Factors of Vegetable Marketing in West Bengal: Evidences and Policy Options

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ABSTRACT

The state of West Bengal, although is the largest producer of vegetables in India, the vegetable growers in the state are reportedly struck by a number of production and marketing related issues- losses from pests, lack of quality seeds, poor irrigation facilities and high variation in yields. The present study aimed at identifying the factors of marketing, the constraints in production and marketing and thereby suggests suitable policy options for improvement of vegetable marketing in West Bengal. Data were collected using a semi structured interview schedule and focused group discussion with a sample of one hundred and twenty vegetable growers from two districts of the state. Principal component analysis was undertaken to extract the factors governing vegetable marketing and Garrett ranking technique was followed to prioritize the vegetable marketing constraints encountered. The major factors governing vegetable marketing in the state emerged in course of the study were- ICT, financial and physical infrastructure, market regulation and surveillance and production environment. Among the constraints faced in vegetable marketing in the state, the predominant ones were- inadequate storage infrastructure, frequent price fluctuation, credit related issues, lower access to market information and low producers' share in consumers' rupee. The government agencies need to redefine their roles in agriculture marketing particularly in vegetables for better and efficient marketing of vegetables in West Bengal.

Key words: *Factor; Vegetable; Marketing; Constraint; Policy;*

Vegetables are the important source of various nutrients such as vitamins, minerals, fibers and proteins. India is the second largest producer of vegetable in the world, only next to China. The annual vegetable production in India is 125.88 million tonnes from an area of 7.80 million ha of land with an average productivity of 16.1 tonnes per ha. (NHB, 2007-08). With the GoI initiatives, India has contributed to about 11.90 per cent to the total vegetable production of the world. Among vegetables, India is the largest producer of peas (29%), second largest in brinjal (28.7%), cauliflower (28.9%), onion (14.7%) and cabbage (8.8%). West Bengal is the largest producer of vegetables in India, comprising an area of 1.18 million ha and production of 18.1 million tonnes. In West Bengal the vegetable growing area as percentage of gross cropped area is 5.7%. (NHB, 2007-08).

The interplay of internal as well as external environments in vegetable markets in West Bengal is sequel to liberalization of agricultural markets in India, and has brought a paradigm shift in the position of different players in the market. Commercial vegetable cultivation has not gained enough popularity among growers because of high input costs, lack of irrigation facilities and difficulties in marketing and storage. The influx of private investments easing rigidity in price transmission due to increase in competition, use of new communication and information technologies in vegetable trading and marketing and infusion of modern and sophisticated transport technology has transformed the existing problem and difficulties into newer forms. Due to some inherent problems of poverty and associated constraints, the small vegetable farmers have not been able to derive the same benefit of modern vegetable cultivation technologies as compared to bigger farmers. Farmers encounter many marketing constraints. Among those, lack of transportation, lack of reliable sources of information, gluts during peak

period, lack of knowledge of grading and packaging are the major constraints (*Tripathi et.al, 2006*). The basic characteristics of vegetables like variability, perish ability and bulkiness cause several problems related to storage and marketing. In this backdrop, it was felt essential to identify and prioritize the factors governing vegetable marketing in West Bengal, the constraints in vegetable marketing in the state and thereby suggest suitable policy options for improvement of vegetable marketing in light of the identified factors and constraints. The knowledge emanating from the research study would help policy makers, planners, researchers, mandi officials, traders, and farmers for understanding suitability of operational mechanism of vegetable marketing for identifying major constraints and factors and tackling these constraints on priority basis based on limited resources.

METHODOLOGY

Vegetable marketing is restrained by individual forces operating on it, generally known as constraints. There are major forces working in set of unison for vegetable marketing, known as factors. These constraints and factors were captured using Garrett's ranking technique and factor analysis respectively. To analyze the constraints of vegetables marketing, primary data on various variables were collected from one hundred and twenty vegetable growers of two randomly selected districts of West Bengal-Nadia and Jalpaiguri with the help of a pre tested interview schedule using personal interview method. Stratified random sampling technique was followed for selecting sample of respondents for the purpose of the study.

