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Marketing Efficiency of Maize in Bangladesh

A. K. M. Golam Kausar[1*] and Mohammad Jahangir Alam[2]

[1]Department of Agribusiness Management, EXIM Bank Agricultural University Bangladesh, Chapainawabganj-6300, Bangladesh.
[2]Department of Agribusiness and Marketing, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

Authors' contributions

This work was carried out in collaboration between two authors. Author AKMGK designed the study, wrote the protocol and performed the survey and tabular analysis of the study. Author MJA supervised meticulously the whole work. Author AKMGK wrote the first draft of the manuscript and managed the literature. Author MJA helped in literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The present study was undertaken to determine marketing efficiency of different maize marketing channels. The study used primary data randomly collected from 55 farmers and intermediaries from two upazilas of Gaibandha district of Bangladesh. The study identified five most prominent maize marketing channels. The channels were (i) Farmers-*Farias*-wholesalers-*Aratdars*-feed mills (ii) Farmers-wholesalers-*Aratdars*-feed mills (iii) Farmers-*Aratdars*-feed mills (iv) Farmers-wholesalers-feed mills, and (v) Farmers- *Farias*-*Aratdars*-feed mills. Among the identified channels, channel III (i.e., Farmers-*Aratdars*-Feed mills) was the most efficient channel. Channel IV was the next best alternative of channel III. The study explained the plausible reasons why channel III was most efficient one. The study suggested to reduce the number of intermediaries by developing a system of direct buying from farmers and selling directly to *Aratdars* or feed mills.

**Corresponding author: E-mail: baukausar@gmail.com;*

Keywords: Efficiency indicators; marketing channel; marketing cost; marketing margin; seasonal price variability.

1. INTRODUCTION

Maize is the third most important crop after rice and wheat among the cereals in Bangladesh. It is most commonly used in poultry and fish feed industries, for baking and other foods such as pop corn, fried corn for human consumption. The nutritional value of maize, its economic importance and its incredibly diverse uses is significant of the immense and transferrable virtues of the crop, important not only in Bangladesh, but across every region of the world. According to an average from the last five years, Bangladesh produces about 1.2 million metric tons of maize annually. This reportedly supplies about 84% of the country's total demand. The data also demonstrates a notable trend of increasing annual domestic production in maize [1]. In 2013, estimated area under maize cultivation was 320 thousand acres with an annual production of 2240 thousand metric tons [2]. In Gaibandha district of Bangladesh, the maize production along with marketing was getting popularity in sandy-loam soils of *Char*[1] areas of the district. The acreage of maize in the district was increasing over time (from 317 thousand acres at 2008/09 to 487 thousand acres at 2011/12) with an increasing production of 1298 thousand tons from 730 thousand tons [3]. Though acreage and production of maize is increasing day by day and the farmers are diverting to maize cultivation from rice and wheat, they are not getting expected price of maize in the area which has been frequently discussed by researchers and policy makers. Most important reasons about why farmers are not getting reasonable price are very weak marketing infrastructure, lack of proper storage facilities, high transport costs, extortion on highways and presence of intermediaries. The intermediaries are crucial for developing and maintaining different marketing channels through which product reaches to end users from producers. Due to the presence of intermediaries product can move from a remote area to commercial area. The numbers of intermediaries should present in a marketing channel depends on transportation facility, transportation cost, demand and supply of the product and so on. Numbers of intermediaries in a channel should be reasonable. In a particular geographical area, different marketing channels exist for a particular product. Likewise, in the study area, there were many channels through which producers or maize growers sold their maize to ultimate users and marketing margins received from selling maize vary from one channel to another. All channels were not similarly important for the maize marketing at a time. Sometimes in these channels, a number of intermediaries (*Faria*s, wholesaler and *Aratdars*) exist between maize producers and consumers. They charged high price to consumers but share only small part of it with the producers and thus exploited the producers. The producers were devoid of getting the benefit of high profit margin which necessitates choosing of best marketing channel and finding out a channel which gives best remunerative to producers. Apparently, it may seem that a channel with minimum number of intermediaries is the best channel for healthy development of the market. But it may not be true at all time. Thus it is needed to examine the provision of their services and rate of return and to know the efficient channel. Measuring maize marketing efficiency is critical to provide fair profit margin to the maize farmers in Bangladesh. Marketing efficiency is defined as the movement of goods from producers to consumers at the lowest cost consistent with the provision of the service that consumers desire and are able to pay for. The efficiency of a market can be evaluated through analyzing the existing channels according to price and service provided. The prevailing price should reflect cost plus a profit margin. The profit must be just sufficient to reward investment at current interest rate. The quality of service should be neither too high nor too low in relation to cost and consumers desire. Factors that count for efficiency can also be evaluated by examining marketing enterprises for structure, conduct and performance [4].

