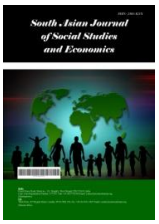


South Asian Journal of Social Studies and Economics

8(2): 46-53, 2020; Article no.SAJSSE.61792
ISSN: 2581-821X

Technology Adoption and Profitability of BINA Released Lentil Variety Binamasur-5 in Bangladesh

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

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

Authors' contributions

This work was carried out in collaboration among all authors. Author SI contributed in designing and performing the experiments, data collection, data analysis, manuscript writing and the manuscript reviewing all through the publication process. Authors MHR, MRH, MMAS and RS equally contributed in data entry and reviewing during the publication process. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/SAJSSE/2020/v8i230209
Editor(s):
(1) Dr. Velan Kunjuraman, University Malaysia Kelantan (UMK), Malaysia.
Reviewers:
(1) Ignacio Carranza Cerda, Colegio de Postgraduados, México.
(2) Talita Ingrid Magalhães Silva Nurse, Federal University of Minas Gerais, Brazil.
Complete Peer review History: http://www.sdiarticle4.com/review-history/61792

Original Research Article

Received 28 July 2020
Accepted 04 October 2020
Published 27 October 2020

ABSTRACT

The study was conducted in five major Binamasur-5 growing areas of Bangladesh, namely Magura, Pabna, Jashore, Kushtia and Faridpur districts. It is important to know the profitability and the existing level of technology in terms of agronomic practices, time of operation and input use. At Magura (85%), Pabna (85%) and Faridpur (75%) farmers, sowed seed in optimum level but 5% in Jashore and 8% in Kushtia farmers followed it. The adoption index of sowing level of adoption Binamasur-5 was higher use. The average net return was Tk. 52405.29 per hectare. The average Benefit cost ratio was 1.86. The highest BCR was found in Magura district (1.96) which was followed by Jashore (1.91), Faridpur (1.88), Pabna (1.84) and Kushtia (1.73) districts, respectively. The first ranked constraint was unavailability of Binamasur-5 seeds (93%) in all areas. It is followed by lack of technical know-how (71%), lack of training (65%), attack of root rot diseases (50%). Nonetheless, lentil farmers should also be provided hand-on training on package technology of lentil cultivation.

**Corresponding author: Email: bausyful07@gmail.com;*

Keywords: Binamasur-5; adoption; profitability; constraints and recommendations.

1. INTRODUCTION

Pulse crops are important for the people of 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. Among the pulses, lentil commonly known as "masur" is a popular pulse crop in Bangladesh. It contains more protein than any other agricultural produce, and is nearer to animal flesh in food value for which it is often called poor man's meat [1]. Bangladesh is a densely populated country where per capita cultivable land availability is not more than 0.066 ha. Farmer is not likely to come forward with a risky crop because harvest risky. The country is facing acute shortage of pulses due to accelerated increase of requirements with its rapid growth of population. Side by side the fallow period between two major crops to be utilized for production of pulse crops. Pulses area decreased from 7.35 lakh hectares in 1988-89 to 3.57 lakh hectares in 2016-17 [2]. 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 [3] recommended consumption of pulse amounting 45gm/head/day for fulfilling protein requirements for an adult. 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 and 59% carbohydrate. The per capita pulses consumption required for balance diet as given by FAO is 15 gm. Lentil ranks first among the pulses in terms of area (40%) and consumer preferences. The area under lentil cultivation in Bangladesh is declining but recently it was slightly upward and the average yield is only 1180 kg/ha [2]. The objectives were i) to determine the technology adoption of Binamasur-5; ii) to estimate the cost and return of Binamasur-5; and iii) to identify the major constraints of Binamasur-5. Some descriptive statistics were used in analyzing the collected data. In the study, costs and return analysis were done on both cash cost and full cost basis. In order to formulate an appropriate policy for import substituting, so the present study was undertaken to highlight the economic performance as well as comparative advantage of pulse crops cultivation in Bangladesh.

