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Economic Assessment of Vegetable Seeds Marketing in Rajshahi District of Bangladesh

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ABSTRACT

An efficient seed marketing system is very crucial for boosting vegetable production in Bangladesh. This study evaluated the vegetable seed marketing channels in Bangladesh including profit margins of various traders and different problems faced by them. Primary data from 45 vegetable farmers and 30 seed traders in Rajshahi district were collected by face-to-face interview. Descriptive and profitability analysis were employed, while problem confrontation index (PCI) was used to rank the problems. The findings revealed that vegetable seeds were traded through six major marketing channels. Private agents supply the majority of seeds where dealers, wholesalers, retailers and farmers were the key actors in the channels. However, rural market traders had the highest marketing margin and terminal market traders had the lowest. BCR for terminal market traders was 1.53 that is highest among the traders' categories where BCR for rural market traders was lowest (1.36). Lack of bank loan facilities, inadequate capital, lack of separate market place, and lack of technical know-how were the major ranked problems faced by traders. The study recommends providing credit facilities to the traders, arranging a separated market place and proper training to increase technical knowledge.

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Introduction

Bangladesh is an agro-economy-based developing country where the agriculture sector contributes 12.09% of the national GDP and employs 32% of the total active labor force to sustain economic and livelihood security (BBS, 2022). In agriculture, vegetables are performing as high-value crops and are crucial to Bangladesh's economic growth (Weinberger & Genova, 2005). The country produces roughly 60 distinct types of vegetables out of the more than 500 varieties grown worldwide, placing it third in terms of vegetable production behind China and India (FAO, 2019). Around 26.7 million tons of vegetables were produced in the 2018–19 fiscal year, despite the fact that rice production accounts for over 75% of the country's total cropped area and that just 7% of the cropped land is used for horticulture crops, such as root and tuber crops (DAE, 2020; BARI, 2017). Vegetable agriculture in Bangladesh takes up a very tiny proportion of cultivable land, however between the fiscal years 2013–14 and 2018–19, production of vegetables increased significantly by 37.63% (Hasan, 2020). However, the country's average daily intake of vegetables per person is 56g, compared to the daily recommended intake of 250g (FAO, 2017). Hence, the country needs to boost its vegetable production further.

Although the cost of the seed represents a mere fraction of the total cost of vegetable production in Bangladesh, it significantly influence the farmers' profitability and inadequate supply of good quality seeds is a major constraint (Husain, 2016; Akter et al., 2016; Chowdhuri et al., 2014).Quality seed, therefore, is the basic critical input upon which all other inputs will depend for its full effectiveness. However, only producing quality seeds are not enough to increase vegetable production. At the same time, an efficient distribution system is needed to ensure that seeds can reach the farmers on time, at a reasonable price, and at the right quantity. An effective marketing system is crucial for economic growth because it encourages production, prevents unneeded changes in output and pricing, lowers production costs, and equalizes

income distribution (Negasi, 2015). The goal of seed marketing is to give farmers with high-quality, enhanced seed varieties on a regular basis. If effective, seed systems can offer smallholder farmers numerous and varied advantages, such as improved food security and income, better nutrition, and increased resilience to climate stress (Kansiime et al., 2021).

Several studies related to vegetable seed marketing channels and seed traders were done in home and abroad. The study by Merrill et al. (2014) conducted research to determine how the introduction of vegetable seed mini-packets in Bangladesh influenced local farmers and their households, as well as changes that resulted in the local market system. Research on seed production and marketing tactics for underdeveloped nations was done by Nandi et al. (2013). The study showed that the lower Indo-Gangetic regions still had very low field crop seed replacement rates. Farm seed productivity, for both fields and crops, was virtually always lower than seed replacement. According to Ijang et al. (2013), the Cameroon seed industry was growing slowly but gradually, and the government had made efforts through legislation and regulations to encourage this growth with the goal of bolstering the agricultural industry and the economy as a whole. Most of the vegetable seeds on the market were brought in from other countries by commercial distribution companies. Rahman et al. (2020) did a study in Sylhet district of Bangladesh, to determine the major difficulties experienced by various value chain actors and how they perceived risk management solutions for vegetable production and marketing.

