



SOCIO ECONOMIC DETERMINANT AND PROFITABILITY OF BARI MUNGBEAN VARIETY IN SOME SELECTED AREAS OF BANGLADESH

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ABSTRACT

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The study was undertaken to find out the socio economic determinants and profitability of BARI mungbean variety in some selected areas of Bangladesh. The study has been conducted three district viz. Jashore, Jhenaidah and Kushtia during June-July, 2020. A total of 90 farmers, 30 from each district were selected randomly for present study. It was observed that most of the farmer cultivated BARI mung-6 (67.78%), BARI mung-5 (21.11%) and BARI mung-7 (11.11%) in the study areas. BARI mung-6 was the popular variety among the farmers in the study areas as its adaptability to diverse nature and high yield. Total cost of mungbean cultivation was Tk. 46368ha⁻¹, where as variable cost was Tk. 27391ha⁻¹ and fixed cost was Tk. 18977ha⁻¹. Among the cost item highest cost was land preparation cost Tk. 7684ha⁻¹ (16.57%) followed by hired labour Tk. 4927ha⁻¹ (10.63%), Seed Tk. 3584ha⁻¹ (7.73%), pod picking cost Tk. 3487ha⁻¹ (7.52%), pesticide Tk. 3029ha⁻¹ (6.53%), fertilizer Tk. 2740ha⁻¹ (5.91%) etc. Pod picking is important cost at mungbean cultivation and farmer expense averages Tk.12.00/kg of green pod. Women (64%) along with children (31%) were involved in pod harvesting. Average yield of mungbean was 1.030 tonha⁻¹ in the study areas. Average Gross return was Tk. 66966ha⁻¹ and net return was Tk. 20598ha⁻¹. Benefit cost ratio was 1.44 that means the mungbean cultivation was profitable. Due to not synchronous ripening of pod mungbean harvest by the mechanical was not possible. Bad weather, pod picking and insect pest attack was major constraints for mungbean cultivation.

Contribution/Originality: This study is one of very few studies which have investigated on the socio-economic determinants and profitability of mungbean cultivation of Bangladesh. This study also document about which variety of mungbean was mostly cultivated in Bangladesh.

1. INTRODUCTION

Pulses are the important crops cultivated all over the 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, field pea and pigeon pea are grown in Bangladesh (Hajong, Rahman, Islam, & Biswas, 2020). Pulses cultivation cover 2.22% of the total cultivated land in Bangladesh (BBS, 2019). In Bangladesh a total of 0.937 million metric ton pulses were grown from 0.78 million ha of land in the fiscal year of 2018-19 (AIS, 2020). Among the pulses mungbean is the very important pulses crops cultivated in Bangladesh. Mungbean (*Vigna radiate* L.) is grown

round the year (three times) in Bangladesh. It provides grain for human consumption as it contains 19.5% to 28.5% protein. Mungbean supplies a substantial amount of nitrogen to the succeeding non-legume crops (i.e., rice) grown in rotation (Sharma & Prasad, 1999). In crop rotation legumes mitigate greenhouse gas emissions by reducing the need for nitrogen fertilizer (Barton, Thamo, Engelbrecht, & Biswas, 2014; Foyer et al., 2016). These plants fix nitrogen to the soil and increase organic matter. It has an important role as a source of plant based proteins which contribute to better human health and environmental sustainability (Springmann et al., 2018). Currently, this crop is being cultivated after harvesting of robi crops (i.e., wheat, mustard, lentil, etc.). In Bangladesh pulses occupy 2.22% of total cultivated areas and among them mungbean cultivated 11.66% of total pulse cultivated areas and gather 4th position (BBS, 2019). In Bangladesh mungbean cultivated areas was 41339.68 hectare and average yield was 0.821 ton/ha (BBS, 2019). Mungbean fit in the existing cropping pattern due to its short duration, low input, minimum care required and drought tolerant nature (Islam, Miah, Rahman, & Hossain, 2013). Cropping intensity increased 300% to 400% after incorporating mungbean in the existing cropping pattern (Ahmed, Quddus, Mohiuddin, Islam, & Hossain, 2019). The fertility status of soil i.e. pH, organic matter, total N, available P, S, Zn and B content in soil were increased over the initial soil due to addition of mungbean biomass. Inclusion of mungbean in the existing cropping pattern were improve soil health and the system productivity as a whole (Khan, Sultana, Akter, Zaman, & Choudhury, 2018). It increase productivity and profitability in rice based cropping pattern than sole rice (Nazran, Ahmed, Karim, & Ghosh, 2019). Bangladesh Agricultural Research Institute (BARI) has been developed eight mungbean varieties and disseminated them with the complete package of management technologies to the farmers for cultivation (Azad et al., 2020). Mungbean cultivation is gaining popularity among the farmers day by day. But, the farm level adoption of mungbean technologies, their economics at farm level, and farmer's technical efficiencies in cultivating the crop are not well known to the researchers and policy planners. In that case it need to assess the adoptions, profitability and existing production of mungbean at farm level. Keeping all these factors in consideration the present study was undertaken to provide information through fulfillment of the following objectives. To study the socio economic determinants of mungbean farmers and to estimate the input use pattern and economic profitability of BARI mungbean was considered in this study.

