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Price fluctuation of vegetables in Bangladesh; is it a disparity of supply chain surplus?

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Abstract
The purpose of this Study is to analyze the variation of supply chain surplus among the stakeholders of vegetable supply chain. Data were collected from different locations for types of intermediaries. Convenient sampling method has been applied in this research to survey the intermediaries. SPSS Software was used to analyze data by descriptive statistics and inferential statistics. Findings explored that several intermediaries from foria to retailer are sharing the supply chain surplus, few intermediaries between the supply chain gain unusual access profits by illegally raising the prices of vegetables which ultimately increases final price to the end customer.

Keywords: vegetable supply chain, surplus, stakeholders

1. Introduction
Unbiased prices of agricultural product for farmers and consumers created a central dispute in Bangladesh for years, but little consideration has been given to market responses to guarantee fair price. The seasonal supplies and perishable nature of vegetables cause intense price instability overtime in Bangladesh. Price drops during the post-harvest period, depriving the farmers from getting reasonable price of what they produce. For this, vegetable retailers face different variation in price of vegetables because they collect vegetables from different intermediaries and different locations. Also, retail prices of vegetables are higher in urban markets as compared to rural markets. The existence of too many intermediaries (who are currently receiving surplus from vegetable value chain without adding any value) in the vegetable value chain is a major source of inefficiency in this sector.

The vegetable supply chain in our country is not effective where farmers of vegetables are always deprived of profit. Growers in this chain face three challenges: financing crop production; poor yields, losses due to the elements which reduce their bargaining power significantly (Ali, 2009) [2]. Asian Productivity Organization (2007) [3] on "Marketing System for Agricultural Products" indicated that the agricultural marketing system of Bangladesh is inefficient because of the different territories, scattered location of production areas, natural disasters and relatively poor condition of infrastructure. Earlier researches on Bangladesh vegetable supply chain found that there are some intermediaries' involved undertaking major role in the distribution and marketing process of vegetable supply chain. Short description of the supply chain with a flow chart is given below:

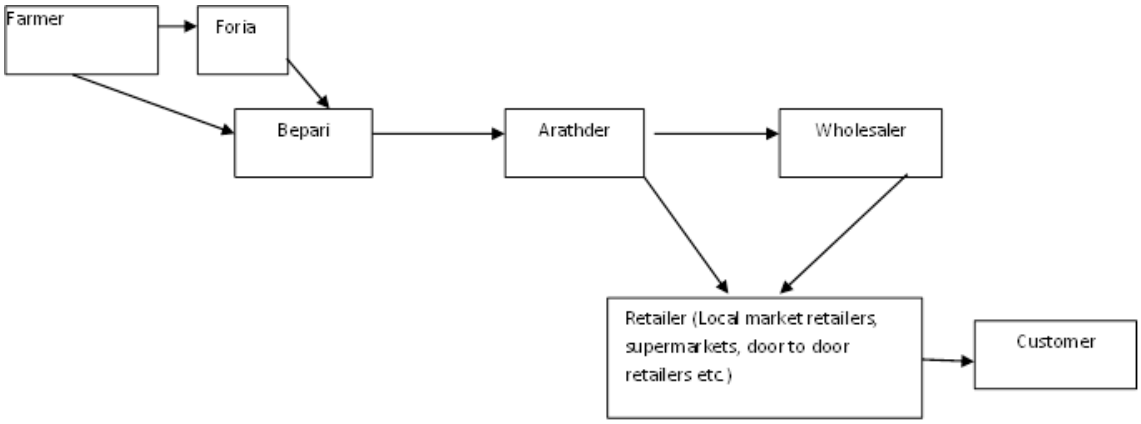

Fig 1: Vegetable Supply Chain in Bangladesh

The farmers sell their vegetables either to the foria at the local market or to the beparies in the nearby rural markets. The products are then distributed by transport (truck) to the different wholesale markets in the district towns based on demands. Bepari pays commission to the Arathders in the wholesale markets for using 'Arats' until the product is sold out to the retailers or wholesalers by auction.
Supply chain surplus is not a phenomenon rather than a quantified value and supply chain Surplus can be calculated by:

Supply Chain Surplus = (Revenue – cost) = Revenue – (Inbound and Outbound Transportation Cost + Labor Cost + Housing Cost + Wastage Cost + Unit Cost of Vegetables + Cost of Inventory + Packaging Cost)

Inbound transportation cost refers to the transport, storage and delivery of goods coming into a business (Chopra and Meindl, 2007) [8]. Inbound transportation cost is almost 0 for Foria because Foria's collect the vegetables from the local farmers by using rickshaw or tupri (local word). Outbound transportation costs incus due to the movement of material associated with storing, transporting, and distributing goods to its customers. In this case study, outbound transportation cost will be near to zero. Labor costs are salaries of the assistants to the retailers. In most cases, salaries are mostly on monthly or daily basis. In this case, daily payments are given to those who do the work of daily shifting of sacks vegetables from truck to the retail shop. Monthly payments are given to those assistants who are appointed to sell vegetables to customers. Housing costs are the amount that a homeowner spends on mortgage payment plus whatever amount is required to service all outstanding household debts. Here, household costs are Rent, Utility Bills etc. Packaging material costs include price of the packaging material, polythene, Rope used for binding bunch or sacks of vegetables, or for any important purpose. Opportunity cost results from post-harvest losses or wastage. Wastage cost is basically the loss resulting from breakage, decay, handling etc. of goods and material. There are various resources have been identified for wastage of vegetables, such as- unsold wastage, lack and unaware of cold storage, poor quality goods, careless handling, poor transportation decisions etc. Due to perishability nature, vegetables incur opportunity cost mainly for rotten vegetables. Unit cost of vegetables is the buying price of vegetables.

Although study of vegetables price fluctuation has been conducted in different researches, little study has been accessed to in the context of supply chain profitability or surplus of vegetable stakeholders. Supply chain efficiency describes the extent to which time, effort or cost is well used for the intended task or purpose, it is often used with the specific purpose of relaying the capability of a specific application of effort to produce a specific outcome effectively with a minimum amount or quantity of waste, expense, or unnecessary effort (Negi, 2014) [16]. Efficient SCM in marketing, not only increases the profitability and efficiency of retailers, but also adds value to different stakeholders like farmers, consolidators and consumers (Deliya, Thakor & Parmar, 2014) [6]. SCM has been stressing the need for collaboration among successive actors, from primary producers to end consumers, to satisfy the consumer demand in a better way at lower costs (Deliya, Thakor & Parmar, 2014) [6]. This research is crucial as the retail prices of vegetables are increasing significantly, and seasonal variations of vegetable prices are observed frequently. This research will add value to compare the profits of individual stakeholders in the supply chain.

2. Problem Statement

Vegetable production contributes in the economy of Bangladesh because Bangladesh is an agrarian country and endowed with fertile land, favorable climate for production of agricultural goods (Hoq & Sultan, 2012) [11] and the economy of this country draws its main asset from agriculture sector. According to Bangladesh Bureau of Statistics (2013) [7], many people are living their life from the earnings of agricultural sector because statistics shows that agricultural sector contributes 19.10% to GDP (at current prices) and employs 50.28% of the labor force (Mondol, 2010) [15]. There are some challenges in the vegetable supply chain which are discussed below:

Firstly, vegetables are perishable in nature and cannot be stored for longer periods, which result in very sensitive and complicated trading of these horticultural commodities and exposing big challenges to suppliers, processors and traders (Ahmad and Feher, 2009) [5]. Secondly, suitable marketing channels and the market actors are important in timely delivery of vegetables from the producers to the consumers but there is no proper systematic channel in the markets for which price of vegetables fluctuates (Anny *et al*., 2016) [4]. Thirdly, The supply chains of vegetables are dominated by traditional businessmen or middlemen (Kundu *et al*., 2011) [13]. Intermediaries are the middleman or parties who gains profit through buy and sell function in the entire supply chain (Raghuram and Chandrasekaran, 2009) [17]. Distribution of goods takes place by means of channels, and the intermediaries are the independent groups or organizations within the channel that make the product available for consumption. Intermediaries are essential part of vegetables supply chain in Bangladesh and portion profit with producer whereas farmers in Bangladesh cannot avoid intermediaries' for shifting their product to market. Farmers get a small share of consumer price, though they should get major portion of it (Anny *et al*, 2016) [4]. Fourthly, in our country farmers has less bargaining power and the marketing channel is dominated by market intermediaries (Anny *et al*, 2016) [4]. Farmers are deprived of the fair price for the products they produced and suffer different types of problems like financial, transportation, storage facilities, lack of cooperation and other facilities that create barriers in marketing their products by themselves (Abdullah and Hossain, 2013) [1]. The farmers are always underprivileged of the fair price for their products due to improper marketing systems that exist in Bangladesh (Abdullah and Hossain, 2013) [1]. The problems of vegetable growers are numerous however lack of market infrastructure and price fluctuations seem to be major bottleneck in the sustained development of vegetable production (Mohapatra and Prusty, 2017) [14].

