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Socio-economic Determinants and Profitability Analysis of Binamasur-8 Production in Some Selected Areas of Bangladesh

Md. Mohsin Ali Sarkar[1], Md. Habibur Rahman[1], Mohammad Rashidul Haque[1], Syful Islam[1] and Razia Sultana[1]

[1]*Agricultural Economics Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh, Bangladesh*

Abstract
The main purpose of this study was to analyze socio-economic determinants and profitability of Binamasur-8 producing farmers in Magura, Faridpur, Pabna and Chapai Nawabganj districts of Bangladesh. This study was based on primary data which were collected from 160 Binamasur-8 producing farmers. In the sampled areas data were collected through pre-designed interview schedule from April-May, 2019. In the study, costs and return analysis were done on both cash cost and full cost basis for estimating profitability. The results showed that most of the farmers in the study area have primary level education (44.53%) and 73.13% of farmers solely engaged in Agriculture. The average gross margin was found Tk. 56563.50/ha on variable cost basis. Gross margin was highest in Pabna (Tk. 64421.00/ha) followed by Magura (Tk. 62740.00/ha), Chapai Nawabganj (Tk. 52616.00/ha) and Faridpur (Tk. 46477.00/ha), respectively. The average net return per hectare was Tk. 38536.25. The net return was highest in Pabna (Tk. 45835.00/ha) followed by Magura (Tk. 43963.00/ha), Chapai Nawabganj (Tk. 34965.00/ha) and Faridpur (Tk. 29382.00/ha), respectively. Benefit cost ratio was estimated at 1.66 and 2.40 on full cost and variable cost basis implying that the Binamasur-8 cultivation at farm level was highly profitable. The farmers in the study areas encountered some constraints to Binamasur-8 production. The first ranked constraint was unavailability of Binamasur-8 seeds in all areas (91%). Other constraints were lack of training (63%), lack of technical know-how (31%), insect infestation is high (28%), Untimely rainfall (22%) and high price of pesticides (9%). Therefore, good quality seeds of lentil should be made available locally to the farmers at a reasonable market price.

Key Word*: Lentil, Binamasur-8, Socio-economic determinants, Profitability, Constraints, Bangladesh*

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I. Introduction

Pulses are important legume crops in Bangladesh. It plays a vital role in the Bangladesh diet as a cheap source of protein. Eight kinds of pulses, such as lentil, mungbean, blackgram, grasspea, chickpea, cowpea, filed pea and pigeon pea are grown in Bangladesh (Bakr, Rahman, & Miah, 1997). Pulses cultivation cover 2.22% of the total cultivated land in Bangladesh (BBS, 2019). Among the pulses, lentil (lens culinaris) commonly known as "masur" is a popular pulse crop in Bangladesh and occupied 40.23% cultivation of pulse crops getting first position (BBS, 2019).

In Bangladesh, its seeds contain 59.8% CHO, 25.5% protein, 10% moisture, 4% mineral and 3% vitamins (Khan, 1981; Gowda, 1982). The green plants can also be used as animal feed and its residues have soil manurial value (Gahoonia *et al*., 2005). It contains about twice as much protein as cereals. It also contains amino acid lysine which is generally deficient in food grains (Elias *et al*., 1986). Pulses have played an important role in sustaining the productivity of soils in Bangladesh for centuries. They are generally grown without fertilizer since they can meet their nitrogen requirement by symbiotic fixation of atmospheric nitrogen in the soil (Senanayake *et al*., 1987; Zapata *et al*., 1987; Fried and Middleboe, 1977). The per capita consumption of pulse in Bangladesh is only 12 g/day, which is much lower than WHO recommendation of 45 g/day (Afzal *et al*., 1999).

Lentil is cultivated in different parts of the country. But it is extensively cultivated in mid-western parts of Bangladesh. The yield of local lentil variety in Bangladesh is very poor, but varied widely between farms and between locations (Sikder and Elias, 1985). The yield of lentil increased with an increase of farm size in India (Tomer *et al*., 1978). Pulses area decreased from 7.35 lakh hectares in 1988-89 to 3.57 lakh hectares in 2016-17 (BBS, 2018). Production also decreased from 5.12 lakh tonnes to 3.79 lakh tonnes during the same period. The average yield of pulse was 1.25 mt/ha. The area and production were decreased due to increase of the area for boro rice and other high value crops. Food and Agricultural Organization (FAO, 2017) recommended consumption of pulse amounting 45gm/head/day for fulfilling protein requirements for an adult.

