

Synopsis for Ph.D.

Title of the study : **ECONOMIC ANALYSIS OF MARKETING OF MAJOR VEGETABLES IN ODISHA**

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1. Introduction

Vegetables are one of the most crucial and vital constituents in human diet so that a meal without a vegetable is supposed to be incomplete in any part of the world. Vegetables are the vital sources of most of the vitamins, minerals and dietary fibres which ultimately help in nutrition and health. Cultivation of vegetable can help to improve the socio-economic condition of the farmer particularly small and marginal farmers since it provides high economic return than that of food grains. Growing of vegetables is 4 to 8 times more remunerative than cereals and its cultivation generates huge employment in the rural areas. About 90-98 percent of vegetables are found to be sold and used afresh in India. India is the 2nd largest producer of vegetables in the world only next to China yet we cannot fulfil our domestic demand of vegetables due to several factors. The annual vegetable production in India is 314.67 million tonnes (2018-19) from an area of 25.87 million ha (2018-19). Leading vegetable producing states in India are Uttar Pradesh, West Bengal, Karnataka, Odisha, Madhya Pradesh, Maharashtra and Andhra Pradesh (GOI, 2018).

It has been observed that more than 70 types of vegetables are grown in India, however higher emphasis is given to few popular vegetables like tomato, brinjal, potato, cabbage, cauliflower, cucurbits, peas, onions and leafy vegetables. These major vegetables have also high export potential and could fetch very remunerative prices in international markets. Therefore, by realizing the increasing importance of these vegetables, there is a need to chalk out long-term strategies so that commercial cultivation of these vegetables could be popularized and research could be initiated on them. Government of India has taken many initiatives which have given boost to vegetable production. Till now, India is contributing about 11.90 percent to the total vegetable production of the world. India is the largest producer of peas (29%) and cauliflower (28.9%), second largest producer of brinjal (28.7%) and onion (14.7%) and third largest producer of cabbage (8.8%) and ranks fourth in case of tomato production (7.3%). Vegetables like tomato, brinjal, cabbage, cauliflower, potato, radish and onion are now produced almost all round the year in different parts of the country. The National Horticulture Mission (NHM) was launched in May 2005 as a major initiative to promote horticulture in order to increase the income of the farmers through cultivation of high value horticultural crops.

In Odisha, the annual vegetable production is 8766.82 thousand million tonnes from an area of 639.7 thousand ha (2017-18). The diverse agro-climatic condition in Odisha offers excellent scope for growing different vegetables like brinjal, potato, tomato, cauliflower, onion, cabbage, beans etc. Odisha is situated at a latitude of 17.780N to 22.730N and longitude of 81.37E to 87.53E. It consists of 4.87% area of the country with a population of 4.20 crores (2011 census). About 65% of the work force derives employment from agriculture. It covers about 155.07 lakh hectares of geographical area, out of which 64.1 lakh hectares of land are under cultivable area which accounts for 41.16 percent of the geographical area of Odisha and the net sown area of Odisha is 56.31 lakh ha (Odisha Economic Survey, 2017-18). The agricultural sector contributes about 19.98 percent of the gross state domestic product. Marketing of horticultural produce continues to take place in disorganised manner in Haats and Bazaars. Different modes of ownership like regional market committees, local bodies including municipalities, NAC, Panchayats at village level and different private associations controls the functioning of these markets. APMC and APMC Act are perceived as deterrent for implementation of market reforms. There is a need to strengthen these bodies for ensuring professional management of these sectors. The schemes for market regulation in Odisha progressed only after enactment of Odisha Agricultural Produce Market Act (OAPM act) 1956 and the rules made there under in 1958.

2. Review of Literature

Different researcher has attempted to study the market behaviour of major vegetables in different parts of the country. Vegetables are important cash crops cultivated by farmers and has huge potential in increasing farmers wellbeing if handled with care and marketed in proper time and proper place. Thus, the study of market behaviour in case of vegetables become inevitable for farmers welfare. Several studies have highlighted the same which is cited hereafter.