Demand for maize is increasing day by day in the world as well as in Bangladesh due to its diversified uses. If the rigid food habit of Bangladeshis is to be diversified from rice to maize, it would probably be possible to reduce food shortage to a great extent. Because, it is a high yielding and low-cost crop compared to rice and wheat. So, comprehensible plan is needed to make the crop popular and sustainable. Maize farming is always more profitable than many other crops and the enthusiastic farmers are

[1] *The land located in an active river basin that is subject to erosion and accretion.*

getting high yielding variety of maize seeds and the latest scientific methods of cultivation for further success. Bangladesh has a great opportunity to sustain such kind of flow in maize, if maize cultivation, processing and marketing are postulated in scientific manner. But no in depth study was conducted on productivity, efficiency, profitability and supply of maize in Bangladesh. A few efficiency studies regarding rice, wheat, potato, tomato, cauliflower, poultry and fish farming were observed in Bangladesh. It is worth to mention that there were many studies on maize in Bangladesh which mainly based on profitability, productivity, economic performance, technical efficiency, economic efficiency etc. But few studies were on maize and there was no study on marketing efficiency of maize. That is why, the present study had been taken to measure marketing efficiency of maize. This is a micro level study but it is expected that this will generate valuable information along with measuring efficiency of channels which would be highly useful for the farmers, government organizations (GOs), non-government organizations (NGOs), policy makers and researchers to further study on maize and to conduct a successful maize revolution in Bangladesh. The paper is organized as follows: data and data collection procedure, survey method and efficiency indicators are discussed in section II, the results are analyzed in section III and the concluding remarks are set down in section IV.

2. METHODOLOGY

2.1 Data and Data Collection

For the present study two upazilas (Sughatta and Fuchhari) from Gaibandha district were selected as these two upazilas covered about 38% of total cultivated area of the district [5]. The four unions (Bonarpara, Vorotkhali, Gojaria and Fulchhari) from the upazilas were selected for collecting primary data. A number of 13 farmers (7 from Sughatta and 6 from Fulchhari upazila, respectively), 10 *Farias* (5 from Sughatta and 5 from Fulchhari upazila, respectively), 15 wholesalers (8 from Sughatta and 7 from Fulchhari upazila, respectively) and 12 *Aratdars* (6 from Sughatta and 6 from Fulchhari upazila, respectively) were interviewed through a semi-structured questionnaires [6-9] during August of 2012. Secondary data were collected from different published and unpublished sources such as Bangladesh Bureau of Statistics (BBS), Statistical Yearbook of Bangladesh, Yearbook of Agricultural Statistics, DAM (Department of Agricultural Marketing) reports, Bangladesh Agricultural Research Institute (BARI) and Internet.

2.2 Efficiency Indicators

Marketing efficiency of maize was determined by six performance indicators proposed by [10] and [11]. These indicators were used by [12-14] to analyze marketing efficiency of potato, mango and high value agriculture commodities, respectively. The indicators are (i) percentage of product which moves through the channels, (ii) producers' share to consumers' price, (iii) relative marketing costs, (iv) level of middlemen's' margin, (v) price deviation i.e. differences of maximum and minimum price of maize (vi) price variability.

(i) Percentage of product moves through a channel was measured by summing up the percentage of product handled by each middleman present in that channel.

(ii) Producers' share to consumers' price is measured by the following formula:

$$\mathbf{Ps = (P_F / P_R)^{*} 100}$$

Where,

Ps = Producers' share
P_F = Price received by the producers
P_R = Consumers price

In this study following formula was used

$$Producers' share = \frac{Producers' average\ price}{Weighted\ average\ price\ of\ maize}$$

In our study, the conversion ratio 1.45 was used to convert wet maize to dry maize.

