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An Analysis of Potato Value Chain in Bogra District of Bangladesh

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Authors' contributions

This work was carried out in collaboration between all authors. Author TA designed the study, wrote the protocol and supervised the work. Authors TA, MMR and MSM carried out all field work and performed the statistical analysis. Author TA wrote the first draft of the manuscript. All authors managed the literature searches, edited the manuscript, read and approved the final manuscript.

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ABSTRACT

This study was an attempt to assess the existing potato value chain and seasonal price variation based on of primary and secondary data. Primary data were collected from the potato growers of Kahaloo upazila under Bogra district and potato retailers were selected from Bogra Sadar upazila by applying direct interview method during the month of February to April 2012. Different value chain actors were involved in production and marketing system, such as Faria, Bepari, wholesaler, retailer and cold storage owner. In Kahaloo upaziala the whole value chain of potato was completed through five separate supply chains of potato from the hand of farmers to the ultimate consumers. Longest supply chain included farmer, Faria, Bepari, wholesaler, Distance wholesaler, Retailer and finally consumer. Highest sales price of potato was received by retailer and the lowest sales price was received by farmer. Total value addition by different actors was found 338.12 Tk. per 40 Kg potato. In value chain, highest value was added by wholesaler and lowest value was added by Faria of the total value addition. Ratio to moving average method was applied to examine

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the price fluctuation of Bogra and Dhaka market with the help of secondary data. The price fluctuation of potato in Bogra and Dhaka market was relatively correlated.

Keywords: Potato; value chain analysis; price fluctuation.

1. INTRODUCTION

The potato is the world's most important root and tuber crop. It is grown in more than 125 countries and consumed almost daily by more than a billion people. Hundreds of millions of people in developing countries depend on potatoes for their survival [1]. Potato was introduced in this subcontinent in the sixteenth century. It was grown then in small plots as a vegetable. Potatoes have been grown in Bangladesh since at least the 19th century. By the 1920s, the first commercial production of the crop was established in the country [2]. In Bangladesh potato occupied the first position among all the vegetables in respect of area coverage and production and contributed 65.65 percent of the total production of vegetables in Bangladesh in 2000 [3]. In 2010-11, the area coverage (4.6 lakh hectare), production (83.5 lakh MT) and yield (18.1 t/ha) of potato were comparatively higher. Simultaneously export also increased sharply during this time. Considering the area coverage in the country, potato is the third major crop after paddy and wheat [4].

The study conducted by Akter [5] showed that potato production was highly profitable and it could be provide cash money to farmers. In terms of profitability, potato production was more attractive than any other winter vegetables. Per unit yield and gross return of potato were found higher than other competitive crops.

A large number of people in Bangladesh is directly and indirectly depended on potato production and marketing. There is a value chain system involved with potato marketing indeed. A series of value-generating activities associated with product marketing from farm level to the ultimate consumer referred to as the value chain. In Bangladesh potato value chain starting from producer then there may have many intermediaries like *Faria, Bepari,* Wholesaler, Retailer etc. Value chain analysis helps to identify the causes of price variation or rising of potato price, make appropriate marketing strategy and pricing policy of potato. Most agricultural products are characterized by some seasonality in production arising from climatic factors and the biological growth of the plant [6]. However, due to the seasonality in production, temporal price variation is more prominent for perishable commodities than many other agricultural products. Fluctuations of price create uncertainty about the market prices and hence risk in production. The biological nature of agriculture production is the principle cause of price instability [7].

In Bangladesh, potato is mainly consumed as vegetable. Various other food items are also made from potato. Adequate supply of potato stabilizes the vegetable market all-round the year [8]. Recently, the government has been trying to diversify food habits and encourage potato consumption to reduce pressure on rice. So, potato is becoming an important food for food security in Bangladesh. So, stability of price is an important factor in taking economic decisions in agriculture. In view of the above, the study had the following objectives;

1. Identify the actors involved in value chain.
2. Estimate the value addition of potato by the actors in potato market.
3. Estimate the seasonal price fluctuation of potato in the study area.

2. METHODOLOGY

The study was conducted in selected areas of Kahaloo upazilla especially is the leading potato producing area of Bogra district. Data were collected during the period from February to April, 2012 through face to face interview. Two retail markets Raza Bazar and Foteh Ali Bazar were selected from Bogra Sadar upazila and two Haats named Bibir Pukur Haat and Dhaper Haat were chosen from Kahaloo upazila of Bogra district by applying purposive sampling technique. The sample size for potato grower was fixed at 20 and out of them 10 were collected from Bibir Pukur and 10 were collected from Dhaper hat in Kahaloo upazila of Bogra district through simple random sampling technique by using random number table. Forty other value chain actors (10 *Farias*, 10 *Beparis*, 10 wholesalers and 10 retailers) and three cold storage owners were selected from the study area by using purposive sampling. The probable analytical techniques and SPSS software were

used to analyze the gross return and net return of the farmer, marketing margin and net margin of value chain actors and seasonal price variation of potato in Bogra and Dhaka market.

