Identification and Prioritization of Constraints of Vegetable Marketing Scenario of South 24 Parganas District of West Bengal

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Vegetable marketing has been affected by several production and marketing constraints, among these losses from pests, lack of quality seeds and irrigation facilities and high variation in yields. The post harvest losses are also high due to perishable nature of the product. Most of the vegetables produced in India are sold afresh. The processing structure is inadequate and value addition is low. Due to some inherent problem of poverty and constraints the small vegetable farmers have not been able to derive the same benefit of modern vegetable technologies as compared to bigger farmers. The high volume and perishability of vegetables causes several problems in their marketing. Other problems which already exist in the market are lack of marketing intelligence, price risk, delayed sale and payment, lack of processing and high cost of packaging.

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The different factors like literacy, fertilizer, institutional credits to agriculture, road density are observed to have positively influencing the marketing of vegetables of South 24 Parganas, West Bengal.

1. INTRODUCTION

India ranked second position in vegetable production in the World next to China. The present 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 16.1tonnes per hectare [1]. India is now contributing about 11.90% to the total vegetable production of the World. Among vegetables, India is the largest producer of peas (29%) and cabbage (28.9%); second largest in tomato (28.7%), onion (14.7%) and third in cauliflower (8.8%) production. West Bengal is the largest producer of vegetable comprising an area of 1.31 million ha and 22.4 million tonnes production. In West Bengal the vegetable area as percent of gross cropped area is around 6%. The percent share of West Bengal in total vegetable area and production across the India are 16.8 and 17.7 respectively [1]. The horticulture sector has witnessed a tremendous growth as a result of investment through National Horticulture Mission and a number of other programmes [2] Vegetables play an important role in horticulture and also in industrial economy. Moreover, in a country like India, where 20-40% of the population is vegetarian, the need of vegetables in our diet is evident. Expenditure on vegetables forms 11% of total food expenditure in the rural India and 10.5% in urban India [3].

It plays a unique role in the economy of the state by improving the income of the rural people. Cultivation of vegetables, substantially more labor-intensive than growing cereal crops and offers more post-harvest opportunities to add value [4,5]. The efficiency of marketing for vegetables in West Bengal has been significant concern in the recent years. Farmers of West Bengal typically depend heavily on middlemen especially in vegetable marketing. The producers and the consumers often get a poor deal and middlemen control the market, but do not add much value.

The interplay of internal as well as external environments in vegetable markets in West Bengal as well as in the district of South 24 Parganas is sequel to liberalization of agricultural markets in India, has brought a paradigm shift in the position of different players in the market. 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 [6]. In this backdrop, it becomes essentials to identify the constraints and dimensions governing vegetable marketing in this district. The study also made an attempt to identify the prevailing value chain from the Farmer → Pre-harvest contractor → Commission Agent → Wholesaler → Retailer → Consumer in terms of costs, prices and their shares in the selected markets. This research study deals with the specified marketing constraints regarding different types of vegetables. The knowledge emanating from the research study would help policy makers, planners, researchers, mandi officials, traders, and farmers for understanding suitability's of operational mechanism of vegetable marketing for identifying major constraints and dimensions and tackling these constraints on priority basis based on limited resources.

2. METHODOLOGY

The phenomenon of vegetables marketing is restrained by individual forces operating on it, generally known as constraints. There are major forces working in set of unison growing vegetables marketing are known as dimensions. These constraints and dimensions are captured using Garrett's Ranking techniques and factor analysis, respectively. To analyze the constraints of vegetables marketing, primary data on various variables were collected randomly from the vegetables growers of South 24 Parganas district of West Bengal with the help of pretested schedule using personal interview methods. The five vegetable growing blocks of South 24 Parganas district viz., Baruipur, Budge Budge, Bhangore, Diamond Harbour and Falta were randomly selected for data collection. First three blocks i.e., Baruipur, Budge Budge, and

Bhangore one were selected randomly from progressive region and the blocks namely Diamond Harbour and Falta were selected randomly from backward vegetable producing region.