(iii) & (iv) The marketing costs of different marketing channels were calculated in local currency (Taka) and the channel having lower marketing cost was ranked 1 and the channel having highest marketing cost ranked last. The same approach had been followed in ranking the margin of middlemen in each channel.

The total marketing cost incurred by the farmers and intermediaries in a channel was estimated by the following formula:

$$\mathbf{C = C_f + C_{m1} + C_{m2} + C_{m3} + \ldots\ldots\ldots\ldots + C_{mi}}$$

Where,

C = Total cost of maize marketing in a channel
C_f = Cost paid by the producer when commodity moves and
C_{mi} = Cost incurred by the i^{th} middlemen in the process of buying and selling of maize in a channel (i= 1, 2. 3……n)

Marketing margin of a channel was measured by using the following formula:

$$M = M_f + M_{m1} + M_{m2} + M_{m3} + \ldots\ldots\ldots + M_{mi}$$

Where,

M_f = Return received by farmer
M = Total margin in a channel
M_{mi} = Margin received by the i^{th} middlemen

(v) Price deviation means the difference between maximum and minimum prices in a month. If the difference is high, it implies highest price deviation and vice-versa. The difference between maximum and minimum prices of each month was calculated and finally the difference of all months was summed up. Then the average deviation was calculated for respective channels to identify the efficient channel.

The study was based on the following formula:

$$\bar{d} = \left(\frac{\sum d}{N}\right)$$

$\bar{d}$ = Average deviation
N = Total number of month (07 months)
d = Deviation between the maximum and minimum price

(vi) The seasonal movement of price had been studied by applying the simple standard deviation (δ) formula. The formula used in the study is as follows:

$$\boldsymbol{\delta} = \sqrt{\left(\frac{\mathbf{1}}{\boldsymbol{T}}\right)\sum \boldsymbol{W_t}(\overline{\boldsymbol{P_t}} - \overline{\boldsymbol{P}})^2}$$

Where,

δ = Seasonal price variability index
$\bar{P}$ = Average farm gate price of maize of the season in each channel
$\bar{P}_t$ = Average farm gate price of maize together for the agricultural year
T = Total months in the season

$$W_i = \frac{\text{Sales during the month in each channel}}{\text{Sum of the sales during the month in channels}}$$

The entire season had been divided in two periods, peak period and lean period. Peak period represented the immediate post-harvest period of four months that is March to June. July to September was considered as lean period. The δ was estimated separately for each period. A lower value of δ implies that the farmers' prices were not affected by seasonality and vice versa. The final ranking of all the six indicators for all the channels was computed by the composite index formula for estimating the efficient marketing channel.

$$I = \frac{\sum I_i}{N}$$

Where, *I* refers to the individual rank, i = 1, ……..,6 and

N is the number of individual ranks used.

The lowest mean represents relatively the most efficient channel and vice-versa.

3. RESULTS AND DISCUSSION

Marketing efficiency of maize was determined by using different performance indicators. The results and discussions are presented below:

3.1 Channel Wise Maize Movement

There were five most prominent channels through which the maize moves from producers to the feed mills. The channels were i) Farmers-*Farias*-Wholesalers-*Aratdars*-Feed mills, ii) Farmers-Wholesalers-*Aratdars*-Feed mills, iii) Farmers-*Aratdars*-Feed mills, iv) Farmers-Wholesalers-Feed mills and v) Farmers-*Farias*-*Aratdars*-Feed mills. Among these channels 45% of the total produce was moved through channel III and 25.5%, 12.5%, 12%, 5% of the total produce was moved through the channel IV, V, II, I, respectively (Table 1). Every channel started with farmers and ended with feed mills. Channel I was dominated by *Farias* who were less attractive to farmers as they had to sell maize to them at lower price and the channel was composed of more intermediaries. Channel II and IV were dominated by wholesalers but channel IV was more attractive to farmers than channel II. Because, in channel IV the possibility of getting high price is more than Channel II due the presence of less number of intermediaries.

Channel III was most attracted by farmers for having minimum number of intermediaries and high possibility of getting better selling price.