Radha Prasad (1995) revealed that there was an increasing trend of time series variables in case of vegetables. They observed higher prices during the months in which arrivals are lower and vice-versa. They also observed that price is affected by arrivals and stock of the product to a great extent. They found that the most important single factor responsible for wide fluctuations in agricultural product prices is the change in supplies of agricultural products. They concluded that the other important factor responsible for positive trend in price of commodity is the changes in demand as a result of change in population, income, habits, customs and establishment of processing industries for the commodity.

Sangwan (1989), Lahiri (1990), Lohr (1991) and Kordeet *al.* (1991) showed that the existence of wide seasonal variation in the wholesale prices of fruits and vegetables. They observed that there exists a definite seasonal pattern for the market arrivals in different regulated markets. They suggested measures like finance, warehouse facilities and market information to eliminate seasonality.

Pajanka *et al.* (2000) and Gadreet *al.* (2002) found the low producers share in consumer rupees in case of different vegetables due to the exploitation of the middlemen and other market functionaries.

Hamid *et al.* (2017) revealed that the arrival (in MT) was more in vegetables as compared to fruits, whereas the turnover (in Rs) was more in fruits than vegetables. They observed that the reason for the same was due to higher average rates in fruits than vegetables.

Goodwin and Schroeder (1991) studied co-integration analysis among prices by using Engle and Granger test in regional markets. It was concluded that markets separated by long distances had lower integration than close proximity markets.

Laure (1991) suggested that farm output prices are not affected by the extent by which the system is out of equilibrium.

Behura and Pradhan (1998) studied the market integration to bring about efficiency in the marketing system. They observed that values of correlation coefficient 'r' would be biased upwards by the existence of common trends or seasonality in price data, so there were chances of spurious regression when the price series were non-stationary.

Narayan *et al.* (2000) studied the degree of relation of price formation in two markets by using zero order correlation matrixes. It was concluded that groundnut oil prices in Chennai and Mumbai were integrated, while there was no integration between two markets for gingerly oil.

Vani and Krishanaih (1998) studied price integration in marketing of chillies in Guntur district of Andhra Pradesh by using Ravallion Model. The result revealed that the index of market connection was 0.82, indicating a high degree of short run market integration. To ensure remunerative prices to chilly growers, they suggested dynamic marketing for maintaining proper price structure in chillies.

Jyotish and Soumyananda (2003) studied market integration in potato in Hooghly district of West Bengal. To show whether potato markets are integrated or not, they used bivariate price correlation as well as co-integration test and error correction method developed by Engle-Granger (1987). On the basis of value of r, the wholesale and retail prices of potato in the Hooghly district are seen to be strongly correlated. Engle-Granger test has been used to show the integration among the potato markets. In the co-integration set up, error correction method estimates the long run relationship between the variables as well as fluctuation in the short run. By using correlation matrix, it showed that the wholesale and retail prices are strongly correlated but the co-integration set up does not support it. Thus, Potato market is highly integrated. It showed that due to high degree market integration, the potato market in the state are competitive and efficient at wholesale level and poor integration at retail level. It was suggested that there was a need to perform a strong and extensive government intervention to enhance the market efficiency at the village level.

Alam (2001) pointed out that about 30 percent of total vegetable output losses are caused by pest. He found that it is one of constraints mainly faced by small holders.

Sunandini *et al.* (1988) studied different technological and socio-economic constraints responsible for yield gaps. Pest and disease incidence, lack of funds, high cost of inputs, lack of timely supply of inputs and inadequate rainfall were considered for identifying the constraints. They suggested that more demonstrations, subsidized and timely supply of inputs, credit facilities, use of improved cultivation techniques and marketing facilities could help in reducing the yield gaps. Post-harvest losses are also an important constraint in marketing of vegetables.

3. Rationale of study

The role of vegetables in Odisha where vast potentialities are available needs hardly any emphasis. However, there has been a silent change in the production of vegetables in Odisha during recent times. The state has a share of about 6.22 percent of area and 4.7 percent of production in the country. The area under cultivation in the state is about 87.46 lakh hectares, out of which 18.79 lakh hectares are irrigated.