2. METHODOLOGY

The present study was conducted at three districts namely Jashore, Jhenaidah and Kushtia of Bangladesh. The study area was purposively selected considering the higher concentration of mungbean cultivation. The study was carried out by using formal survey method. A total of 90 farmers out of which 30 from each district was randomly selected for interview. Jashore Sadar upozila from Jashore, Kaligonj upozila from Jhenaidah and Kushtia Sadar upozila were selected for primary data collection. Data were collected through pre-design interview schedule during the period of June-July, 2020. Field investigators under the direct supervision of the researcher collected field level data using pre-tested interview schedule. Necessary information regarding this study was collected based on input costs, price, yields etc. Both fixed cost and variable cost were taken into account in calculating cost of mungbean cultivation. Land use cost was calculated on the basis of per year existing lease value of land. The profitability of mungbean cultivation was examined on the basis of gross margin, net return and benefit cost analysis. Collected data were edited, summarized, tabulated and analyzed to fulfill the objectives of the study. Descriptive statistics using different statistical tools like averages, percentages and ratios were used in presenting the results of the study.

Following profit equation was employed to assess the profitability of mungbean production.

$$\Pi = P_1 \cdot Q_1 - (TVC + TFC)$$

Where, π = Profit of producer per hectare (Tk.ha⁻¹)

P_1 = Per unit price of mugbean (Tk.mt⁻¹)

Q_1 = Quantity of mungbean (tonha⁻¹)

TVC = Total variable cost of mungbean (Tk.ha⁻¹)

TFC = Total fixed cost of mungbean (Tk.ha⁻¹)

3. RESULT AND DISCUSSION

This study was discussed about socio economic status of mungbean farmer which was determinants of mungbean cultivation and profitability of mungbean cultivation.

3.1. Socio-Economic Characteristics of Mungbean Farmer

Socioeconomic profile was the mirror of the society where it can gather knowledge about the present status of farmer. Among the respondents farmer 30 percent farmer age was between 31-40 years old and most of the farmer was workable age Table 1. Technical efficiencies such as education, income and farming experience increase the mungbean productivity (Haque, Miah, Ali, & Luna, 2014). In case of education qualification most of the farmer was in primary and secondary level. That means farmer were literate and had knowledge about farming and their farming experience was 12.56 years, where as mungbean farming experience was 9.31 years. Only 13.33 percent farmer had less knowledge or only can sign their name but had experience in farming. About 50 percent farmer main occupation was agriculture that means they only depends on farming for their family needs. About twenty seven percent farmer was engaged agriculture as well as other activities such as day laborer, auto-rickshaw driver and other activities besides farming. Average family member was 4.91 which was more or less equal to national average. Average farmer own cultivated land was 0.52 ha where as mungbean cultivated land was 0.14 ha which was 27.89 percent of total cultivated land.