3. Literature Review

Supply chain management has been defined as set of approached utilized to efficiently integrate suppliers, manufacturers, warehouses so that merchandise is produced and distributed at the right quantities to the right locations and in the right time in order to minimize system wide costs while satisfying service level requirements (Simchi-Levi *et al*, 2008) [19]. Positive inflation rate in agricultural market is now a serious issue for many countries because according to Food and Agricultural Organization (FAO), Bangladesh is in one of the crisis country for frequent price changes of foods (Rathore *et al*, 2010) [18]. There are different demand factors and supply phenomenon which can contribute in this price fluctuation game but several authors emphasized the chain of supply of vegetables as a major reason of price changes. Negi S and Anand N (2013) [16] explored that, due to perishability nature supply chain of vegetables and fruits have become more complex and several intermediaries are conscious to gain profit money in their pockets. Sing and Mishra (2013) [20] mentioned that, in agricultural marketing, several complexities exist because of risk of perishability and he also mentioned low literacy rate of farmers, limited access to information, multiple channels of distribution as risk factors of vegetable supply chain. There are several intermediaries

involved in the food supply chain from the farmers' field to retail market and every intermediary gains profit through buy-sell function. Shukla (2013) [23] noticed that, most of the vegetable farmers are not adequately literate and they are harassed by the middleman due to lack of knowledge and awareness. Halder and Pati (2011) [10], in his study mentioned lack of cold store as a barrier of fruits and vegetables distribution channel and he emphasized role private sectors and cooperatives to set up the infrastructure of cold chains. Veena *et al* (2011) [24] blamed the fragmented supply chain that means the presence of large number of intermediaries in the complex vegetable supply chain as a root cause of price fluctuation. Singh *et al* (2009) [21] mentioned lack of information flow between forward and backward linkages from farm to fork level of agricultural supply chain in developing countries. Sharma and Singh (2011) [22] mentioned that, lack of infrastructural facilities like improper warehouse, poor loading and unloading, improper packaging material does not add value in the supply chain and deceases food quality by degrading values. He also mentioned poor grading and material handling techniques during the logistics function of the vegetables. Rathore *et al* (2010) [18] analyzed poor technological facility and lack of seminars, awareness exhibitions to improve the marketing channels of vegetables.

4. Research Methodology

This research was followed by empirical study. Empirical research relies on experience or observation and is based on data coming up with conclusions which are being verified by observation and empirical research is appropriate when proof is sought that certain variables affect other variables in some way (Kothari, 2013) [12]. In this research, vegetable supply chain intermediaries have been surveyed as respondents. The target population of the study has been divided into four groups. The research focused on the intermediaries of Foria, Bapery, Atathder and Retailer. Sample size and location have been selected according to convenient sampling. Convenient sampling method has been applied because intermediaries are spread in different locations and few intermediaries perform multiple roles of intermediaries. Forias were surveyed in Hemayetpur, Savar and Norshingdi (Belabo and polash thana), Baperies and Arothders were surveyed from Kawran Bazar and Mirpur 1, retailers were surveyed from Mohammadpur Geneva Camp Bazar and Krishi Market. For this research, eighteen (18) forias, twenty (20) beparis, nine (9) arathders, and eighteen (18) retailers have been surveyes as respondents by face to face interview with careful consuderation. The primary data have been collected from the target population by using structured questionnaire. The questionnaire has been furnished with some open ended and some close ended questions. Data have been collected with proper attention by researcher. Data obtained from questionnaire and interviews have been tabulated and summarized and analyzed by using SPSS. Both descriptive statistics and inferential statistics have been used for this research. The research findings analyzed quantitative findings and qualitative judgments and opinions to represent the variation of supply chain surplus and causes behind the disparity.