2. MATERIALS AND METHODS

Sampling design: A multi-stages sampling procedure was followed to select study areas and sample households. At first, we selected five major Binamasur-5 growing areas of Bangladesh, namely Magura, Pabna, Jashore, Kushtia and Faridpur district and then two Upazilas in each Jashore district were purposively selected for the study. Secondly, two villages were purposively selected from each upazila for household survey. Finally, a list of lentil growers was constructed for each village and then a total of 200 samples taking 40 samples from each district were randomly selected for data collection.

Data collection procedure: Data for the present study were collected by interviewing sample lentil growers using a pre-tested interview schedule during the period from March to May 2016. Secondary data were also collected from Directorate of Agricultural Extension to supplement the study. Analytical techniques: The collected data were analyzed by tabular and statistical methods. The profitability of lentil cultivation was examined on the basis of gross margin, net return, and rate of return over cost. A higher index indicates a higher level of adoption, while a lower index indicates a lower level of adoption of a technology. Technology adoption level was categorized for mean index > 100 as over use; (70-100) as high; (50-69) as medium and <50 as low [4]. Adoption index was determined by the following formula.

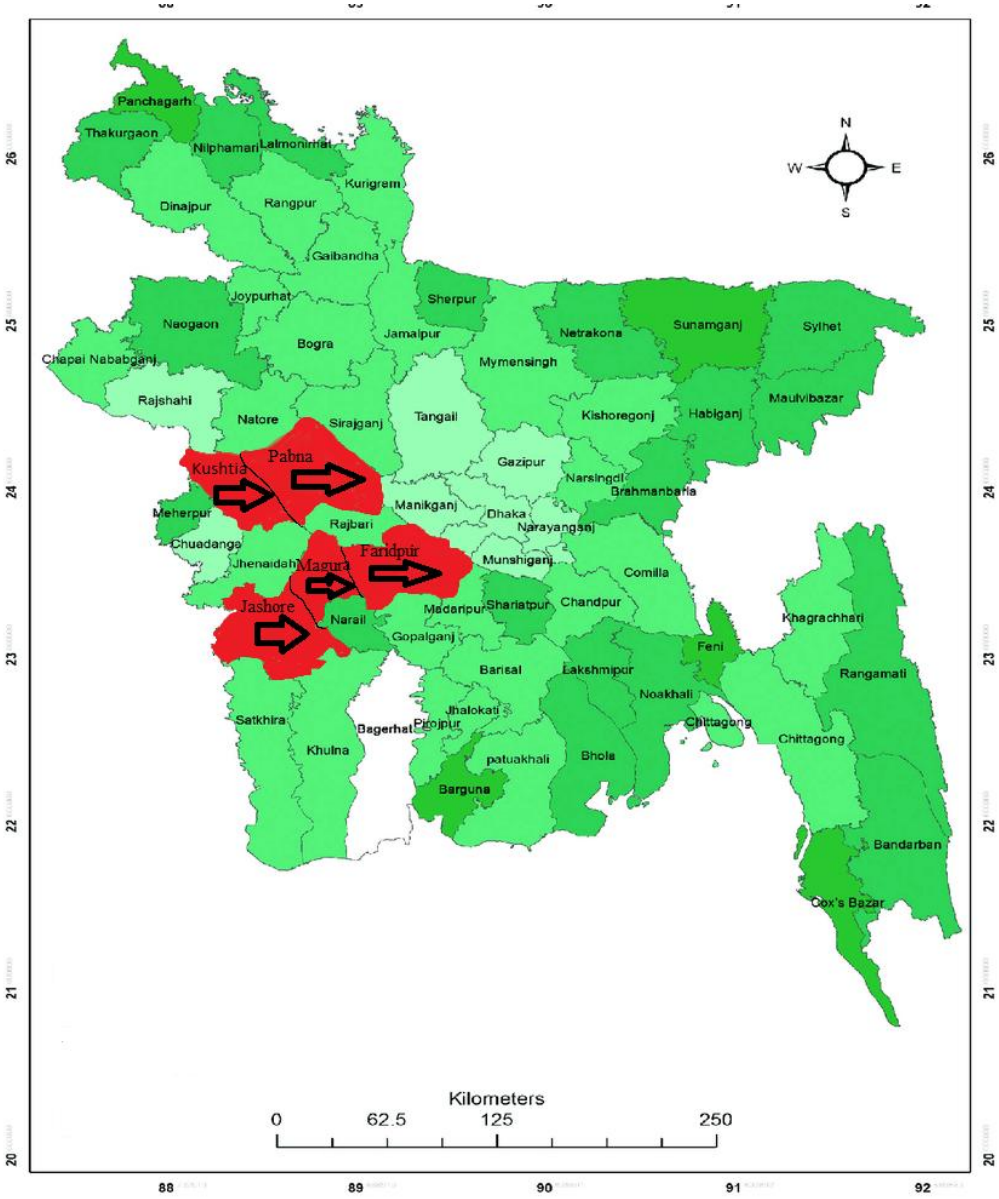
$$\text{Adoption index} = \frac{\text{Farmers' practice}}{\text{Recommendation}} \times 100$$

