

MARKET DYNAMICS AND GRADING CHALLENGES OF MAIZE IN BANGLADESH: A CASE STUDY OF RANGPUR

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ABSTRACT

Demand for maize in Bangladesh is increasing day by day for its diversified use in poultry, fish, and animal feed, processed foods, and export markets. The present study deals with the maize marketing system in Rangpur district with a focus on different categories of intermediaries that participate, and the determination of problems associated with the marketing process. The current study was undertaken in 2024 through face-to-face interviews with 30 maize producers, 40 intermediaries, and five feed millers. Seven marketing channels were clearly identified, involving the following as intermediaries: Farias, Beparis, Wholesalers, and Wholesaler-cum-Aratdars. Profit margins varied across channels. The producer-to-feed miller channel earned a profit of BDT 286, while the producer to wholesaler-cum-aratdar to feed miller channel earned a profit of BDT 503, respectively. Similarly, per maund (40 kg) marketing cost also varied from BDT 145 to BDT 173 in the marketing channels. Beparies obtained the highest return because of their end-to-end processing of maize. The marketing challenges were price fluctuations and nutrient-based grade disparities, to meet the same Metabolism Energy (ME) requirement using Grade B maize, an additional Tk. 22 per maund is incurred. Furthermore, the crude protein analysis demonstrates that balancing the CP content equivalent in one maund of feed requires an additional Tk. 186 when using Grade B maize compared to Grade A maize. This study has pointed out a remarkable influence of marketing channels on profit margins and feeding production costs of feed millers. It suggests focusing on the intermediaries for overcoming the existing marketing challenges and optimizing the maize grading for efficient and cost-effective feed production.



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I. INTRODUCTION

Maize, although not yet a staple food grain in Bangladesh, holds the position of the third most important cereal crop after rice and wheat (BWMRI, 2023). The country's maize production reached 5.63 million tons in the 2021-22 fiscal year, cultivated over 0.55 million hectares, while the annual demand stands at approximately 7.0 million tons. This production surge, with an average yield of 10.2 tons per hectare, has been driven by the adoption of hybrid varieties and improved crop management practices (BWMRI, 2023). The rising demand for maize in Bangladesh stems from its versatile applications, including its use in poultry, fish, and animal feed, processed foods, and export markets. Despite its growing significance, the disparity between maize production and demand underscores the necessity of continuous innovation in cultivation techniques and market systems. The Bangladesh Wheat and Maize Research Institute (BWMRI) plays a pivotal role in addressing these challenges through the development of high-yielding, stress-tolerant varieties that align with existing cropping systems. Maize cultivation in Bangladesh dates back to the 19th century, with Rangpur and Dinajpur districts being notable early adopters (Begum & Khatun, 2006). Presently, maize contributes significantly to the agricultural economy, with agriculture accounting for 11.66% of the national GDP (BBS, 2024). A robust agricultural marketing system is essential to sustain equitable prices for farmers, promote production, and ensure fair returns for producers (Dimitri and Gardner, 2019). However, the involvement of multiple intermediaries, including Farias, Beparies, Wholesalers, and Wholesaler-cum-Araddars, often leads to price inefficiencies and producer exploitation.

Marketing system may be thought of as the connecting link between specialized producers and consumers (Sung, 2019). Marketing channels and their activities held by channel members such as handling, storage, and transport of products, essential for connecting producers with consumers (Dorward *et al.*, 2008). The marketing channel is the trade or distribution channel and it is defined by (Palmatier *et al.*, 2019) as sets of interdependent organizations involved in the process of making a product or service available for use or consumption. The channel follows a vertical structure where products flow from producer to the ultimate consumer and in which actors meet each other at markets. Producers, Farias, Beparies, Wholesalers and Wholesaler-cum-Araddar exist in the channel arrangements to perform marketing functions that contribute to the product flow. Actors stood between producers and final users are known as intermediaries. An increase in production of food would be meaningless, if the producer cannot transfer the product to the consumer at price, which represents a fair remuneration to the producer and within the consumers' ability to pay. In Bangladesh where agriculture is the principal economic activity, this factor becomes even more important. An efficiently organized agricultural marketing system not only facilitates proper and smooth disposal of what the farmer produces but also acts as a catalyst to stimulate increased production. So, an efficient marketing system is essential for the producer as intermediaries.

