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Price Behaviour of Arecanut in the State of Karnataka (India) Under e-tendering Regime

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ABSTRACT

Karnataka is said to be a forerunner among Indian states to reform agricultural markets. E-tendering system was introduced by the state to ensure better price realisation for the farmers. The present study focusses on analysing the behaviour of arecanut prices during pre and post e-tendering period in Shivamogga and Bheemasamudra APMCs. Secondary data on monthly model prices of arecanut were collected from www.krishimaratavahini.kar.nic.in for a period from January 2007 to December 2019. In the selected APMCs, the arecanut prices exhibited a significant positive exponential trend over the years. Intra year variations were observed in arecanut prices. The monthly growth rate of arecanut prices were found to be higher during the post e-tendering period in comparison to pre e-tendering period. Findings indicate the impact of e-tendering system on arecanut prices and could be attributed to the increased number of traders participating in the tendering process and the improved transparency of the system.

Keywords: Price trend, Arecanut, E-tendering, APMC, Seasonal index

INTRODUCTION

Farmers' decision regarding resource allocation and product disposal could be shaped by the anticipated price of that commodity, especially if it is a cash crop. Arecanut being a cash crop is no exception and the arecanut growers in Karnataka were found to be highly responsive to price with regard to acreage under the crop (Patil *et al*., 2013). For every one per cent increase in the expected price, arecanut growers in Karnataka would bring 4.14 per cent additional area under arecanut cultivation (Patil *et al*., 2014). In the past few decades, the state of Karnataka has been witnessing increased growth in both area and production of arecanut. However, most of the arecanut growers in the state are confronting problems related to marketing of the crop, specifically in terms of frequent price fluctuations and market malpractices (Shambhavi, 2016). Further, Agriculture is one of the promising areas where Information and Communication Technologies (ICTs) can be effectively used to benefit the farming community (Mishra *et al.,* 2020). In this context, the government of Karnataka has formulated various reforms concerning agricultural marketing for the overall development of the sector. One such initiative was the implementation of e-tendering system in place of the traditional closed tendering system in 2009 under the Mandi Modernisation Programme (MMP) (Chengappa *et al.,* 2012). It was accompanied with the implementation of the concept of Unified Market Platform (UMP) in 2014 by the government of Karnataka in association with the National Commodity Derivative Exchange (NCDEX). Along with that, Rashtriya e-Market Service Private Limited (ReMS) was created as a joint venture company for

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providing e-marketing services (Aggarwal *et al*., 2016). Unified Market Platform integrates the APMC markets across the state through an online platform. It provides access to the licenced traders to participate in the online trading of the notified agricultural commodities. The e-tendering system under UMP reduces transaction time and offers advantages of competitive price discovery and transparency (Pavithra *et al.,* 2018).

A small reform in the marketing system can have huge repercussions on the prices received by the farmers. For instance, a 13.00 per cent rise in crop prices translates to 9.10 per cent growth in farmers' income (Chand, 2017). For the formulation of a policy intervention that ensures competitive prices for the farmers, it is imperative to have a better understanding of the effects of price on the marketing of the crop. Further, there has been hardly any study on assessing the price behaviour of arecanut after the implementation of e-tendering system in arecanut. Therefore, the present study was formulated to study the seasonal variations in arecanut prices and to estimate the price trend during the pre and post e-tendering period.

METHODOLOGY

Karnataka alone produces 70.33 per cent of the total arecanut produced in the country (6.0 lakh tonnes) from an area of 2.79 lakh hectare (GoI, 2019). Among the districts of the state, Shivamogga stands first in both area (21.06%) and production (21.30%), followed by Davanagere, Dakshina Kannada, Thumkuru, Chikkamagaluru and Chitradurga (GoK, 2018). Thus, two major Arecanut trading APMCs of Karnataka, *viz*., APMC of Shivamogga district and Bheemasamudra APMC of Chitradurga district were chosen for the present study. APMC of Shivamogga district was chosen to represent the traditional arecanut growing region. Whereas, Bheemasamudra APMC in Chitradurga district, one of the biggest arecanut markets in the state was chosen to represent the non-traditional arecanut growing regions in Karnataka. Around two third of the arecanut produce coming to both Shivamogga APMC as well as Bheemasamudra APMC was of Rashi and Bette varieties. Hence, price trend and seasonal variations in Rashi and Bette varieties were analysed to understand the general behaviour of arecanut prices.