2.1 Garrett's Ranking Technique

Garrett's Ranking Technique was used to identify and rank the constraints to marketing of major vegetables. This technique provides the facility to change the orders of constraints and advantages into numerical scores. The prime advantage of this technique over simple frequency distribution is that the constraints are arranged based on their importance from the point of view of respondents. Hence the same number of response on two or more constraints may have been given different rank. Garrett's formula for converting ranks into percent was given by:

% of position = $100 \times (R_{ij} – 0.5)/N_j$

Where,

R_{ij} = rank given for i^{th} factor by j^{th} individual,
N_j = number of factors ranked by j^{th} individual.

The percent position of each rank is converted into scores referring to the table [7]. For each factors, the scores of individual respondents are added together and divided by the total number of the respondents for whom scores are added. These mean scores for all the factors are arranged in descending order, ranks are given and most important factors are identified.

2.2 Dimensions Governing Vegetables Marketing

To know the different dimensions (factors) which are affecting marketing of major vegetables principle component method was used in the present study. Factor analysis technique was used to discern and quantify the dimensions of constraints of vegetables marketing. The unique feature of factor analysis is that it facilitates identification of key traits from the mosaic of overlapping relationship and is capable of achieving scientific parsimony by reducing a set of large number of variables to a convenient size of factors (often called dimensions) which cannot be easily accomplished by any other analytical technique, including multiple regression analysis. It was done with the principle component or axis method of factoring [8]. Principal component model is expressed as follows:

Zj = aj1 + aj2 F2 + aj3 F3 +………+ ajqFq

Where,

Zj = magnitude of the indicator j; *i.e.,* jth principal component or factor in the Model.
ajq = the factor loading of the qth indicator in the jth principal component or factor
Fq = 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 varimaxrotation 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 3 times thestandard error. The inference was drawn on the basis of factor loadings (≤ 0.50) in the final loading matrix by using the following formula:

Σa = 1/2√ (3/r-2-5r +4r2)/N

Where,

σa = standard error of the factor loadings,
r = average value in correlation matrix or factor loading and
N = number of observation

3. RESULTS AND DISCUSSION

3.1 Socio-personal-economic and Communication Characteristics of Vegetable Growers

Analysis about those aspects will give an idea about the characteristics of the vegetable growers along-with their background. The preliminary data was analyzed using descriptive statistics (frequencies, percent, mean etc.) as per the norms of the objective. This study will help to improvise appropriate policy implications for the betterment of the vegetable growers.

3.1.1 Family size

From the study it can be confirmed that only 15% of the vegetable growers belongs from the small family *i.e.,* less than 4 members in family whereas 45% growers had large family more than 6 members and 40% growers had medium sized family that means having 4 to 6 members (Table 1).

From the survey it can be inferred that about 85% of the vegetable growers had medium to large sized families. It may be as because of vegetable cultivation is labour intensive programme, only large and medium families who had enough family labour force which could affordable for vegetable production. For small size families, due to lack of family labour, only few of them were engaged themselves in cultivation of vegetables. Such families are bounded to hire labours for different activities of vegetable production.

Table 1. Distribution of the vegetable growers according to their family size N=300

Category of family	Frequency/Percentage
Small (< 4)	15 (45)
Medium (4 to 6)	40 (120)
Large (> 6)	45 (135)
Total	**100 (300)**

3.1.2 Educational level of the farmer

The data collected about educational level of the vegetable growers are noted in Table 2 reveals that 35% of vegetable growers had middle school education whereas 30% had high school education. It was found that 25% growers having primary level education, 5% growers were functionally literate and only 5% of the vegetable growers were graduate. None of the respondents was postgraduate and it is quite energetic that nobody was illiterate.

Table 2. Distribution of the vegetable growers according to their education N = 300

Level of education	Frequency/ Percentage
Illiterate	0
Can read and write	5 (15)
Primary school	25 (75)
Middle school	35 (105)
High school	30 (90)
Graduate	5 (15)
Post graduate	0
Total	**100 (300)**

3.1.3 Occupation

As reported in Table 3 almost 90% of the growers had taken vegetable cultivation as their mainstay. They used to get more enough of their income from vegetable cultivation. The data revealed that, only 10% of the growers had taken vegetable cultivation as their subsidiary

income source. In those cases, the source of major income was came from business, services etc.

