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PROFITABILITY AND VALUE ADDITION OF MUNGBEAN PRODUCTION IN BARISHAL AND PATUAKHALI DISTRICTS OF BANGLADESH

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Abstract

Mungbean is a popular pulse in the diet because it is easily digestible, free from flatulence and easy to cook. Besides as mungbean is a short duration crop, it can fit in as a cash crop between major cropping seasons. Considering the overall importance of mungbean, an extensive field survey was conducted for the assessment of profitability, value addition and constraints to mungbean production in two southern coastal districts: Barishal and Patuakhali. The study revealed that few farmers of these areas used chemical as well as organic fertilizers. The total cost incurred for mungbean production was Tk. 51850 ha^{-1} of which 50% is variable cost and the remaining 50% was fixed cost. The average return was Tk. 54143 ha^{-1}. The benefit cost ratio on variable cost basis was 2.09 but on total cost basis it was 1.04. Considering the variable cost, per kg production cost was Tk. 24.62 but on total cost basis it was estimated at Tk. 49.05 per kg. Producer share was 66% for husked mungbean and for fried packed mungbean it was 19.8% only. Disease infestation, insect attack, uneven and heavy rainfall, flash flood, unavailability of cultivating machines and inadequate labour during harvesting were found to be the major constraints to mungbean production in the study areas.

Key words: Mungbean, Profitability, Value addition, Coastal areas

Introduction

Bangladesh is a small country with a large population where agricultural sector plays a vital role in accelerating economic growth. With other crops pulses crop are playing a vital role in achieving nutritional security as well as economic profitability. It contains protein about twice as much as cereals. It also contains the amino acid lysine, which is generally deficit in food grains (Elias, 1986). Pulse grain is also used as quality feed for animals. Apart from these, the ability to fix nitrogen and the addition of organic matter to the soil are important factors in maintaining soil fertility (Senanayake *et al.*, 1987). In the existing cropping systems, pulses fit well due to their short duration, low input, minimum care required and drought-tolerant nature. Among the food legumes grown, lathyrus, lentils,

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chickpea, black gram, and mungbean are the major and they contribute more than 95% to the total pulses production in the country (Rahman, 1998). It is still widely grown in Southeast Asia, Africa, South America and Australia. Wilczek is a pulse crop that is particularly attractive for farmers in South Asia because of its short duration and decent performance under adverse climatic conditions such as heat, drought and salinity (Hanumantha *et al.*, 2016; Farnworth *et al.*, 2021). Mungbean (*Vigna radiata)* is also widely grown in Bangladesh. Mungbean is a popular pulse in the diet because it is easily digestible, free from flatulence and easy to cook. Rich in easily digestible protein (24%), mungbean adds much-needed diversity to the cereal-based diets of the poor (Thirumaran and Seralathan, 1988; Depenbusch *et al.,* 2020). Major area of mungbean is replaced by cereals (Abedin *et al.*, 1991). Now a days, it is being cultivated after harvesting of Rabi crops (wheat, lentil, etc.). As mungbean is a short duration crop, it can fit in as a cash crop between major cropping seasons. It is grown three times in a year covering 43,680 ha with an average yield of 0.78 ha^{-1} (BBS, 2007).

Mungbean is becoming popular crop in different areas due to its short duration, profitability and nutritious for human as well as for soil. Besides, mungbean is used for multi-purpose. Now a days it become a value added product. Value-chain concepts in agriculture denote an important change in thinking about development and the relationships among producers, traders, processors, and consumers (Nang'ole *et. al.,* 2011). This approach in agricultural development helps identify weak points in the chain and actions to add more value (Raj, S.P. 2011; Devaux *et al.,* 2018). It also provides valuable insights into policy formulation and implementation. (Kaplinsky, 2000). A value chain typically consists of inbound distribution or logistics, manufacturing operations, outbound distribution or logistics, marketing and selling, and after-sales service (De Silva, 2011). Dekker, (2003) noted that a value chain analysis (VCA) is a useful tool to meet the provision of information for the coordination and optimization of activities across firms in a value chain. Therefore, mungbean value chain is gaining high value day by day among the farmers and traders. Now it is essential to know the existing value chain assessment of mungbean marketing in the southern region of Bangladesh. Many people directly or indirectly related to the value-added activities which in turn creating a great opportunity for employment as well as diversified products. That is why the present study is conducted with the ground of the following objectives: i. to estimate the financial profitability of mungbean production; ii. to assess value addition at different level of mungbean production and marketing; and iii. to identify constraints of mungbean production and recommend some policy measures. The study would provide detail information on profitability, value addition, marketing system. Besides, the study would recommend some policy on the basis of the study. Very few studies were conducted on the above title and objectives in the selected study areas. Besides these, the study would be helpful for the policy maker to formulate appropriate policy and researcher to conduct further research in the same line.