2.1 Gross Return and Net Return of the Farmer

Gross Return was calculated by multiplying the total volume of output of an enterprise by the average price in the harvesting period [9]. It consisted of sum of the volume of main product and by product. On the other hand, net return was calculated by deducting all costs (variable and fixed) from gross return.

2.2 Marketing Margin and Net Margin of Value Chain Actors

The marketing margin and net margin of different value chain actors were estimated by the following formula [10]:

- Marketing Margin= Sales price – Purchase price
- Net Marketing Margin =Marketing Margin – Marketing cost
- Value Addition (%) =

$$\frac{Sales\ price - Purchase\ price}{Purchase\ Price} \times 100$$

- Interest on operating capital= Amount of operating capital× Interest rate (%)× Time required (in years) /2
- Variable cost of potato production was considered as operating capital.

2.3 Seasonal Price Variation

Secondary data about average monthly wholesale prices of potato in Bogra and Dhaka market was collected from the report of weekly wholesale price published by the Department of Agricultural Marketing (DAM) during the period from 2001 to 2011 [11]. Ratio to moving average method was applied to examine the price fluctuation of potato of two markets. Ratio to moving average method is superior to others because this method can eliminate both trend and cyclical components from the indices of seasonal variations and provides a true seasonal variation.

2.3.1 Coefficient of variation

The coefficient of variation is a well-known statistical concept and is calculated as follows:

$$CV = \frac{SD}{Sp} \times 100$$

Where;

CV = Coefficient of Variation
SD = Standard Deviation of seasonal price
Sp = Arithmetic mean of seasonal price [12].

3. RESULTS AND DISCUSSION

3.1 Cost and Return Analysis of Potato

It was seen that gross return per 40 kg of potato was Tk. 480.38 and Tk. 12.01 per kg respectively. Variable cost and fixed cost per 40 kg of potato was Tk. 81.80, Tk. 161.16 and Tk. 2.05, Tk. 4.03 per kg respectively. Total cost (with marketing cost Tk. 66.12) per 40 kg of potato cultivation was Tk. 309.08 and Tk. 7.73 per kg respectively. Gross margin per 40 kg of potato was Tk. 398.58 and Tk. 9.96 per kg respectively. Net return per 40 kg of potato was Tk. 171.30 and Tk. 4.28 per kg respectively. Farm gate price is that price which farmer gets through selling their produce at the farm yard that was Tk. 380.21 per 40 kg. Value addition per 40 kg of potato was Tk. 100.17 and Tk. 2.50 per kg respectively. Among the value addition farmers covered the 26.35 percent of total value addition (Table 1). Highest sales price per 40Kg of potato received by retailer was Tk. 818.50 (Fig. 1) and the lowest sales price received by farmer was Tk. 480.38 (Table 1). Highest value (17.86 percent) was added by wholesaler and lowest value (9.88 percent) was added by *Faria* of the total value addition (Fig. 1).

Table 1. Profitability of potato farmer

Particulars		Tk. /40 Kg	Tk. / Kg
i.	Gross return	480.38	12.01
ii.	Fixed cost	161.16	4.03
iii.	Variable cost	81.80	2.05
iv.	Marketing cost	66.12	1.65
v.	Total cost	309.08	7.73
vi.	Gross margin (i-iii)	398.58	9.96
vii.	Net return (i-v)	171.30	4.28
viii.	Average farm gate price	380.21	-
ix	Value addition (i-viii)	100.17	2.50
x	Value addition (%)	26.35	

3.2 Value Chain Actors of Potato in Bogra

Potato moved from the sellers to consumers through the same chains i.e. through some

market actors like *Faria*, *Bepari*, wholesaler, retailer and cold storage owner. Movement of potato from the point of producers to the consumers through some actors forming value chain in the selected potato marketing area. Cold storage plays a very important role in increasing production of potato by supplying quality seed potato in time [13].

Following two diagrams (Figs. 2 and 3) represent the Value Addition, Marketing Cost and Net Marketing Margin of different market actors of potato.

Among the different actors, F*aria* incurred lowest (in percentage) marketing cost but earning second highest net marketing margin (near to highest Net Marketing Margin); on the other hand wholesaler incurred highest marketing cost but earning lowest net marketing margin (Fig. 3).