Identification of factors governing vegetable marketing: To identify the different factors which were affecting marketing of major vegetables, principle component method was used. Factor analysis technique was used to discern and quantify the factors of vegetables marketing. The unique feature of factor analysis was that it facilitated identification of key traits from the mosaic of overlapping relationship and was capable of achieving scientific parsimony by reducing a set of large number of variables to a convenient size of factors (often called dimensions) which could not be easily accomplished by any other analytical technique, including multiple regression analysis. It was done with the principle component or Axis Method of factoring (*Hotelling, 1933*). Principal component modelis expressed as follows:

$$Z_j = a_{j1} + a_{j2} F_2 + a_{j3} F_3 + \ldots\ldots\ldots + a_{jq} F_q$$

Where,

Z_j = magnitude of the indicator j; i.e., jth principal component or factor in the model.

a_{jq} = the factor loading of the qth indicator in the jth principal component or factor

F_q = the amount of association in magnitude of indicators, the uncorrelated trait measured by factor q which is possessed by indicator j,

j = factor loading with reference to indicators

q = a set of indicators in the model

$a_{jq}F_q$ = factor coefficient or loading of indicator j on factor q.

The Varimax Rotation method was used which maximized the variance of factors in the matrix. Only those factor loadings were considered which had more than or equal to three times the standard error. The inference was drawn on the basis of factor loadings (= 0.50) in the final loading matrix by using the following formula:

$$\sigma_a = \frac{1}{2}\sqrt{\left(\frac{3/r - 2 - 5r + 4r2}{N}\right)}$$

Where,

σ_a = standard error of the factor loadings,

r = average value in correlation matrix or factor loading and

N = number of observations

Garrett's Ranking Technique: Garrett's ranking technique was used to rank the constraints in marketing of major vegetables. This technique facilitated in changing the orders of the constraints and relative advantages into numerical scores. The prime advantage of the technique over simple frequency distribution method was that the constraints could be arranged based on their importance from the point of view of respondents. Hence the same number of response on two or more constraints could be given different ranks. Garrett's formula for converting ranks into per cent position was given by:

$$\% \text{ position} = \frac{R_{ij} - 0.5}{N_j} \times 100$$

Where,

Rij= rank given for ith factor by jth individual;

Nj = number of factors ranked by jth individual.

The per cent position of each rank was converted into scores referring to the table given by Garrett and Woodworth. The Garrett's scores for corresponding per centage positions are given in Table 3. For each of the constraints, the scores of individual respondents were added together and divided by the total number of the respondents for whom scores were added. These mean scores for all the constraints were arranged in descending order, ranks were given and most important constraints were identified.

RESULTS AND DISCUSSION

Identification and prioritization of factors influencing vegetable marketing in West Bengal: To discern and quantify the factors of vegetables marketing, factor analysis was done. In the present study thirty three different variables related to different aspects of vegetables marketing were carefully selected.

Identification and prioritization of different factors influencing vegetables marketing in Jalpaiguri district : Out of total thirty three variables only eleven variables could enter in discerning the factors which were mutually exclusive. Four factors were extracted through principal component method. The constituent variables had communalities (h^2) more than 6.0 (Table 1).

Factor 1. ICT infrastructure: The variable namely, 'availability of telephone booths, internet café or kiosk' had the highest factor loading (0.603) which was positively related with factor 1. The variable namely 'timely access to market information' occupied the second rank in terms of factor loading (0.502) and was positively associated with the factor. This positive association of the said two variables with the factor explained the positive and boosting feature for taking informed decisions regarding marketing of vegetables.

ICT being a new factor in vegetable marketing process occupied a prominent position in imparting knowledge to the farmers for taking timely decisions. The variables like role of APMC to watch and monitor the conduct of bidders and bidding mechanism was negatively related with the factor. It means that this worked as a stumbling block for realization of market price of the produce by the farmers in market place.

Factor 2. Market regulation and surveillance: Factor 2 consisting of three variables was named as 'market regulation and surveillance'. These three variables namely 'private participation in bidding process' explaining the role of Public Private Partnership (PPP) model in encouraging market competition, 'time sequence of bidding' for avoiding overlapping of bidders and other traders at a particular point of time and 'assured market price' had factor loadings 0.605, 0.554 and 0.517 respectively in factor 2. All were positively associated with the factor. The respondent farmers in the district expressed happiness with the market regulation and surveillance mechanism in the district of Jalpaiguri. This was possible because of modification and introduction of APMC Act 2003 in the state.

