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PRODUCTION AND PRICE BEHAVIOUR OF VEGETABLES IN BANGLADESH

S. A. Sabur

I. INTRODUCTION

Bangladesh, after independence, has adopted various measures to raise the vegetable production for tackling the malnutrition problem in the country. Nevertheless, vegetable production has marginally increased from 7.4 lakh tons in 1974/75 to 9.2 lakh tons in 1987/88 with year to year fluctuation (GOB 1985 to GOB 1989). Their growth of production is lagging far behind the growth of other important crops such as wheat, potato Boro paddy etc. Furthermore, the growth is not same for all vegetables. Production of some vegetables are increasing at a very faster rate whereas others showing a decreasing trend.

The seasonal supplies and perishable nature of vegetables cause violent price fluctuation over time and space in Bangladesh. Price declines sharply during the post harvest period, thereby depriving the producers from getting a fair price for their produce. They rise to very high levels in the lean season which makes it difficult for the poor consumer to incorporate vegetables in their diet. There are also spatial variations between producing and consuming areas which can not be accounted for by the cost of transportation. These wide temporal and spatial price variation are partly owing to lack of economic and scientific storage and quick transportation facilities and partly due to the market imperfection.

In view of the above facts, the present study is an attempt to estimate the growth rates in area, production and productivity of vegetables

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The author is an Associate Professor, Department of Cooperation and Marketing, Bangladesh Agricultural University, Mymensingh.

and to examine the trend, seasonal fluctuation and spatial variation of selected vegetables prices in Bangladesh,

II. METHODOLOGY

Data regarding area, production and yield of important vegetables are gathered from the year book of Agricultural Statistics Published by the Bureau of Statistics, Government of Bangladesh for the period 1972/73 to 1987/88. Average monthly wholesale prices of selected vegetables, viz., egg plant, polwal, tomato, radish and pumpkin as well as potato and Aman rice since 1972/73 in Karatia (Tangail), Comilla, Jessore, Rangpur and Dhaka City markets were collected from the Directorate of Agricultural Marketing, Government of Bangladesh. In addition, weekly retail and wholesale prices of selected vegetables were collected from the selected retail and wholesale markets, e. g., Mirpur, Rayer Bazar, Muhammadpur, Moulavi Bazar, New Market, Gulshan, Kawranbazar, and Shambazar, in Dhaka city through weekly visit to the markets by the investigators during 1988-89.

Analytical Procedure

The compound growth rates (C.G.R) of area, production, yield and price of vegetables were calculated by fitting exponential functions of the type $Y = ae^{bt}$ or $\log_e y = \log_e a + bt$ where, $Y = \text{Area / production / yield / price of a particular vegetable}$, $t = \text{time period}$ and $e^b - 1$ be the compound growth rate. The seasonal indices of prices were calculated by using the following multiplicative model :

$$S = \frac{T X C X S X T}{T X C X I}$$

Where T stands for the trend, C for cyclical fluctuations, S for seasonal and I for irregular fluctuations, respectively. Trends were estimated by 3, 5 and 8 months moving average method for radish, tomato and Polwal respectively. In case of other crops 12 months moving average method was followed. Seasonal indices were worked out for each market by averaging the detrended series. It was seen that the seasonal price indices were of similar nature in all the selected markets. That is why, seasonal indices of a particular crop were calculated by averaging the monthly indices of different markets.

Due to non-availability of alternative suitable method, simple correlation coefficient as a measure of market integration was used in this study,

III. TREND IN AREA, PRODUCTION AND PRODUCTIVITY

For calculating compound growth rate, 1972/73 was taken as the base year. Although 1972/73 was not a normal year but from that year area and production of vegetables started increasing after a temporary slump during 1970-72. Compound growth rates of area, production and productivity of important vegetables in Bangladesh during 1972/73 to 1987/88 are presented in Table 1.

Area

The area of all vegetables except Kharif egg plant shows an increasing trend in the post-independence period. The total planted area of all vegetables has increased by 2.4% per annum ; while area under Rabi vegetables by 2.5% and Kharif vegetables by 2.24%. There is ample scope to raise Rabi vegetables area in Bangladesh and production of Rabi vegetables has slightly an edge over the growth rate of Kharif vegetables area.