The literature reviews indicate that very few numbers of studies have been conducted on marketing system of vegetable seed especially in the Northern part of Bangladesh. This study attempts to determine the vegetable seed marketing system so that farmers can get seed at right time at right price. Moreover, many traders are also involved with seed business. But no studies have been conducted on how much profit they earn from business. This study attempts to see their profitability of business. By concentrating on the supply side, or those actors who make potential seed accessible, this article first seeks to increase understanding of local seed marketplaces. This research seeks to shed light on this group of actors and activities through a marketing channel given that local market seed is essential to smallholder seed security and that traders are the primary motivators in operating this business. The paper also draws together the marketing margin and profitability on the different types of traders working in the potential seed business. A third aim is to explore the challenges of seed traders which they face doing their business. Traders are one core of overall farmer seed supply and perhaps, the backbone for the socially vulnerable, geographically remote farmers, and for those residing in conflict and fragile state areas.

Materials and Methods

Sampling Procedures and Data Description

The primary data from different respondents were obtained where a multistage sampling technique was used to select the samples. This study purposively selected the Rajshahi district due to the higher proportion of vegetable farming (BBS, 2020). There were two types of respondents for this study, i.e., vegetable growers and vegetable seed traders. Forty-five vegetable growers from three selected *Upazilas* namely Paba, Puthia and Bagha, were selected who produced tomato, cauliflower, and brinjal. A total of 30 vegetable seed traders were selected from the list collected from the *Upazila* Agriculture Offices using simple random sampling where the secondary market of three *Upazilas*. In this study, three vegetables named tomato, cauliflower, and brinjal were selected for the study as their production was higher than all other vegetables in the year of 2019-20 (BBS, 2020). This region was chosen purposively as vegetables like tomato, cauliflower and brinjal are extensively grown. To collect in-depth information from each stakeholder/actor category, purposive random sampling was done. Each of the members of every category was interviewed face-to-face. Although purposive sampling was conducted, an attempt was made to collect data from a wide range of actors in each category to avoid bias in samples. Secondary data were also obtained from various sources. Secondary data were collected from the Bangladesh Bureau of Statistics (BBS), Upazila Agriculture Offices, journals, articles and relevant literature. Prior to the final survey, a draft interview schedule was developed and pretested with a few farmers and traders. The schedule was then modified according to the objective. The final interview schedule included farmers' socioeconomic information, different marketing channel, marketing cost and return data, profitability analysis of vegetable seed traders, and their challenges.

Analytical Techniques

The study used a mixed research design approach using both qualitative and quantitative methods. Qualitative data were first coded and converted into quantitative in order for them to be computed. Statistical Package for Social Science (SPSS) was used for analyzing the data. The analysis's final results were compiled into tabular form, along with its insightful interpretations.

Marketing Margin

To determine the marketing margin, the following formula was used (Hafeez et al., 2001).

$$MM_{aw} = \frac{\sum(P_{si} - P_{pi})Q_i}{\sum Q_i}$$

Where,

Q_i= quantity purchase/sale of ith variety seed

P_{si}= Sale price of the ith variety seeds

P_{pi}= Purchase price of the ith variety seeds

i=1,2,3……n

MM_{aw}= Weighted average marketing margin.

Profitability Analysis

This study estimated the profitability of vegetable seed business, from the view point of individual traders, was measured in terms of gross return, net return and benefit cost ratio (undiscounted). Different parameters of the vegetable seed agribusiness were calculated using the formula below. The total of all sales invoices was added to determine the gross return (GR), which did not include

operating costs, cost of products sold, tax payments, or any other charges. All costs were subtracted from the gross return to determine the net return. An undiscounted benefit-cost ratio (BCR) was also estimated in this study by using the following equation:

Benefit cost ratio (BCR) = Gross return/ Gross cost

Problem Confrontation Index (PCI)

The dealers encountered a number of issues when conducting business. The traders were asked for their thoughts on nine problems that had been picked out throughout the data collection phase. A respondent's problem score was calculated using a four-point rating system to develop problem confrontation index (Saha et al., 2022; Hoque et al., 2021). Each trader was asked to rate the level of difficulty of each challenge by selecting one of the four options: "high," "medium," "low," or "not at all." These replies were given weights of 3, 2, 1, and 0 accordingly. As a result, the problem confrontation score was calculated by summing the weights of the problems' responses and therefore, PCI of any problem could range from 0 to 90, 0 indicating no problem confrontation and 90 indicating high problem confrontation (Hossein and Miah, 2011). For making rank order, Problem Confrontation Index (PCI) was computed as used by Hossein and Miah, 2011. The PCI was computed by using the following formula:

$$PCI=(P_H\times3)+(P_M\times2)+(P_L\times1)+(P_N\times0)$$

Where,

P_H = Total number of traders expressed problem as high;
P_M = Total number of traders expressed problem as medium;
P_L = Total number of traders expressed problem as low; and
P_N = Total number of traders expressed problem as not at all.