Materials and Methods

The study was conducted in two coastal districts namely Patuakhali and Barishal of Bangladesh. A total of 150 respondents were selected through simple random sampling

technique where 120 were the farmers and 60 from each two districts. From the remaining 30 faria, bepari, processor and retailor werer 10, 6, 4 and 6, respectively. Data were collected through survey method using a pre- designed and pre – tested questionnaire during 2020-21. The collected data were then edited, summarized, tabulated and analyzed to achieve the objectives of the study. Tabular method of analysis using different statistical tools were used in this study.

Analytical technique

Profitability assessment

In calculating profit or loss, the cost benefit items need clarification. Farmers used both purchased and home supplied inputs in producing different corps. For purchased inputs they had to pay in cash, but for home-supplied inputs they made no cash payment. Therefore, costing of home-supplied inputs was quite difficult. To determine the relative profitability of different crops however, it was necessary to compute all the cost items which were deducted from the value of output. The input items were valued at the prevailing market rates. The output was also valued at the prevailing market rate. Purchased inputs involved out of pocket or direct expenses. Since, no payment was made for the home-supplied inputs; the costs of these inputs were estimated by using the opportunity cost principle. Per hector profitability of crop production from the view point of individual farmers was measured in terms of gross return, gross margin, net return and benefit cost ratio (undiscounted).

Computation of total cost

The total cost was calculated using the following equation:

$$TC = TVC + TFC$$

Where,

TC = Total cost (Tk./ha); TVC = Total Variable cost (Tk./ha); and TFC = Total Fixed cost (Tk./ha)

Computation of gross return

Following Dillon and Hardaker (1993), the value of produced output (main product and by-products) of farm enterprises at actual farm gate prices, together with any in-kind gifts, have been included as gross return. The following equation was used to estimate gross return (GR):

$$GR = \sum Q_y \cdot P_y + \sum Q_b \cdot P_b$$

Where,

GR = Gross return (Tk./hectare);
Q_y = Total quantity of outputs (Kg/ha);
P_y = Per unit prices of the output (Tk./Kg);
Q_b = Total quantity of the by-product (Kg/ha); and
P_b = Per unit prices of the by-product (Tk./Kg)

Derivation of gross margin

Gross margin was calculated by the difference between gross return and total paid-out costs which is expressed as:

$$GM = GR - TVC$$

Where,

GM = Gross margin;
GR = Gross return; and
TVC = Total Variable Cost.

Derivation of net return

Net return was calculated by the difference between gross margin and total imputed costs which is expressed as:

$$NR = GM - TIC$$

Where,

NR = Net return;
GM = Gross margin; and
TFC = Total Fixed cost.

Profitability Analysis

To analyze the costs and returns of the mungbean farmers, the following profit equation was used:

$$\Pi = P_y Q_y - \Sigma (P_{xi}.X_i) - \text{Other costs}$$

Where,

Π = Profit from mungbean production
P_y = Price of mungbean (Tk./kg)
Q_y = Quantity of mungbean (Kg)
P_{xi} = Price of ith inputs (Tk./Kg)
X_i = Quantity of ith inputs (Kg)
i = (1, 2, 3,…….....….., n)

Value Addition Analysis

Value addition is the total sales of a firm minus purchases of inputs from other firms. What is left is available for the wages of its employees and the profit of its owners (Black, 2008). Value additions of different stakeholders were estimated in the following way:

Value addition by stakeholders
Value addition = Gross margin – Marketing cost.
Gross margin = Sales price – Purchase price.