Secondary data on monthly modal prices of arecanut in Shivamogga and Bheemasamudra APMCs for the last 12 years (January 2007 to December 2019) were collected from Krishimaratavahini (www.krishimara tavahini.kar.nic.in). Intra year variations in arecanut prices were estimated using seasonal indices with the 12-period centred moving average method. The price trend of arecanut in the selected markets in the course of pre and post e-tendering period was analysed using ordinary least square method with reliable transformations.

Seasonal variation refered to the change that occurs with regular periodicity within a period of one year. To capture the intra year variation in arecanut prices, seasonal indices were calculated using twelve month centred moving average method. The moving average for time 't' (M_t) was calculated as:

$$M_1 = (Y_2 + Y_3 + Y_4 + \ldots.. + Y_{13}) / 12$$

$$M_2 = (Y_3 + Y_4 + Y_5 + \ldots.. + Y_{14}) / 12$$

$$M_t = (Y_t + Y_4 + Y_5 + \ldots.. + Y_{t+12}) / 12 \ldots \text{etc}$$

Where, M_t = Moving average for time 't', Y_t = Actual price at time 't'

The twelve month centred moving average removes the influence of seasonal effect in the actual prices and the remaining effects could be attributed to the secular trend. Since even numbered moving average method was employed, it necessitates the use of centred moving average (CM_t). It is estimated using the formula,

$$CM_t = (M_t + M_{t+1}) / 2$$

Where, CM_t = Centred moving average at time 't', In order to disentangle seasonal components from the actual price series (T*C*S*I), the actual price series was divided with obtained centred moving average. The obtained series (S_t) was later arranged month wise for each year and the average of each month was taken. In the absence of seasonal variations, the sum of averages thus obtained will add to 1200. Any deviations from 1200 imply the existence of seasonal variation which should be accounted with a correction factor obtained by dividing 1200 with the actual sum of averages. Seasonal indices were obtained by multiplying monthly averages obtained with the correction factor.

$$S_t = (Y_t / CM_t)*100$$

Where, S_t = Specific seasonal index at time 't', Correction factor = 1200 / Actual total of indices

Seasonal index = Monthly average of S_t * Correction factor

Now, the calculated seasonal indices were used to remove the influence of seasonality from the actual time series data. To de-seasonalised the price data, the actual price of each month was divided by the seasonal index and multiplied with a hundred.

$$\text{De-seasonalized price} = \frac{\text{Actual price}}{\text{Seasonal index}} \times 100$$

Price trend illustrated the movement of prices over a period of time and is usually influenced by either demand or supply of that particular commodity in the open market. Policy interventions and market reforms by the government can also affect the product price. The ordinary least square method was employed on the de-seasonalized price data to estimate the trend in arecanut prices in the course of pre and post e-tendering period. Based on the value of the coefficient of determination, goodness of fit of the trend line was estimated and exponential function tends to be the best fit model for the given data. The compound growth trend equations can provide a notion about the trend in price, area, production and productivity of any particular crop over a given period of time (Kalia *et al*., 2021). The compound monthly growth rate of arecanut prices during pre and post e-tendering period were also estimated to have a better understanding of the price trend.

$$Y = ae^{bt} \text{ or, } Ln\ Y = Ln\ a + bt$$

Where, $Ln\ Y$ = Real price, t = Time (Years), a = Intercept, b = Regression coefficient