Factor 3. Financial infrastructure: Three variables had major contribution in the third factor- financial infrastructure. 'Accessibility to loans for standing field crops', 'mode of payment' to the farmers and 'KCC

Table 1. Factor loading and communality of variables, eigen value and variance contribution of each factor influencing vegetable marketing in Jalpaiguri district (N= 60)

Factor	Constituent Variable	Factor loading	Communality (h^2)	Eigen value (λ)	Variance contribution (%)
I	Availability of telephone booths, internet café or kiosk	0.603	0.825	4.77	29.95
	Timely access to market information	0.502	0.710		
	Conduct of the bidders during auction	0.505	0.713		
II	Private participation in bidding process	0.605	0.663	1.33	19.37
	Time sequence of bidding	0.554	0.700		
	Assured market price	0.517	0.756		
III	Accessibility to loans for standing field crops	-0.609	0.656	0.33	14.96
	Mode of payment (in cash, in cheque or in other forms)	0.554	0.752		
	KCC facilities	0.559	0.755		
IV	Suitable temperature	0.598	0.712	0.144	8.46
	Suitable rainfall	-0.531	0.845		

facilities' had factor loadings of -0.609, 0.554 and 0.559 respectively to factor 3. Although the farmers were happy about payment plan and plastic money provision available to them, the variable 'accessibility to loans for standing field crops' was negatively related to the factor. It means that the farmers were not happy with the provisional condition of repayment capacity to get access to the required loan for standing field crop. It could be rectified by making production loans available to the farmers by public institutions like Cooperatives and SHGs.

Factor 4. Production Environment: This factor contained two variables namely, 'suitable temperature' and 'suitable rainfall' as per requirement of vegetable crops at different stages. Although the farmers were satisfied with photoperiodicity with respect to vegetable production as indicated by a positive factor loading (0.598) of the first variable, they were not satisfied with the intensity and distribution of rainfall which had a negative loading (-0.531) in the said factor. It shows that unpredictable behaviour of rainfall as per requirement of vegetables is a bothering issue affecting vegetable production and marketing in the district

A further perusal in Table 1 revealed that adequacy of ICT infrastructure in the district was perceived by the vegetable growers as the most important factor governing efficiency in vegetable marketing as explained by the highest per centage of the variance (29.95%) contributed by the factor. 'Marketing infrastructure' ranked second as it explained 19.37 per cent of the total variance. 'Financial infrastructure' ranked third in importance of efficient marketing. It explained nearly 14.95 per cent of the total variance in the study area. The last and the final factor -'Production environment' ranked fourth in governance of marketing. It explained nearly 8.46 per cent of the total variance. It was important to note that the fourth factor i.e., 'production environment' trailed far behind in order of importance hence seems to have little importance for the vegetable growers in making choice for marketing.

Identification and prioritization of different factors of vegetable marketing in Nadia district: Fourteen out of thirty three variables could enter in discerning the factors influencing vegetable marketing in Nadia district, which were mutually exclusive and all having communalities (h^2) more than 6.0. A total of four underlying factors governing marketing of vegetables in Nadia district could be extracted (Table 2).

Factor 1. Financial infrastructure: The first factor influencing marketing of vegetables in Nadia district of West Bengal consisted of five variables, namely linkage between production and marketing' (0.782), 'mode of payment (in cash, in cheque or in other forms)' (-0.610), 'availability of banking institutions' (-0.554), 'timeliness of payment (in lump sum or in installment)' (-0.675) and 'rate of interest' (0.517). The factor was named as financial infrastructure. It explained the highest percentage (24.96) in total variance indicating that this factor exerted the highest influence on marketing of vegetables in the district.

Table 2. Factor loading and communality of variables, eigen value and variance contribution of each factor influencing vegetable marketing in Nadia district (N=60)

Factor	Constituent Variable	Factor loading	Communality (h^2)	Eigen value (λ)	Variance contribution (%)
I	Linkage between production and marketing	0.782	0.897	4.92	24.96
	Mode of payment (in cash, in cheque or in other forms)	-0.610	0.714		
	Availability of banking institutions	-0.554	0.653		
	Timeliness of payment (in lump sum or in installment)	-0.675	0.757		
	Rate of interest	0.517	0.754		
II	Connectivity of production site withthe market	-0.554	0.806	1.72	19.32
	Condition of market yard	0.600	0.713		
	Lodging and boarding facilities	0.621	0.785		
III	Suitable temperature	0.617	0.735	0.55	18.55
	Assured market price	0.519	0.786		
	Suitable rainfall	0.506	0.852		
IV	Availability of telephone booths, internet café or kiosk	-0.652	0.818	0.32	13.06
	Weighing and measurement facilities	-0.536	0.768		

Factor 2. Physical Infrastructure: This factor contained three variables namely 'connectivity of production site with the market' (-0.554), 'condition of market yard' (0.600) and 'lodging and boarding facilities' (0.621) to farmers in the market place. Although the farmers were satisfied with later two conditions as indicated by positive factor loadings the poor road connectivity of the production site to the market acted as a hindrance to efficient marketing of vegetables as depicted by a negative loading of the variable to the factor. The second factor was named as physical infrastructure and it explained the second highest percentage (19.32) to total variance.