Table-1. Socio-economic characteristics of the respondent's farmer (%).

Farmer attributes	Categories	Jashore	Jhenaidah	Kushtia	All areas
Farmer age (%)	Up to 30 years	23.33	26.67	16.67	22.22
	31-40 years	30.00	30.00	30.00	30.00
	41-50 years	23.33	16.67	16.67	18.89
	Above 51 years	23.33	26.67	36.67	28.89
Farmer Education (%)	Can sign	10.00	16.67	13.33	13.33
	Primary	30.00	50.00	36.67	38.89
	SSC	43.33	23.33	40.00	35.56
	HSC and above	16.67	10.00	10.00	12.22
Farmer Occupation (%)	Agriculture	50.00	56.67	43.33	50.00
	Agriculture + business	13.33	10.00	20.00	14.44
	Agriculture + service	6.67	10.00	10.00	8.89
	Agriculture + others	30.00	23.33	26.67	26.67
Family member	Average	4.97	4.83	4.93	4.91
	Male	1.83	1.67	1.83	1.78
	Female	2	1.77	1.87	1.88
	Children	1.48	1.46	1.38	1.44
Farming experience (Years)		11.37	12.1	14.2	12.56
Mungbean farming experience (Years)		9.37	10.6	7.97	9.31
Own cultivated land (ha)		0.42	0.64	0.50	0.52
Mungbeasn cultivated land (ha)		0.13	0.16	0.15	0.14

Source: Field survey, 2020.

3.2. Production Technology of Mungbean Cultivation

Agronomic management is the most important input for getting potential yield and high net returns in any crop or crop sequence. Mungbean was cultivated three times in a year in Bangladesh viz. for kharif-I season 2nd week of February to 2nd week of March which was prominent season, kharif-II season August-September and late robi season January 3rd week to February 1st week. In study areas most of the farmers cultivated mungbean at kharif-I season, among them fifty nine percent farmer sown mungbean seed at March and forty one percent was in

February [Table 2](#). But in the coastal region of Bangladesh it was sown in the period of 1st week of January to 1st week of February ([Islam, Rahman, Hossain, & Hossain, 2011](#)). For sowing mungbean seeds about 3.75 times ploughing was done with tractor and power tiller. Cent percent farmer sown seed in broadcasting, where as line sowing was the convenient for agronomic management but farmer did not sown in line. Early sowing of grain legumes produces more seeds and biomass after rice harvest than late sowing ([Marcal, 2018](#)). In case of lentil 93.33 percent farmer was broadcasting ([Hajong, Rahman, Kobir, & Paul, 2020](#)). Due to short duration weeding did not required though they weeding once in mungbean fields. About seventy four percent farmer buy seed from local market and twenty six percent farmer kept for their own seeds from previous year cultivation, in where 78.44% cowpea farmer ([Uddin, Rashid, & Begum, 2020](#)) and 80% lentil farmer ([Hajong et al., 2020](#)) collect seed from local market. Due to required seed treated for better yield forty four percent farmer treated mungbean seed before sowing seeds and fifty six percent farmers did not seed treated. Seed treatment protects mungbean seeds from seed borne disease. Highest germination, percent disease reduction, plant height, grain yield was found high when seed was treated with fungicides Provac 200WP ([Md-Shahriar, Rahman, Pradip, & Md-Harun, 2020](#)). Cent percent farmer spray pesticide in their fields and average pesticide spray was 2.30 times in mungbean fields which was less than other crops (11.19 times spray in bitter gourd fields) ([Hajong.. et al., 2020](#)). About 80 percent farmer spray at morning and only twenty percent at evening.

Table- 2. Agronomic management of mungbean cultivation in the study areas (%).