From the Table 1, it was noticed that lowest amount of maize moved through the channel I. The channel consists of more middlemen or intermediaries. In that channel farmers sold wet maize to *Farias* generally at low price. And finally maize went to feed mills and price became high. It was also noticed that maximum amount of product (maize) was moved through the channel III (farmers-*Aratdars*-feed mills). Farmers were more intended to sell their maize directly to *Aratdars* in expecting higher price for their maize and easy access to *Aratdars.*

3.2 Channel Wise Producers' Share to Consumers' Price

Farmers sold wet maize to *Farias*, wholesalers and *Aratdars*. Dry maize was bought by feed mills from *Aratdars* and sometimes from wholesalers. Producers' share to consumers' price was the highest in channel III (89.98%) and followed by channel IV (87.54%), channel V (84.30%) and channel II (79.71%) (Table 2). Producer' share to consumers' price was the lowest in channel I (75.15%). In channel II and IV farmers sold their maize to wholesalers and for that reason the producers' average price was same. The selling price of *Aratdars* was assumed as the consumers' price as *Aratdars* was the last intermediary before feed mills and feed mills were considered as end point since the study did not consider processing activities of the feed mills. When farmers sold wet maize directly to the *Aratdars* there was a chance to get more shares to consumers' price. But when they sold maize to *Farias* and wholesalers they received fewer share in consumers' price than those of *Aratdars*. Farmers sold maize to *Farias* and wholesalers for meeting immediate cash requirement. They could not sell it to the feed mill or *Aratdars* as they did not have drying, storage, processing facilities for preparing it according to the requirement of them which require high investment. High transportation cost also made hindrance in that case. Market imperfection or producers' disorganization and lack of market information or the high cost of information search were also responsible for depriving them from getting more shares to consumers' price.

3.3 Channel Wise Marketing Cost and Margin

Marketing margin and marketing cost of different channels also was an indication of marketing efficiency. Knowledge of the distribution of marketing costs among various intermediaries is very important for improving the efficiency of marketing system. Marketing cost items include processing cost, transportation cost, storage cost, electricity bill, rent for shop, market toll/tax, weighing cost, labor cost, sack cost, loading/unloading cost, information search cost, personal expenses etc. Nature and extent of

Table 1. Maize moves through the major marketing channels in selected areas

Channels	Marketing channels	% of product handled	Rank (I_1)
I	Farmers-*Farias*-Wholesalers-*Aratdars*-Feed mills	5	5
II	Farmers-Wholesalers-*Aratdars*-Feed mills	12	4
III	Farmers-*Aratdars*-Feed mills	45	1
IV	Farmers-Wholesalers-Feed mills	25.5	2
V	Farmers-*Farias*-*Aratdars*-Feed mills	12.5	3
Total		100	

Source: Field survey, 2012
Note: Rank 1 stands for highest, rank 5 stands for lowest and so on

Table 2. Channel wise producers' share to consumers' price

Particulars	Marketing channels				
	I	II	III	IV	V
Producer average price (A)	850	862.5	869.17	862.5	850
Weighted average price of maize (B)	1131.03	1082.05	965.97	985.25	1008.25
% of producers' share (A/B)*100	75.15	79.71	89.98	87.54	84.30
Rank (I_2)	5	4	1	2	3

Note: The conversion ratio of wet maize to dry maize was 1.45
Source: Field survey, 2012
Note: Rank 1 stands for highest, rank 5 stands for lowest and so on

marketing cost varied from intermediary to intermediary due to size of the business, product handling system, access to the market, access to the customers, choosing of modes of transportation, distance from the next intermediary or market etc. Average cost incurred by *Farias*, wholesalers and *Aratdars* for marketing 100 kg of maize were Tk. 61.48, Tk. 122.75, and Tk. 96.80, respectively. *Farias*' marketing cost was less than those of wholesalers as they did not take part in many activities like processing, storage, electricity bill for renting a permanent shop and hired labour cost which gave them advantage over wholesalers. Bargaining method was used to fix price. Farmers in the study areas used *Van* and by-cycle to carry maize in the markets.