3.1.4 Operational Land holding

On the basis of land holding, the vegetable growers were classified into 5 categories (i) landless (no land) (ii) marginal (up to 2.5 acre) (iii) small (2.51 to 5.00 acres) (iv) medium (5.01 to 10.00 acres) (v) big farmer (more than 10.00 acres). The data collected regarding this aspect are presented in Table 4.

Table 3. Distribution of the vegetable growers according to their occupation N=300

Occupation	Frequency/ Percentage
Vegetable cultivation as main occupation	90 (270)
Vegetable cultivation as subsidiary occupation	10 (30)
Total	**100 (300)**

Table 4. Distribution of the vegetable growers according to their land holding N=300

Land holding (Acres) categories	Frequency/ Percentage
Landless farmers (no land)	0
Marginal farmers (up to 2.50)	40 (120)
Small farmers (2.50 to 5.00)	35 (105)
Medium farmers (5.00 to 10.00)	20 (60)
Large farmers (above 10.00)	5 (15)
Total	**100 (300)**

It can be seen that mainly small (35%) and marginal farmers (40%) dominated the vegetable growing. From the study it can be opined that 20% of the vegetable growers were found to bemedium and only 5% of the growers were big farmers. As vegetable cultivation is labour intensive and more expensive enterprise the growers who have larger land holding were not cultivating vegetables on the total land. The medium farmers and big farmers grow vegetable crops in part of their land holding mainly for consumption purpose. The Table 4 referred that the marginal and small farmers were mainly involved in vegetable cultivation. By nature the vegetable cultivation on commercial scale is being highly labour intensive and expensive, the growers, in general were not able to manage vegetable production on a large scale hence they continued vegetable production in only a part of their holdings.

3.1.5 Net annual income from vegetables

the farmers should have to be motivated to diversify to more remunerative cropping patterns like vegetable cultivation instead of the traditional, less profitable ones [9].

The distribution of annual income from vegetables is depicted in Table 5. It was categorized into three types low income (up to Rs.40,000), medium income (Between Rs. 40,001 to 1,00,000) and high income (above Rs. 1,00,000).

Table 5. Distribution of the vegetable growers according to their net annual income from vegetables N=300

Income	Frequency/ Percentage
Low income (up to Rs.40,000)	15 (45)
Medium income (between Rs. 40,001 to 1,00,000)	45 (135)
High income (above Rs. 1,00,000)	40 (120)
Total	**100 (300)**

The data revealed that 40% of the vegetable growers had getting high income from the sale of their vegetables, followed by 45% growers getting medium income and 15% vegetable producers were found to have low income from vegetable cultivation. Therefore 85% of the vegetable producers came under the jurisdiction of medium to high-income level. It can be concluded from the study that vegetable cultivation had boosted the income level of the growers. In other words, we can say that, the vegetable cultivation was a viable income raising enterprise in the study area. Some studies have shown that producers' share in consumers' rupee is comparatively lower for perishable crops [10]. This could be due to a variety of factors such as number of intermediaries, cost of various market functions rendered by intermediaries, spread of location of the producers and consumers.

Education level of the farmer: Education level of vegetable growers was found to have positive and significant contribution with adoption at one percent level of significance ($r = 0.765$, $p> .01$). It implies that, higher education level will be more in the adoption of improved vegetable cultivation technology.

Annual income from vegetables: The overall survey revealed that annual income from vegetables was significantly correlated with adoption ($r =0.210$, $p>.05$) of modern scientific technologies which clearly indicates that the vegetables growers having much higher profitability from vegetable cultivation. Conversely, those who earned lesser amount from vegetable cultivation are less skilled and unable to adopt modern production technologies it can concluded that those guys were grew relatively poor crops of vegetables.

Knowledge of vegetable production technology: Technical knowledge about vegetable cultivation is certainly variable that influence the profit level from vegetable production, but in the present survey the knowledge level of the growers were found to be positive and significantly correlated with adoption of new technologies.

