

Research Paper

Factors Affecting Marketing of Vegetables among Small-Scale Farmers in West Bengal: An Analysis

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ABSTRACT

This study was conducted to identify and analyse factors affecting marketing of vegetables among small-scale farmers in West Bengal. Data collected with structured questionnaire and analyzed using descriptive and regression analysis. Data collected from 80 vegetable growers selected from Cooch Behar using structured interview schedule and analyzed through econometric techniques. Regression analysis showed that the factors like price, production, farm size, extension contact, competition, transportation, etc. determine the arrival of vegetable crops in the market. Correlation analysis among the variables from demand-side showed that population growth, per capita income and production level had positive correlations with market arrival (demand) of vegetable crops. The study recommended higher investment, favourable government policy, quality of produce, post-harvest facilities, etc. for improving overall marketing efficiency.

Highlights

- Population growth, per capita income, and production level of vegetables had positive relationship with market arrival (demand side) of vegetable crops.
- Price had remained to be the most important independent variable to determine the volume of market arrival when analyzed from both supply-side and demand-side.

Keywords: Demand-side factors, supply-side factors, vegetable marketing, West Bengal

Vegetables in general are the essential commercial crops. Production/supply and marketing of these crops help dietary requirements of the consumers and income of the farmer-producers. Thus, matching between quantities demanded for and supply (arrival) of these crops in the transaction locations assumes much importance from economic point of view. Any deviation from this situation, both consumers and producers are supposed to be badly affected due to its adverse effect (fluctuation) on prices. Vegetables cultivation has a great potential of high yield, nutritional richness, and has great economic importance for enhancing the income of farmers particularly and growing of vegetables are 4 to 8 times more profitable than cereals and generating employment (NHB, 2017-18). India ranks

second in vegetables production in the world, only next to China. India produced 184.40 million tonnes of vegetables from an area of 10.2 million hectares. (NHB, 2017-18) and contributed about 16 percent to the total vegetable production of the world (Neeraj *et al.* 2017). Thus, India's huge vegetables production base offers it great opportunities for export. During 2018-19, India exported vegetables really well worth of ₹ 5419.48 (APEDA). According to Dastagiri *et al.* (2013) the Nominal Protection Coefficient for all vegetables showed less than unity,

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indicating they are competitive in the international markets and Indian vegetables have great potential for exports if government give importance to vegetables production, processing and exports. The vegetables which contribute mostly to vegetable export are Onions, Okra, Bitter Gourd, Green chilies, Mushrooms and Potatoes. The most important destinations for Indian vegetables are Bangladesh, United Arab Emirates, Netherland, Nepal, Malaysia, United Kingdom, Sri Lanka, Oman and Qatar (APEDA). West Bengal is the largest producer of vegetables in India, comprising an area of 10.10 million hectares and production of 29.55 million tonnes, accounting for 15.9 percent of India's total vegetable production in 2018-19. Uttar Pradesh rank second followed by Madhya Pradesh, Bihar and Gujarat. West Bengal is primarily an agrarian state. There are 71.23 lakh farm households of whom 96% are small and marginal farmers. The area (CAGR 4.81%) under vegetable crops increases from 9.33 lakh ha in 2009-10 to 14.64 lakh ha in 2018-19. Apart from this, the crop shows a positive growth trend for production (CAGR=9.52%) and productivity (CAGR=4.39%). Growth rates for area and production of vegetables in the State remain higher as compared to the country in general. The State exported 231876 tonnes fresh vegetables in 2008-09, which has been increased to 916218.62 tonnes in 2017-18 with CAGR as high as 11.96 percent, Earning about ₹ 150.51 crores all through 2017-18 to export of vegetables.

Marketing of vegetables is one of the important aspects of agricultural business (Shankar *et al.* 2017). The production of vegetables increases every year to fulfill the demand, though farmers are unaware about the quantity to produced and supply to the market as they lack understanding about market trends and forecast about future demand. This led to rapid fluctuations of prices in vegetables marketing due to glut or scarcity (Reddy *et al.* 2018). Market arrivals and market prices are subjugated to wide fluctuation, which brings out of imbalances in demand for and supply of agricultural commodities. To reduce the extent of variability in market arrivals and prices establishing of storage facilities, dissemination of market information, pledge loan to check distress sale and continual guard on market arrivals and price which are necessary to protect the interest of both the producers and consumers