Production

Production of all but four vegetables exhibits positive growth rate since 1972/73. The total production of all vegetables has registered an increase of 2% per annum. As the population growth rate is higher than the growth rate of vegetable production, the finding indicates that per capita availability of vegetables has decreased over the years. Besides, the growth rate of Rabi vegetables production (2.7%) is much higher than that of Kharif vegetables production (0.9%). This implies that the lion's share of production increase of Kharif vegetables due to acreage expansion is clearly cancelled by the negative growth rate in productivity of these crops.

Productivity

The productivity growth rate of most of the vegetables is negative since independence. There may be two important reasons for this negative growth rate in productivity : i) Non-availability of high yielding varieties of vegetables

Table 1. Compound Growth Rate (C.G.R.) of Area, Production and Productivity of Vegetables in Bangladesh, 1972-73 to 1987-88.

Vegetables	Area		production		Productivity	
	C.G.R(%)	R ²	C.G.R(%)	R ²	C.G.R(%)	R ²
Tomato	2.6752*	0.9350	2.5213*	0.8805	-0.1501	0.0645
Radish	4.1435*	0.9351	5.0851*	0.9263	0.9104*	0.7231
Rabi Eggplant	0.3506*	0.4167	0.0002	0.0000	-0.3657*	0.5053
Rabi Pumpkin	2.0507*	0.8046	1.4506	0.5948	-0.5797*	0.4897
Cauliflower	3.3034*	0.9407	4.7493*	0.9386	1.0555*	0.5142
Cabbage	2.8910*	0.8994	3.9874*	0.9448	1.0656*	0.9178
Water Gourd	2.9116*	0.9289	3.6863*	0.8954	0.7528*	0.5303
Country Beans	3.1589*	0.9550	2.5325*	0.8049	-0.6081	0.3705
All Rabi Vegetables	2.4803*	0.9306	2.6649*	0.9429	0.1870	0.2126
Polwai	3.4274*	0.9389	1.7858*	0.5090	-1.9080*	0.8990
Kharif Eggplant	-0.3356	0.1442	-2.1733*	0.7603	-1.8367*	0.8990
Kharif Pumpkin	0.7327	0.1846	-0.8587	0.1875	-1.6027*	0.8678
Lady's Finger	4.0290*	0.9509	1.7532*	1.7290	-2.1955*	0.9194
Ridge Gourd (Jhinga)	3.8731*	0.9127	1.6942*	0.5140	-2.1173*	0.9424
Bitter Gourd (Karala)	1.7247*	0.8799	-0.5783	0.0867	-2.6152*	0.9452
Arum	5.4535*	0.8616	4.7807	0.9780	-1.0049*	0.8584
White Gourd	2.2141*	0.5686	0.5113	0.0694	-1.6758*	0.9661
Cucumber	1.5925*	0.7774	-0.5186	0.2349	-2.0683*	0.9739
Snakebean (Barbati)	1.1870	0.2805	12.3333*	0.6453	10.9157*	0.5380
All Kharif Vegetables	2.2448*	0.8488	0.9343*	0.6211	-1.3186*	0.8734
All Vegetables	2.3881*	0.9660	2.0814*	0.9436	-0.3004*	0.5934

*Significant at 1% level

in general and Kharif vegetables in particular, and ii) expansion of acreage of cereals, particularly during Kharif season, compels the vegetables to be grown in the less fertile land. Sanke bean, cauliflower, cabbage and radish show positive trend mainly due to the availability of their high yielding varieties. The non-significant growth rate in productivity of Rabi vegetables implies that their increase in production comes from area expansion.

IV. PRICE BEHAVIOUR

Price Trends

Growth rate of actual and deflated (by consumer's price index) prices of the selected vegetables are depicted in Table 2. All the actual prices have undergone positive growth during 1972/73 to 1987/88. However, the growth rates of deflated or real prices are very small and non-significant¹.

This indicates that vegetables price rises due to the rise in the general price level.

Seasonal Price Variation

The seasonal price indices of selected vegetables, potato and Aman rice are shown in Tables 3 and 4.

The seasonal price indices of radish and tomato are the highest in the beginning of the season and gradually decrease in the following months

Table 2. Compound Growth Rates of Actual and Deflated Prices of Vegetables during 1972-73 to 1987-88.