However, marketing of vegetables is quite complex and risky due to its perishable nature, seasonality in production and bulkiness. Due to these features the marketing system in vegetables differs from other agricultural crops particularly in providing time, form and space utilities. The spectrum of prices from producer to consumer, which is an outcome of demand and supply of transactions between various intermediaries at different levels in the marketing system, is also unique for vegetables. Similarly, commercial vegetable cultivation is not getting as popular as it should be among the growers because of high input costs and difficulties in marketing and storage. The small vegetable farmers have not been able to derive the equal benefit of improved technologies as compared to bigger farmers due to some inherent problem of poverty.

In view of the above, the question arises even higher profitability and demand of vegetables, whether the extension of area may be feasible at this stage. This is because of the fact that the environment of several market imperfections makes the problem insurmountable in Odisha. It is also a fact that fluctuation in daily prices and a larger margin between the wholesale and retail prices is a common feature in almost all markets (Sarkar *et al.*, 1997). There is also concern about impact of WTO and trade liberalization measures on export performance and competitiveness and how this sector will respond to a free market economy and liberal trade regime. Still deeper is the concern as to how the free trade regime will affect this sector, particularly small and marginal farmers.

With this background, the present study will be conducted to know the overall marketing pattern of major vegetables in Odisha. The study may help to take appropriate policies for the betterment of marketing of vegetables in Odisha in general and India in particular.

4. Objectives

The specific objectives of the study are:

- (i) to examine the present status of marketing of vegetables in Odisha particularly in relation to the trends in arrivals and prices of major vegetables;
- (ii) to examine the extent of integration of vegetable markets;
- (iii) to estimate the speed of adjustment of price for equilibrium and analyse the impulse response;
- (iv) to identify the major constraints in marketing of vegetables; and
- (v) to suggest suitable policy measures for the improvement of marketing of vegetables.

5. Data and Methodology

The present study will be conducted based on both primary as well as secondary data. The secondary data will be collected from various published sources. Time series data on area and production along with wholesale price and arrivals of six major vegetables namely brinjal, potato, tomato, cauliflower, cabbage and onion both for the state level and all India levels will be collected from the publications of National Horticulture Board, Ministry of Agriculture; AGMARKNET (Agricultural Marketing Information Network), Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India. The secondary data on wholesale price and arrival of each vegetable will be analysed in order to examine the pattern and behaviour of arrival and movement of price. The primary data on marketing of vegetables will be collected from farmers, middlemen, wholesaler and retailer for calculation of marketing efficiency. Sample sizes will be restricted to 150 respondents of different size classes. Simple random sampling will be employed to select the 150 respondents spread over two major vegetable producing districts of Odisha.

Analytical Framework:

5.1 Present status of marketing of vegetables in relation to the trends in arrivals and prices of major vegetables

Trend Analysis

Trend is the long-term direction in prices and arrivals which is influenced by the steady change in commodity demand and supply. Trend components of time series will be calculated by employing the following equation

$$Y_t = a_0 + a_1 t$$

Where,

Y_t = value of the variable at time t

a_0 = Constant value

a_1 = Slope

t = time variable (1, 2, 3, n)

Seasonality Analysis

The seasonal nature of production of vegetables leads to change in arrivals from time to time. Poor storage facility and perishability of the commodity further worsen the scenario. Different available statistical procedures will be employed to determine the seasonality of the selected major vegetables for the study.

Marketing Efficiency

The Movement of goods from the point of production to point of consumption at the lowest possible cost, consistent with the provision of services desired by the consumer, may be efficient marketing. Generally high marketing cost and margins are considered to be indicator of inefficiency in the marketing process. Some factors like place of production, time of production, season of production cause a high proportion of marketing cost. Therefore, Shepherd equation will be used to calculate the marketing efficiency of different marketing channels of the selected vegetables.