Table 3. Marketing cost of farmers

Cost items	Average cost (Tk. per 100 kg)	Percentage of total cost
Transportation	32.89	41.57
Market toll/tax	14.61	18.47
Weighing	5.54	7.00
Packaging (sack)	17.36	21.94
Load/Unload	6.85	8.66
Information search	0.90	1.14
Personal expenses	0.96	1.21
Total	79.12	100

From the Tables 3 and 4, it is clear that, cost of marketing for wholesalers was the highest among all intermediaries due to high transportation cost, storage, market toll and packaging cost (sack) and the lowest for *Farias.* Besides, the wholesalers bought maize from a lot of *Farias* and farmers from different areas and sold it to different *Aratdars* and feed mills through various mode of transportation (*Van*, pick-up, power tillers and truck). For their buying and selling purpose, they had to contact with more farmers, *Farias, Aratdars* than other intermediaries which created higher information search cost for the wholesalers than those of others. *Farias* were the temporary or seasonal businessmen. They bought few amount of maize from different farmers at low price within a short time and they tried to sell it to wholesalers and *Aratdars* with minimum marketing cost. Total marketing cost of all intermediaries has been shown in Table 4. The total marketing cost incurred by all intermediaries was Tk. 281.03 per 100 kg of maize. Transportation cost was highest cost, which was 46.42% of the total marketing cost. Information search cost was lowest, which was 1.35%. Since maize was transported for long distance from farmers to ultimate users or feed mills, high transportation cost was incurred by traders at different levels of marketing. The total marketing margin consists of margins at different stages of marketing. The marketing margin of *Farias,* wholesalers and *Aratdars* were Tk. 81.50, Tk. 164.67 and Tk. 158, respectively (Tables 5 and 6).

The marketing margin of wholesalers was the highest due to larger volume of business and the lowest for *Farias* due to small amount of buying and selling. Marketing margin of wholesalers was highest than those of *Aratdars* and *Farias.* Because the wholesalers could buy maize from farmers at low price and they sold their maize to those *Aratdars* and feed mills to which they could secure more selling price. They were not highly involved in processing of maize. *Aratdars'* margin was middle between wholesalers and *Farias.* They had to pay higher prices for buying maize from farmers than those of wholesalers. They purchased wet maize from farmers and *Farias* and semi processed maize from wholesalers. The wet maize lost weight after drying and ultimately they sold dried maize to the feed mills. For that reason marketing margin was less than wholesalers. The marketing margin was the lowest for *Farias* because of their temporary business nature, higher marketing cost for small volume of trading and charging minimum margin over the purchase price and marketing cost.

Number of intermediaries and marketing channels is a major factor in increasing or decreasing marketing cost. The marketing costs and marketing margins for different channels are presented in Table 7. Marketing cost was the lowest for channel III for involving fewer numbers of intermediaries followed by channel IV, V and II, respectively. It was highest in channel I for the presence of large number of intermediaries. Marketing margin was also lowest for channel III followed by channel IV, V, II and I, respectively. The Table reveals that the marketing margins to the middlemen of maize marketing system amounts to be highest in channel I and the lowest in channel III. The highest marketing margin appeared due to large number of intermediaries involved in channel I as compared to other channels. So, the number of intermediaries involved in maize marketing should be reduced, but it would not be feasible to eliminate all of the intermediaries from the channel of maize marketing.

3.4 Deviation between Maximum and Minimum Price

Price deviation means the difference between maximum and minimum prices in a month. For measuring deviation, it is needed to consider whole availing period (peak and lean period) of a product. In the study area, farmers harvested maize at March and April which may continue to May (peak period) and the maize availed in the market up to September (lean period) of the year. So, for the study 7 months (March-September) were selected covering peak period and lean period of maize. The price deviations of different channels for each month are presented in Table 8.

Table 4. Marketing cost of maize for different intermediaries (Tk. per 100 kg)

Cost items	*Farias*	Wholesalers	*Aratdars*	Total	
				Cost	Percentage
Processing	0	5.2	21.48	26.68	9.49
Transportation	21.08	68.11	41.25	130.44	46.42
Storage	0	7.04	2.94	9.98	3.55
Electricity bill	0	2.64	2.51	5.15	1.83
Rent	0	2.55	2.50	5.04	1.79
Market toll/tax	10.85	7.25	5.25	23.35	8.31
Weighing	3.43	2.98	1.88	8.29	2.95
Labor	0	4.99	5.82	10.82	3.85
Sack	16.33	10.70	6.86	33.89	12.06
Load/Unload	5.53	6.31	3.26	15.10	5.37
Information search	1.42	1.63	0.76	3.80	1.35
Personal expense	2.84	3.36	2.28	8.48	3.02
Total	61.48	122.75	96.80	281.03	100
Percentage	21.88	43.68	34.44		