The U.S. Congress passed the Grain Quality Improvement Act in 1986, aiming to standardize grain quality to promote trade, assess storability, and provide accurate information for evaluating yield and quality (Lu *et al.*, 2025). Maize quality varies due to factors like genetics, soil, climate, and management practices, making consistency in grading crucial for market stability. Producers often mix maize from different fields, limiting their control over quality. Discounts in grain buying indicate the desired quality. Grain standards are based on factors that provide the most valuable information to buyers, and grading influences marketing pricing strategies (Hill, 2021). The existing literature highlights the critical role of maize as a staple

crop and its significance in agricultural economies worldwide. Studies such as Akhter and Hafiz (2015) and Basera *et al.* (2016) have examined maize marketing systems in Bangladesh and Zimbabwe, respectively, emphasizing the impact of organizational inefficiencies and profitability determinants on smallholder farmers. Research by Venkannanvara *et al.* (2019) and Chakma *et al.* (2021) focuses on maize production and marketing challenges, including high transportation costs, limited market access, and inefficiencies in value chains. Similarly, Kausar and Alam (2016) and Minithra (2019) underline the need for infrastructure improvements, market linkages, and policy interventions to enhance efficiency and profitability. Innovations in storage technologies and grading systems, as discussed by Chuma *et al.* (2020) and Paulsen *et al.* (2019), further demonstrate opportunities for improving maize marketing outcomes. Despite these findings, the scope for maize grading in Bangladesh remains underexplored, presenting a unique opportunity for advancing the sector and fostering sustainable agricultural development.

This study focuses on analysing the maize market system in the Bangladesh more specifically in rangpur district, with an emphasis on identifying key market participants, marketing channels, costs, profit margins, and grading practices. The findings aim to identify strategies that enhance farmer profitability while maintaining market stability. Grading, in particular, plays a critical role in improving market opportunities for maize. Currently, a limited number of farmers engage in grading, highlighting the need for interventions to promote this practice and ensure higher returns. By addressing these critical aspects, this research seeks to contribute to the understanding and optimization of the maize market system in Bangladesh, fostering sustainable agricultural development and economic growth.

II. MATERIAL AND METHODS

2.1 Selection of the Study Area

The choice of area for a business survey depends on the specific purpose and potential cooperation from local farmers. For farm management studies, relevant data must be gathered from the selected region. This study focused on the maize marketing system in Rangpur district, Bangladesh, which was purposively chosen due to its growing popularity of maize cultivation (Roy *et al.*, 2017). The district consists of eight upazilas, all of which cultivate maize to varying extents, making it an ideal location for gathering market information.

2.2 Selection of Sample and Sampling Technique

These would include factors affecting the accuracy and reliability of data, such as sample size and variability, which can be controlled through the use of proper sampling techniques. The ultimate goal is to formulate an effective, yet low-cost, sampling plan that would not only minimize variability but also consistently yield estimates of comparable quality (Barnett, 1991). Sampling involves the selection of a group, smaller in size, to represent the larger group or population. In research, sampling is necessary because it saves time and resources compared to surveying the whole population. In this study, the target population was maize growers. To get a representative sample size, all maize traders were interviewed. Purposive sampling was used because of the limited availability of samples. This technique was, therefore, applied to select maize traders from different stages of the marketing system. Altogether 40 maize traders were selected from different markets in the Rangpur district. The sample also included 30 maize producers and 45 other actors comprising Farias, Beparis, Wholesalers, Wholesaler-cum-Aratdars, and Feed Millers.

2.3 Period of Data Collection

In this study, a survey technique was employed to collect data, with a questionnaire developed after reviewing existing sources and literature review. The questionnaire was tested and refined to ensure its relevance and effectiveness in the field. Primary data were collected from maize traders during June and July 2024, a period when maize is widely available in Bangladesh due to its year-round cultivation. The researcher conducted face-to-face interviews with selected farmers, ensuring minimal disruption to their work. The accuracy and reliability of the data were crucial to the success of the survey.

2.4 Analytical Techniques

The collected data were analysed using excel software. Descriptive statistics and marketing cost were used in analysing the data collected.

Marketing margin: The absolute margin of the middleman, wholesaler, trader and retailers were determined by the following formula

$$MM = SP - PP \text{ ----- (1)}$$

Where, MM= Marketing margin, SP= Selling price, PP= Purchase price

The cost of marketing was calculated and the low-cost marketing chain was ranked I and that which was the highest cost as the last. The same approach was followed in ranking the margin of middlemen in each chain.