5. Findings and Analysis

The findings and analysis have been represented in two sections as quantitative findings and qualitative discussions. SPSS software provided outcome after giving entry of data collected and discussed below. In the table below, the mean profit of the Foria is 2286 taka with sample size of 18 and the profits of other stakeholders with minimum profit, maximum profit and standard deviation of the profits have been represented.

Table 1: Mean profit of different intermediaries

Profit	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Foria	18	2.2868E3	1187.61874	2.79924E2	1696.2444	2877.4222	-415.00	3881.00
Bapery	20	4.1878E3	1698.01264	3.79687E2	3393.0556	4982.4444	639.00	8235.00
Arathder	9	4.9963E3	851.48723	2.83829E2	4341.8223	5650.8444	3761.00	6209.00
Retailer	18	2.2376E3	1997.14308	4.70731E2	1244.4552	3230.7670	80.00	6490.00
Total	65	3.2333E3	1906.11208	2.36424E2	2760.9501	3705.5730	-415.00	8235.00

The intermediaries have variations in the profit levels but Arathders have the highest amount of marketed surplus which is almost 5000 taka. Total 65 intermediaries have been surveyed and from the data table it is observed that standard deviation of profit exists among the stakeholders. This deviation reflects the discrepancy of supply chain surplus and market share of the vegetable intermediaries.

Table 2: Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
2.975	3	61	.038

As, the above table of homogeneity of variance assumption, the equality of variances of four groups of intermediaries are assumed, the significance level .038 implies that data has not violated the assumption of homogeneity of variances. According to Leven's statistic, significance value higher than .05 assumes homogeneity of variances between the stakeholders.

Table 3: Analysis of Variance (ANOVA)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	8.016E7	3	2.672E7	10.698	.000
Within Groups	1.524E8	61	2497791.058		
Total	2.325E8	64			

ANOVA table with significance level .000 implies that there are significant difference of profits between Foria, Bapery, Arathder and Retailer.

Table 4: Robust Tests of Equality of Means

Profit	Statistic[a]	df1	df2	Sig.
Welch	18.200	3	31.367	.000
Brown-Forsythe	12.286	3	52.626	.000

a. Asymptotically F distributed.

Table 5: Multiple Comparisons of Profit (Tukey HSD)

(I) Intermediary	(J) Intermediary	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Foria	Bapery	-1900.91667*	5.13474E2	.003	-3257.1518	-544.6816
	Arathder	-2709.50000*	6.45212E2	.001	-4413.6931	-1005.3069
	Retailer	49.22222	5.26813E2	1.000	-1342.2456	1440.6901
Bapery	Foria	1900.91667*	5.13474E2	.003	544.6816	3257.1518
	Arathder	-808.58333	6.34367E2	.582	-2484.1325	866.9658
	Retailer	1950.13889*	5.13474E2	.002	593.9038	3306.3740
Arathder	Foria	2709.50000*	6.45212E2	.001	1005.3069	4413.6931
	Bapery	808.58333	6.34367E2	.582	-866.9658	2484.1325
	Retailer	2758.72222*	6.45212E2	.000	1054.5291	4462.9153
Retailer	Foria	-49.22222	5.26813E2	1.000	-1440.6901	1342.2456
	Bapery	-1950.13889*	5.13474E2	.002	-3306.3740	-593.9038
	Arathder	-2758.72222*	6.45212E2	.000	-4462.9153	-1054.5291

*. The mean difference is significant at the 0.05 level.