Source: Field survey 2012

Table 5. Marketing margin of different intermediaries (Tk. per 100 kg)

Intermediaries	Purchase price	Sale price	Gross marketing margin	Percentage
Farias	862.5	944	81.50	20.17
Wholesalers	944.67	1109.33	164.67	40.74
Aratdars	1109.5	1267.5	158	39.09
Total			404.17	100

Source: Field survey, 2012

Table 6. Net marketing margin of different intermediaries (Tk. per 100 kg)

Intermediaries	Gross marketing margin	Marketing cost	Net marketing margin	Percentage
Farias	81.50	61.48	20.02	16.26
Wholesalers	164.67	122.75	41.92	34.04
Aratdars	158	96.80	61.20	49.70
Total	404.17	281.03	123.14	100

Source: Field survey, 2012

Table 7. Channel wise marketing cost and margin

Particulars	Marketing channels				
	I	II	III	IV	V
Marketing cost (Tk.)	281.02	219.55	96.80	122.75	158.28
Rank (I_3)	5	4	1	2	3
Marketing margin (Tk.)	404.17	322.67	158	164.67	239.50
Rank (I_4)	5	4	1	2	3

Source: Field survey, 2012

Note: Rank 1 stands for lowest, rank 5 stands for highest and so on

Price deviation varied from channel to channel. The Table 8 revealed that channel I obtained the lowest price deviation followed by channel II, V and III. The price deviation was highest in channel IV. Deviation between the maximum and minimum price was high in June which was appeared high in channel III and low in channel II and lowest in May and August. It might be the reason of demand and supply condition of maize during the month. Sometimes, the traders availed of this opportunity and made price discrimination. Seasonal production and high demand throughout the year is another reason of high deviation of prices. In May price deviation was low in channel I and high in channel III and IV. In August, price deviation appeared low in channel II and high in channel III and IV. Channel II and channel V showed lowest deviation and highest deviation through the month, respectively.

3.5 Seasonal Price Variability

The seasonal price variations of maize in different channels are presented in Table 9 (peak season) and Table 10 (lean season). Highest price variation was found in channel I and lowest in channel III in peak season (Table 9). It indicated that the producers would be benefited more if they sold their maize through *Aratdars*-feed mills as that channel had the lowest price variation. Producers' price was less affected by seasonality in channel III compared to other channels. On the other hand, in lean season the highest price variation in price was found in channel V and lowest in channel IV (Table 10). Finally for two seasons price variation was lowest in channel III and IV which may be due to the lowest number of intermediaries and highest in channel I due to highest number of intermediaries in the channel.

3.6 Channel Efficiency Measures

The efficiency of different marketing channels was concluded on the basis of ranks of all six-performance indicators by using composite index formula and the computed ranks. These are presented in Table 11.

Table 8. Monthly price deviation of maize in different marketing channels (Taka/100 kg)

Months	Maximum price	Minimum price	Marketing channels				
			I	II	III	IV	V
March	2000	1800	100	150	200	180	150
April	1875	1775	25	75	100	100	75
May	1800	1750	50	80	150	150	125
June	1500	1000	450	425	500	475	450
July	1350	1000	280	300	325	350	325
August	1350	1300	100	80	150	150	100
September	1900	1500	380	350	350	400	350
$\sum d$			1385	1460	1775	1805	1575
N			7	7	7	7	7
$\bar{d} = \left(\frac{\sum d}{N}\right)$			197.86	208.57	253.57	257.86	225
Rank (I_5)			1	2	4	5	3

Note: N = Total number of month (07 months), d = deviation between the maximum and minimum
Source: Field Survey, 2012 & Department of Agricultural Marketing (DAM) report.
Note: Rank 1 stands for lowest, rank 5 stands for highest and so on

Table 9. Channel wise seasonal price variability for peak season

Months		Marketing channels				
		I	II	III	IV	V
March	$W_t(\overline{P_t} - \overline{P})^2$	13.5	35.42	0.04	1.08	11.25
April		70.44	67.38	1.06	28.13	31.25
May		337.5	151.25	49	53.08	35.42
June		307.05	110.54	28.38	55.63	61.25
$\sum \boldsymbol{W_t(\overline{P_t} - \overline{P})^2}$		728.49	364.58	78.49	137.92	139.17
Total number of months		4	4	4	4	4
$\boldsymbol{\delta}$		18.13	13.98	5.12	7.97	8.59
Rank		5	4	1	2	3