5.2 Examine the extent of integration of vegetable markets

Market Integration

The variables under consideration is said to be integrated if there exists a stationary linear combination of non-stationary random variables. The variables will be in long run relationship if they are co-integrated. To assess the same a number of steps need to be followed.

The first step towards analysing market co integration hovers around stationarity check of the data and several statistical tests can be incorporated viz, Augmented Dickey Fuller Test (ADF), Phillips Perron Test (PP) and Kwiatkowski-Schmidt-Shin (KPSS) tests.

Augmented Dickey-Fuller test will be utilised to check the order of integration by using the model:

$$\Delta Y_t = \alpha + \delta T + \beta_1 Y_{t-1} + \sum_{i=1}^p \beta_i \Delta Y_{t-i} + \varepsilon_t$$

where, $\Delta Y_t = Y_t - Y_{t-1}$, $\Delta Y_{t-1} = Y_{t-1} - Y_{t-2}$, and $\Delta Y_{t-2} = Y_{t-2} - Y_{t-3}$, etc., ε_t is pure white noise term, α is the constant-term, T is the time trend effect, and p is the optimal lag value which is selected on the basis of Schwartz information criterion¹ (SIC). The null hypothesis is that β_1 , the coefficient of Y_{t-1} is zero. The alternative hypothesis is: $\beta_1 < 0$. A non-rejection of the null hypothesis suggests that the time series under consideration is non-stationary (Gujarati., 2010).

On the other hand Phillips-Perron (PP) test estimates the following model:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 t + u_t$$

Where β_0 is a constant and t is a trend. If the series has a unit root then $\beta_1 = 0$, and the PP test is a test of the hypothesis that $\beta_1 = 0$. The PP test differs from the ADF test insofar as the ADF test seeks to approximate the ARMA dynamics of the series at question through the use

of lagged first differences in the test model (1) while the PP ignores autocorrelation in the test model (2) and instead calculates what can be thought of as the analogue of the ADF tau statistic that is robust to autocorrelation and heteroskedasticity.

Kwiatkowski-Schmidt-Shin tests(KPSS) test estimates the following model:

$$y_t = \beta_0 + \beta_1 t + u_t + \mu_t$$

$$\mu_t = \mu_{t-1} + \epsilon_t \sim iid(0, \sigma_\epsilon^2)$$

Where β_0 is a constant, t is a trend, and μ_t is a random walk. The null hypothesis is specified as the variance of the error term in the random walk being equal to zero. Thus, the KPSS test tests the hypothesis that $\sigma_\epsilon^2 = 0$.

Cointegration Analysis Using Johansen Methodology:

The Johansen procedure examines a vector auto regressive (VAR) model of Y_t , an $(n \times 1)$ vector of variables that are integrated of the order one— I (1) time series. This VAR can be expressed as the following Equation

$$\Delta Y_t = \mu + \sum_{i=1}^{p-1} \Gamma_i Y_{t-1} + \Pi Y_{t-1} + \epsilon_t$$

where, Γ and Π are matrices of parameters, p is the number of lags (selected on the basis of Schwarz information criterion), ϵ_t is an $(n \times 1)$ vector of innovations. The presence of at least one cointegrating relationship is necessary for the analysis of long-run relationship of the prices to be plausible. To detect the number of co-integrating vectors, Johansen proposed two likelihood ratio tests: trace test and maximum eigen value test, shown in below Equations

$$J_{trace} = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i)$$

$$J_{max} = -T \ln(1 - \hat{\lambda}_r + 1)$$

where, T is the sample size and $\hat{\lambda}_i$ is the i th largest canonical correlation. The trace test examines the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigen value test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of $r+1$ cointegrating vectors (Hjalmarsson and Osterholm., 2010).