Net marketing margin (NMM = Marketing margin (MM) – Marketing cost (MC)

Percentage Margin = (Net marketing margin / Selling price) × 100

Return on Investment (ROI) = (Net Return / Cost of Investment) × 100

Cost of investment = purchase price + marketing cost

III. RESULTS AND DISCUSSION

3.1 Marketing Channel of Maize

Marketing channels are the routes through which maize moves from the producers to the ultimate consumers. There are also a number of intermediaries involved in these channels. These channels involve successive links from producers to Farias, Beparis, Wholesalers, Wholesaler-cum-Aratdars, and Feed Millers. In Bangladesh, maize trading is seasonal, but a small quantity is supplied throughout the year. This keeps both the seasonal and permanent traders in business. Figure 1 shows the different common maize marketing channels of the study areas. Maize moves from the producers who sell to the intermediaries either at farm gates or at local markets, while progressing through successive stages of drying and grading and other value addition chains before the commodity reaches its terminal consumers.

The various intermediaries in maize marketing assume different roles and business models. Producers initiate the chain for marketing of maize through selling maize through various intermediaries at farm-gate level or local marketplaces. The purchases of maize produced by producers, Farias without permanent staff and storage facilities are selling to Beparis and Wholesalers mainly with reliance of Mahajan finance. Beparis are large traders buying maize

from Farias and producers and selling it to Wholesalers, Wholesaler-cum-Aratdars, or Feed Millers. They are partly self-financed and supplemented with loans by NGOs and banks. The wholesalers have storage facilities and a permanent staff that is able to carry out the high-volume trade of maize. Wholesalers receive maize supplies directly from the producer or through Farias or Beparis, delivering directly at their storage facility. Wholesaler-cum-Aratdars in district markets are the last agents before Feed Millers. They undertake the functions of drying, cleaning, and packaging under the major determinants of Feed Millers' requirements. Feed Millers are the terminal buyers of maize, and they process the produce into various types of feed. They buy stocks during peak season to keep the mills operational throughout the year and use both seasonal and permanent labourers for procurement and processing.

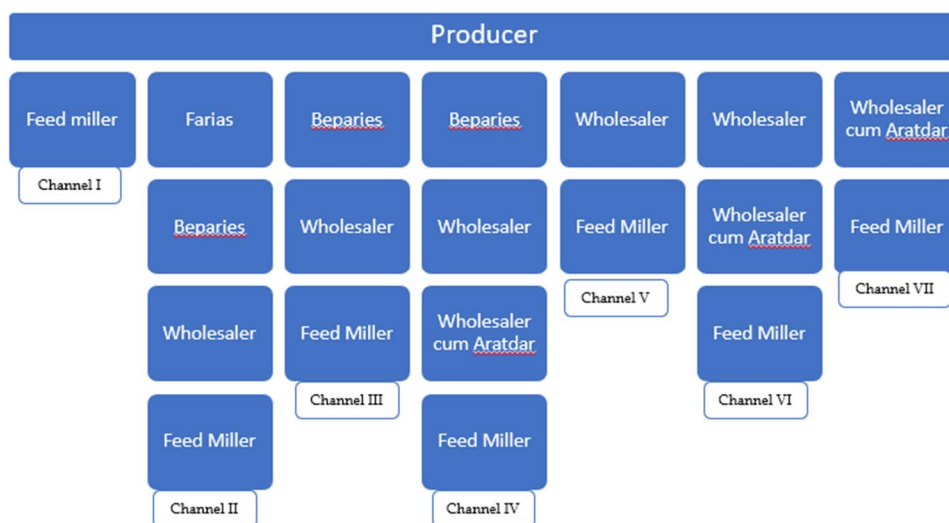


Figure 1: Marketing Channel of Maize

Table 1: Buying and Selling (% of Total) of Maize by Different Intermediaries

Intermediaries		Producer	Farias	Beparis	Wholesaler	Wholesaler-cum-Aratdar	Feed miller
Purchased from	Farias	100					
	Beparis	85	15				
	Wholesaler	44	21	35			
	Wholesaler cum Aratdar	23	4	23	50		
Sold to	Farias			28	48	24	
	Beparis				89	11	
	Wholesaler					93	7
	Wholesaler cum Aratdar						100

Source: Authors own computation from field survey.

The Farias bought the entire volume of maize from producers and sold it to Beperis, wholesalers, and wholesaler-cum-Aratdars at prices that marked up by 28%, 48%, and 24%, respectively (Table 1). The Beperis purchased 85% of their maize from Farias while 15% was sourced directly from producers. They sold to wholesalers 89% and wholesaler-cum-Aratdars 11%. The wholesalers purchased the maize from different sources: 44% from producers, 21% from Farias, and 35% from Beperis. They sold to 93% wholesalers and 7% feed millers. Wholesaler-cum-Aratdars sourced maize from the following sources: producers (23%), Farias (4%), Beperis (23%), and wholesalers (50%). It sold the whole volume of maize to feed millers. All middlemen involved in the purchase and sale of maize used open bargaining to determine prices depending on the grading and quality of the maize. The producers have low bargaining powers because they cannot maintain consistent quality and also have immediate cash needs.