Vegetables	Actual Price		Deflated Price	
	C.G.R.(%)	R ²	C.G.R.(%)	R ²
Radish	10.2852*	0.6125	-1.1056	0.0347
Polwal	11.6836*	0.9252	-0.3330	0.0146
Eggplant	11.1266*	0.9174	-0.3793	0.0160
Tomato	12.6257*	0.9199	0.9646	0.0659
Pumpkin	8.8826*	0.8855	-0.6777	0.0149

*Significant at 1% level.

owing to increase in supply and decrease in demand. That means, unlike other crops, the price of radish and tomato are determined by the joint influence of change in demand and supply.

Polwal price index is highest in the month of April, which gradually decreases and reaches to minimum in June. The price begins to firm up by August and reach the peak level in October. Polwal prices remain high in the beginning and ending of the season while they are lower in the middle of the season. This implies that the arrival in the market is the important factor determining the price of Polwal.

After reaching highest price in October, the price of eggplant begins to fall by November and during February-March the price is the lowest. This has happened due to the arrival of eggplant in general and winter eggplant in particular because, winter eggplant constitutes about three-fourth of total egg-plant production in Bangladesh (GOB 1989). Pumpkin price, on the other hand, is highest in November, remains stagnant till January and then decreases by February owing to the arrival of the fresh winter pumpkin in the market.

From the foregoing results it is evident that vegetable prices display wide seasonal fluctuation which differs from one vegetable to another depending upon their perishability, production period and seasonality of demand. The difference between highest and lowest indices, a measure of seasonal fluctuation, is maximum for eggplant (96.82) and minimum for polwal (14.58), as shown in Table 3 and 4. The reason for maximum difference to eggplant is that the maximum amount of winter eggplant are harvested within 2 to 3 months. Monthly sale of winter eggplant by farmers shows that about 90 per cent of produce are sold within three months (Sabur, 1990). On the other hand, the monthly harvest of polwal is by and large same throughout the season.

A comparison has been made between the seasonal indices of selected vegetables with those of potato and Aman rice which enjoy good storage facility in Bangladesh. Tables 3 and 4 show that the difference between maximum and minimum indices (Range) of potato is higher than those of selected vegetables except eggplant. Similarly, in spite of non-perishability having price support programme, the range of seasonal price indices of Aman rice is not much lower than those of selected vegetables. The findings thus

Table 3. Seasonal Price Indices of Radish, Tomato and Polwal

Month	Radish	Tomato	Polwal
November	122.22	—	88.27
December	100.12	188.67	—
January	77.66	121.94	—
February	—	64.68	—
March	—	48.25	—
April	—	76.46	128.14
May	—	—	96.34
June	—	—	83.31
July	—	—	85.63
August	—	—	98.34
September	—	—	104.06
October	—	—	115.91
Difference between highest & lowest indices	44.56	50.64	14.58

suggest that the cold storing of potato fails to reduce its seasonal price fluctuation in Bangladesh.

The average coefficient of variation of monthly price of selected vegetables, potato and Aman rice for the period 1972/73 to 82/83 and 1983/84 to 87/88 were worked out and presented in Table 5. The table shows that the seasonal price variation of selected vegetables has slightly increased during 1983/84 to 87/88 over the period 1972/73 to 82/83 in four out of five cases. However, the seasonal price variation of Aman rice has declined during the same period which support the earlier study made by Chowdhury (1987).

Spatial Price Integration

Correlation matrices of all selected vegetables were calculated. Since results are similar for all types of vegetables, only correlation matrices of eggplant are presented in this paper. Table 6 shows the correlation matrix of monthly wholesale price of eggplant in the selected urban markets during 1972/73 to 1988/89. All the coefficients are very high and

Table 4. Seasonal Price Indices of Egg-plant, Pumpkin, Potato and Aman Rice.

Months	Egg-plant	Pumpkin	Potato	Aman Rice
January	83.01	120.89	80.37	92.37
February	53.34	99.02	58.39	94.18
March	43.92	80.76	58.78	99.06
April	67.27	80.55	68.21	102.08
May	92.80	81.40	80.20	101.91
June	108.00	89.08	90.35	101.90
July	126.79	92.91	107.95	104.81
August	132.62	94.81	124.53	107.53
September	126.52	105.04	126.23	110.49
October	139.74	113.50	133.25	106.63
November	121.82	121.44	143.29	92.21
December	104.17	120.60	128.45	86.81
Difference between highest & lowest Indices.	95.82	40.89	74.86	23.68

Table 5. Average Seasonal Price Variation (C. V) of Selected Vegetables, Potato and Aman Rice during 1972/73 to 82/83 and 83/84 to 87/88.