Producers share

Producers share is calculated using the following formula
Producers share = (Producers price × 100) / Consumers Price

Results and Discussion

Socioeconomic profile of the sample farmers

It was found that that highest percentage (47%) of farmers was in the age group of 31- 45 years followed by age group 46-60 years (33%) and up to 30 years (20%). On an average, 12% of the farmers were illiterate and others having variable levels of academic background. Among the educated farmers 49% had primary level of education, 25% had secondary level and 11% had education at SSC and 2% had education at HSC and above. Only 14% of the farmers were engaged in agriculture profession alone. The responded farmers were also involved in other business, services and hired labourer at agricultural and non-agricultural area and this involvement express the income diversification of the farmers. Average family size is 5 of which 5 in Patuakhali district 4.5 in Barishal district. In the study area, average farm size was 0.67 ha of which 0.69 ha in Patuakhali, 0.64 ha in Barishal district (Table 1).

Table 1. Socioeconomic Characteristics of the sample farmers

Characteristics	Patuakhali	Barishal	All areas
Age group (%)			
Up to 30 years	23	16	20
31-45 years	41	53	47
46-60 years	34	31	33
Above 60 years	2	0	1
Education level (%)			
Illiterate	14	9	12
Primary	50	47	49
Secondary	27	23	25
SSC	5	16	11
HSC	3	3	3
HSC and above	1	2	2
Occupational Status (%)			**0**
Agriculture	16	12	14
Agricultural + Hired labour	32	23	28
Agriculture + Business	25	38	32
Agriculture + Van/Rickshaw/Auto puller	14	21	18
Agriculture + Service	13	6	10
Family size (No.)	5	4.5	5
Average farm size (ha)	0.69	0.64	0.67
Mungbean area (% of total land)	76	71	74

Source: Author's Survey (2021).

Adoption level of mungbean varieties

In the study areas, farmers primarily cultivated two mungbean varieties: BARI Mung-6 and BINA Mung-8. BARI Mung-6 was the most widely adopted, with 68% of farmers using it. Other popular choices included BINA Mung-8 (18%), BARI Mung-8 (4%), and BINA Mung-5 (3%). Additionally, 8% of farmers replied that they used local varieties (Table 2).

Table 2. Adoption level of mungbean varieties (% of farmers responded)

Varieties	Patuakhali	Barishal	All areas
BARI Mung-6	65	70	68
BARI Mung-8	3	5	4
BINA Mung-5	5	2	3
BINA Mung-8	15	20	18
Local	12	3	8

Source: Author's Survey (2021).

Input use pattern of mungbean production

Inputs are the crucial factor in any production process. In the study areas farmers used 31 kg of mungbean seed per hectare of which 24 kg is own seed and 8 kg is purchased seed. Farmers of Patuakhali and Barishal used 32 kg ha^{-1} and 30 kg ha^{-1} respectively. Farmers used very lower level of chemical fertilizers. On an average farmers used 15kg Urea, 10.5 kg TSP and 8.5 kg MoP per hectare. Most of the farmers didn't use manure but average manure used was 35.5 kg ha^{-1}. Human labour is crucial for mungbean production process. Mungbean requires huge manpower during harvesting period. Mainly women and children involved in the harvesting of mungbean pod. They are often paid in kind ($1/5^{th}$, $1/4^{th}$, 1/3th of crop at first, second and 3^{rd} harvest respectively and sometimes in cash (Tk.10, Tk. 12. Tk. 15 per kg for 1^{st} 2^{nd} and 3^{rd} harvest respectively). However human labour information is converted into man-day/ha. Average human labour required was 52.5 man-days/ha while 64 % were family labour and remaining 36% are hired labour (Table 3).