(Bera *et al.* 2017). Further, vegetables are highly seasonal, which leads to seasonality in the market arrivals and prices. Fluctuating pattern of arrivals and prices and lack of market intelligence increases the despairs of the growers (Kundu *et al.* 2019) Thus, it is evident that arrival (supply) of vegetables in the market at right time with right quality and quantity has immense effect on commercial perspectives of farmers as well as consumers' welfare. References showed that arrival of vegetables in the market did not coincide with the quantity demanded and there were many factors influencing this situation. Besides, being the perishable in nature, productivity and production level of vegetable crops largely depend on different climatic factors. So, it was necessary to examine both demand-side and supply-side factors and constraints in West Bengal, the largest vegetable producing state. With the above background, this study was conducted to estimate the volume and pattern of arrival, disposal and gap of selected vegetables and analyze the factors influencing the movement of vegetables crops.

METHODOLOGY

The study is based on the primary data collected randomly and purposively from different market functionaries during 2019-20 with help of structured schedule. Technique of simple random survey was purposively. The respondents were approached personally when market was in operations for interview and secondary information was also collected from the journals, magazine, periodicals, government sources, websites, etc.. The crops were selected namely Potato, Tomato, Chilli and Brinjal. The selection was done based on Surplus Production of Coochbehar district of West Bengal was selected purposively. Out of 12 blocks of Coochbehar district, two blocks namely, Coochbehar-I and Coochbehar-II, had been selected purposively. From these two blocks, 8 markets were selected randomly. Lastly, 4 markets from each blocks namely, Ghunghumari hat, Daowaguri hat, Dewanhat, Satmail hat in Coochbehar-I and Pundibari, Rajarhat, Dodearhat and Baneswar in Coochbehar-II were fixed up purposively in West Bengal. Thus, the study was done with total respondents of 80 for obtaining field data.

Analytical Methods

Multiple Regressions analysis

Econometric tool like multiple regression analysis was used to find out independent variables/factors responsible for determining the level/quantity of arrival/supply of vegetable crops in the market. The factors selected in this analysis were from supply side. The mathematical expression of the multiple regressions is given below:

$$Y = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + X_{11} + X_{12} + u_i$$

Where, Y = Arrival of vegetable

X_1 = Age (Years)

X_2 = Farm size (ha)

X_3 = Extension contact (Dummy variable)

X_4 = Price (₹)

X_5 = Length of marketing channel (Nos.)

X_6 = Expected price (Dummy variable)

X_7 = Production (Dummy variable)

X_8 = Distance to market (Km)

X_9 = Demand in the market (Dummy variable)

X_{10} = Transportation (Dummy variable)

X_{11} = Competition between farmers (Dummy variable)

X_{12} = Storage facilities

u_i = Error term (Koutsoyiannis, 1997).

Correlation analysis

Correlation is a statistical method that measures whether or not the pairs of variables are linearly related. Results of correlation coefficient between dependent (market arrival) and independent variables would show the positive or negative linear effect/relationship. A correlation statistic, which is used to know the degree and direction of association between two variables, is known as Pearson correlation coefficient. The correlation coefficient is denoted by r that is acquired the usage of the formula (Koutsoyiannis, A. 1997).

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

Where, $x = X - \bar{X}$, $y = Y - \bar{Y}$

\bar{X} = Represents the sample mean of the variable x

\bar{Y} = Represents the sample mean of the variable y

RESULTS AND DISCUSSION

Factors affecting the arrival of vegetables in the market – (Multiple Regressions) an Econometric analysis

This section encompasses the issues related to the factors which were assumed to be the probable factors to influence the level of arrival of selected vegetable crops in the different retail markets. The econometric model like technique of multiple regression analysis had been adopted for this purpose. Values of the selected supply side independent variables as obtained through field survey have been used. The model had been applied to all the selected crops separately. The estimates have also been shown crop-wise.

Potato

The values of the estimates of different independent variables which were incorporated in the multiple regression models have been shown in the Table 1. The values of the estimates show that farm size ($X_2 = 0.872$), price of the potato ($X_4 = 3.154$), length of marketing channel ($X_5 = 0.028$), farm production level ($X_7 = 0.146$), market demand ($X_9 = 5.426$) and transport facilities ($X_{10} = 1.025$) have positive and significant effect on market arrival of potato. Age, extension contact, expected price, etc. were positive but not significant. An estimate of distance between farm and market implies negative impact on market arrival. R^2 (Multiple regression co-efficient) values (0.72) is also significant at 1% probability level.