The equation has been applied for each of the selected farmers:

$$\pi = Y_m * P_m + Y_b * P_b - \Sigma (X_i * Px_i) - TFC$$

Where,

π = Net return;
Y_m= Total quantity of main product;
P_m= Price of main product per units;
Y_b= Quantity of by-product;
P_b = Price of by-product per unit;
X_i= Quantity of the ith input used for Binamasur-5 production;
Px_i= Price of ith input per unit used for Binamasur-5 production;
TFC = Total fixed cost
i = 1, 2, 3.....n (number of input)



Map 1. Binamasur-5 variety growing study areas in Bangladesh

The estimation of interest on operating capital (IOC) was as follows:

$$\text{Interest on OC} = AI \times i \times t$$

Where,

AI = (Total investment)/2;
I = Rate of interest per annum (%); and
T = Period of lentil production (in month).

The benefit cost ratio (BCR) is a relative measure which is used to compare benefit per unit of cost. Benefit-cost ratio is the ratio of present net worth of benefit and present net worth of cost. It indicates that the benefit of per unit cost at present worth.

3. RESULTS AND DISCUSSION

3.1 Technology Used and Their Level of Adoption

Appropriate inputs use and time of operations are 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 [5]. The existing level of technology employed in the production of Binamasur-5 and their level of adoption have been presented in Table 1. Farmers in the study areas ploughed their lands with the help of power tiller. The number of ploughing and laddering varied from farm to farm and location to location. On an average, 71% farmers ploughed their land 3-4 times, which is the recommended for lentil cultivation. Based on the mean index, land preparation secured the overuse level of adoption. About 87% farmers applied laddering 2-3 times, which was lower than recommendation. Therefore, the level of adoption of laddering was secured lower use. About 52% farmer's sowed seeds during last week of October to first week of November which is optimum time for seed sowing, whereas 37% farmers sowed during second week of November to 1st week of December. At Magura (85%), Pabna (85%) and Faridpur (75%) farmers, sowed seed in optimum level but 5% in Jashore and 8% in Kushtia farmers followed it. The adoption index of sowing level of adoption Binamasur-5 was higher use. The recommended seed rate of Binamasur-5 ranged 35-40 kg/ha [6]. All respondent farmers used higher amount of seed (40% higher) than its recommendation. Therefore, the adoption level seed rate was found to be over used.

Weeding was done by human labour. Forty percent of the total farmers performed weeding once between 20 and 30 days. At Magura and Kushtia, all farmers weeded their land one time, while Pabna, Jashore and Faridpur farmers did not remove weed. The lower level of adoption was occurred in providing weeding to Binamasur-5. The study found that farmers often do not follow recommendations for applying fertilizers and tended to excess use of fertilizers. All the sample farmers applied urea, TSP, MoP and Gypsum in higher quantity compared to their recommended doses. Therefore, according to adoption index, the level of adoption for applying fertilizer was over use.