Factor 3. Production environment: The third factor contributed 18.55 per cent to total variance and explained the suitability of environmental conditions for production of vegetables in the district. The factor consisting of three variables- 'suitability of temperature', 'assured market price' in the vegetable production site and 'suitability of rainfall' as per requirement of vegetable crops at different stages, had indirect influence on remunerative marketing of vegetables in the district. The positive loadings of all the three variables indicate to a congenial vegetable production environment in the district.

Factor 4. ICT and measurement infrastructure: ICT and measurement infrastructure emerged as the fourth important factor governing efficient marketing of vegetables in Nadia district. Two variables, one related to communication facilities accessible to the arhatiyas (-0.652) and the other related to extent of calibration in weighing machines (-0.536) explained the factor. This factor contributed 13.06 per cent to the total variance.

Constraints in vegetable production and marketing in West Bengal: Factors endowments of different regions cause differences in productivity and acreage of vegetables in many states of India. The inherent characteristics of vegetables viz. seasonality, bulkiness, variability and perish ability creates huge gap between demand and supply besides deficiency in physical and other infrastructural parameters. The problems encountered by the farmers in marketing of vegetables in West Bengal are given in Table 3.

Table 3. Problems faced by farmers in West Bengal in marketing of vegetables (N=120)

Problem in vegetable marketing	Score	Rank
Storage problem	89.5	I
Unstable price	84.0	II
Credit problem	70.5	III
Higher marketing margin	67.0	IV
Market information	52.0	V
Transportation problem	49.0	VI
Malpractices likely faulty weight	30.2	VII
Pest and disease problem	22.2	VIII

Vegetables are perishable and semi-perishable commodity. There is different harvesting seasons for different vegetables. In the study area the normal season for harvesting of vegetables was from November – March. Season specific production creates glut in the market and pushes the price of majority of the vegetables very low due to mismanagement of demand and supply. Vegetables in India are preferred to be eaten fresh, hence are sold in the market immediately after harvest. Vegetable growers reported lack of adequate storage facilities as the most important problem related to marketing as faced by them (Table 1). Some farmers although were preparing kachha house like storage structures, these could not save vegetables for more than a couple of weeks from heavy rainfall, extreme heat during summer months, insects and pests. In the study area majority of the farmers were small to marginal. They suffered from cash deficit due to their limited sources of income, hence did not have adequate retention capacity. Respondent farmers perceived unstable price of vegetables in the markets as the second most important problem in efficient marketing of vegetables. This precarious situation of vegetable marketing catches the attention of policy makers to construct cold storage infrastructure in the state. It requires private players to come up and invest in cold storage infrastructure besides providing for construction of storage facilities for farmers at their field level itself. Lack of or improper market information was the problem which affected the actual price received by the farmer and it was ranked fifth by the farmers. Though Pest and disease problem in storage and farm level got low score, it also affected growers' income adversely.

CONCLUSION

The present study could delineate a number of important factors exerting direct or indirect influence on efficient marketing of vegetables in West Bengal state. As depicted by findings of the study, lack of

adequate storage facilities for vegetables was the most important problems perceived by the state farmers. Price of vegetables register high fluctuations within a year as well as between the years and farmers reported unstable price as a constraint in marketing. For protecting farmers against such price fluctuations, the producers are suggested to organize themselves into growers' associations and plan to grow different varieties of different vegetables, having different sowing and harvesting periods to avoid market glut. Besides, the state government need to perform activities like (a) announcing support price programme for onion and potato (b) purchasing the produce at support price directly from the producer and transporting it to the market facing scarcity of vegetables (c) increasing the retention power of producers by providing adequate credit facilities (d) strengthening storage facilities (e) strengthening ICT infrastructure for making market intelligence information timely available to vegetable growers (f) establishing more processing industries in large scale vegetable growing areas and promoting linkages.

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