Table 3. Input use status on mungbean production

Particulars	Patuakhali	Barishal	All Areas
Seed (kg ha^{-1})	32	30	31
Own (kg ha^{-1})	23	25	24
Purchased (kg ha^{-1})	9	7	8
Fertilizers			
Urea (kg ha^{-1})	17	13	15
TSP (kg ha^{-1})	12	9	10.5
MoP (kg ha^{-1})	8	9	8.5
Manure (kg ha^{-1})	43	28	35.5
Human labour (man-days)	54	51	52.5
Family labour (man-days)	36	31	33.5
Hired labour (man-days)	18	20	19

Source: Author's Survey (2021).

Costs and return analysis

To calculate total cost different input costs, along with opportunity cost were also included. Table 4 shows the cost and return of mungbean production. Total cost of mungbean production was Tk. 48074 per hectare where total variable cost was covered by 46.2% and remaining 53.8% was fixed cost. Among the variable cost, highest cost was incurred by

power tiller (20.3%) followed by others costs. The average yield of mungbean was 1221 kg ha^{-1}, But Mandal *et al*. observed yield was 805 kg ha^{-1} in 2021. Gross return from mungbean production was Tk. 62453 per hectare. Gross margin from mungbean production was Tk. 40247 per hectare with a net return of Tk. 14379 per hectare. Benefit cost ratio (Undiscounted) was calculated on both variable cost and total cost basis which were 2.81 and 1.30. The benefit cost ratio (BCR) on total cost basis for mungbean production was 1.30 which indicated that mungbean production was profitable. However, Islam *et al.* (2011) estimated BCR in their study as 2.19 and uddin et *al. (2021) e*stimated BCR in their study as 1.73 which were much higher than the BCR calculated in the present study. The main reason behind of lower BCR was due to higher input cost. Human labour cost was 49% of the total cost that inflated the total cost (Table 4). It should be noted here that huge labour required during harvesting period against inadequate labour supply.

Table 4. Cost and return of mungbean cultivation (Tk./ha)

Particulars	Patuakhali	Barishal	All Areas	% of total cost
Variable cost				
Hired labour	8013	8900	8457	17.6
Power tiller	9673	9873	9773	20.3
Seed (Purchased)	735	541	638	1.3
Fertilizers			**0**	
Urea	289	234	262	0.5
TSP	300	243	272	0.6
MoP	128	144	136	
Insectisides	1874	1467	1671	3.5
IOC	976	1022	999	2.1
A. Total Variable cost	21988	22424	22206	46.2
Fixed cost				
Family labour	16026	14198	15112	31.4
Seed cost (Family supplied)	1806	1931	1869	3.9
Cowdung (Family supplied)	86	56	71	0.1
Land use cost	9876	7756	8816	18.3
B. Total Fixed cost	27794	23941	25868	53.8
C. Total cost (A+B)	49782	46365	48074	100.0
Yield (Kg/ha)	1278	1163	1221	
D. Gross return	65395	59511	62453	
E. Gross Margin	43407	37087	40247	
F. Net Return	15613	13146	14379	
G. BCR on Variable cost	2.97	2.65	2.81	
H. BCR on Total cost	1.31	1.28	1.30	

Source: Author's Survey (2021).

Supply Chain of mungbean

Mungbean producer mainly sold their product to the faria and some farmers sold to a company named Euglena that used mungbean for sprouting and sold to the foreign countries specially in Japan and Netherlands. However, in the husked mungbean marketing system

following supplying chain was found in the study areas:

1. Producers - Faria - Bepari - Miller - Wholesaler - Retailer - Consumer
2. Producers - Faria - Bepari - Miller - retailer - consumer
3. Producers - Faria - Bepari - Miller - Wholesaler - Consumer

But in case of consumers product following two supply chain was found

4. Producers-Faria-Bepari-Consumer food company-dealer-Wholesaler-Retailer-Consumer
5. Producer-Faria-Bepari-Consumer food company-dealer-Retailer-consumer