Table 1: Estimates of Multiples Regression Analysis for Potato

Sl. No.	Variables	Units	Coefficients
1	Intercept (a)	—	46.332*
2	Age (X_1)	Years	1.423
3	Farm Size (X_2)	ha	0.872***
4	Extension contact (X_3)	Dummy variable	1.043
5	Price (X_4)	₹	3.154***
6	Length of Market channel (X_5)	Nos.	0.028*

7	Expected Price (X_6)	Dummy variable	0.317
8	Production (X_7)	Quintal	0.146*
9	Distance to market (X_8)	Km	-0.244
10	Demand in the market (X_9)	Dummy variable	5.426***
11	Transportation (X_{10})	Dummy variable	1.025**
12	Competitions between farmers (X_{11})	Dummy variable	1.546
13	Storage facilities (X_{12})	Dummy variable	0.155
R ²			0.72***

*, **, *** indicates 10%, 5% and 1% level of significance.

Tomato

The values of the estimates of different independent variables which are incorporated in the multiple regression models have been shown in the Table 2. The values of the estimates show that farm size ($X_2 = 0.09$), price of the tomato ($X_4 = 1.50$), length of marketing channel ($X_5 = 0.20$), farm production level ($X_7 = 0.55$), transport facilities ($X_{10} = 2.648$) and competition between producers ($X_{11} = 0.034$) have positive and significant effect on market arrival of tomato. Among them, estimates of market price and competition between the producer-farmers have more impact as they are significant at 1% probability level. Age, extension contact, market demand, etc. have insignificant impact on market arrival. Distance has a negative effect. R² value (0.78) remains to be significant at 1% probability level.

Table 2: Estimates of Multiples Regression Analysis for Tomato

Sl. No.	Variables	Units	Coefficients
1	Intercept (a)	—	1.64***
2	Age (X_1)	Years	0.01
3	Farm Size (X_2)	Ha	0.09*
4	Extension contact (X_3)	Dummy variable	1.46
5	Price (X_4)	₹	1.50***
6	Length of Market channel (X_5)	Nos.	0.20**
7	Expected Price (X_6)	Dummy variable	0.28
8	Production (X_7)	Quintal	0.55**

9	Distance to market (X_8)	km	-0.032***
10	Demand in the market (X_9)	Dummy variable	0.081
11	Transportation (X_{10})	Dummy variable	2.648*
12	Competitions between farmers (X_{11})	Dummy variable	0.034***
R ²			0.78***

*, **, *** indicates 10%, 5% and 1% level of significance.

Chilli

The values of the estimates of different independent variables affecting the arrival level in the market which are incorporated in the multiple regression model have been shown in the Table 3. The values of the estimates show that farm size ($X_2 = 1.24$), price of the chilli ($X_4 = 1.43$), length of marketing channel ($X_5 = 0.08$), farm production level ($X_7 = 0.05$) and market demand ($X_9 = 1.606$) have positive and significant effect on market arrival of chilli. Among them, estimates of market price and market demand have more impact as they are significant at 1% probability level. However, transport, expected price, competition, etc. have positive impact but are not significant. Age and distance remain to be the factors with negative impact on market arrival. R² value (0.82) is also found to be significant at 1% probability level.

Table 3: Estimates of Multiples Regression Analysis for Chilli

Sl. No	Variables	Units	Coefficients
1	Intercept (a)	—	2.77***
2	Age (X_1)	Year	-0.06
3	Farm size (X_2)	Ha	1.24*
4	Extension contact (X_3)	Dummy variable	1.94
5	Price (X_4)	₹	1.43***
6	Length of market channel (X_5)	Nos.	0.08**
7	Expected price (X_6)	Dummy variable	0.41
8	Production (X_7)	Quintal	0.05**
9	Distance to market (X_8)	km	-0.456
10	Demand in the market (X_9)	Dummy variable	1.606***
11	Transportation (X_{10})	Dummy variable	0.342

12	Competitions between farmers (X_{11})	Dummy variable	1.065
R ²			0.82***

*, **, *** indicates 10%, 5% and 1% level of significance.

Brinjal

The values of the estimates of different independent variables affecting market arrival which are incorporated in the multiple regression models have been shown in the Table 4.