3.2 Financing of Maize

The source of finance for Producer, Farias, Beperis, Wholesaler, Wholesaler-cum-Aratdar and Feed miller in the study area were shown in the table 2. In the study area 100% of the producer were self-financed. Intermediaries complained that they do not have enough credit in time of their need and they are complained Banks and NGOs also about high interest rates. Sometimes they took loan from bank to their business but loan is not available for all.

Table 2: Sources of Finance (percentages)

Intermediaries	Sources of capital (%)				
	Own fund	Bank	NGO	Relatives and Friends	Mahajan
Producer	100				
Farias	59		30		58.33
Beperis	64.5	41.67	51.67	37.5	
Wholesaler	68.33	55			
Wholesaler-cum Aratdar	55	41.66	25	50	
Feed miller	62.5	50			

Source: Authors own computation from field survey.

3.3 Transportation of Maize

Transportation plays a crucial role in the functioning of modern marketing systems, providing producers with place convenience and enabling effective market operations. In the study area, producers transported maize using both vans and bicycles. Farias used vans and pick-up vans to promote and deliver their maize. Since maize cultivation occurred in scattered locations across the upazila, farmers relied on vans to transport maize from their fields to nearby markets. Beperis and wholesalers used pick-up vans to transport maize to terminal markets, while vans were commonly used for delivery to village markets. Aratdars employed trucks for transporting maize to feed mills, as the main roads were suitable for such vehicles. For long-distance transportation to feed mills, both trucks and pick-up vans were used, ensuring efficient movement of goods.

3.4 Drying, Cleaning, and Processing of Maize

Most of the producers sold raw maize directly to intermediaries after harvesting. However, a few of them sun-dried and cleaned the maize in their own farms with the help of family

members in 2–3 days before storing it in sheds until the time of sale. The maize was packed either in plastic or jute sacks for transportation to market. Farias purchased raw maize from the producers, and a few of the producers dried and cleaned it before selling it to wholesalers or Aratdars. Beparis also dried and cleaned maize in their premises or at places specially meant for it like Chatal, with the assistance of seasonal or regular laborers and sold the same to Wholesalers, Aratdars, or feed mills. These wholesalers, within the study area, very often engaged in the whole value chain: buying, drying, cleaning, and processing, up to selling to Aratdars or feed mills. Aratdars would specifically prepare the product, dry it, sanitize it, and package it for resale to feed mills. They preferred to use jute sacks stitched together and tied with jute ropes. These processes were done with dedicated labor so that the quality standards could be kept.

3.5 Storage, Packaging, and Grading of Maize

Storage is that vital marketing function which creates time utility between the points of production and consumption. Most of the producers, as well as Farias, avoided storing the maize whereas a few kept it stored temporarily for future sales. Many Beparis and wholesalers commonly store maize either in their shops or godowns whereas Aratdars keep them in their godowns for many months to ensure better prices for their produce. For packaging, Farias, Beparis, and wholesalers used plastic and jute bags, while Aratdars preferred jute sacks. Plastic bags, holding 60 to 70 kg of maize, cost Tk. 15 to 20 per bag, while jute sacks, capable of holding 75 to 80 kg, cost Tk. 30 to 35 per bag. Although more expensive, jute sacks were preferred for storage and transportation since it is stronger in case of grading, it is important as this separates the product into lots which possess similar qualities, and facilitates an easy way of selling and determining its price. Intermediaries in Rangpur district grades maize by size and colour and even moisture content. Grading was generally done into two to four categories-A, B, C, D-though some intermediaries mentioned grading up to seven or eight categories. In any case, the key rationale for grading was to ensure easier sales and justify higher prices.

3.6 Market Information and Price Determination

Market information is a vital facilitating role that determines marketing decisions on volumes of purchase, sales, and price. An efficient market information system is central to agricultural marketing and agribusiness in overcoming typical problems such as very long transaction chains, lack of transparency, and inadequate market access. Traders in the study area obtained market information from different sources. A significant proportion of traders sourced information through personal observation, market visits, and consultations with fellow traders. Aratdars mostly depended on mobile phone calls for information, whereas Beparis relied on market visits. Wholesalers and Aratdars generally received information from fellow traders. The efficiency of market information contributed to the better decision-making by producers, traders, and policy-makers and ultimately, demand, supply, and quality were the main determinants of market prices. Open negotiations were the general practice for price determination during transactions. Price fluctuations were strongly dictated by the number of buyers and the volume of maize in the market.