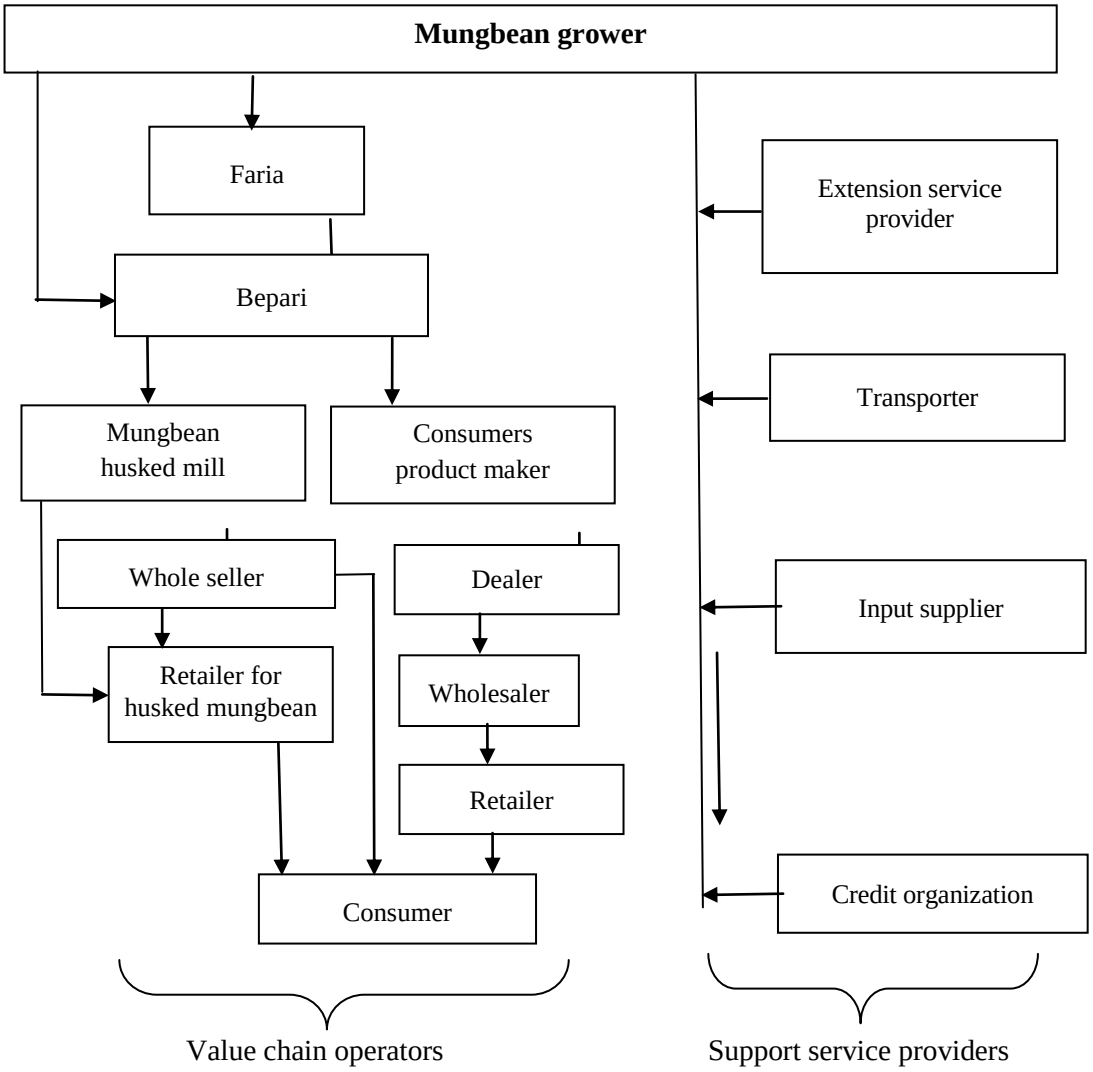

Figure 1. Value chain map of mungbean

Value Chain Map

Value chain map illustrates the way product flows from raw material to end markets and presents how the industry functions. It is a visual diagram which supports the narrative description of the chain.