Farmer attributes	Categories	Jashore	Jhenaidah	Kushtia	All areas
Number of ploughing		3.5	3.92	3.83	3.75
Number of weeding		1	1	1	1.00
Sowing time	February	46.67	36.67	40.00	41.11
	March	53.33	63.33	60.00	58.89
Sowing method	Line	0.00	0.00	0.00	0.00
	Broadcasting	100.00	100.00	100.00	100.00
Source of seed	Own	26.67	30.00	20.00	25.56
	Buy	73.33	70.00	80.00	74.44
Seed treatment	Yes	36.67	56.67	40.00	44.44
	No	63.33	43.33	60.00	55.56
Pesticide spray	Yes	100.00	100.00	100.00	100.00
	No	0.00	0.00	0.00	0.00
Average pesticide spray		2.43	2.10	2.37	2.30
Spray schedule period	Morning	76.67	76.67	86.67	80.00
	Evening	23.33	23.33	13.33	20.00

Source: Field survey, 2020.

3.3. Post Harvest Management of Mungbean Cultivation

Post-harvest management is a system of handling, storing, and transporting agricultural commodities after harvest. Pod harvest of mungbean from fields very important as it could not harvest one time. At least three times required to harvest mungbean pod from fields. Pod harvest that means fruits picking was done by mainly women and children and it was done by contract basis. For pod picking averagely per kg ripening pod was picking Tk.12 per kg in the study areas. About sixty four percent pod was harvest by women and thirty one percent by children [Table 3](#). Harvesting mungbean was done by landless women, particularly married women with children ([Farnworth et al., 2020](#)). Participation rates in harvesting and post harvest processing men involved were less than women. About eighty two percent farmer sold their products after harvest to the market and only eighteen percent farmer kept mungbean seed for few days. Farmer did not crushing the mungbean seeds and they sold whole beans to the market. Due to sold immediately after harvest mungbean eighty two percent farmer did not stored mungbean and only eighteen percent farmer store for getting high price at future. It is noted that storing long time of some products then it add value at future. At harvesting period the price become low and then it increase after harvesting period ([Hajong, Moniruzzaman, Mia, & Rahman, 2014](#)). Those who store mungbean they store in plastic drum with

air tight condition. Plastic bag, jute sacks and golas were used for stored for longer times (Baksh, Rossi, Momin, Hajong, & Tiwari, 2017). Seventy percent farmer sold their products to the local market and only thirty percent was at home.

Table- 3. Post harvest management of mungbean cultivation in the study areas (%).

Farmer attributes	Categories	Jashore	Jhenaidah	Kushtia	All areas
Pod harvest (Picking)	Men	6.67	3.33	3.33	4.44
	Women	60.00	70.00	63.33	64.44
	Children	33.33	26.67	33.33	31.11
Sell after harvest	Yes	76.67	90.00	80.00	82.22
	No	23.33	10.00	20.00	17.78
Sell after crushing	Yes	0.00	0.00	0.00	0.00
	No	100.00	100.00	100.00	100.00
Store mungbean	Yes	16.67	23.33	13.33	17.78
	No	83.33	76.67	86.67	82.22
Storage pot	Poly bag	0.00	0.00	0.00	0.00
	Plastic drum	100.00	100.00	100.00	100.00
Selling place	Home	26.67	26.67	36.67	30.00
	Local market	73.33	73.33	63.33	70.00

Source: Field survey, 2020.

3.4. Adoption of Mungbean Variety

An attempt was made to assess the level of adoption in terms of percent of farmers adopted mungbean variety at farm level. The scientists of BARI developed eight mungbean variety which was high yielding variety (Azad et al., 2020). Among the mungbean variety BARI mung-5, BARI mung-6 and BARI mung-7 were mostly cultivated in the study areas. Among them highest adoption mungbean variety was BARI mung-6 (67.78%) followed by BARI mung-5 (21.11%) and BARI mung-7 (11.11%) Table 4.

BARI Mung-6 variety was more capable in tolerating water stress and was considered as drought tolerant due to its high relative water content, leaf water potential, proline content, shoot dry matter and lower rate of electrolyte leakage (Nazran et al., 2019). BARI Mung-6 was the popular variety among the farmers in the study areas. Though BARI Mung-8 was the latest variety released from Bangladesh Agricultural Research Institute but this variety did not found in the farmer level. This variety need to extension in the farmer level and seed also need available at farmer filed.