The nine problems' computed PCIs, which were ranked according to their problem indices, ranged from 35 to 69 (as opposed to a feasible range of 0 to 90).

Result and Discussion

Marketing Channel of Vegetable Seeds

A marketing channel is effective when the appropriate goods are supplied to the appropriate customers in time for purchases. Vegetable seed does not follow the normal channel of any crop marketing, i.e., producer/farmer to consumer. A number of peculiarities in the marketing of vegetable seeds have been observed in this study that there found no vegetable seed producer to have sold their seeds to the consumer directly. The distribution of vegetable seeds at both wholesale and retail levels was fully carried out by the free market agents. In the distribution of vegetable seeds, six different channels were identified as follows-

Channel 1: Dealer-Wholesaler-Retailer-Farmer
Channel 2: Dealer-Wholesaler-Farmer
Channel 3: Dealer-Retailer-Famer
Channel 4: Retailer-Farmer
Channel 5: Wholesaler-Farmer
Channel 6: Dealer-Farmer

It is shown in Figure 1 that how the seeds reach the farmer. Dealers collected 94 percent of seeds from the private agents of seed companies, and the rest 6 percent were local collection. Dealers sold 5 percent of the seeds directly to the farmers. The rest of the seeds were sold to wholesalers and retailers. Wholesalers sold 32 percent of the seeds directly to the farmers. A large amount of seeds were passed through channel-1. The highest percentage of seeds had reached the farmers through this channel. However, Mallick et al. (2018) also revealed that major proportion of the vegetable seeds in Bangladesh were supplied by seed companies. The figure shows the ways how the traders collected and distributed the seeds.

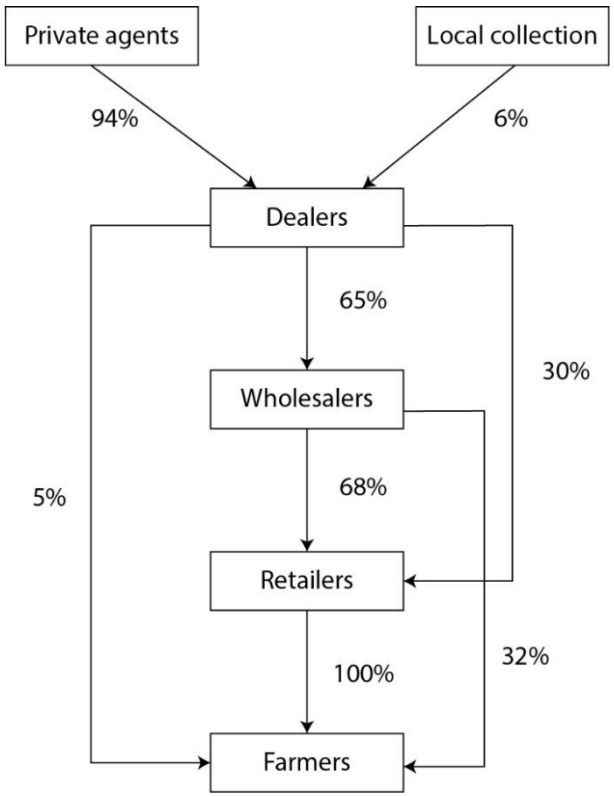

Figure 1. Vegetable seed supply chain network system from dealer to the farmer

In the business of selling vegetable seeds, the dealers made up a larger group. They were the primary buyers of seeds from the seed company's private agents. The seed company fixed up a particular rate to sell seeds to the dealers. Dealers either sold seeds directly to farmers or to wholesalers and retailers. They received a commission from seed firms based on the quantity of seeds sold at the end of the year. The wholesalers were prominent seed traders as well. Most of the seeds they collected came from the sellers. They either sold it to farmers directly or to retailers. The retailer bought seeds from wholesalers or dealers and distributed them directly to farmers. The findings are consistent with Mallick et al. (2018).