Table 6. Correlation between adoption of commercial vegetable cultivation practices and selected independent variables

Sl. no.	Socio-personal-economic	Correlation coefficients (r)
2.	Family size	0.024
4.	Education	0.765**
5.	Occupation	0.142
7.	Land holding	0.181
8.	Annual income from vegetables	0.210*

** Significant at 0.01 level of probability; * Significant at 0.05 level of probability

3.1.6 Constraints perceived by the farmers in vegetable cultivation

There were various types constraints which was faced by growers during vegetable cultivation and marketing. These constraints were categorized into four groups as like infrastructural, technical, economic and marketing constraints. Data was analyzed by using ranking technique followed by frequency and percentage distribution was given in Table 7.

Infrastructural constraints: Among selected infrastructure constraints, 'Unavailability of good quality seed' was ranked first by the growers with 83% of them find it as a major constraint. Lack of extension worker (67%) and Lack of Scientific idea (52%) were the other major infrastructure constraints were replicated from growers point of view in respect of commercial vegetable cultivation.

Table 7. Ranking of constraints in commercial vegetable cultivation and marketing N= 300

Constraints in vegetable marketing	Ranking	Frequency/Percentage
Infrastructural Constraints		
1. Unavailability of good quality seed	I	83
2. Lack of extension worker	II	67
3. Lack of Scientific idea	III	52
4. Inadequate facilities of irrigation	IV	12
Technical constraints		
1. Loss due to pest infestation	I	85
2. Unavailability of inputs facilities like fertilizers etc.	II	73
3. Lack of appropriate varieties	III	19
Economic constraints		
1. Less capital to purchase farm inputs	I	68
2. Higher cost of production	II	39
3. Lack of skilled labour	III	26
Marketing Constraints		
1. High post harvest losses	I	79
2. Lack of market information	II	62
3. Lack of post-harvest management	III	53
4. Lack of mechanical grading and packaging	IV	42
5. Lack of cold storage	V	28

Technical constraints: The most important constraint was Loss due to insect pest infestation for 83% of the respondents followed by Non-availability of good quality inputs like fertilizers etc. (73%). Lack of appropriate varieties was referred a minor constraint as perceived by 19% of the vegetable growers.

Economic constraints: Less capital to purchase farm inputs was picked by important constraint among economic constraints as reported by 68% of the growers as because of farmers belonged to marginal and small category have taken the lion share vegetable cultivation requires more investment. It was also observed that higher cost of production was the second most important economic constraint for 39% of the farmers followed by lack of skilled labour which was conceived by 26% vegetable growers.

Marketing constraints: Shifting Indian farming from a rural lifestyle to an agribusiness sector and linking farmers to super markets is a key drier for industrialization of agriculture [11]. Several studies were done on traditional areas/conventional crops by different researches [12]. Studies were mainly focused on traditional marketing channels [13]. Limited scientific studies on the emerging/newer institutional marketing models are available [14].

The study found that the marketing margin of wholesaler's was less than the retailer's margin,

due to the fact that the retailers were noted to bear the major burden of losses and deterioration of quality of the produce. Similar types of results were reported by different researches [15].

Due to perishable nature of vegetables post harvest loss was the prime constraint among all marketing constraints as perceived by 79% of the respondents. Lack of market information (62%) and Lack of post-harvest management (53%) were found to be other major constraints. Minor constraints in the marketing of vegetables were referred as Lack of mechanical grading and packaging (42%) and lack of cold storage (28%).

Thus it can be seen that unavailability of quality seed, loss due to pest infestation, Less capital to purchase farm inputs and high post harvest losses were found to be the most important and vulnerable constraint in vegetable cultivation and marketing at commercial scale.

The problems encountered by the farmers in marketing of vegetables in South 24 Parganas are given in the Table 8.

Most of the horticultural crops being bulky and highly seasonal are sold through the Pre-Harvest Contractor (PHC) at the field much before they come to harvest. Very often, the PHC takes most of the production risks due to pests and diseases and also the cost of maintenance, while he makes his margin through bulking [16].

