[1], Mohammad Rashidul Haque[1], Razia Sultana[1] and Muhammad Yunus[2]

[1]Agricultural Economics Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh
[2]Dept. of Agricultural Economics, Bangladesh Agricultural University, Mymensingh, Bangladesh

[*]Corresponding author: Syful Islam, Agricultural Economics Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh. E-mail: bausyful07@gmail.com

Received: 23 November 2016/Accepted: 21 December 2016/ Published: 29 December 2016

Abstract: Estimating profitability and yield gap between research station and farm level of Binamoog-8 was conducted in five major Binamoog-8 growing areas of Bangladesh, namely Ishwardi, Magura, Natore, Jessore and Meherpur. The average cost of production in farm level of Binamoog-8 is Tk. 47373.55ha^{-1} and higher in Ishwardi (Tk. 53454.92 ha^{-1}) followed by Meherpur, Magura, Natore and Jessore of Tk. 45160.28, Tk. 44300.14, Tk. 45232.95 and Tk. 48719.47 per hectare, respectively .The major shares of total cost were human labour, power tiller and irrigation. The net returns were Tk. 41160, Tk. 42902.30, Tk. 53603.18, Tk. 47494.60 and Tk. 40437.16 per hectare followed in Ishwardi, Meherpur, Magura, Natore and Jessore, respectively. The highest net return (Tk. 53603.18 ha^{-1}) comes from Magura district for Binamoog-8.The undiscounted average benefit cost ratio over full cost basis were 1.77, 1.95, 2.21, 2.05 and 1.83 for Binamoog-8 in field level for Ishwardi, Meherpur, Magura, Natore and Jessore, respectively. The average yield gap of Binamoog-8 in farm level and research station was 129.05 kg per hectare. The yield gap between research station and farm level were 102.97 kg, 185.50 kg, 45.85 kg, 128.50 kg and 182.45 kg per hectare for Binamoog-8 in Ishwardi, Meherpur, Magura, Natore and Jessore, respectively. The highest yield gap between research station and field level was in Meherpur (185.50 kg per hectare) and lowest in Magura (45.85 kg per hectare). Farmers were facing various constraints in Binamoog-8 cultivation. Different strategies, such as lack of quality seed and fertilizer in appropriate time, lack of credit facilities, rainfall during germination period, insect infestation and pathogen infection, pod maturity in different times have been discussed as strategies to minimize yield gaps.

Keywords: profitability; yield gap; constraints; strategies; Binamoog-8

1. Introduction

Pulses are the most important protein source 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, 2014). The national statistics of mungbean shows fluctuating trend in area and production and registered increasing trend in productivity due to introduction of HYV mungbean. It is grown three seasons a year covering 43,680 ha with an average yield of 0.68 t/ha (BBS, 2014).The concept of yield gaps originated from the studies conducted by BRRI in the seventies. The yield gap discussed in this paper is the difference between the potential farm yield and the actual average farm yield. According to Rao *et al.* (2010) the main challenges for research and development are to bridge the gap between actual and attainable yield by enhancing farmers' access to quality inputs, improved technologies and information. Patole *et al.* (2008) revealed that total yield for the production zones ranged from 550 to 770 kg ha^{-}

[1] for pigeonpea and 610 to 1150 kg ha^{-1} for chickpea. According to Burman *et al.* (2010) the overall gap in adoption of technologies was larger in the rainfed situation than in the irrigated situation. The yield gaps are mainly caused by biological, socio-economic, climate and institutional/policy related factors. In Bangladesh, despite the technologies developed by different National Agricultural Research System (NARS) institutes and extension agencies to disseminate the technologies, yield gaps exist in different crops of Bangladesh, such as rice, wheat, potato, oilseeds, pulses, etc. that may range from 19% to about 64% of the potential yield (Alam, 2006; OFRD, 2003-2004 & 2008-2009; Roy, 1997; Matin *et al.*, 1996). The existence of yield gaps was also observed in rice, mustard, and cotton in India (Aggarwal, 2008). In India, yield gap varied from 15.5 to 60% with the national average gap of 52.3% in the irrigated ecosystem (Siddiq, 2000). Yield gaps in crops are real and the challenge needs to be addressed in the interest of increased and sustainable crop production. The objective of this review article is to discuss the causes contributing to yield gaps in crops, suggest strategies to minimize the gaps to increase yield and finally make recommendations mainly to the government/policy makers to develop guidelinesor action plans to address the problem.

2. Materials and Methods

The locations for the study were selected purposively Ishwardi, Magura, Natore, Jessore, Meherpur districts. A total of 200 farmers were randomly selected as sample size by using multistage sampling method in the study area, 40 from each District. Data were collected from Binamoog-8 growers through interview schedule. Some descriptive statistics were used for analyzing the collected data. In the study, costs and return analysis were done on both cash cost and full cost basis.