Profitability of Vegetable Seed Traders

Table 1 represents the information related to the cost associated with delivering goods or services to customers. It reveals that the transport cost of TMTR, SMTR, and RMTR was Tk. 4.07/kg, Tk. 1.88/kg, and Tk. 0.73/kg, which were 44 percent, 39 percent, and 24 percent of total

marketing cost, respectively. Transportation cost occupies the highest proportion among the cost items which also found in the study by Mustafiz et al. (2021). In case of SMTR and TMTR, loading and unloading cost was not applicable as they carried a very small quantity of a product by themselves. The rural market traders (vendors) had to pay some tax known as "market toll" to the market committee for doing business in the hat. Market tolls of RMTR were Tk. 0.29/kg, which was 10 percent of total marketing cost. Traders used polythene bags for selling locally produced seeds. Packing cost of TMTR, SMTR and RMTR were 7 percent, 5 percent and 15 percent of total marketing cost respectively. The terminal market traders and the secondary market traders had warehouse for the storage of seeds. Storage cost of TMTR and SMTR was 13 percent and 18 percent of total marketing cost respectively. The rural market traders had to give some donations to the name of market associations and other organizations. Subscription cost of RMTR was Tk. 0.13/kg which was 4 percent of total marketing cost. The personal cost of TMTR, SMTR and RMTR were 11 percent, 17 percent and 20 percent of total marketing cost respectively. Sometimes the trades had to entertain buyers with food, tea, cigarettes and snacks etc. Miscellaneous cost of TMTR, SMTR and RMTR respectively 18 percent, 21 percent and 27 percent of total marketing cost respectively. the average total cost of marketing varied from traders to traders. In secondary market, the marketing cost was Tk. 3.01/kg in the rural market which was the lowest. Marketing cost incurred in the terminal market was found to be the highest than of other two different traders.

Table 1. Marketing cost of vegetable seeds

Items	TMTR(Tk./kg)	SMTR(Tk./kg)	RMTR(Tk./kg)	Total cost(Tk./kg))
Transport	4.07(44)	1.88(39)	0.73(24)	6.68(39)
Loading and unloading	0.62(7)	-	-	0.62(4)
Market tolls	-	-	0.29(10)	0.29(2)
Packing	0.66(7)	0.22(5)	0.46(15)	1.34(8)
Storage	1.23(13)	0.83(18)	-	2.06(12)
Subscription	-	-	0.13(4)	0.13(1)
Personal cost	1.03(11)	0.80(17)	0.6(20)	2.43(14)
Miscellaneous	1.57(18)	1.00(21)	0.8(27)	3.37(20)
Total	9.18(100)	4.73(100)	3.01(100)	16.92(100)

Note: Values in the parentheses indicate the percentage. TMTR= Terminal Market Traders; SMTR= Secondary Market Traders, and RMTR= Rural Market Traders

Table 2. Marketing margin of Tomato, Cauliflower & Brinjal seed business (Tk./kg)

Types of Traders	Marketing margin of Tomato seed business			Marketing margin of Cauliflower seed business			Marketing margin of Brinjal seed business		
	Sale price	Purchase price	Marketing margin	Sale price	Purchase price	Marketing margin	Sale price	Purchase price	Marketing margin
TMTR	28541	23341	5200	19970	16566	3404	6330	5255	1075
SMTR	35962	28541	7421	25013	19970	5043	7423	6330	1093
RMTR	49931	35962	13969	33000	25013	7987	10021	7423	2598

Note: TMTR= Terminal Market Traders; SMTR= Secondary Market Traders, and RMTR= Rural Market Traders

Table 3. Average marketing margin of vegetable seed business at different markets (Tk./kg)

Types of Traders	Purchase Price (A)	Marketing cost (B)	Sale price (C)	Price spread (C-A)	Net benefit [C-(A+B)]	Profit as percent of investment
TMTR	15054	9.18	18280.33	3226.33	3217.15	21.37
SMTR	18280.33	4.73	22799.33	4519	4514.27	24.69
RMTR	22799.33	3.01	30984	8184.67	8181.66	35.89

Note: TMTR= Terminal Market Traders; SMTR= Secondary Market Traders, and RMTR= Rural Market Traders

It is evident from Table 2 that in the terminal market, traders purchased tomato seeds at Tk.23341/kg and sold it to the secondary market at Tk. 28541/kg. Thus, the terminal market traders got a weighted average margin of Tk. 5200/kg. Similarly, secondary market traders sold it to the rural market retailer at Tk. 35962/kg and earned TK. 7421/kg as weighted average margin. Finally, the rural retailer sold tomato seeds to the farmer in the study areas at Tk. 49931/kg and obtaining Tk. 13969/kg as weighted average margin.