Table 4. Percent of adoption of improved mungbean varieties by the respondent farmers.

Variety	Jashore	Jhenaidah	Kushtia	All areas
BARI mung-5	26.67	10.00	26.67	21.11
BARI mung-6	63.33	76.67	63.33	67.78
BARI mung-7	10.00	13.33	10.00	11.11
Total	100.00	100.00	100.00	100.00

Source: Field survey, 2020.

3.5. Input Use Pattern

In mungbean cultivation necessary input less require than any other crops. Seed is important for any crop cultivation. On an average farmer use 29.91 kg ha^{-1} mungbean seed for sowing which was the higher than the recommended seed rate, because farmer sowing seed broadcasting method. Total fertilizer apply was 121.97 kg ha^{-1} , where as TSP was highest 55.36 kg ha^{-1} followed by MoP (36.45 kg ha^{-1}), urea (28.33 kg ha^{-1}) and boron (1.83 kg ha^{-1}) Table 5. Farmer did not interested apply fertilizer in their mungbean fields. They opined that mungbean fields did not require or less require fertilizer.

Table-5. Input use pattern of mungbean varieties by the respondent farmers.

Variety	Jashore	Jhenaidah	Kushtia	All areas
Seed (Kg/ha)	28.10	31.18	30.44	29.91
Family labour (Man-days)	60.74	53.95	57.77	57.49
Hired labour (Man-days)	26.03	23.12	24.76	24.64
Urea (kg/ha ⁻¹)	26.45	28.03	30.51	28.33
TSP (kg/ha ⁻¹)	57.93	55.51	52.64	55.36
MoP (kg/ha ⁻¹)	33.49	36.40	39.46	36.45
Boron (kg/ha ⁻¹)	1.63	1.85	2.00	1.83
Total fertilizer (kg/ha ⁻¹)	119.50	121.80	124.62	121.97

Source: Field survey, 2020.

3.6. Cost and Return

The cost of production was included all variable cost items like human labour, land preparation, seed, manure, fertilizers, insecticides and irrigation. Besides, interest on operating capital was also considered as variable cost. Family labour and rental value of land was considered as fixed cost for the estimation of cost of production. For calculating the cost of cultivation of mungbean, all variable costs like human labor, land preparation, seed, manures, fertilizers, insecticide, irrigation were calculated per hectare basis. The fixed cost of mungbean cultivation included cost of land use and interest on operating capital. The cost of land use was calculated on the basis of lease value of land. The total cost included fixed cost and variable cost. Total cost of mungbean cultivation was Tk. 46368ha⁻¹, where as variable cost was Tk. 27391ha⁻¹ and fixed cost was Tk. 18977ha⁻¹ Table 6. Interest on operating capital was calculated at the rate of 9 percent with two months of cultivation period. Land use cost was calculated Tk.44880ha⁻¹ per year which was lease value of land at the study areas. Among the cost item highest cost was land preparation cost Tk. 7684ha⁻¹ (16.57%) followed by hired labour Tk. 4927ha⁻¹ (10.63%), Seed Tk. 3584ha⁻¹ (7.73%), pod picking cost Tk. 3487ha⁻¹ (7.52%), pesticide Tk. 3029ha⁻¹ (6.53%), fertilizer Tk. 2740ha⁻¹ (5.91%) etc. Pod picking is important cost at mungbean cultivation and farmer expense averages Tk.12.00kg⁻¹ of green pod. Picking cost was 7.52% among the cost item but it was highest cost in the production cost (Islam, Miah, Alam, & Hossain, 2008).

Table-6. Cost of mungbean cultivation in the study areas (Tk./ha).