The production of Binamoog-8 is likely to be influenced by different factors, such as human labour, seed, chemical fertilizer, insecticide, etc. The following Douglas type production function was used to estimate the parameters. The functional form of the Cobb- Douglas multiple regression equation was as follows:

$Y= AX_1^{b1} X_2 b^2 \ldots\ldots\ldots\ldots\ldots\ldots X_n^{bn} e^{ui}$

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

$Log\ Y= Log\ a+b_1 \log X_1 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots + b_n Log\ X_n +e^{ui}$

The empirical production function was the following:

$LogY= Log + b_1 LogX_1 + b_2 LogX_2 +b_3 LogX_3 +b_4 LogX_4 +b_5 LogX_5 +b_6 LogX_6 +Ui.$

Where, Y= Yield (kg/ha)

X_1 = No. of human labour (man-day/ha)

X_2 = Amount of seed (kg/ha)

X_3- Amount of urea (kg/ha)

X_4 Amount of TSP (kg/ha)

X_5= Amount of MP (kg/ha)

X_6= Cost of insecticides (Tk./ha)

a= constant value

b_1 b_2 .... b_6 = Co-efficient of the respective variables and

U_i = Error term.

Yield Gap between Research Station and Farm Level of Binamoog-8 was estimated by subtraction of yield between research Station and farm Level.

3. Results and Discussion

From Table 1, it can be seen that the average cost of production in field level of Binamoog-8 cultivation was Tk. 47373.55ha^{-1}. The major shares of total cost were human labour, power tiller and irrigation. In case of Binamoog-8 in farm level cost was also higher in Ishwardi (Tk. 53454.92 ha^{-1}) followed by Meherpur, Magura, Natore and Jessore in Tk. 45160.28, Tk. 44300.14, Tk. 45232.95 and Tk. 48719.47 per hectare, respectively (Table 1).

Table 1. Location-wise cultivation cost of Binamoog-8.

Cost component	Location-wise cost in taka					Average
	Ishwardi	Meherpur	Magura	Natore	Jessore	
Human-labor (man-days/ha)	24854.47	22534.12	23092.50	22186.11	23583.20	23250.08
Power tiller	5251.50	4416.00	3841.00	3955.00	4812.64	4455.23
Seed	1620.16	1410.10	1452.88	1671.50	1590.40	1549.01
Fertilizer	**8438.72**	**6333.72**	**5998.67**	**7256.55**	**7203.03**	**7046.04**
Urea	2919.45	2280.45	2141.02	2381.46	2256.98	2395.87
TSP	2236.45	2123.25	2036.60	1982.13	2016.88	2079.06
MP	1832.05	1930.02	1821.05	1800.23	1941.25	1864.92
Organic manure	1450.32	-	-	1092.73	987.92	706.19
Pesticide	966.61	572.21	681.10	774.44	847.56	768.38
Interest on operating capital	2738.01	2329.88	2317.46	2375.38	2505.33	2453.21
Total variable cost	**48371.52**	**41161.17**	**40941.76**	**41964.98**	**44260.88**	**43340.06**
Total Fixed cost	5083.40	3999.11	3358.38	3267.97	4458.59	4033.49
Total cost	**53454.92**	**45160.28**	**44300.14**	**45232.95**	**48719.47**	**47373.55**

Table 2. Profitability of Binamoog-8 cultivation in different location.

Type	Cost and return in taka					Average
	Ishwardi	Meherpur	Magura	Natore	Jessore	
Yield (kg/ha)	1695.03	1582.50	1754.15	1662.50	1598.55	1658.55
Yield (Tk./ha)	93226.65	87037.50	96478.25	91437.50	87920.25	91220.25
By product (kg/ha)	2777.10	2050.15	2850.14	2580.10	2472.75	2546.05
By product (Tk./ha)	1388.55	1025.08	1425.07	1290.05	1236.38	1273.03
Gross Return	94615.20	88062.58	97903.32	92727.55	89156.63	92493.06
Total variable cost	48371.52	41161.17	40941.76	41964.98	44260.88	43340.06
Total Cost	53454.92	45160.28	44300.14	45232.95	48719.47	47373.55
Gross margin	**46243.68**	**46901.41**	**56961.56**	**50762.57**	**44895.75**	**49153.00**
Net return (Tk./ha)	**41160.28**	**42902.30**	**53603.18**	**47494.60**	**40437.16**	**45119.51**
Benefit cost ratio (Undiscounted)	**1.77**	**1.95**	**2.21**	**2.05**	**1.83**	**1.96**

The gross return of Binamoog-8 cultivation was found higher in Magura (Tk. 97903.32 ha^{-1}) followed by Ishwardi, Meherpur, Natore, Jessore in Tk. 94615.20, Tk. 88062.58, Tk. 92727.55 and Tk. 89156.63 per hectare among the study areas. The net returns were Tk. 41160, Tk. 42902.30, Tk. 53603.18, Tk. 47494.60 and Tk. 40437.16 per hectare followed by Ishwardi, Meherpur, Magura, Natore, Jessore, respectively. The highest net return (Tk. 53603.18 ha^{-1}) comes from Magura district for Binamoog-8. The undiscounted average benefit cost ratio over full cost basis were 1.77, 1.95, 2.21, 2.05 and 1.83 for Binamoog-8 in field level for Ishwardi, Meherpur, Magura, Natore and Jessore, respectively (Table 2).