In the survey work various type of vegetables were taken which having different harvesting seasons but the normal season of harvesting from the month of November to March. It was reported that, season specific production creates glut in the market and it pushes the prices very low due to mismanagement of demand and supply creating undulating situation. Lack of good storage facilities was principal constraint for the vegetable growers. Lack of Credit facilities side by side high marketing margin were other major problems for the marketing of vegetables was reported by the respondents. Lack of or improper market information was play key role in the marketing problem which affect the actual price received by the farmer and it was ranked fifth by the growers. Though Pest and disease problem and malpractices level got low score also affecting growers' income adversely.

3.2 Identification and Prioritization of Different Dimensions, Influencing Vegetables Marketing

To quantify the dimensions of vegetables marketing factor analysis was also carried out. The unique feature of Factor analysis is that it facilitates identification of key traits from the mosaic of overlapping relationship and is capable of achieving scientific parsimony by reducing a set of large number of variables to a convenient size of factors (often called dimensions) which cannot be easily accomplished by any other analytical technique, including multiple regression analysis. In our study we have selected 33 different variables which are enormously related with the marketing of Vegetables. Producers' share also often varied during peak and lean seasons [17]. Substantial variation in producers' share in consumers' rupee for vegetables was also observed even in the same location itself. Damage cost, intermediaries exploitative practices, perishability of product, transportation cost and high storage cost etc. have been reported to be the major problems of marketing vegetables in farmers' market [18].

3.2.1 Identification and prioritization of different dimensions influencing vegetables marketing in progressive region (Baruipur, Budge Budge-I and Bhangore-II)

Out of total 33 variables only eleven variables could enter in discerning the dimensions which

are mutually exclusive. All these variables have communalities (h^2) more than 6.0 (Table 9).

Dimension 1: ICT (Information Communication Technology) and measurement Infrastructure

The existing variables *viz.,* private or public telephone booths occupied the highest Eigen value 0.608 which is positively related with the dimension. The variables namely availability of timely market price information stand for second position, positively associated with the dimension with the Eigen value 0.509. This positive association of the variables with the dimension explains the positive and boosting factor for taking decision. This ICT is a new dimension in vegetable marketing process and has occupied a prominent position in imparting literacy for taking timely decision. The variables like role of APMC (Agricultural Produce Marketing Committee) to watch and monitor the conduct of bidders and bidding mechanism is negatively related with the dimension.

Dimension 2: Market regulation and surveillance

The order of ranking of the variables namely role of Public private partnership (PPP) model in encouraging market competition , avoiding overlapping of bidders and other traders at particular point of time, assurance of price of productive market have occupied Eigen value 0.605, 0.554 and 0.517 respectively. All are positively associated with the dimension. It means farmers are happy with these variables.

Dimension 3: Financial infrastructure

The order of ranking of variables namely link of crop production with the capacity to repay the loan after harvest, payment mode to the farmer and provision of plastic money available to farmers have Eigen values -0.609, 0.559 and 0.554 respectively. Though the farmers are happy about payment plan and plastic money provision available to them but the variables like link of crop production with the capacity to repay the loan is negatively related with the dimension. It means farmers are not happy with this conditional provision.

Dimension 4: Production environment

This dimension contains two variables namely suitability of temperature and distribution of rainfall as per requirement of vegetable crops at different stages. Though the farmers are

satisfied with photoperiodicity with respect to vegetable production because it is positively related with the dimension acquiring Eigen value 0.598 but intensity and dimension of rainfall has Eigen value -0.531 which is negatively related with the dimension. It shows that unpredictable behaviour of rainfall as per requirement of vegetables is bothering Vegetable growing farmers in Vegetable producing belt.

Factor analysis revealed that the comparative ranking of factors governing the performance of constraints in vegetables marketing (Table 10). Information and communications technology (ICT) and measurement infrastructure, to the farmers of vegetable growers ranked first factor because it explained 41.16% of the variance.

It shows that for growers, 'ICT and measurement infrastructure' was the most important consideration for marketing of Vegetables in the district Progressive region (Baruipur, Budge Budge and Bhangore Blocks). 'Marketing infrastructure' ranked second as it explained 26.63% of the total variance. The factor identified were 'financial infrastructure' ranked third in importance of efficient marketing because it explained nearly 20.5% of the total variance in the study area. The last and the final factor identified were 'Production environment' and ranked fourth in importance governance of marketing because it explained nearly 11.6% of the total variance in the study area. It was important to note that fourth dimension *i.e.,* 'production environment' trails far behind in order of importance and hence it seems to have little importance in making the choice.

