

## Banana Price Integration between Major Markets of Andhra Pradesh – A Cointegration Analysis

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Andhra Pradesh is the fourth largest banana (*Musa paradisiaca* L.) producing state in the country, with nearly 10 per cent of yield from the state. The total estimated production in Andhra Pradesh is 45,72,045 tonnes. For the country's economic development, an increase in agricultural production must be accompanied by an increase in farm income. The rate at which agricultural production expands is an index of the pace of agricultural development while the growth in farm income is an index of the pace of economic development [1].

Banana cultivating farmers in YSR district of Andhra Pradesh facing various constraints both in production and marketing. The local market's present system is not conducive for providing the farmers with a remunerative price for their produce. The consumers are also in a disadvantageous position as they cannot get quality bunches at competitive prices. The farmers are compelled to give various marketing charges, and the trade allowances and the sales are affected at the negotiated rate, which is often advantageous to the commission agents/traders. The means for communication for market information is also inadequate. Actually, the business transactions are carried out as per the prevailing customs which are favorable to the commission agents and the successful bidders who manage the market [2]. Because of the chain of functionaries, there is a wide gap between the farm gate prices obtained from the producers and the actual consumer prices. Thus, the market agents enjoy a major chunk of the profit in channelizing banana bunches from the farmers to the consumers. According to a trade source in Andhra Pradesh, during the months from March to May, supply of banana exceeds demand in the market, which leads to a decline in prices of banana. Because of the excess supply, traders and farmers search for new markets for banana. Karnataka and Telangana are the nearest markets [3]. These marketing constraints affect the production of banana as well as the profitability of banana cultivation. At this juncture, the present study was attempted to analyze the price integration of banana with the following major objectives of (i) to analyze

spatial price integration of banana for the major banana markets in the study area. (ii) to offer policy suggestions based on the results of the study.

The required primary data were collected from the 120 sample respondents i.e., market intermediaries of Pulivendula, Rajampeta and Bangalore markets of Andhra Pradesh during the months of July – December 2018. The secondary data collected from the Y.S.R district fruit market committee and Department of Agriculture and District Statistical Offices of the study area. The collected data is analyzed through co-integration analysis.

### Co-Integration Analysis

The concept of co-integration developed by Engle and Granger has been made using testing market integration. Most market commodity prices, whether international or domestic, are basically non-stationary. A stochastic process is said to be stationary, if its mean and variance between any two time periods depend only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed. The most widely used tests for unit roots are the Dickey-Fuller test (DF) and the Augmented Dickey-Fuller test (ADF). Both would test the null hypothesis that the series has a unit root or in other words, it is not stationary. The DF test is applied by running the regression of the following form.

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + U_t$$

Where,  $\Delta Y_t = (Y_t - Y_{t-1})$ ;  $Y_t = \ln Y_t$

The ADF test is run with the following equation:

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \alpha_i + \sum_{i=1}^N \Delta Y_{t-i} + e_t$$

Where,  $\Delta Y_t = (Y_t - Y_{t-1})$ ;  $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$

The critical values of the t' static of the lagged term have been tabulated by Dickey and Fuller. They have also been considerably extended by Mackinson through Monte Carlo Simulations.

The regression equation would then be as indicated below:

$$Y_t = \beta_1 + \beta_2 X_t + Z_t$$

Where,

$Y_t$  and  $X_t$  the two price series and

$Z_t$ - random errors

The difference lies in the critical values compared for the test statistics.

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Spatial market integration refers to a situation in which prices of a commodity in spatially separated markets move together and price signals and information are transmitted smoothly across the markets. Hence, spatial market performance may be evaluated in terms of the relationship between the prices of spatially separated markets and spatial price behaviour in regional markets may be used as a measure of overall market performance [4].

The Dickey Fuller Test (DF) is used to test the spatial price integration of banana in the markets of Pulivendula, Rajampeta and Bangalore. The results are conferred in the (Table 1).

Table 1 Stationarity test for the order of integration

Markets	Dickey Fuller Test
Pulivendula	-2.0072
Rajampeta	-1.2991
Banglore	-1.5134
Pulivendula $\Delta$	-3.2710**
Rajampeta $\Delta$	-4.1001**
Banglore $\Delta$	-4.0098**

\*\*Significant at 1 per cent level;  $\Delta$  Denotes first difference

The test of co integration starts with a test of stationarity at different levels. To test the stationarity, Dickey Fuller (DF) test was used. When the data were used as such without any differentiating, the DF tests gave non-significant estimates. This indicated that the data were not stationary. Hence, the DF test is applied to find out the first difference. In this case, the DF test was found to be significant, implying that the data were stationary with the order of integration being one [5]. It indicated that the data qualified for pair-wise co-integration test. The results of the pair wise co integrating regressions are given in (Table 2).

Table 2 Pair wise co-integration test of price of banana

Dependent variables	Independent variables	Dickey fuller test
Pulivendula	Rajampeta	-3.1299**
Rajampeta	Banglore	-2.1284
Banglore	Pulivendula	-2.7985**

\*\*Significant at 1 per cent level

The pair-wise combination of Pulivendula – Rajampeta – Bangalore gave significant estimates at one per cent significant level, showing that the prices of banana in these

markets were co-integrated [6]. It concluded that, there existed a free flow of market information between these markets, where as the pair-wise combination of Rajampeta-Banglore not given significant estimates, showing that the price of banana in these markets were not co-integrated and there was no free flow of market information between these markets [7].

The pair wise co-integration test of price of banana showed that prices of banana between Pulivendula and Rajampeta markets and Pulivendula and Bangalore markets were co-integrated. From the co-integration analysis following inferences were arrived for the study.

- (i) Free flow of market information taken place between Pulivendula and Rajampeta markets, similarly between Pulivendula and Bangalore markets. But there is no free flow of market information between Rajampeta and Bangalore markets. This is mainly due to the traders from Pulivendula market regularly travelling to Rajampeta and Bangalore markets for their trade.
- (ii) Even though Bangalore is far away from the Pulivendula market, the banana arrived to this market (Pulivendula) which was cultivated in Y.S.R district having huge demand in Bangalore market due to its taste and delayed perishability so that traders from Pulivendula having trade with Bangalore throughout the year.

## SUMMARY

The present study was attempted to analyze spatial price integration of banana markets in the study area and to offer policy suggestions based on the results of the study. The primary data required for the study were collected from the 120 sample respondents from the market intermediaries of major markets. The collected data is analyzed through co-integration analysis. The results of the study concluded that banana farmers in the study area not received higher price as that of distant markets where their produce were sold through market intermediaries. The results of the study concluded that banana farmers in the study area not received higher price as that of distant market where their produce were sold through market intermediaries. This study suggested that to increase the farmers price, linking farmers with eNAM for promoting real time price discovery through transparent auction process based on actual demand and supply is necessary for them. By increasing farmers share in consumer rupee, farmers as well as consumers will be benefitted in the study area.

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