3.2 Profitability of Binamasur-5 Cultivation

Human labour was measured in terms of man-days which usually consisted of 8 hours. It was employed for sowing seed, fertilizing, weeding, pesticiding, harvesting, threshing and drying. The cost of cultivation was calculated on the basis of total variable cost and total cost.

From Table 2, it can be showed that the average total variable cost of Binamasur-5 production was estimated in Magura (Tk. 58358.06), Jashore (Tk. 56234.82), Faridpur (Tk. 55664.68), Pabna (Tk. 55615.25) and Kushtia (Tk. 55592.57) ha^{-1}, respectively. The major shares of total cost were human labour (35.53%), fertilizer (15.16%), power tiller (12.07%), irrigation (6.79%) and seed (6.80%). The highest total cost in farm level of Binamasur-5 was in Magura (Tk. 62816.65 ha^{-1}) followed by Jashore (Tk. 60160.69), Faridpur (Tk. 60086.56), Pabna (Tk. 60003.70) and Kushtia (Tk. 59714.45) ha^{-1}, respectively. The average total cost of production in field level of Binamasur-5 was Tk. 60556.41.

From Table 3, it can be showed that the grain yield was higher at Magura (1879.67 kg/ha) compared to Kushtia (1709.90 kg/ha). The gross return of Binamasur-5 cultivation was found higher in Magura (Tk. 123084.32ha^{-1}) followed by Jashore (Tk. 115164.72), Faridpur (Tk. 112783.28), Pabna (Tk. 110338.95) and Kushtia (Tk. 103437.26) per hectare among the study areas. The net returns per hectare were Magura (Tk. 60267.66), Faridpur (Tk. 53652.75), Jashore (Tk. 53404.03), Pabna (Tk. 50335.25) and Kushtia (Tk.46860.81), respectively. The average net return was Tk. 52405.29 per hectare. The average Benefit cost ratio was 1.86; which indicates that cultivation of this variety is profitable to the farmer's level when all sorts of cost were taken into consideration. The highest BCR was found in Magura district (1.96) which was followed by Jashore (1.91), Faridpur (1.88), Pabna (1.84) and Kushtia (1.73) districts, respectively.

3.3 Constraints to Binamasur-5 Cultivation at Farm Level

The farmers in the study areas encountered some constraints to Binamasur-5 cultivation. The first ranked constraint was unavailability of Binamasur-5 seeds (93%) in all areas. It is followed by lack of technical know-how (71%), lack of training (65%), attack of root rot diseases (50%). Therefore, necessary steps should be taken to make disease resistant Binamasur-5 seed available to the farmers. Nonetheless, lentil farmers should also be provided hand-on training on package technology of lentil cultivation.

Table 1. Adoption of crop management technologies for Binamasur-5 production at farm level

Name of Technology	Recommendation	Magura	Pabna	Jashore	Kushtia	Faridpur	Average	Adoption level
1. No. of Ploughing (% of respondents)								Over use
3-4	Optimum	75	69	72	68	70	71	
5-6		25	31	28	32	30	29	
Adoption index		113	116	114	116	115	115	
2. Laddering (% of respondents)								Lower use
2-3	Optimum	87	80	92	85	90	87	
4-5		13	20	8	15	10	13	
Adoption index		48	52	45	49	46	48	
3. Sowing time (% of respondents)								Higher use
Third week of October		10	15	30			11	
Last week of Oct. –First week of Nov.	Optimum	85	85	5	8	75	52	
2nd week of Nov.– 1st week of Dec.		5		65	92	25	37	
Adoption index		93	93	53	54	88	76	
4. Seed rate (kg/ha)								Over use
Adoption index	35-40	55	48	50	44	52	50	
		138	120	125	110	130	125	
5. No. of weeding (% of respondent)								Lower use
One time (20-30 days after germination)	Optimum	100	0	0	100	0	40	
Adoption index		100	0	0	100	0	40	
6. Fertilizer dose (kg/ha)								Over use
Urea	30-35	55	48	52	40	50	49	
Adoption index		157	137	149	114	143	140	
TSP	80-90	132	127	112	135	121	125	Over use
Adoption index		147	141	124	150	134	139	
MoP	30-35	48	35	25	69	51	46	Over use
Adoption index		137	100	71	197	146	130	
Gypsum	25-30	40	38	41	22	40	36	
Adoption index		133	127	137	73	133	121	