Lentil is a winter pulse of temperate and subtropical region. Its contribution to pulse production of the world is 2.4%. Being legume, lentil is restorative in nature and its seed contains average 25.7% protein, which is almost three times higher than that of cereals (Erskine & Witecombe, 1984) and 59% carbohydrate (Bakhsh, Gafoor, Zubair, & Iqbal, 1991). Lentil ranks first among the pulses in terms of area (40%) and consumer preferences (Miah & Rahman, 1991). Lentil is the highest most important pulse crop in terms of area (142510 ha) and production (175384 MT) and ranks the highest in consumer preference and total consumption (BBS, 2019). Lentil seed is a rich source of protein and several essential micronutrients (Fe, Zn, β-carotene) (Bhatty, 1988).

Bangladesh Institute of Nuclear Agriculture (BINA) has developed some high yielding popular varieties of lentil, which is growing in the farmers' fields. Binamasur varieties especially Binamasur-8 production is gaining popularity day by day among the farmers. But the economic performance of this varieties are unknown to the researchers and policymakers. Because, a limited study was done in this line. Therefore, the present study was undertaken to the following objectives:

i) To identify the socio-economic status of Binamasur-8 producers;
ii) To estimate the profitability of Binamasur-8;
iii) To find the major constraints to Binamasur-8 cultivation.

II. Material and Methods

Selection of the study area, sample size and sampling technique:

This study was conducted in the four districts namely Magura, Faridpur, Pabna and Chapai Nawabganj in Bangladesh. A total of 160 Binamasur-8 farmers taking 40 farmers from each districts were randomly selected with the help of Department of Agricultural Extension (DAE) personnel for interview. Field investigators under the direct supervision of the researchers collected field level cross sectional data using pre-tested interview schedule.

Method of data collection and period of study:

Data for the present study were collected from sample Binamasur-8 farmers through face to face interview method using a pre-tested interview schedule. Field level primary data were collected by the researcher with the help of trained enumerators for the period of April-May, 2019.

Analytical techniques:

Collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. The data were analyzed with the help of suitable statistical measures as frequencies, percentages, mean and standard deviation. Descriptive statistics were used to analyze and compare the socioeconomic characteristics. The total cost is composed of total variable costs (TVC) and total fixed costs (TFC). TVC includes costs of human labour (both family and hired labour, wherein the cost of family labour is estimated by imputing market wage rate), mechanical power, seed, manure, fertilizers, and pesticides. The gross return (GR) is computed as total lentil output multiplied by the market price of lentil. Profits or gross margin (GM) is defined as GR-TVC, whereas the net return (NR) is defined as GR-TC. Finally, the Benefit Cost Ratio (BCR) is computed as GR/TC (Begum *et al.,* 2019). Following profit equation was in used to assess the profitability of Binamasur-8 production.

$$\Pi = Pl.Ql - (TVC+TFC)$$

Where, Π = Profit of Binamasur-8 growers per hectare,
Pl = Per unit price of Binamasur-8 (Tk/mt),
Ql = Quantity of Binamasur-8 (ton/ha),
TVC = Total variable cost of Binamasur-8,
TFC = Total fixed cost of Binamasur-8.

III. Results and Discussion

Socio-economic profile of Binamasur-8 farmers

The socio-economic conditions of the households of Binamasur-8 farmers are of much important in planning of development activities because the nature and extent of them are influenced largely by such issues.

Age structure

The age of farmers has a key influence on the adoption of new farming practices (Singh *et al.,* 2010). Farmer's age also plays an important role in boosting up of household economy. Farmers become more efficient and experienced as they grow older. So, age is positively related to profitability. The age of the Binamasur-8 farmers were examined by classifying the farmers into six groups: Up to 30, 31-40, 41-50, 51-60, 61-70 and 71-above years (Table 1). The average of Binamasur-8 farmers belonged to the age group of 41-50 years and

percentage was 30.63. This information implies that the majority of the farmers was in middle age and was in a position to put more physical effort for lentil production.