3.7 Risk Management

Risk management in marketing is necessary for the safety of products, personnel, and customers while limiting various risks that result from marketing decisions. Marketing risks are in form of fire, disasters, accidents, floods, storms, falling prices, bad debts, and fluctuating consumer demand, which all increase marketing expenses. In order to limit these risks, businesspersons

adopt safety measures or transfer their risks to insurance companies through premium payments. Within the study area, maize intermediaries were exposed to risks such as damage during transportation, fluctuating prices, and accidents. Unlike other industries, these risks were borne by the intermediaries themselves, who adopted individual strategies to minimize losses.

3.8 Marketing Costs and Margins

The total marketing cost incurred by intermediaries calculated at BDT 615 per maund maize. Wastage cost because of drying facility was the highest cost item, which was 61.9 percent of the total cost of marketing. The second largest cost was transportation expenses, which was 12.1 percent. The lowest cost was the other cost that was 1.0 percent of the total marketing cost. we could see that the cost of wastage because of drying facilities was higher of the total marketing cost. Transportation cost and storage cost also the lower than wastage cost for maize marketing. Personal cost is the medium highest cost for maize marketing. The marketing cost of Farias was more than other intermediaries that was 28.2 percent of the total marketing cost and less for the Beparis, which was 23.6 percent of the total marketing cost (Table 3).

Table 3: Marketing Cost of Maize for Various Intermediaries (BDT/Maund)

Cost items	Farias	Beparis	Wholesaler	Wholesaler cum Aratdar	Total Cost	%
Transportation cost	17.8	18.0	19.4	19.1	74.4	12.1
Wastage cost	108.7	89.3	89.7	92.9	380.6	61.9
Packaging cost	7.5	12.9	15.8	16.4	52.6	8.6
Loading and unloading cost	0.0	4.4	4.6	3.5	12.5	2.0
Personal expenses	7.9	5.4	3.9	3.4	20.6	3.4
Storage cost	29.9	13.5	14.5	9.7	67.6	11.0
Other costs	1.4	1.7	1.8	1.3	6.2	1.0
Total	173.3	145.3	149.7	146.3	614.6	100.0
Percentage	28.2	23.6	24.4	23.8	100.0	

Source: Authors own computation from field survey.

Beparis developed the highest marketing margin and net margin among the intermediaries involved in this sub-system because Beparis are fully involved with drying, processing, grading, and finally marketing of the maize. Thus, they purchase maize at an average price of BDT 873 per maund and sold at BDT 1,215, earning the marketing margin of BDT 342 and the net margin at BDT 197. The overall ROI was 16.20%, indicating the highest among all groups and yielding a big profit advantage. Wholesalers are the second with a marketing margin of BDT 294 per maund and a net margin of BDT 145, yielding an ROI of 13.67%. The wholesalers, though achieving relatively high margins, have yielded a little lower profitability than that of Beparis. Wholesaler-cum-Aratdars with a marketing margin of BDT 230 and a net margin of BDT 83 had an ROI of 7.27%, which is considered moderate profitability. The worst performer was Farias, with a marketing margin of BDT 176 and a very negligible net margin of BDT 2.70. Its ROI was the lowest, 0.26%, due to limited value addition by the intermediaries (Table 4).

Table 4: Marketing Margins of Maize for Different Intermediaries (BDT Maund)

Intermediaries	Buying Price	Selling Price	Marketing Margin	Marketing Cost	Net Marketing Margin	Percentage	ROI
Farias	863.00	1038.95	175.95	173.25	2.70	0.26	0.26
Beparis	872.50	1214.50	342.00	145.30	196.70	16.20	19.33
Wholesaler	909.10	1203.50	294.40	149.69	144.71	12.02	13.67
Wholesaler-cum-Aratdar	1000.04	1229.70	229.66	146.33	83.33	6.78	7.27

Source: Authors own computation from field survey.

3.9 Grading Opportunities

The value of graded maize sold is higher than that of non-graded maize at the producer level, accompanied by a higher net profit derived from grading activities. The increased value for graded maize is attributable to producers' engagement in value-added processes such as drying, processing, grading, and marketing. These activities enhance the quality and marketability of the maize, thereby yielding greater profits for producers.