Period	Eggplant	Tomato	Radish	Polwal	Pumpkin	Potato	Aman Rice
1972/73 to 1982/83	38.89	49.26	21.84	23.96	25.98	34.58	14.55
1983/84 to 1987/88	43.14	59.23	30.55	22.90	28.84	36.29	7.57

significant. This indicates that the urban markets are significantly correlated in respect of their price change*. Good communication among the traders and easy transportation facility have made the urban markets more competitive.

The estimated correlation coefficients of weekly retail prices of eggplant between the selected retail and wholesale markets in Dhaka city show that all the markets are in competition with each other except the retail markets (Gulshan & New Market) in the higher income locality (Table 7). Strong

Table 6. Correlation Matrix of Monthly Wholesale Price of Eggplant in the Selected Urban Markets during 1972/73 to 1988/89.

	Tangail	Comilla	Rangpur	Jessore	Dhaka
Tangail	1				
Comilla	0.8621	1			
Rangpur	0.9326	0.8699	1		
Jessore	0.8635	0.7748	0.8535	1	
Dhaka	0.9384	0.8719	0.8946	0.9866	1

All coefficients are significant at 1% level.

Table 7. Correlation Matrix of Weekly Retail Price of Egg-plant in the Selected Retail and Wholesale Markets in Dhaka during 1988/89.

	Mirpur	Rayer Bazar	Muham-mad pur	Moulavi Bazar	New Market	Gulshan	Kawran/Sham Bazar	Sham Bazar
Mirpur	1							
Rayer Bazar	0.6972*	1						
Muhammadpur	0.7145*	0.7885*	1					
Moulavibazar	0.6770*	0.6305*	0.8150*	1				
New Market	0.1478	0.5963*	0.5766*	0.3653	1			
Gulshan	-0.0816	0.8188*	0.5693*	0.3272	0.7150*	1		
Kawranbazar	0.7847*	0.7456*	0.8001*	0.3897	0.0816	0.0649	1	
Sham Bazar	0.9852*	0.7576*	0.7495*	0.8364*	0.0760	-0.1647	0.8389*	1

* Significant at 1% level.

barriers to entry and special behaviour of the consumers have resulted in imperfection in these markets. In the high income locality one can not sell his produce unless he possesses a shop which is very difficult to obtain. Further, rich consumers are less price conscious.

V. CONCLUSIONS

Bangladesh, since its independence, has been witnessing an upward trend in vegetable production. This increase in production has come from area expansion. The productivity, however, has declined during this period mainly due to the non-availability of high yielding varieties of vegetables in general and Kharif vegetables in particular and due to growing vegetables gradually in the less fertile land arising from the area expansion of cereals. Hence, it is necessary to put special emphasis to make high yielding varieties of all types of vegetables available to the farmers in Bangladesh.

The real price of vegetables has remained the same after independence. This implies that increase in supply has completely been absorbed by the increase in demand arising from the increase in population during this period.

Vegetable prices exhibit wide seasonal fluctuation due to their seasonal supply, demand and perishability. This seasonal fluctuation can be smoothened for ensuring a reasonable income to the producer by prolonging the sowing and harvesting periods of vegetables and by establishing processing units for vegetables. Market arrival of vegetables can be uniformly distributed throughout the season if early and late varieties of each vegetable are developed and made available to the farmers. The success of processing unit depends upon the access to profitable markets for the processed products and efficient management.

As the seasonal price fluctuation of selected vegetables does not differ much from those of potato, cold storing of vegetables for longer period will not be worth-while in Bangladesh. Because, our consumer are happy to consume whatever fresh vegetables available during a particular season. However, market loss of vegetables may be reduced significantly by improving the short period storage facilities at different stages of marketing.

The study shows that the seasonal price variation of vegetables in the recent past has increased than before. This calls for improvement of physical facilities in vegetable marketing.

Finally, the study reveals that except retail markets in high income locality of Dhaka, all the urban markets are significantly correlated in respects of their price change.

NOTES

1. Mohammad *et al.* (1984) showed that the relative price of vegetables which he considered as the real price has increased during 1973-83.
2. Sabur (1988) as well as Scott (1988) obtained the similar results for potato in Bangladesh.

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