3.2.2 Identification and prioritization of different dimensions of vegetable marketing in backward vegetable producing region (Diamond Harbour-I and Falta Blocks) (2017-2018)

Out of total 33 variables only eleven (14) variables could enter in discerning the dimensions which are mutually exclusive. All these variables have communalities (h^2) more than 6.0 (Table 11).

Dimension 1: Financial infrastructure

The existing variables *viz.,* forward and backward linkage of production and marketing occupied the highest eigen value 0.782 which is positively related with the dimension. The variables namely whether payment comes to the farmers in cash or cheque (-0.675) occupied second rank and is negatively associated with the dimension. Existence of banking institution is negatively associated with the dimension. Payment after sale of produce is lump sum or in installment is also negatively associated with the dimension and occupied eigen value -0.554.

Dimension 2: Physical Infrastructure

This dimension contains three variables namely production site is connected by road, whether market yard is cemented or not and lodging and boarding facilities to farmers in the market place. Though the farmers are satisfied with next two facilities because it is positively related with the dimension acquiring eigen value 0.600 and 0.554 but connectivity of the production site has Eigen value -0.621 which is negatively related with the dimension. It shows that weak road connectivity with the production site bothering vegetable growing farmers in Vegetable producing belt.

Dimension 3: Production Environment

This dimension contains three variables namely suitability of temperature, assured market price in the vegetable production site and distribution of rainfall as per requirement of vegetable crops at different stages. Farmers are satisfied with photoperiodicity, rainfall pattern and geographic location of their field with respect to vegetable production because these are positively related with the dimension acquiring Eigen value 0.617, 0.519 and 0.506 respectively.

Table 8. Problem faced by the farmers in marketing of vegetables

Reason	Score	Rank
Storage problem	88.6	1
Unstable price	83.2	2
Credit problem	69.2	3
Higher marketing margin	63.0	4
Market information	51.2	5
Transportation problem	48.5	6
Malpractices likely faulty weight	30.6	7
Pest and disease problem	21.9	8

Source: Computed by author using survey data, 2017-2018

Table 9. Principle component matrix (Raw component)

Variables	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Communalities (h^2)
Public or private telephone booth	0.608	-0.142	0.550	-0.10	0.825
Access to timely information	0.509	0.142	0.355	-0.450	0.710
Conduct of the bidders during auction	0.502	-0.323	0.212	-0.210	0.713
Private participation in bidding process	0.221	0.605	-0.035	0.331	0.663
Time sequence of bidding	0.540	0.554	0.284	0.110	0.700
Assured Market price	0.376	0.517	0.077	0.192	0.756
Loans for the standing field crops	0.240	0.031	-0.609	-0.151	0.656
Mode of payment	0.169	-0.001	0.559	0.063	0.752
Kisan credit card facilities	0.140	-0.302	0.554	-0.131	0.755
Suitable temperature	0.375	-0.100	0.222	0.598	0.712
Suitable rainfall	0.329	0.394	0.341	-0.531	0.845
% of variance explained	29.954	19.374	14.957	8.464	Total=72.75
	ICT and measurement and infrastructure	Market regulation and surveillance	Financial infrastructure	Production environment	

Table 10. Variations explained by different dimensions of marketing of vegetables in Progressive region (Baruipur, Budge Budge-I and Bhangore-II Blocks) (2017-2018)

Particulars/Dimensions	Rotation sums of squared loadings			% of Cumulative
	Total	% of Variance	Cumulative	
ICT and measurement	7.788	29.954	29.954	41.16
Market infrastructure	6.375	19.374	49.328	26.63
Financial infrastructure	3.889	14.957	64.285	20.56
Production environment	2.200	8.464	72.75	11.65
Total				**100.0**

Variance explained by each factor is the Eigen value of the factor

Table 11. Principle component matrix (Raw Component) of backward vegetable producing region (Diamond Harbour-I and Falta Blocks) (2017-2018)