Value Addition

Value addition analysis of mungbean producer

In the study area, mungbean producers sold raw mungbean. Most of the producers sold raw mungbean at the farm gate point and some farmers sold their product to the nearest market.

Marketing cost

The marketing cost represents the cost of performing the various marketing functions and operations by different agencies involved in marketing process. In other words, the costs which are incurred to move the product from producer to user are ordinarily known as marketing cost. It may involve transportation cost, storage cost, market toll, packaging cost, loading, unloading and operating labour cost etc.

Producer share of mungbean production

About 66% of the total farmers sold their product at farm-gate and remaining 34% sold in the nearby market and total marketing cost was Tk 0.54 per kg (Table 5). The production cost of mungbean producer was Tk. 24.62 per kg on variable cost and Tk. 49.05 on total cost. Average selling price was Tk 49.5 per kg to the farias. So, the net margin by mungbean producers was estimated at Tk. 24.34 per kg on variable cost and on total cost basis it was Tk. -0.09 per kg. In case of shelled mungbean producers share was 66% on but for fried packed mungbean producers share was only 19.8% (Table 5).

Marketing cost, value addition and gross margin of faria

Faria collect mungbean mainly from the farm-gate and total marketing cost incurred by farias was Tk 0.83 per kg (Table 5). Value addition by faria is shown in Table 6. Average purchase price was Tk. 49.50 per kg. Average selling price was Tk. 51.5 per kg to the bepari. Gross margin was was Tk. 2 per kg. So, the value addition by faria was estimated at Tk. 1.17 per kg (Table 5 & 6).

Marketing cost, value addition and gross margin of bepari

Bepari collect mungbean mainly from the Farias and sold to the processors/ manufacturers and total marketing cost incurred by bepari was Tk 1.72 per kg (Table 5). Value addition by bepari is shown in Table 6. Average purchase price was Tk. 51.5 per kg. Average selling price was Tk. 53.7 per kg to the Processors. Gross margin was Tk. 14.3 per kg. So, the value addition by bepari was estimated at Tk. 0.48 per kg (Table-5 & 6).

Marketing cost, value addition and gross margin of processor

Processor collect shelled mungbean mainly from the bepari and using machine they add vale by husking, packaging and sold it to the whole sellers at different areas and total marketing cost incurred by Processor was Tk. 2.6 per kg (Table 5) Value addition by Processor is shown in Table 6. Average purchase price was Tk. 53.7 per kg. Average selling price was Tk. 68 per kg to the wholesaler. Gross margin was Tk. 14.3 per kg. So, the value addition by Processors was estimated at Tk. 11.7 per kg. But for fried mungbean, the company's average purchase price was Tk. 53.7 per kg and selling price was Tk.193.5 per kg. Marketing cost was Tk. 28.7 per kg which was higher for fried mungbean as they process it through frying, packaging and facilitates marketing through carrying the product to the dealers, wholesellers and retailers (Table 5 & 6).

Marketing cost, value addition and gross margin of Wholesaler

There are two types of whole sellers in the mungbean marketing system. One group of whole sellers involved in the purchase and selling of husked mungbean and other group in fried packed mungbean. In case of husked mungbean whole sellers purchased husked mungbean mainly from the processors and sold to the retailers at different areas and total marketing cost incurred by wholesaler was Tk 0.7 per kg. Value addition by wholesalers is shown in Table 6. Average purchase price was Tk. per kg. Average selling price was Tk. 71 per kg to the wholesaler. Gross margin was Tk. 3 per kg. So, the value addition by Processors was estimated at Tk. 2.3 per kg. In the case of fried mungbean, average purchase price was Tk. 202.5 per kg and average selling price was Tk. 208.5 per kg to the retailers. Gross margin was Tk. 6 per kg and the value addition by whole sellers was estimated at Tk. 6 per kg (Table 5 & 6).