Note: Adoption level was categorized for mean index> 100 as Over use; (70-100) as Higher use; (50 -69) as medium and <50 as lower use
Source: Field Survey, 2016

Table 2. Input wise cost of Binamasur-5 production at farm level

Cost Component	Location-wise cost in Taka					Average (%)
	Magura	Pabna	Jashore	Kushtia	Faridpur	
Labor (man-days)	21740.37	21738.93	21462.02	20827.20	21825.05	21518.71(35.53)
Family	6371.60	5725.97	5920.06	5534.22	5823.2	5875.01
Hired	15368.77	16012.96	15541.96	15292.98	16001.85	15643.70
Power tiller	7590.44	6802.37	6931.70	7010.19	8212.92	7309.53 (12.07)
Owned	2530.15	2267.46	2310.57	2336.73	2737.64	2436.51
Hired	5060.29	4534.91	4621.14	4673.46	5475.28	4873.02
Seed	4073.16	4120.91	4023.56	4411.93	4351.75	4196.26 (6.80)
Owned	1357.72	1373.64	1341.19	1470.64	1450.58	1398.75
Purchased	2715.44	2747.28	2682.38	2941.29	2901.17	2797.51
Fertilizer	9588.49	8413.54	9007.54	9041.99	9848.71	9180.05(15.16)
Organic manure	1952.95	1834.35	1817.87	1826.70	1901.92	1866.76 (3.78)
Pesticide	962.32	1306.97	904.16	866.56	1050.44	1018.09 (1.68)
Insecticide	727.15	704.44	811.66	864.75	995.85	820.77 (1.36)
Irrigation	4087.65	4114.54	4086.63	3927.96	4327.21	4108.80(6.79)
Owned	1362.55	1371.51	1362.21	1309.32	1442.40	1369.60
Hired	2725.10	2743.03	2724.42	2618.64	2884.81	2739.20
Interest on operating capital	3043.35	2942.16	2942.71	2902.64	3150.831	2996.34 (4.95)
Total variable cost	58358.06	55615.25	56234.82	55592.57	55664.68	56293.08 (92.96)
Total Fixed cost	4458.59	4388.45	3925.87	4521.88	4421.88	4343.33 (7.04)
Total cash cost	49241.69	47430.78	47408.79	47370.17	46730.81	47636.45 (78.66)
Total Cost	62816.65	60003.70	60160.69	59714.45	60086.56	60556.41 (100)

Source: Field Survey, 2016

Table 3. Productivity and profitability of Binamasur-5 production at farm level

Type	Costs and Return in Taka					Average
	Magura	Pabna	Jashore	Kushtia	Faridpur	
Yield (kg/ha)	1879.67	1737.53	1812.03	1709.90	1798.55	1787.54
Yield (Tk./ha)	122059.24	108913.88	113874.67	102200.88	111510.25	111711.78
By product (Tk./ha)	1025.08	1425.07	1290.05	1236.38	1273.03	1249.92
Gross return	123084.32	110338.95	115164.72	103437.26	112783.28	112961.71
Total variable cost	58358.06	55615.25	56234.82	55592.57	55664.68	56293.08
Total Cost	62816.65	60003.70	60160.69	59714.45	60086.56	60556.41
Gross Margin	64726.25	54723.70	58929.90	47844.69	57118.60	56668.63
Net Return (Tk./ha)	60267.66	50335.25	55004.03	43722.81	52696.72	52405.29
Benefit Cost Ratio (BCR)						
Full cost basis	1.96	1.84	1.91	1.73	1.88	1.86
Cash cost basis	2.50	2.33	2.43	2.18	2.41	2.37