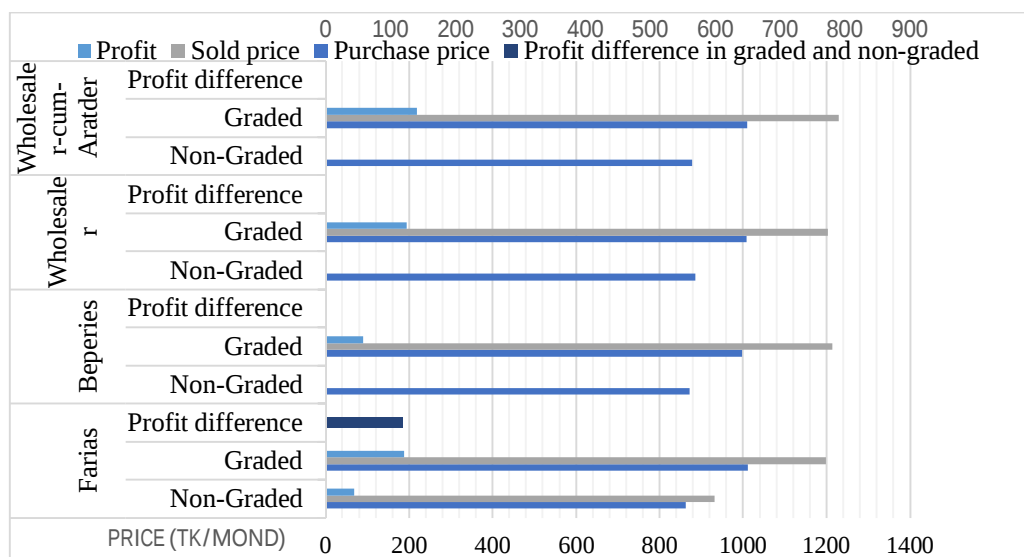


Figure 2: Purchase Price, Sold Price and Grade Wise price difference at Different Intermediaries

From Figure 2 we can see that; Farias directly buy the maize from producers. Some of them sell graded maize after purchasing non-graded maize, while the others sell non-graded maize, which they obtain from other intermediaries. Graded maize incurs higher profit margins for Farias compared with non-graded maize. Beparis purchase both graded and non-graded maize from producers and Farias and sell graded maize to Wholesalers and Wholesaler-cum-Aratdar intermediaries. However, the net profit of Beparis from graded maize is lower than other categories of intermediaries. Wholesalers, who procure graded maize from different classes of

intermediaries, get higher net profits from the graded maize than both Farias and Beparis. Wholesaler-cum-Aratdar gains the highest net profit amongst all the intermediaries, since they supply the graded maize to feed millers.

Profit margin for grading in different channels					Total Profit
Channel-1	Producer → F. miller				
Profit (Tk)	286				286
Channel-2	Producer →	Farias →	Beparies →	Wholesaler → F. Miller	
Profit	286	186	93	193	757
Channel-3	Producer →	Beparies →	Wholesaler →	F. Miller	
Profit	286	93	193		571
Channel-4	Producer →	Beparies →	Wholesaler →	Wholesaler-cum-Aratdar → F. Miller	
Profit	286	93	193	217	789
Channel-5	Producer →	Wholesaler →		F. Miller	
Profit	286	193			478
Channel-6	Producer →	Wholesaler →	Wholesaler-cum-Aratdar →	F. Miller	
Profit	286	193	217		696
Channel-7	Producer →	Wholesaler-cum-Aratdar →		F. Miller	
Profit	286	217			503

Figure 3: Price differential (BDT/Maund) in Maize Marketing Channels Grading

Figure 3 illustrates the margin of profit at grading across the different supply chain channels, which highlights the margins contributed by intermediaries. The overall profit for a channel is estimated as the total profit of all intermediaries, including Producer, Farias, Beparis, Wholesalers, and Wholesaler-cum-Aratdar. Channel 1 has the simplest structure, with the Producer and the Feed Miller only; the total profit of the Producer in that channel is BDT 286. Channel 2 is more complex because it includes more intermediaries than Channel 1. Channel 3, though less complex compared to Channel 2, involves the Producer, Beparis, and Wholesaler. Channel 4 is the most diverse in terms of intermediaries and gives the highest total profit of BDT 789. Channel 5 is relatively simple, with only two intermediaries: the Producer and Wholesaler. Channel 6 is similar to Channel 4, with the Producer, Wholesaler, and Wholesaler-cum-Aratdar as intermediaries. Finally, Channel 7 has two intermediaries.