Source: Field survey, 2012

Table 10. Channel wise seasonal price variability for lean season

Months		Marketing channels				
		I	II	III	IV	V
July	$W_t(\overline{P_t} - \overline{P})^2$	2816.16	2000	80	168.48	3379.39
August		2000	3125	180	49.5	2812.5
September		1013.82	500	525.68	573.15	450.59
$\sum W_t(\overline{P_t} - \overline{P})^2$		5829.97	5625	785.68	791.13	6642.48
Total number of months		3	3	3	3	3
δ		74.84	71.00	26.15	25.38	76.44
Rank		4	3	2	1	5
Final rank I_6 (two period)		5	3	1	1	4

Source: Field survey, 2012
Note: Rank 1 stands for lowest, rank 5 stands for highest and so on

Table 11. Efficiency of different marketing channels

Marketing channel	Performance indicators						Composite index ($\sum I_i / N$)	Final ranking
	I_1	I_2	I_3	I_4	I_5	I_6		
I	5	5	5	5	1	5	4.33	5
II	4	4	4	4	2	3	3.5	4
III	1	1	1	1	4	1	1.5	1
IV	2	2	2	2	5	1	2.33	2
V	3	3	3	3	3	4	3.17	3

Note: I_i = Total value of the ranks of performance, N = Total number of performance indicator, Rank 1 stands for lowest, rank 5 stands for highest and so on.
Source: Table 1, 2, 7, 8 and 10

Based on the six indicators the channel III was the most efficient marketing channel. In that channel the percentage of producers' share to consumers' price was the highest. Forty five percent of farmers' maize moves through that channel. Deviation between the maximum and minimum price, seasonal price variation and marketing cost and margin, all were the lowest in channel III. So, it was concluded that out of five channels identified, channel III was the best. This means that farmers were better-off if they traded maize through channel III than those of other channels.

4. CONCLUSION AND RECOMMENDA-TIONS

Farmers are diverting to maize cultivation from rice and wheat. The reasons are low cost of production, higher profitability, higher demand in poultry industry and less riskier. The farmers are allocating a major share of their total cultivable land to maize. But it was frequently discussed by the farmers and the policy makers that the farmers are not receiving expected price due to various reasons such as higher marketing cost, large number of intermediaries, lack of information, seasonal price variability, high price difference between maximum and minimum price etc. However the study identified the efficient channel. The study identified seven marketing channels in the study area. Among the channels only five channels through which almost all maize was marketed. As a result, these five channels were considered for identifying the most efficient channel. The study found that the channel III (farmers-*Aratdars*-feed mills) was the most efficient channel. It was more efficient because maximum amount of product moves through that channel. In that channel, the farmers could secure more price for selling directly to *Aratdars* i.e. the share of producers' was the highest which was expected by every farmers. Due to the presence of minimum number of intermediaries, maize moved through a short channel which facilitated to reduce marketing cost. When there was a short channel the intermediaries could not grasp more margins. Lowest deviation between maximum and minimum price and lowest seasonal variation was also influenced by few numbers of intermediaries in that channel. It can be said that if farmers could sell their produce directly through *Aratdars*-feed mills then they would be more benefitted. Farmers could be benefited to trade their maize through wholesalers-feed mills (channel IV) as the channel was like channel III composed of minimum number of intermediaries.

It can be suggested the farmers to choose the channel IV as next best alternative of channel III. The performance indicators also revealed that the channel I was not efficient in case of maize marketing as it composed of large number of intermediaries which facilitated to have more deviation in price and helped intermediaries to take more returns from the channel. The channel was dominated by *Farias* who were not more trustworthy to farmers and for that reason it possessed lowest percent of maize movement.