3.3 Role of Cold Storage Owner in Potato Value Chain

After collection and grading of the potato some routine regulations and practices were followed in all the cold storages before and after storing period. Diseased, mechanically injured and bruised potato were sorted out before storing. Pre-cooling of the potato was sorted out before storing at a temperature of 48℉ for 24 hours in

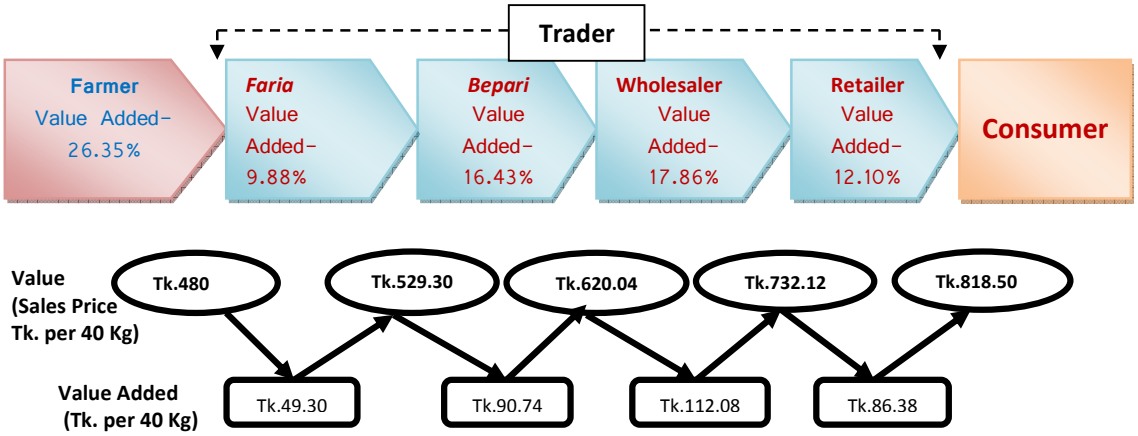

Fig. 1. Sales price, value addition and value addition (%) of different value chain actors of potato

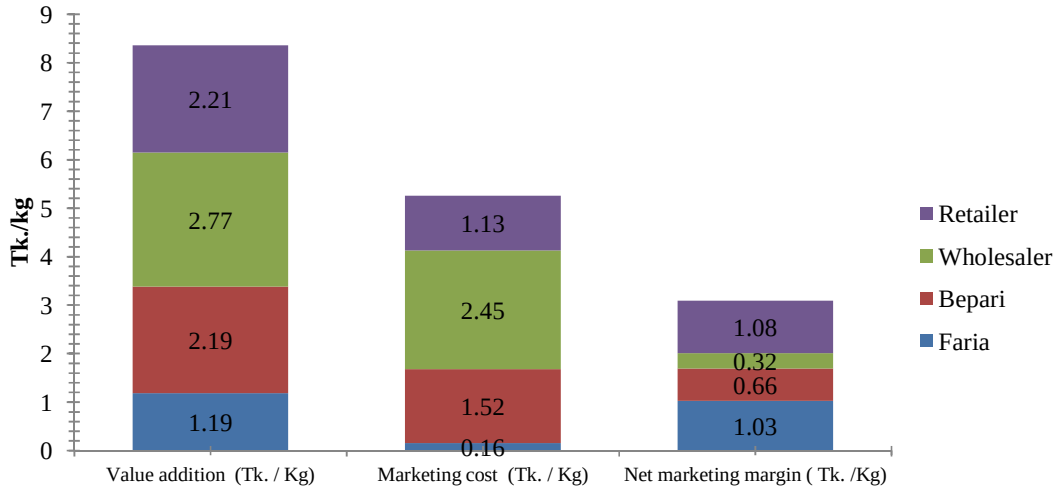

Fig. 2. Value addition, marketing cost and net marketing margin of different market actors in potato marketing