Table 4: Estimates of Multiples Regression Analysis for Brinjal

Sl. No	Variables	Units	Coefficients
1	Intercept (a)	—	3.06***
2	Age (X_1)	Year	-0.01
3	Farm size (X_2)	Ha	1.77
4	Extension contact (X_3)	Dummy variable	0.002*
5	Price (X_4)	₹	1.10***
6	Length of market channel (X_5)	Nos.	0.17***
7	Expected price (X_6)	Dummy variable	0.11
8	Production (X_7)	Quintal	0.10**
9	Distance to market (X_8)	km	-0.155
10	Demand in the market (X_9)	Dummy variable	1.154***
11	Transportation (X_{10})	Dummy variable	0.567***
12	Competitions between farmers (X_{11})	Dummy variable	1.345***
R ²			0.76***

*, **, *** indicates 10%, 5% and 1% level of significance.

The values of the estimates show that extension contact ($X_3 = 0.002$), price of the brinjal ($X_4 = 1.10$), length of marketing channel ($X_5 = 0.17$), farm production level ($X_7 = 0.10$), transport ($X_{10} = 0.567$), market demand ($X_9 = 1.154$) and competition between the farmer-producers ($X_{11} = 1.345$) have positive and significant effect on market arrival of brinjal. Among them, estimates of market price, length of market channel, market demand and competition have more impact as they are significant at 1% probability level. However, farm size and expected price have positive impact but are not significant. Distance as usual has a negative effect on market arrival. R² value (0.76) is found to be significant at 1% probability level.

The study of multiple regression analysis, thus, shows that market arrival of vegetable crops depends upon some common factors like farm size, production level, price, transportation, length of marketing channel, market demand, etc. They have positive influence. However, other selected variables like extension contact, expected price, competition, etc. have also impact on supply of vegetables in the market, but, their strengths of effect are not significant.

Demand-side Factors Influencing the Arrival of Vegetable Crops in the Markets (Pearson Correlation Coefficient (PCC) analysis)

In view to ascertain the strength of the factors/variables which influence the extent of arrival of vegetables in the market for purchase by the consumers, statistical tools of correlation coefficient had been attempted. Details of the estimates are presented in the Table 5.

Table 5: Estimates of correlation coefficient (r) between annual demand (market arrival) of vegetables and the factors affecting the demand

	Annual demand	% share of vegetable crops	Retail price	Per capita income	Production	Population growth
Annual demand	1	0.940	-0.640	0.925**	0.925**	0.925**
% share of vegetable crops	0.940	1	-0.168	0.317	-0.093	0.300
Retail Price	-0.640	-0.168	1	-0.639	-0.547	-0.696
Per capita income	0.925**	0.317	-0.639	1	0.755	0.996**
Production	0.947**	-0.093	-0.547	0.755	1	0.783
Population growth	0.940**	0.300	-0.696	0.996**	0.783	1

*, **, *** indicates 10%, 5% and 1% level of significance.

Sources: National Horticulture Board, (2018).

The values of correlation coefficient show that population growth ($r = 0.940$), per capita income ($r = 0.925$) and production level ($r = 0.947$) had positive correlations with market arrival (demand) of vegetable crops. Estimate of correlation coefficient between demand for vegetables and percentage share on consumption of vegetables ($r = 0.940$) show linear and positive association but the relationship not significant. On the other hand, retail price had negative impact ($r = -0.640$) on market (consumer) demand as depicted with negative value of correlation coefficient, which too was not significant.

CONCLUSION

Vegetable marketing is crucial to achieve the overall goals of sustainable agriculture, food security, and poverty reduction, especially among small-scale farmers in rural areas. Econometric model (multiple regression analysis) was fitted and estimated to find out the important independent variables, which were supposed to influence the volume of market arrival from supply-end. The significant factors determining the arrival of vegetable crops positively in the market were price, production, farm size, extension contact, competition, transportation etc. The factors like distance to market and length of marketing channel are found to affect negatively. Correlation analysis on the variables from demand-side showed that population growth, per capita income and production level had positive correlations with market arrival (demand) of vegetable crops. Estimate of correlation coefficient between demand for vegetables and percentage share on consumption of vegetables show linear and positive association. Though the estimate was not significant. On the other hand, retail price had negative impact on market (consumer) demand as depicted with negative value of correlation coefficient. Vegetable markets were of similar pattern in operation. Price had remained to be the most important independent variable to determine the volume of market arrival when analyzed from both supply-side and demand-side. Few suggestions in terms of higher investment, govt. policy, quality produce, post-harvest facilities, etc. were made for overall marketing efficiency.

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