Of these, Channel 4 provides the highest return to the intermediary and Channel 1 the lowest return. Channels 5 and 7 also provide higher returns than Channel 1. If the Feed Miller chose the low-return Channel 1, feed costs might be slightly lower. However, this channel primarily benefits the Producer. In addition, there are only a few producers who can grade feed to the feed mills' requirements, so this creates supply constraints.

Considering these factors, Channel 5 would be more applicable to Feed Miller. The channel combines profitability and practicality in a manner that best resembles the simplicity of Channel 1 but comprises only the producer and wholesaler. This comes closer to that which would resonate with the interests of the Feed Miller. Deliveries of maize to the miller usually occur after grading. From all these factors, Channel 5 strikes an ideal balance between profitability and logistical feasibility, making the most appropriate choice for the Feed Miller.

3.10 Amount of A and B Grade maize to fulfil the ME and CP Requirement in 40 Kg Broiler Feed

The grade-A and Grade-B maize were purchased from a local feed mill (Bangladesh Feed Mill, Muktagachha, Mymensingh) and the maize grade was identified by their moisture, bulk density, purity and soundness. These characteristics of grade-A and grade-B maize were corresponded to the characteristics of US corn grade No. 1 and 2 (Allen, 2022). Tables 5, 6, and 7 provide a comparative analysis of Metabolism Energy (ME) and Crude Protein (CP) content, as well as the associated costs of using Grade A and Grade B maize for broiler starter feed production.

Table 5 highlights the nutritional differences between the two grades of maize, showing an 8000-kcal difference in ME and a 0.015% difference in CP content per maund of maize. These disparities necessitate adjustments in feed formulation to achieve equivalent nutritional standards. Table 6 outlines the budget required to prepare one maund of broiler starter feed. For Grade A maize, the cost of ME for 40 kg (one maund) of feed is Tk. 1279, while for Grade B maize, the cost is Tk. 1257. However, to meet the same ME requirement using Grade B maize, an additional Tk. 22 per maund is incurred. Table 7 presents the crude protein analysis, demonstrating that balancing the CP content equivalent in one maund of feed requires an additional Tk. 186 when using Grade B maize compared to Grade A maize.

A critical evaluation of these findings reveals that while the use of Grade B maize involves additional costs Tk. 22 for balancing ME and Tk. 185 for CP per maund it remains a viable option for feed millers. This flexibility allows them to balance ME and CP content differently depending on cost considerations and nutritional requirements in poultry feed production

Table 5: Nutritive Value of A and B Grade Maize

		Nutrient level (in One Kg)		Feed miller's purchase price, Tk/Kg
		ME	CP (kg)	
Grade	A	3200	0.12	31.0
	B	3100	0.105	29.5
Difference		200	0.015	1.5

Source: (Own research 2024, Poultry Science Laboratory, BAU, Mymensingh); ME = Metabolism Energy; CP= Crude Protein

Table 6: Comparison of Volume and Cost Involvement of Grade A and Grade B Maize to Balance Metabolizable Energy (ME) Requirement in 40 Kg (One Maund) Broiler Feed

Broiler starter feed		Content in 40 kg feed for broiler		Extra Need of B grade
ME	ME equivalent (Kcal) in 40 Kg (one Maund) broiler feed#	132000	132000	---
	Maize grade	A	B	
	Amount (kg) of maize to fill the ME requirement by maize only (Suppose)	41.25	42.60	1.35
	Cost (Tk) need for one maund as per grade @ A grade= 31 Tk, B grade = 29.5	1278.75	1256.7	22.05

#In broiler starter feed the ME content is 3300 Kcal/Kg feed (NRC, 1994).

Table 7: Comparison of Volume and Cost Involvement of Grade A and Grade B Maize to Balance Crude Protein (CP) Requirement in 40 Kg (One Maund) Broiler Feed

Broiler starter feed		40 kg feed content for broiler feed		Extra Need of B grade
CP	CP equivalent (kg) in 40 Kg (one Maund) broiler feed#	9.2	9.2	---
	Maize grade	A	B	
	Amount (kg) of maize to fill the CP requirement by maize only (Suppose)	76.66	86.85	10.19
	Cost (Tk) need for one maund as per grade @ A grade= 31 Tk, B grade = 29.5	2376.46	2562.00	185.61

#In broiler starter feed the CP content is 23% or 23 kg/100 kg feed (NRC, 1994).

Source: Authors own computation from field survey.