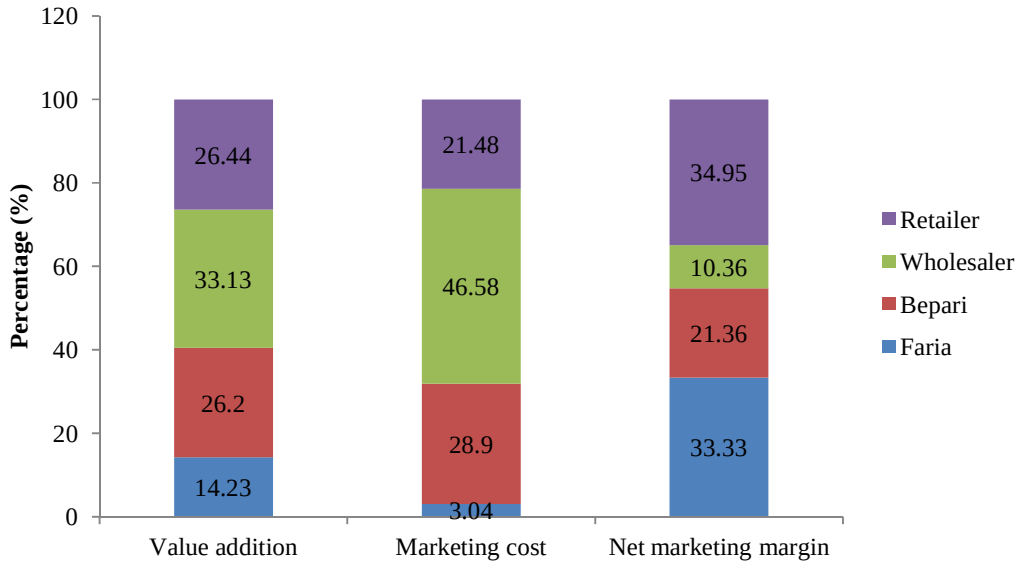

Fig. 3. Share of different actors in value addition, marketing cost and net marketing margin of potato

case of table potatoes and for 7 days in case of seed potato. Then the pre-cooled potato was kept in gunny bags, stacked on wooden racks inside the plants and stored at 48°–50℉ temperature and 80 to 90 percent relative humidity. The stored potato was checked at different times during the whole storage period and the gunny bags were again put at 48°−50℉ temperature for 24 hours and then dried under electric fan for 5 to 6 hours at adjacent premises. After releasing, the seed potato was required to be kept in shady place for at least 7 days before selling to reject diseased, physically disordered and sprouted potatoes to be sold at higher prices [14].

The average capacity (40 kg) of cold store is 206667, starting month of the storage is 1st March and release month is November. Price of the potato during the production period is Tk. 330 (40 Kg), price during the harvesting period is Tk. 380 (40 Kg) and price during the storage is Tk. 485 (40 Kg) (Table 2).

The average storage amount of table potato of farmer is 36333 (40 Kg) and seed potato is 79863 (40 Kg), average storage amount of table potato of *Bepari* and wholesaler was 67000 (40 Kg) and 23471 (40 Kg) respectively. Both the actors start their storage in the month of March and release in the month of November. The average cold storage charge was Tk. 175 (40 Kg) for both value chain actors (Table 3).

3.4 Seasonal Price Variation of Potato

Seasonal price variation was analyzed by construction of seasonal index numbers using ratio to moving average method. Seasonal price index of potato was the highest 134. 74 in Bogra district and 136.33 in Dhaka district in the month of December i.e. price becomes about 35 percent higher than the average price in this month and lowest 65.33 of Bogra district and 67.45 of Dhaka district in the month of February i.e. price becomes 35 percent lower than the average price in this month. Prices began to increase by April and reached the peak in December. During the harvest period, potato price remained low and then it gradually rose up to the start of next harvesting period. The coefficient of variations (21.84, 20.08) between Bogra and Dhaka market are near about same that means in that period, price of potato in Bogra and Dhaka district were relatively correlated (Table 4). A Fig. 4 shows that ranges of seasonal price variation by months are greater in Bogra than that of Dhaka market most of the cases but in case of December, range of seasonal price variation is greater in Dhaka market than Bogra market.

Following diagram (Fig. 4) was made according to the Table 5.

Table 2. Information on cold storage

Average capacity (40 Kg)	Month of storage	Month of release	Price before harvesting (Tk. / 40 Kg)	Price during harvesting (Tk. / 40 Kg)	Price during storage (Tk. / 40 Kg)
206667	1st March	November	330	380	485

Table 3. Information on storage of different value chain actors

Actors	Table potato (40 Kg)	Seed potato (40 Kg)	Duration of the storage		Cost of storage (Tk/ 40 Kg)
			Table potato	Seed potato	
Farmer	36333	79863	March to November	March to November	175
Bepari	67000	_	March to September	_	175
Wholesaler	23471	_	March to June	_	175

Table 4. Seasonal price variation of potato

Month	Seasonal price index in Bogra District	Seasonal price index in Dhaka District
January	88.50	90.93
February	65.33	67.45
March	70.46	71.27
April	75.98	84.27
May	90.72	88.08
June	102.17	103.08
July	109.48	111.49
August	115.20	108.16
September	110.25	109.05
October	113.72	110.52
November	123.45	118.98
December	134.74	136.33
Maximum value	134.74	136.33
Minimum value	65.33	67.45
Range	69.42	68.89
Coefficient of variation (%)	21.84	20.08