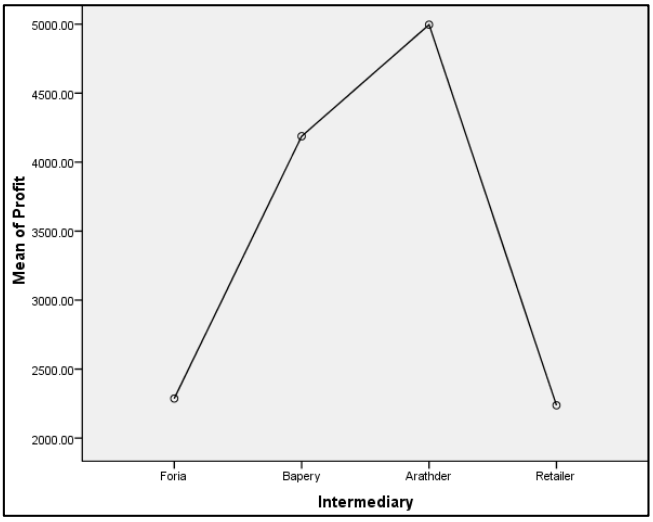

Fig 2: Mean Profit of Intermediaries

To compare the difference of profits between each pair of stakeholders, the Post Hoc table has been displayed above. This table is explained because; findings already show significance value less than .05 for overall ANOVA. The post Hoc table tells where the exact differences exist between each pair of stakeholders. From the columns of mean difference and significance value, the retailer profit is not significantly different from Foria, profit of Bapery and Arathder's surplus are not significantly different from each other. The other significance values are less than .05 and exactly reveal that, there are significant differences of profits among the pairs of stakeholders. The research findings suggest that, variation of supply chain surplus is very high for intermediaries of supply chain of vegetables from foria to retailer. Price is increased by few dishonest intermediaries although there are specified prices mentioned by Government and Ministry of Agriculture. Customers are paying high price but farmers are not getting the desired money.

The open discussion and opinion survey revealed some interesting findings to discuss the causes of disparity in supply chain surplus.

Case 1: Mr. Abdul is a vegetable farmer at Norshingdi and he inherited the business from his family. Every day he and his family members collect vegetables from field and deliver the vegetables in the local market to the beparies. The beparies always deduct some money from the actual receivables of the farmers because beparies have to pay commissions to the local political leaders regularly. The local policeman is reluctant in this game because they are also getting commissions from the political leaders.

Case 2: Mrs. Helena lost her husband 5 years ago and she is now owner of the vegetables filed located nearby to her home at Savar where she cultivates vegetables with the help of her four sons and daughters. She sells vegetables to the Hemayetpur market to the Arathders daily where most of the days she delivers the goods with late payment. Due to her low literacy level and awareness and knowledge about current market prices, arathders take the chances of late payment and low cost.

Case 3: Mr. Jamal is a wholesaler at Kawran Bazar where he owns his own shop to sell the vegetables regularly. He collects vegetables from beparies and sells to the retailers regularly. Every day at the late afternoon, he sells out the vegetable at a lower price due to the shrinkage of vegetables as perishable in nature. He does not have any cooling store in the Bazar to maintain the quality of the vegetables. He mentioned that, few dishonest wholesalers spray chemical to maintain the green vegetables perishability.

6. Conclusions and Recommendations:

From the above outcomes, it is clear that, there are differences in the supply chain surplus among the intermediaries which may be cause of inflation rate of vegetables but there may be other factors which are responsible for this phenomenon. This research investigated qualitative judgments and quantitative evidences to proof the disparity in surplus. Some recommendations to reduce the disparity in surplus have been discussed below

1. Logistics and transport- Advances logistics and transport management system like cool refrigerated vehicles and other equipment's relating to logistics can decrease the losses of shrinkage value of vegetables and can increase the quality of food.
2. Decreased number of levels of intermediaries- Appropriate marketing models and strategies to transfer vegetables from one location to another location can reduce the number of intermediaries and also reduce the price of vegetables.
3. Information dissemination- As Government initiated digitalization throughout the country, information technology updated information and set policies relating to price can reduce the bargaining power of intermediaries hence illegally raising price.
4. Public private partnership- Government associations and private agencies can collaborate take the responsibility

of market control to reduce the price gap between levels of intermediaries by upgrading infrastructure, logistics system and transportation facilities.

The government has a responsibility to ensure transparency of supply chain of vegetables and effective market control can reduce gap between rural market price and urban retail market price. In addition, effective pricing mechanisms are necessary for supply chain of vegetables. The improvement of information system can have a significant impact on the reduction of price and profit variation. This research incurs few limitations as convenient sampling has been used and sample size was low to describe the entire vegetable supply chain market. Future research suggests other factors apart from supply chain surplus need to be analyzed to incorporate the actual findings in the above mentioned phenomenon.

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