3.11 Problem Faced by Intermediaries

The study identifies several critical challenges (Table 8) faced by intermediaries in the maize supply chain, highlighting a lack of capital, storage facilities, transportation, market information, and grading, alongside issues like high storage charges, insect infestations, and insufficient load-shading. Of these, 92.5% of intermediaries reported insufficient capital as a pervasive problem. Storage facilities were inadequate for 50%, while poor transportation affected 87.5%. Of these, 77.5% expressed their concern about imperfect market information, while 22.5% complained of higher storage charges. In addition, 62.5% reported insect infestation, 52.5% complained about grading issues, and 70% showed the absence of load-shading. These again highlight systemic inefficiencies and infrastructural voids that ultimately drag down the supply chain performance and operational sustainability.

Table 8: Problems Faced by Maize Intermediaries

Problems	Farias	Beperis	Wholesaler	Wholesaler-cum-Aratdar	Total
Lack of capital	100	90	90	90	92.5
Lack of storage facilities	70	50	10	70	50
Lack of good transportation	90	80	80	100	87.5
Lack of market information	40	90	90	90	77.5
High storage charge	40	20	10	20	22.5
Problem attacks of insects	10	100	80	66	62.5
Lack of grading	100	20	40	50	52.5
Lack of Load-shading	100	80	60	40	70

Intermediaries suggested various measures to overcome the problems in the maize supply chain, as depicted in table 9. The suggestions were on financial support, infrastructure, and knowledge enhancement. Low-interest loan facilities were the most suggested solution, as 77.5% of the intermediaries, particularly Wholesalers (100%) and Wholesaler-cum-Aratdars (90%), suggested this measure to improve financial capacity. Adequate storage facilities were suggested by 52.5%, especially Beperis (80%) and Wholesaler-cum-Aratdars (80%), to address storage concerns. Improved transportation and communication systems were suggested by 70%,

which was fully supported by Wholesaler-cum-Aratdars (100%) and strongly supported by Wholesalers (90%). The provision of market information received 85% support, which was fully supported by Wholesalers and Wholesaler-cum-Aratdars (both 100%). Scientific storage knowledge was stressed by 75%, especially among Wholesalers (100%) and Beperis (90%). However, maize grading facilities were the least important, as only 25% of the intermediaries supported them. Finally, 60% suggested ensuring adequate power supply, mainly Beperis 90%, and Wholesalers 80%. The measures listed reflect a mutual priority in terms of improving financial access, logistics, infrastructure, and knowledge as part of bettering supply chain operations.

Table 9: Measure Suggested by Intermediaries (Percentage)

Suggestion	Farias	Beperis	Wholesaler	Wholesaler cum Aratdar	Overall
Low interest loan facilities	30	90	100	90	77.5
Providing adequate storage facilities	20	80	30	80	52.5
Improvement of transportation and communication system	10	80	90	100	70
Providing market information	50	90	100	100	85
Scientific storage knowledge	20	90	100	90	75
Maize grading facilities	10	20	50	20	25
Adequate power supply	0	90	80	70	60

IV. CONCLUSION

Maize is a major crop in Bangladesh, which ranks as the third most important cereal after rice and wheat. Its demand is extremely high because of the poultry and dairy sectors. The country produced 5.63 million tons of maize in 2021-22, although it faces shortages against the demand of 7 million tons. This study analyzed the maize marketing system in the Rangpur District, focusing on marketing channels, costs, profit margins, and the role of grading. Findings revealed a multi-layered supply chain with intermediaries performing critical functions like financing, transportation, and grading. Challenges included high marketing costs, lack of infrastructure, delayed financing, and risks such as transportation damage. Grading became an important activity to enhance market value and quality for the benefit of producers and intermediaries. The suggestions were low-interest loans, improved storage and grading facilities, improvement in market infrastructure, and resolving power supply issues. The study emphasized financial support, logistical improvements, and knowledge development as key measures for improving the maize supply chain.

Value addition, the study found, allowed intermediaries like Beperis to achieve the highest net margin, BDT 196, while the grading of maize increased the market value and returns for all the stakeholders consistently. Graded maize improved the quality and efficiency of poultry feed for feed millers. The study has recommended the improvement of the maize marketing system through institutional credit facilities with low interest, improved scientific storage and grading facilities, and upgrading of market infrastructure. The study also stressed addressing communication and transportation challenges, regulation of maize prices to give farmers a good compensation, and an uninterrupted power supply. It has also been suggested that the development of direct marketing channels to feed millers, grade-based maize purchase, and incentives for sustainable practices could eventually lead to an efficient and equitable marketing

system for maize within Bangladesh. The improvements would affect the financial outcomes of both producers and intermediaries by strengthening the general maize industry.

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