Table no 1: Distribution of Binamasur-8 according to age group (percentage)

Profile	Magura (n = 40)		Faridpur (n = 40)		Pabna (n = 40)		Chapai Nawabganj (n = 40)		All area (n = 160)	
Age group (years)	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%
Up to 30	4	10.00	4	10.00	5	12.50	6	15.00	19	11.88
31-40	6	15.00	7	17.50	8	20.00	7	17.50	28	17.50
41-50	12	30.00	11	27.50	12	30.00	14	35.00	49	30.63
51-60	8	20.00	9	22.50	8	20.00	6	15.00	31	19.38
61-70	7	17.50	6	15.00	4	10.00	5	12.50	22	13.75
71-above	3	7.50	3	7.50	3	7.50	2	5.00	11	6.88
Total	40	100.00	40	100.00	40	100.00	40	100.00	160	100.00

Source: Field survey, 2019

Education level

Education is likely to influence the farmers to adopt the modern technology and it makes them more capable to manage scarce resources efficiently so that they can earn higher profit. It enhances the farm efficiency and knowledge with regard to agricultural production function. On the basis of education level, the literacy status of the respondent farmers has been grouped into five categories. The categories are (1) illiterate, (2) primary, (3) secondary, (4) higher secondary and (5) degree and above. From the table 2 it is shows that the average 17.50% farmers did not have formal education. The average 44.53%, 26.72% and 7.19% farmers had primary, secondary and higher secondary level of education, respectively. A few number of farmers had a degree and above level of education (4.06%). So, it is observed that most of the farmers in the study area had primary level of education. Veerina *et al.* (1999) stated that factors such as literacy have a role in influencing yields through production decisions.

Table no 2: Distribution of Binamasur-8 according to education level (percentage)

Profile	Magura (n = 40)		Faridpur (n = 40)		Pabna (n = 40)		Chapai Nawabganj (n = 40)		All area (n = 160)	
Education level	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%
Illiterate (0)	6	15.00	6	15.00	7	17.50	9	22.50	28	17.50
Primary (1-5)	19	47.50	18	45.00	18	45.00	16	40.63	71	44.53
Secondary (6-10)	10	25.00	10	25.00	11	27.50	12	29.38	43	26.72
Higher secondary (11-12)	3	7.50	4	10.00	3	6.25	2	5.00	12	7.19
Degree & above (13 & above)	2	5.00	2	5.00	2	3.75	1	2.50	7	4.06
Total	40	100.00	40	100.00	40	100.00	40	100.00	160	100.00

Source: Field survey, 2019

Occupational status

Ray (1998) defined the main occupation as the work for a man who has engaged him throughout the year. The average of four locations, 73.13% of farmers solely engaged in Agriculture (Table 3). But small/medium farmers with their small land cannot survive on agriculture alone. For this reason, they have to go for subsidiary/off-farm activities for supplementing the family income. For this reason, some of the respondents were found to depend on business and others activities.

Table no 3: Distribution of Binamasur-8 according to occupational status (percentage)

Profile	Magura (n = 40)		Faridpur (n = 40)		Pabna (n = 40)		Chapai Nawabganj (n = 40)		All area (n = 160)	
Occupational status	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%
Agriculture	25	62.50	27	67.50	31	77.50	34	85.00	117	73.13
Agriculture + Business	9	22.50	7	17.50	6	15.00	3	7.50	25	15.63
Agriculture + Services	6	15.00	5	12.50	3	7.50	2	5.00	16	10.00
Agriculture + Van/Auto/ Rickshaw puller/day labourer	-	-	1	2.50	-	-	1	2.50	2	1.25
Total	40	100.00	40	100.00	40	100.00	40	100.00	160	100.00

Source: Field survey, 2019

Farming experiences

Experience is one of the important factors to determine profitability. Experience is defined by years of farming which may be directly associated with increasing productivity and may improve economic efficiency or profitability. It is cleared from table-4 that the average 6.88% respondents had less than 10 years experiences, 21.25% respondents had the experiences between 11 to 20 years, 32.50% respondents had the experiences between 21 to 30 years, 29.38% respondents had the experiences between 31 to 40 years and 10.00% respondents had 41 (or above) years experiences.

Table 4: Distribution of Binamasur-8 according to farming experiences (percentage)

Profile	Magura (n = 40)		Faridpur (n = 40)		Pabna (n = 40)		Chapai Nawabganj (n = 40)		All area (n = 160)	
Farming experience (years)	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%
Less than 10	2	5.00	4	10.00	2	5.00	3	7.50	11	6.88
11-20	9	22.50	8	20.00	10	25.00	7	17.50	34	21.25
21-30	14	35.00	13	32.50	11	27.50	14	35.00	52	32.50
31-40	11	27.50	10	25.00	14	35.00	12	30.00	47	29.38
41-above	4	10.00	5	12.50	3	7.50	4	10.00	16	10.00
Total	40	100.00	40	100.00	40	100.00	40	100.00	160	100.00

Source: Field survey, 2019

Status of societal membership

Social participation allows farmers to be in touch with their committee members. This allows them not only to exchange with committee members on new technologies, but also to have access to agricultural inputs. These committees/societies and the meetings they organize are channels for the dissemination of innovations. So belonging to a societal membership committee is expected to have a positive influence on the cultivation of Binamasur-8. There are some social organizations in study areas, such as Farmer's Cooperative Society, Youth Cooperative Society, Mosque Committee, Integrated Pest Management (IPM) /Integrated Crop Management (ICM) Clubs, School Committee and Union Council. The average 35.00% of the farmers were reported to be the member of the Farmer`s Cooperative Society followed by 25.00% Mosque Committee, 16.88% Union Council, 10.00% School Committee, 7.50% Youth Cooperative Society and 5.63% IPM/ICM Clubs (Table 5).