Cost item	Jashore	Jhenaidah	Kushtia	All areas	% of cost
A. Variable cost					
Land preparation cost	7778	7645	7628	7684	16.57
Seed	3372	3727	3653	3584	7.73
Fertilizer	2675	2744	2801	2740	5.91
Picking cost	3276	3848	3336	3487	7.52
Hired Labour	5206	4624	4952	4927	10.63
Pesticide	3344	2914	2831	3029	6.53
Irrigation	1693	1470	1442	1535	3.31
Interest on operating capital	410	405	400	405	0.87
Total variable cost	27755	27375	27042	27391	59.07
B. Fixed cost					
Land use cost	7480	7480	7480	7480	16.13
Family labour	12147	10790	11555	11497	24.80
Total fixed cost	19627	18270	19035	18977	40.93
Total cost (A+B)	47382	45645	46077	46368	100.00

3.7. Profitability of Mungbean Cultivation

Return was calculated by multiplying yield with its price. Return per hectare of mungbean cultivation is shown in Table 7. Profitability is one of the major criteria for determination of acceptance of a crop. The returns came from the sale of mungbean seed which was consume by consumer as pulses. Average yield of mungbean was 1.030 tonha⁻¹ in the study areas which was greater than national average (BBS, 2019) Table 7. Among them Jashore farmer get

the highest yield (1.083 tonha⁻¹) followed by Jhenaidah (1.035 tonha⁻¹) and Kushtia (0.973 tonha⁻¹) farmer. But BARI developed mungbean varieties BARI mung-5 yield was 1.20-1.50 tonha⁻¹, BARI mung-6 yield was 1.50-1.60 tonha⁻¹ and BARI mung-7 yield was 1.70-1.90 tonha⁻¹ (Aziz-ur-Rehman et al., 2019). Average Gross return was Tk. 66966ha⁻¹ and net return was Tk. 20598ha⁻¹. Highest gross return gain Jashore farmer (Tk. 70391ha⁻¹) followed by Jhenaidah farmer (Tk. 67295ha⁻¹) and Kushtia farmer (Tk. 63213ha⁻¹). The highest net return gain Jashore farmer (Tk. 23009ha⁻¹) followed by Jhenaidah (Tk. 21650ha⁻¹) and Kushtia farmer (Tk. 17136ha⁻¹). Though Jhenaidah farmer mungbean production cost was lowest than other two location but it did not gain highest return. Benefit cost ratio was 1.44 that means the mungbean cultivation was profitable.

Table-7. Profitability of mungbean cultivation in the study areas.

Particulars	Jashore	Jhenaidah	Kushtia	All areas
Yield (tonha ⁻¹)	1.083	1.035	0.973	1.030
Gross return	70391	67295	63213	66966
Total cost	47382	45645	46077	46368
Net return	23009	21650	17136	20598
BCR	1.49	1.47	1.37	1.44

Note: Mungbean price : Tk.65.00kg⁻¹.

3.8. Constraints of Mungbean Cultivation

As mungbean cultivated kharif-I season in Bangladesh then it felt some major constraints. Weather is important threats for mungbean, that's this time seasonal rain occur sometimes. For that reason insect pest also attack and yield become lessen.

Pod picking was most important constraints that's cent percent farmer face this problem. Farmer opined that they did not get labor for pod picking, though they get labor then its costly. Mungbean cultivation was decreasing due to labor crisis for pod picking.

Mungbean fruits did not ripen in a same time. The time of pod maturation is a vital feature in the synchronous pod maturation (Aziz-ur-Rehman et al., 2019). Mungbean pod ripening is not synchronous. Irregular pod maturity primes to low yield and low harvest index in mungbean. In that case mechanization could not used in mungbean harvest. So farmer did not collect pod in one rows.

4. CONCLUSION

Mungbean is important pulse crops in Bangladesh cultivated during kharif-I and kharif-II season. Though most of the region cultivated mungbean in kharif-I season but it can also cultivated in kharif-II season. For cultivating in this season it has less competitive crop.

It also profitable crop, if farmer can collect pod from field in due time. If all the fruits ripen in same time (synchronous ripening) then farmer can collect pod in a time and get high yield. Farmer expect in such variety which fruiting in a synchronies. So researcher has need to research such variety which fruiting synchronizing and harvest maximum pod in one row. But it is noted that it is a leguminous crop then its crop residue enhance the soil health by adding nitrogen and nutrients. So its very important pulse crops and has scope to expand its cultivation throughout the country and generate the farmers income.

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