Variables	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Communalities (h^2)
Linkage between production and marketing	0.782	-0.375	-0.180	0.119	0.897
Payment mode	-0.675	0.300	-0.083	0.043	0.714
Banking institution	-0.610	0.287	0.425	-0.184	0.653
Payment after sale is lump sum or installment	-0.554	-0.318	0.093	-0.006	0.757
Rate of interest	0.517	0.330	-0.047	0.278	0.754
Production site connected with market by road	0.367	-0.621	0.191	0.050	0.806
Condition of Market yard	0.160	0.600	0.039	0.129	0.713
Lodging & Boarding facilities	-0.364	0.554	0.027	-0.128	0.785
Suitable temperature	-0.222	0.124	0.617	0.138	0.735
Assured market price	-0.077	0.075	0.519	-0.083	0.786
Suitable rainfall	-0.064	-0.231	0.506	-0.164	0.852
Communication facilities	-0.037	-0.200	0.076	-0.652	0.818
Weights and measure	-0.207	0.338	-0.245	-0.619	0.768
Public/ private telephone	-0.433	0.237	-0.132	0.536	0.866
% of explained	24.96	19.31	18.554	13.00	Total=75.8
	Financial infrastructure	Physical infrastructure	Production environment	ICT measurement	

Table 12. Variations explained by different dimensions of marketing of vegetables in backward vegetable producing region (Diamond Harbour-I and Falta Blocks) (2017-2018)

Particulars/ Dimensions	Rotation Sums of squared			% of each dimension in total
	Total	% of Varience	Cumulative	
Financial	8.238	24.963	24.963	32.886
Physical	6.374	19.315	44.278	25.448
Production	6.122	18.554	62.832	24.446
ICT and measurement	4.311	13.064	75.892	17.120
Total				**100.0**

*Variance explained by each factor is the Eigen value of the factor

Dimension 4: ICT and measurement infrastructure

The existence of variables *viz.,* communication facilities of arhatiyas via telephone occupied the highest eigen value -0.652 which is negatively related with the dimension. The variables namely whether weights are calibrated or not (-0.619), occupied second rank and is negatively associated with the dimension. It means these two variables are creating hindrances in efficient functioning of the market. The variable namely existence of public or private telephone booth or internet café has positive association with this dimension. This positive association of the variables with the dimension explains the positive and boosting factor for taking decision.

A perusal of Table 12, obtained through Factor analysis revealed that the comparative ranking of factors governing the performance of constraints in vegetable marketing. Financial infrastructure, to the farmers of vegetable growers ranked first factor because it explained 32.8% of the variance. It shows that for growers, 'Financial infrastructure' was the most important dimension in consideration for marketing of Vegetables in the backward vegetable producing region (Diamond Harbour-I and Falta Blocks). 'Physical infrastructure' ranked second as it explained 25.4% of the total variance. The third factor identified were 'production environment' in importance of marketing because it explained nearly 24.4% of the total variance in the study area. It was important to note that fourth dimension i.e., 'ICT and measurement infrastructure' trails far behind in order of importance and hence it seems to have little importance in making the choice.

4. CONCLUSION

Garrett Ranking technique was used to analyze the constraints of production and marketing of vegetables. From the survey data, it can be coined that storage problem was the prime or main problem followed by unstable price, problem in credit facilities, higher marketing margin by the middlemen or agents, proper information about the market, transportation problem etc. In case of progressive vegetable producing region (Baruipur, Budge Budge-I and Bhangore-II Blocks), it recorded that for the farmers, 'ICT and measurement infrastructure' was the utmost important consideration for vegetable marketing followed by infrastructure of markets, subsequent financial status and also the production circumstances. In that cases where the resource was limited, priority should be given to 'ICT and measurement infrastructure' in improving as well as betterment of vegetable marketing process. In backward vegetable producing region the factor analysis inferred that, the comparative ranking of factors giving governance to the overall performance of constraints in marketing of selected major vegetables, Financial infrastructure ranked as utmost top position among the various type of factors followed by physical infrastructure, production environment and ICT and measurement infrastructure in importance of marketing system. For improvement of vegetable marketing systems in backward vegetable producing region, financial infrastructure always should get first priority.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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