Table no 5: Binamasur-8 involved with different social organizations (percentage)

Profile	Magura (n= 40)		Faridpur (n = 40)		Pabna (n = 40)		Chapai Nawabganj (n = 40)		All area (n = 160)	
Type of organization	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%	Number of farmers	%
Farmer`s cooperative society	15	37.50	13	32.50	13	32.50	15	37.50	56	35.00
Youth cooperative society	3	7.50	4	10.00	2	5.00	3	7.50	12	7.50
Mosque committee	10	25.00	12	30.00	10	25.00	8	20.00	40	25.00
IPM/ICM clubs	2	5.00	1	2.50	3	7.50	3	7.50	9	5.63
School committee	4	10.00	3	7.50	4	10.00	5	12.50	16	10.00
Union council	6	15.00	7	17.50	8	20.00	6	15.00	27	16.88
Total	40	100.00	40	100.00	40	100.00	40	100.00	160	100.00

Source: Field survey, 2019

Profitability analysis of Binamasur-8 production

Profitability is one of the major criteria for determination of acceptance of a crop. The cost of Binamasur-8 production, gross return, gross margin, net return and the benefit cost ratio (BCR) for Binamasur-8 cultivation are being discussed in the following sections.

Cost of Binamasur-8 cultivation

The cost of human labour, land preparation, seed, fertilizers, pesticides and irrigation were taken into consideration, while calculating cost of Binamasur-8 production. Beside this, interest on operating capital was also considered as the cost of Binamasur-8 production. Total cost consists of variable cost and fixed cost that covered 69.08% and 30.92% of total cost for Binamasur-8 production. From table 6, the average costs of Binamasur-8 cultivation were Tk. 58299.25 and Tk. 40272.00 per hectare on full cost and cash cost basis, respectively. The highest production cost was for human labour (36.85%), followed by land use (17.07%), power tiller (15.38%), fertilizer cost (15.09%), seed (6.82%) and irrigation (6.79%). The cost of Binamasur-8 cultivation was found highest in Magura (Tk. 61266.00/ha) followed by that in Chapai Nawabganj (Tk. 59171.00/ha), Pabna (Tk. 57697.00/ha) and Faridpur (Tk. 55063.00/ha), respectively.

Table no 6: Per hectare cost of Binamasur-8 production in different locations

Cost Component	Cost of production (Tk/hectare)				Average	% of total cost
	Magura	Faridpur	Pabna	Chapai Nawabganj		
(A)Variable Cost	42489.00	37968.00	39111.00	41520.00	40272.00	69.08
Hired labour (Man days)	14634.00	11660.00	13569.00	13766.00	13407.25	23.00
Power tiller	9879.00	8735.00	7876.00	9365.00	8963.75	15.38
Seed	4180.00	3980.00	3783.00	3965.00	3977.00	6.82
Fertilizers	8759.00	8565.00	8825.00	9034.00	8795.75	15.09
Urea	1460.00	1350.00	1168.00	1534.00	1378.00	2.36

TSP	3963.00	3751.00	3823.00	3880.00	3854.25	6.61
MP	1042.00	1124.00	1462.00	1260.00	1222.00	2.10
Gypsum	560.00	480.00	690.00	580.00	577.50	0.99
Cow dung	1734.00	1860.00	1682.00	1780.00	1764.00	3.03
Pesticides	854.00	768.00	698.00	832.00	788.00	1.35
Irrigation	3782.00	3861.00	4014.00	4182.00	3959.75	6.79
Int. on operating capital	401.00	399.00	346.00	376.00	380.50	0.65
(B) Fixed Cost	18777.00	17095.00	18586.00	17651.00	18027.25	30.92
Family labour	7423.00	8642.00	8245.00	7986.00	8074.00	13.85
Land use cost	11354.00	8453.00	10341.00	9665.00	9953.25	17.07
Total Cost (A+B)	61266.00	55063.00	57697.00	59171.00	58299.25	100.00