Source: Field Survey, 2016

Table 4. Constraint to Binamasur-5 cultivation at farm level

Constraints	Percent farmers' responded						Rank
	Magura	Pabna	Jashore	Kushtia	Faridpur	All	
Unavailability of Binamasur-5 seed	90	97	78	100	98	93	1
Lack of technical know-how	66	63	75	77	75	71	2
Lack of training	55	69	61	70	69	65	3
Attack of root rot disease	44	48	57	48	55	50	4

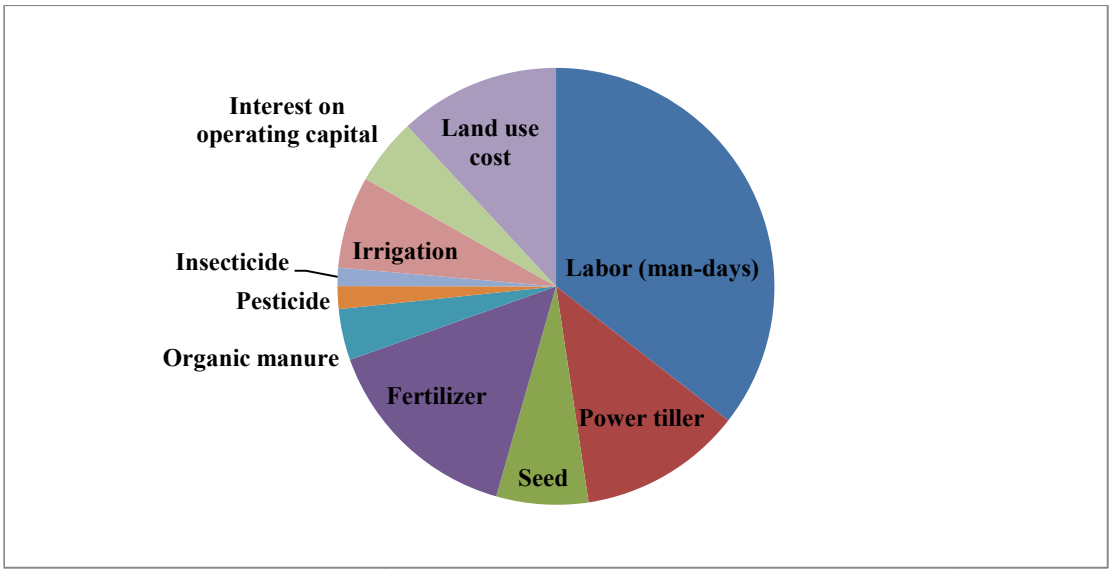


Fig. 1. Major shares of cost of production

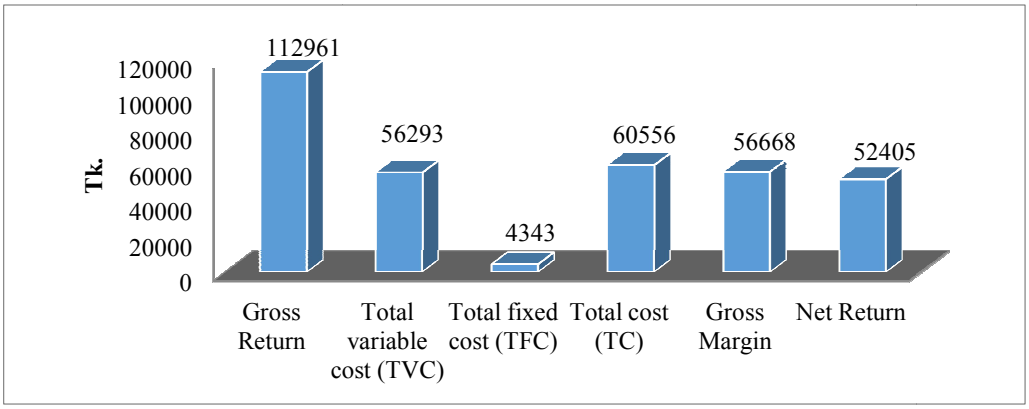


Fig. 2. Cost and return of Binamasur-5 production

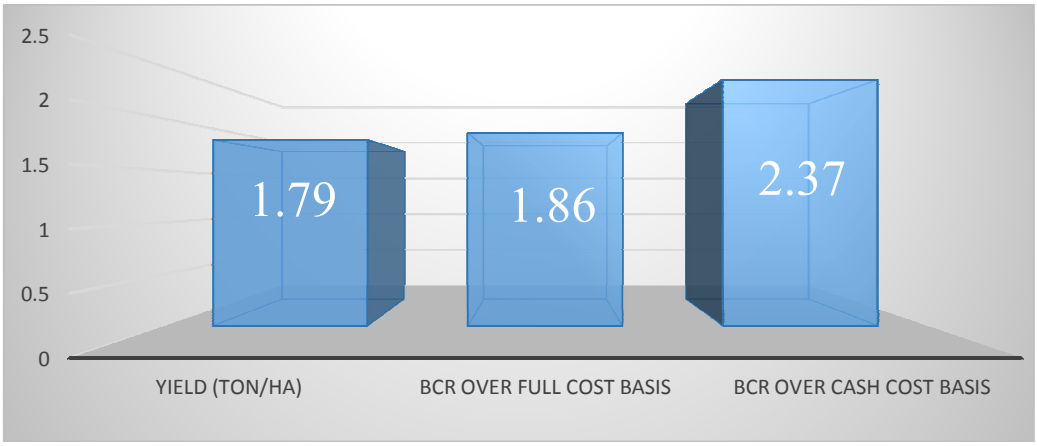


Fig. 3. Profitability of Binamasur-5 production

4. CONCLUSION

Binamasur-5 production in the study areas is profitable. Lentil farmers received high return on its investment. The gross margin and net return of Binamasur-5 cultivation were positive and encouraging to the farmers. Although Binamasur-5 is a profitable crop, majority of the farmers did not get desired yield for ignoring the recommended use of inputs. Also Binamasur-5 farmers could not receive higher benefit from lentil cultivation due to various constraints. Government should ensure timely adequate supply of quality or adulteration free inputs (seed, fertilizer, pesticides, etc.). Frequent interaction was needed among farmers, extension personnel and Binamasur-5 growers. Hand-on training on improved lentil cultivation and crop management practices for the groundnut growing farmers is also an important and government should take care of it.

CONSENT

As per international standard or university standard, participant's written consent has been collected and preserved by the author(s).

ACKNOWLEDGEMENT

The authors acknowledged the financial grant from Government of Bangladesh.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Burman RR, Singh SK, Singh AK. Gap in adoption of improved pulse production technologies in Uttar Pradesh. Indian Research Journal of Extension Education. 2016;10(1):99-104.
2. BBS. Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Dhaka, Bangladesh; 2018.
3. FAO. Production Yearbook, Food and Agricultural Organization, Rome, Italy; 2017.
4. Miah MAM, Alam QM. Adoption and relative profitability of mustard production in Bangladesh; 2008.
5. Rao PP, Birthal PS, Bhagavatula S, Bantilan MCS. Chickpea and pigeonpea economies in Asia: facts, trends and outlook; 2010.
6. Rahman MM, Yasmine F, Rahman MA, Ferdous Z, Kar PS. Performance of poultry bio-slurry as a source of organic manure on potato production. Journal of Agroforestry and Environment. 2011;5:81-84.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/61792