Based on the results found in the study the following recommendations can be made:

i) Transportation and communication system should be developed which can contribute greatly to reduce the transportation cost and increase overall efficiency of the maize marketing system. The efficiency of less efficient channels can also be improved through developing better transportation and communication system.
ii) Number of intermediaries should be reduced not to eliminate all the intermediaries to lessen their influence in the channel and to provide more share to farmers by developing a system of direct selling from farmers to the *Aratdars* or feed mills. It may also help to increase the efficiency of channels.
iii) Credit facilities should be made available to the maize farmers from different formal and informal financial institutions and NGOs on easy terms and conditions to meet their cash requirements as in the peak period most of the farmers sold their maize immediately after harvest to meet immediate cash requirement which create excess supply in the market and price become lower and opposite happens in lean period which ultimately make market inefficient. Credit facilities can avail drying, storage, processing facilities to farmers for preparing it as per requirement of *Aratdars* or feed mills and selling it at favorable time which can secure good price to them. Entrepreneurs should be encouraged to establish feed mills adjacent to the maize growing areas. In that case, provision of credit facilities may be made available through prescribed sources.
iv) Stable market will reduce deviation of price over the period and over channels which can be made by farmers regular and continuous selling of maize to the market. Establishment of *Godowns* (store house) may be helpful in this regard. Adopting ceiling and floor price policy by the government may be another way to reduce deviation between the maximum and minimum price in a month in the market. Seasonal price variation of maize should also be controlled by the government through controlling the supply to make the maize market efficient.
v) Market information should be provided to the farmers regularly by strengthening DAM of GoB. If they get the market information about their product, they would be able to know the real situation of their product and could decide to take the produces to high price distant markets.
vi) Farmers may be suggested to form cooperative. The cooperative movement as a process will bring themselves one step closer to ultimate users of the product. As an organized body, they would also acquire a better bargaining power for their products over the powerful middlemen that manipulate and control the price of maize in the marketing system.

The above recommendations will help to increase the efficiency of existing marketing channels for providing more shares to farmers and reasonable margin to maize traders if these are in action.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

A brief discussion on market participants

Farmers

Maize marketing channels started from the farmers. Farmers sold maize to intermediaries both at market and farmyard. They sold 100% of maize to *Farias* (30%), wholesalers (25%) and *Aratdars* (45%).

Farias

Farias were found in the study area who purchased maize from producers at the farm gate or in the local village market and sold to the wholesalers and *Aratdars*. They did their business independently and were self-financed in maize trading. Apart from maize trading most of the *Farias* were engaged in trading of other agricultural commodities such as paddy, jute, wheat etc. They had no permanent staff.

Wholesalers

The wholesalers had fixed establishments in the market with adequate storage facilities. Apart from maize trading, most of the wholesalers were engaged in trading of other agricultural commodities like paddy, jute, pulses, groundnut, soybean and wheat etc. They purchased large amount of maize from farmers and small amount of maize from *Farias* in the village market. They had permanent staff and did their business at large scale.

Aratdars

Aratdars were the last intermediary in the channel before feed mills or ultimate users of maize of the study. They had permanent business premises in the upazila market. They purchased maize from *Farias* and wholesalers. Sometimes, they bought wet maize from the farmers on the understanding that the farmers could ask them for immediate cash any time. They supplied dry maize to the feed mills within one to two days of taking an order. Generally, the agent of feed mills came to the *Aratdars'* premises for taking maize and sometimes sent purchase volume through truck or pick-up along with the buying receipt and the feed mills paid money later. Then the *Aratdars* sent maize to the feed mills as their purchase volume and collected money at the notified date. The *Aratdars* stored maize for some days, if undelivered, at their business premise. The average period of storage varies from three to four months. The *Aratdars* working with feed mills had little freedom to purchase and sale decisions. They followed the decisions of the feed mills. Always they stay connected with the feed mills to take decision whether they would purchase maize or not at the prevailing market prices. *Aratdars* had Chatal of their own and all processing activities such as drying, cleaning, and packaging were done at Chatal for sending to the feed mills. Who would bear the expenses of buying or selling, depended on the price charged for maize?

Feed Mills

Feed mills were the ultimate user of maize. They bought dry maize from wholesalers and *Aratdars*. Then, they processed the dried and cleaned maize into different forms like poultry feed, fish feed, maize floor etc. Feed mills had a good number of permanent employees and also hired day labourer to do those buying and processing activities. They bought a large amount of maize in peak season and stored it for lean season to maintain pace in their daily business.

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