Source: Field survey, 2019

Return from Binamasur-8 production

The average return from Binamasur-8 production in different locations is shown in Table 7. The average yield of Binamasur-8 was 1690.75 kg/ha. The yield was highest at Pabna (1803.00 kg/ha) followed by Magura (1797.00 kg/ha), Chapai Nawabganj (1684.00 kg/ha) and Faridpur (1479.00 kg/ha). Most of the farmers in the study areas sold their product just after harvest. The price of Binamasur-8 was found the highest in Magura (Tk. 57.00/kg) and the lowest in Chapai Nawabganj (Tk. 54.00/kg). The total return from Binamasur-8 production consists of the values of Binamasur-8 and straw.

The average gross margin was found Tk. 56563.50/ha on variable cost basis. Gross margin was highest in Pabna (Tk. 64421.00/ha) followed by Magura (Tk. 62740.00/ha), Chapai Nawabganj (Tk. 52616.00/ha) and Faridpur (Tk. 46477.00/ha), respectively. The average net return per hectare was Tk. 38536.25. The net return was highest in Pabna (Tk. 45835.00/ha) followed by Magura (Tk. 43963.00/ha), Chapai Nawabganj (Tk. 34965.00/ha) and Faridpur (Tk. 29382.00/ha), respectively. Benefit cost ratio was estimated at 1.66 and 2.40 on full cost and variable cost basis implying that the Binamasur-8 cultivation at farm level was highly profitable.

Table no 7: Profitability of Binamasur-8 cultivation in different location

Type	Study areas				Average
	Magura	Faridpur	Pabna	Chapai Nawabganj	
Yield from Binamasur-8 (Kg/ha.)	1797.00	1479.00	1803.00	1684.00	1690.75
Return from Binamasur-8 (Tk./ha)	102429.00	81345.00	100968.00	90936.00	93919.50
Return from straw (Tk./ha)	2800.00	3100.00	2564.00	3200.00	2916.00
Total return (Tk./ha)	105229.00	84445.00	103532.00	94136.00	96835.50
Total variable cost (Tk./ha)	42489.00	37968.00	39111.00	41520.00	40272.00
Total Cost (Tk./ha)	61266.00	55063.00	57697.00	59171.00	58299.25
Gross margin (Tk./ha)	62740.00	46477.00	64421.00	52616.00	56563.50
Net return (Tk./ha)	43963.00	29382.00	45835.00	34965.00	38536.25
Benefit Cost Ratio (BCR)					
BCR on full cost	1.72	1.53	1.79	1.59	1.66
BCR on variable cost	2.48	2.22	2.65	2.27	2.40

Source: Field survey, 2019

Major constraints to Binamasur-8 cultivation

The farmers in the study areas encountered some constraints to Binamasur-8 production. The first ranked constraint was unavailability of Binamasur-8 seeds in all areas (91%) (Table 8). Other constraints were lack of training (63%), lack of technical know-how (31%), insect infestation is high (28%), Untimely rainfall (22%) and high price of pesticides (9%).

Table no 8: Major constraints to Binamasur-8 cultivation in the study areas

Sl.No.	Constraints	Percent of farmers respondent					Rank
		Magura	Faridpur	Pabna	Chapai Nawabganj	All area	
1.	Unavailability of Binamasur-8 seed	95	98	91	78	91	1
2.	Lack of training	65	55	59	71	63	2
3.	Lack of technical know-how	32	56	9	28	31	3
4.	Insect infestation is high	30	25	41	15	28	4
5.	Untimely rainfall	17	27	12	31	22	5
6.	High price of pesticides	8	13	8	7	9	7

Source: Field survey, 2019

IV. Conclusion and recommendations

Binamasur-8 production in the study areas is profitable. The key socio-economic characteristics that affects on profitability are age, education level, occupational status, farming experience and social organizations. The yield performance and economic return of Binamasur-8 production were encouraging to the farmer's and cultivation of this variety increasing day by day in the study areas. Major constraints faced by Binamasur-8 farmers in the study areas are unavailability of Binamasur-8 varieties seed, lack of training, lack of technical know-how, insect infestation is high, untimely rainfall, high price of pesticides. There is a need of proper guide to farmers about Binamasur-8 production. Farmers training on Binamasur-8 production should be needed and also extension works should be strengthen on Binamasur-8 cultivation. Therefore, Government may provide more subsidies on the production and distribution of these important inputs (seed, fertilizer, pesticides, etc.) and make them available at local markets with reasonable price.

Conflict of Interest

Authors have declared that no conflict interests exist.

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