Table 5. Range of seasonal price variation of potato in Bogra and Dhaka market

Month	Range of price variation at Bogra (%)		Range of price variation at Dhaka (%)	
	High	Low	High	Low
January	140.94	46.70	115.25	59.65
February	113.98	49.56	92.78	53.38
March	105.64	54.78	96.53	52.73
April	95.14	52.13	110.42	60.95
May	110.63	62.05	108.16	65.68
June	118.00	64.80	126.87	78.71
July	126.65	85.93	127.96	94.77
August	138.17	94.83	123.10	87.09
September	129.97	78.45	133.69	89.98
October	144.21	76.53	152.09	67.41
November	163.78	79.83	147.36	78.85
December	187.84	101.30	244.19	71.87

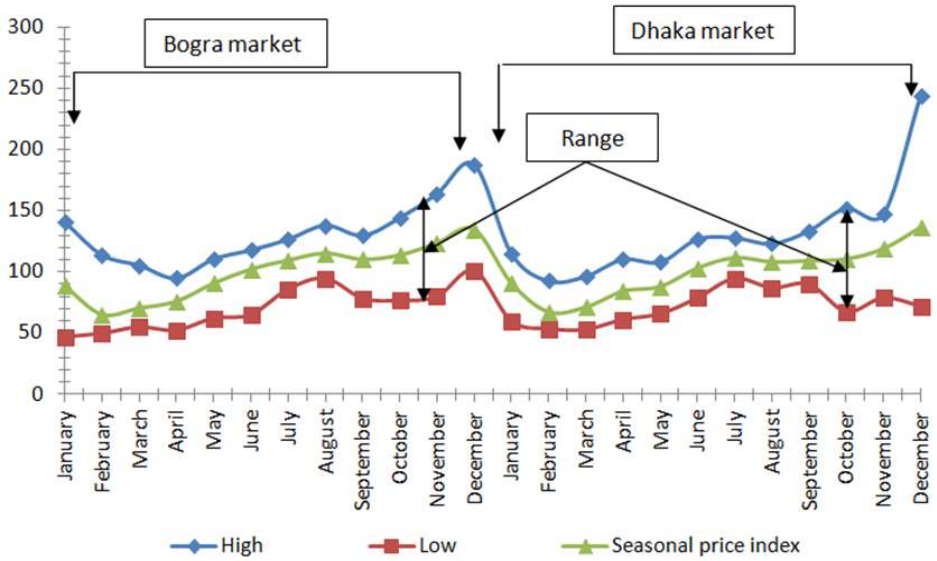

Fig. 4. Range of seasonal price variation of potato between Bogra and Dhaka market

In general it was found that the price of potato fluctuated in different seasons. The causes of this fluctuation might be:

i. Supply of potato comes to an end in November-December especially in November but the demand remains unchanged and also rises.
ii. Also in the part of the season, the farmers store seed potato. So the price of table potato begins to rise.
iii. The cause of falling prices of potato in February is that the supply of potato was higher (because of harvesting season) than its demand. In this time other winter vegetables become easily available and the price of potato begins to fall gradually.
iv. Cost of storage also increases the price of potato.

4. CONCLUSION

Based on the findings of the study it can be concluded apparently that considerable scope exists to increase the productivity of potato and to develop the value chain. Expanded potato cultivation can upgrade the living standard of the function areas of value chain. Potato is not only a source of nutrients but also a source of cash income for farmers. A large number of people are involved in the production and marketing of potato. So, the farmers and actors could certainly be benefited financially if production and marketing system of potato are well developed.

For stabilizing potato prices, forecasting of potato prices and target production should be made in time before sowing, so that the farmers can adjust potato acreage accordingly. With successful operation of a buffer stock, price instability may be reduced. Government intervention in potato marketing is necessary to ensure fair price to the farmers by controlling such unexpected price fluctuations.

Farmer engaged in potato production was not very solvent to make the full utilization of value chain opportunity. They could not store potato for better price in the off season. Credit facilities should be made available at low interest rate by government. Processing opportunities were not available in the study area. Some local and traditional methods were applied by the processor. So, if there were any technological and financial support in processing industries more value could be added efficiently. Grading and standardization facilities should be utilized properly for efficient value chain of potato market. Lack of timely and proper market information was a great problem. So, market information should be available and ease accessible for the producers also for other value chain actors.

Finally agro-processing industries especially for study area were badly needed. For making efficient value chain of potato marketing all the actors including farmer should have proper knowledge, financial assistance and also good transportation system.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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