Granger Causality Test

The Granger causality test will be performed within the framework of a VAR model which is used to test the existence and the direction of long-run causal price relationship between the markets (Granger., 1969). It is an F-test of whether changes in one price series affect another price series. Taking the causality relationship between two markets (denoted as 'D' and 'A') as an example, the test was based on the following pairs of OLS regression equations through a bivariate VAR:

$$P \ln D_t = \sum_{i=1}^m \alpha_i P \ln D_{t-i} + \sum_{j=1}^m \beta_j P \ln A_{t-j} + \epsilon_{1t}$$

$$P \ln A_t = \sum_{i=1}^m \gamma_i P \ln A_{t-i} + \sum_{j=1}^m \delta_j P \ln D_{t-j} + \varepsilon_{2t}$$

where, D and A are the two markets, $P \ln$ stands for price series in logarithm form and t is the time trend variable. The subscript stands for the number of lags of both variables in the system. The null hypothesis in Equation, i.e. $H_0: \beta_1 = \beta_2 = \dots = \beta_j = 0$ against the alternative, i.e., $H_1: \text{Not } H_0$, is that $P \ln A_t$ does not Granger cause $P \ln D_t$. Similarly, testing $H_0: \delta_1 = \delta_2 = \dots = \delta_j = 0$ against $H_1: \text{Not } H_0$ in Equation is a test that $P \ln D_t$ does not Granger cause $P \ln A_t$. In each case, a rejection of the null hypothesis will imply that there is Granger causality between the variables (Gujarati, 2010).

5.3 Estimate the speed of adjustment of price for equilibrium and analyse the impulse response

Vector Error Correction Model (VECM)

If co integration has been detected between series then it refers that there exists a long-term equilibrium relationship between them and accordingly VECM will be applied in order to evaluate the short run properties of the cointegrated series. In case of no cointegration VECM is no longer required and we directly precede to Granger causality tests to establish causal links between variables. The regression equation form for VECM is as follows:

$$\Delta Y_t = \alpha_1 + p_1 e_{1t} + \sum_{i=0}^n \beta_i \Delta Y_{t-i} + \sum_{i=0}^n \delta_i \Delta X_{t-i} + \sum_{i=0}^n \gamma_i Z_{t-i}$$

$$\Delta X_t = \alpha_2 + p_2 e_{2t} + \sum_{i=0}^n \beta_i Y_{t-i} + \sum_{i=0}^n \delta_i \Delta X_{t-i} + \sum_{i=0}^n \gamma_i Z_{t-i}$$

In VECM the cointegration rank shows the number of cointegrating vectors. For instance, a rank of two indicates that two linearly independent combinations of the non-stationary variables will be stationary. A negative and significant coefficient of the ECM (i.e. e_{t-1} in the above equations) indicates that any short-term fluctuations between the independent variables and the dependant variable will give rise to a stable long run relationship between the variables.

Impulse Response Function (IRF)

The granger causality test under consideration can afford to specify only the direction of causality in selected time span. However, it flops to reveal the effect of shock on future values. The impulse response function shows a specific point of time t_0 , that a shock originates from one equation proceeds through the system (Kirchgässner *et al.*, 2012). Generalized impulse response function initially developed by the Koop *et al.* (1996) and since then many have added for development of both the theory and application of it. The generalized impulse response is specified as follows:

$$IRF_{t+k} = (u, P, P, P, \dots) = E [P_{t+k} | P_t = p_t + u, P_{t-1} = p_{t-1}, \dots] - E [P_{t+k} | P_t = p_t, P_{t-1} = p_{t-1}, \dots]$$

Where, lower case letters i.e., p represents realized values, and u is the impulse shock P_{t-1} is the history.

5.4 Identify the major constraints in marketing of vegetables

Garrett's Ranking Technique

Garrett's ranking technique is known to be the most popular and widely accepted methodology to identify and rank the constraints to marketing of major vegetables and the same will be used for the present study. This technique provides the facility to change the orders of constraints and advantages into numerical scores.

Garrett's formula to convert the ranks into percent is as follows:

$$\text{Percent Position} = 100 \times [R_{ij} - 0.5] / N_j \text{ [Garrett \& Woodworth, 1969]}$$

Where,

R_{ij} = Rank given to i^{th} factor by j^{th} farmer/ respondent and

N_j = Number of factors ranked by j^{th} farmer/ respondent.

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