Marketing cost, value addition and gross margin of retailer

In our study retailer are the grocery shop owner who purchased both husked as well as processed fried packed mungbean from the whole sellers of both kind and sold all sort of processed mungbean to the consumers at different areas. In case of husked mungbean total marketing cost incurred by retailer was Tk. 0.7 per kg. Value addition by retailer is shown in Table 6. Average purchase price was Tk. 71 per kg. Average selling price was Tk. 75 per kg to the consumers. Gross margin was Tk. 4 per kg and the value addition by retailer was estimated at Tk. 3.3 per kg. But in case of fried packed mungbean Average purchase price was Tk. 208.5 per kg and average selling price was Tk. 250 per kg to the consumers. Gross margin was Tk. 41.5 per kg and the value addition by whole sellers was estimated at Tk. 41.36 per kg. (Table 5 & 6).

Table 5. Marketing cost of mungbean for different stakeholder (Tk. Kg^{-1})

Particulars	Producer	Faria	Bepari	Processors		Wholesaler		Retailer	
Cost items				Husked	Fried	Husked	Fried	Husked	Fried
Transportation cost	0.34	0.45	1	0	1.7	0.5		0.5	0.14
Labor cost	-	0.32	0.34	1.48	4	0.2			
Market toll	0.2			0					
Storage cost		0.06	0.08	0.07					
Operation cost				0.8	8				
Packaging cost			0.3	0.25	15			0.2	
Total marketing cost	0.54	0.83	1.72	2.6	28.7	0.7		0.7	0.14

Source: Author's Survey (2021).

Table 6. Value addition by different stakeholders on variable cost (Tk. Kg^{-1})

Particulars	Faria	Bepari	Processors		Wholeseller		Retailer	
			Husked	Fried	Husked	Fried	Husked	Fried
a. Purchase price	49.5	51.5	53.7	53.7	68	202.5	71	208.5
b. Marketing cost	0.83	1.72	2.6	28.7	0.7	0	0.7	0.14
c. Sales price of mungbean	51.5	53.7	68	193.5	71	208.5	75	250
d. Gross margin (c-a)	2	2.2	14.3	139.8	3	6	4	41.5
e. Value addition (d-b)	1.17	0.48	11.7	111.1	2.3	6	3.3	41.36

Source: Author's Survey (2021).

Constraints to mungbean production

Several factors hinder mungbean production in the study regions that are shown in Table 7. The most significant challenge cited by 95% of farmers is a labor shortage, particularly affecting harvesting, which is primarily carried out by women. Insect attacks, especially during flowering and pod formation, are a serious concern for 79% of farmers. Other issues include erratic and heavy rainfall (58%), a lack of cultivating machinery (46%), diseases (41%), flooding (35%), low prices (32%), and soil salinity (3%). These constraints significantly impact mungbean yields and farmer incomes.

Table 7. Constraints to mungbean production (% of farmers responded)

Particulars	Patuakhali	Barishal	All areas
Diseases infestation	30	52	41
Insect attack	76	82	79
Uneven rain and heavy rainfall	62	53	58
Small pieces of land	48	63	56
Salinity	5	0	3
Shortage of cultivating machine	37	55	46
Inadequate labour during harvesting	98	92	95
Low price of mungbean	26	38	32
Flash flood	38	32	35

Source: Author's Survey (2021).

Conclusion and Recommendations

Mungbean is a high protein valued crop. The demand of the mungbean is higher than local supply in Bangladesh. Producers share was higher on variable cost basis Besides, huge manpower is involved in the value addition activities. Although, mungbean is a relatively old crop in Bangladesh, it has an enormous market potential as well as its production. Mungbean can help in improving the economic status of the rural people. This study also revealed that area and production performance of mungbean was not up to the mark due to insect attack, uneven and heavy rainfall, small pieces of land, shortage of cultivating machine, inadequate labour during harvest, low price of mungbean and flash flood etc. If modern inputs and production technology can be made available to the farmers in time, yield and production of mungbean may be increased which would help the farmers to increase income and improve livelihood conditions. High yield variety of Mungbean could invented to produce more production that should be cost effective. Training, availability of inputs specially the stress tolerant variety, variety that can be harvest at once, ensure fair price of mungbean, better management of land through increased institutional and infrastructural support would help enhance mungbean production and hence help the farmers to earn more income from mungbean production.

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