In the secondary market, traders purchased cauliflower seeds at Tk.16566/kg and sold them to the secondary market at Tk. 19970/kg. Thus, the terminal market traders got a weighted average margin of Tk. 3404/kg. Similarly, secondary market traders sold it to the rural market retailer at Tk. 25013/kg and earned TK. 5043/kg as weighted average margin. Finally, the rural retailer sold cauliflower seeds to the farmer in the study areas at Tk. 33000/kg and obtaining Tk. 7987/kg as weighted average margin.

In rural market, traders purchased brinjal seeds at Tk.5255/kg and sold it to the secondary market at Tk. 6330/kg. Thus, the terminal market traders got weighted average margin of 1075/kg. The secondary market traders sold it to the rural market retailer at Tk. 7423/kg and earned TK. 1093/kg as weighted average margin. Rural retailers sold brinjal seeds to the farmer in the study areas at Tk. 10021/kg and obtaining Tk. 2598/kg as weighted average margin.

When all categories of vegetable seeds were considered, the gross average weighted marketing margin was Tk. 3226.33/kg for terminal market traders. It was Tk. 4519/kg for secondary market traders and Tk.8184.67/kg for rural market traders (Table 3). It was observed from Table 3 that the terminal market traders purchased vegetable seeds at an average price of Tk. 15054/kg and after spending Tk. 9.18/kg as marketing cost and sold it to the secondary market at Tk. 18280.33/kg. They received Tk. 3217.15/kg as a net benefit. Secondary market traders spent Tk. 4.73/kg as marketing cost and sold to rural market traders at Tk. 22799.33/kg and obtained Tk.4514.27/kg as a net benefit. The rural market traders spent TK. 3.01/kg as marketing cost and sold it to farmers at Tk. 30984/kg and obtained Tk. 8181.66/kg as net benefit. Among the net benefits earned by the different traders, it reveals that rural retailer got the highest benefit of Tk. 8181.66/kg, which was 35.89 percent of investment and terminal market traders obtained the lowest benefit of Tk. 3217/kg, which was 21.37 percent of an investment. These results are higher than Ray et al. (2001).

Table 4 represents the information related to the cost, return, and profit of vegetable seed traders. The traders are categorized on the basis of terminal markets of the Rajshahi division. It reveals that the purchase cost was the major cost items for the vegetable traders. Purchase cost of terminal market traders, secondary market traders and rural market traders was almost 95 percent, 93 percent and 91 percent of total cost respectively which is much higher than any other cost. The second most cost for terminal market traders and secondary market traders was the salary of employees. It is noteworthy that this item was totally absent in rural market traders. The next high cost for all of them was rent of shop. The marketing cost was occurred by all these three traders and had a remarkable contribution. The storage facilities were required for terminal market traders and secondary market traders while this cost was unnecessary for rural market traders. Another cost namely interest on operating capital was occurred by all of them. Besides, there were several costs which had a little contribution in total cost i.e.; Depreciation cost, Electricity bill, Tax and Miscellaneous cost. The total cost was highest for terminal market traders (about Tk. 10840367) and lowest for rural market traders (about Tk. 6310110). The highest gross return was achieved by the traders at terminal markets (Tk. 16561111) while rural market traders had the lowest (Tk. 859167). However, BCR for traders at terminal, secondary and rural markets is estimated at 1.53, 1.45 and 1.36, respectively. Hoque and Haque (2014) found similar results for rice seed.

Challenges Faced By Vegetable Seed Traders

The trader's perceptions of major sources of challenges were summarized by selecting 9 problems that were identified during the data collection period. A four-point rating scale was used for estimating the problem score of a respondent, and Problem Confrontation Index (PCI) was computed for ranking the challenges, as used by Hossein and Miah (2011). The results are presented in Table 5.