Table 3.Yield gap between research station and farm level of Binamoog-8.

District	Yield in research station (Kg/ha)	Yield in farm level (Kg/ha)	Yield gap between research station and farm level (Kg/ha)
Ishwardi	1798.00	1695.03	102.97
Meherpur	1768.00	1582.50	185.50
Magura	1800.00	1754.15	45.85
Natore	1791.00	1662.50	128.50
Jessore	1781.00	1598.55	182.45
Average	1787.60	1658.55	129.05

The average yield gap of Binamoog-8 in farm level and research station was 129.05 kg per hectare. The yield gap between research station and farm level were 102.97 kg, 185.50 kg, 45.85 kg, 128.50 kg and 182.45 kg per hectare for Binamoog-8 in Ishwardi, Meherpur, Magura, Natore and Jessore, respectively (Table 3). The highest yield gap between research station and field level was in Meherpur (185.50 kg per hectare) and lowest in Magura (45.85 kg per hectare).
Farmers faced various constraints (Table 4) to Binamoog-8 cultivation like, lack of quality seed and fertilizer in appropriate time, lack of credit facilities, rainfall during germination period, insect infestation and pathogen infection, pod maturity in different times were reported to be main constraints.

Table 4. Constraints of Binamoog-8 cultivation at farmers level.

SL. No.	Constraints	Rank value
1.	Unavailability of quality seed and fertilizer at proper time	1
2.	Pod maturity in different times	2
3.	Lack of Credit facilities	3
4.	Insect infestation and pathogen infection	4
5.	Rainfall during germination period	5

4. Conclusions

In many countries of the world, profitability and yield gaps in crops between potential and farmers' yields are still substantially high due to the combination of constraints, such as poor management and economic conditions of farmers and lack of resources, especially credit and knowledge and commitment of the government. Efforts should, therefore, be made to minimize the yield gaps and increase and sustain production and productivity of crops by properly addressing the constraints. It is also essential to promote collaboration among research, extension, NGOs, and private sector to develop appropriate technologies with a view to narrowing yield gaps.

Conflict of interest

None to declare.

References

Senanayake L, DP Knievel, SE Stevena, 1987. Nodulation and symbiotic nitrogen fixation of cowpea (*Vignaunguiculata* L.). Plant Soil, 99: 435-439.

Zapata F, SKA Danso, GHardarson, M Fried, 1987. Nitrogen fixation and translocation in field-grown fababean. Agronomy Journal,79: 505-509.

BBS, 2014. Bangladesh Bureau of Statistics. Statistical Yearbook of Bangladesh. Statistics Division, Ministry of Planning, GOB.

Rao, PP Birthal, PS Bhagavatula, S Bantilan, 2010. Chickpea and pigeonpea economies in Asia: facts, trends and outlook. 68: 24-25.

Patole, SD Shinde, HR Yadav, 2008. Chickpea production in Ahmednagar district of Maharashtra: a technological gap analysis. Journal of Food Legumes, 21:270-273.

Burman, RR Singh, SK Singh, 2010. Gap in adoption of pulse production technologies in Uttar Pradesh. Indian Research Journal of Extension Education, 10: 99-104.

M Alam, 2006. Factors affecting yield gap and efficiency in rice productions in some selected areas of Bangladesh. PhD thesis, Department of Economics, Jahangir Nagar University, Bangladesh.

Annual Report, OFRD, BARI, 2003-2004. Yield gap analysis of wheat under different management situation at MLT site, Palashbari, Rangpur.

Annual Report, OFRD, BARI, 2008-2009. Yield gap analysis of mustard in the farmers' fields.

Roy, Indrajit, 1997. Stagnating productivity in crop agriculture. The quest for sources of growth Environment and agricultural productivity in Bangladesh. Bangladesh Academy of Agriculture (BAAG).

Aggarwal PK, KB Hebbar, MV Venugopalan, S Rani, A Bala, A Biswal and SP Wani, 2008. Quantification of yield gaps in rainfed rice, wheat, cotton and mustard in India.

Siddiq EA, 2000. Bridging rice yield gap in India. In Proceedings of Expert Conference on bridging the rice yield gap in the Asia- Pacific Region, RAP, FAO.