The majority of the traders pointed out that lack of bank loan facilities was the main problem in the vegetable seed business. Maximum traders confronted this problem in the study areas; hence was considered as the 1st ranked problem. A good number of traders pointed out that inadequate capital was one of the important problems in the study area and was considered one of the major ranked problems. Lack of a separate marketplace was considered as one of the top-ranked problems confronted by the traders, with PCI 59 against as a possible range 0 to 90. Lack of technical know-how of seed handling was considered as the next rank problem confronted by the traders. Seed traders felt to have adequate technical knowledge on seed processing and handling, but they did not have such knowledge. According to ascending order, several more Marketing constraints of vegetable traders in Bangladesh through analysis of the received data from respondents are Lack of storage facility, Lack of good quality seeds, Loss arising from unsold seeds, subscription, and Higher market toll. Similar constraints were reported by Ray et al. (2001), Mallick et (2018) and Mustafiz et al. (2021).

Table 4. Profitability of vegetable seed traders for last year

Item	TMTR	SMTR	RMTR
	Amount(Tk.)	Amount(Tk.)	Amount(Tk.)
A. Cost Items (For last year)			
Purchase cost	10267889(95)	3754667(93)	575641.70(91)
Rent of shop	98000.00(0.9)	61777.78(1)	16666.67(3.15)
Salary of employees	140000.00(1)	71333.33(2)	-
Depreciation cost	24444.44(0.22)	13333.33(0.33)	3750.00(0.65)
Electricity bill	25255.56(0.23)	13933.33(0.4)	2833.33(0.5)
Storage	54222.22(0.5)	28400.00(0.75)	-
Tax	56666.67(0.52)	29555.56(0.8)	3583.33(0.7)
Marketing cost	83666.67(0.8)	37822.22(0.94)	13468.33(2)
Interest on operating capital	76000.00(0.70)	28444.44(0.70)	6666.66(1)
Miscellaneous	14222.22(0.13)	3111.111(0.08)	7500.00(1)
B. Gross Cost	10840367.00(100)	4042378.00(100)	630110(100)
C. Gross Return	16561111.00	5866667.00	859166.70
D. Net Return (C-B)	5720744.00	1824289.00	229056.70
BCR(C/B)	1.53	1.45	1.36

Note: Values in the parentheses indicate the percentage. TMTR= Terminal Market Traders; SMTR= Secondary Market Traders, and RMTR= Rural Market Traders

Table 5. Traders' problem confrontation along with rank order

Problems	The extent of problem confrontation				PCI	Rank order
	High (3)	Medium (2)	Low (1)	Not at all (0)		
Lack of bank loan facilities	12	15	3	0	69	1
Inadequate capital	13	10	7	0	66	2
Lack of separate market place	12	9	5	4	59	3
Lack of technical know-how of seed handling	10	11	4	5	56	4
Lack of storage facility	8	7	10	5	48	5
Lack of good quality seed	6	9	8	7	44	6
Loss arising from unsold seeds	4	7	13	6	39	7
Subscription	6	7	5	12	37	8
Higher market toll	5	6	8	11	35	9

Conclusion

This study assessed the vegetable seed marketing channels, profit margins of various traders and different problems faced by them. To achieve objective, primary data were collected from farmers and traders involved with tomato, cauliflower and brinjal seed marketing in Rajshahi district of Bangladesh. The results revealed that private agents are the main supplier of vegetable seeds. Besides, other actors in the marketing channel include dealers, wholesalers and retailers where farmers are the customers. Six major vegetable seed marketing channels were identified. However, farmers are unable to grow enough vegetable seeds on their own. The absence of technology, knowledge, and financing are critical problems. The existence of middlemen is undeniable given the state of the infrastructure, but it's important to improve the economic climate so that farmers can produce vegetable seeds at their own discretion and so they have more negotiating power when buying and selling supplies. Transportation and storage are the major cost item for the traders. For all the three vegetables seed, rural market traders had the highest marketing margin and terminal market traders had the lowest. However, BCR for terminal market traders was 1.53 that is highest among the traders' categories where BCR for rural market traders was lowest (1.36). Among the various problems faced by traders, the identified major ones are lack of bank loan facilities, inadequate capital, lack of separate market place, and lack of technical know-how of seed handling. The study suggests providing credit facilities to the traders, especially rural market traders as they had low BCR in spite of higher marketing margins. Coordination between the public and private sectors is also crucial. Besides, a separated market place should be arranged and proper training to increase technical knowledge of traders should be ensured.

Conflicts of Interest

The authors declare no conflict of interest.

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