Compound monthly growth rate (CMGR) in per cent = (antilog of b – 1) *100

RESULTS AND DISCUSSION

Seasonal variations

Intra year variations in arecanut prices were analysed by estimating seasonal indices with the 12-month moving average method. The results depicted in the Table 1 reveals that, the seasonal price index of Rashi and Bette varieties in Shivamogga APMC was highest in January with an index of 116.93 per cent and 112.88 per cent, respectively. The lowest seasonal price index was recorded in September for both the varieties with an index of 88.19 per cent for Rashi and 88.30 per cent for Bette variety. Further, in the case of Bheemasamudra APMC, the seasonal index was found to be highest in January for Rashi (110.99%) and Bette (104.97%) variety. The lowest seasonal index for Rashi variety was observed in June (94.33%) and in March (96.99%) for Bette variety. Altogether, the highest seasonal indices for arecanut prices were observed in the period of November to January and coincided with the peak season as two third of the total arecanut produce arrives at the market during this period. Presence of seasonal variations (intra year) in arecanut prices could be attributed to the discrepancy in the time of production and time of marketing. Arecanut being a crop with longer shelf life, majority of the arecanut farmers stores the produce until the market price becomes remunerative. Thus, the likely reason for the foregoing results could be the price consciousness of the arecanut growers with regard to resource allocation as well as product disposal. Farmers tend to depend on the anticipated prices to make market decisions.

Table 1: Seasonal indices of arecanut prices in Shivamogga and Bheemasamudra APMCs from 2007-2019

Month	Shivamogga APMC		Bheemasamudra APMC	
	Rashi	Bette	Rashi	Bette
January	116.93	112.88	110.99	104.97
February	99.90	98.11	101.58	100.26
March	101.78	101.77	97.35	96.99
April	97.10	101.76	97.44	97.70
May	95.80	99.14	95.16	98.21
June	93.46	97.62	94.33	97.59
July	96.57	99.89	95.33	98.58
August	100.85	99.14	99.25	100.22
September	88.19	88.30	97.84	100.22
October	96.36	94.47	102.37	102.25
November	106.30	102.75	103.68	101.85
December	106.76	104.16	104.68	101.17

Table 2: Trend component in time series data of monthly modal arecanut prices from the year 2007 to 2019 (Rs/quintal)

Market	Model equation	Intercept	Coefficient/	F value	R^2	CMGR (%)
Shivamogga (Rashi)	$7325.2e^{0.0112t}$	7325.20	0.0112	503.05**	0.7656	1.13
Shivamogga (Bette)	$7624.8e^{0.0116t}$	7624.80	0.0116	543.59**	0.7792	1.17
Bheemasamudra (Rashi)	$8857.9e^{0.010t}$	8857.90	0.010	494.65**	0.7626	1.00
Bheemasamudra (Bette)	$7385.8e^{0.008t}$	7385.80	0.803	548.64**	0.7808	0.80

**Significant at 1% level of significance

Price trend

Analysis of price trends involves determining the general direction of movement of prices over a period of time. Simple regression models such as linear, quadratic and exponential models were tried and based on the value of the coefficient of determination, the exponential regression model was found to be the best and the results were depicted in Table 2. In the selected APMCs, the arecanut prices exhibited a significant positive exponential trend over the years. The trend equation estimated for the study was depicted in Table 2 and graphically represented in figures (Figure 1 to 4). The monthly increase in prices was 1.13 per cent and 1.17 per cent for Rashi and Bette variety in Shivamogga APMC. Whereas, in Bheemasamudra APMC, the compounded monthly increase in prices was 1.00 per cent and 0.80 per cent for Rashi and Bette variety, respectively (Table 2). The probable reason for this rise in price could be the steep fall in arecanut production in

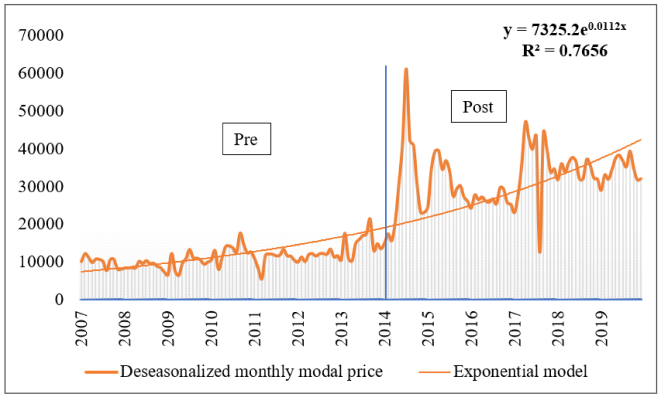

Figure 1: Trend in monthly modal arecanut (Rashi) prices in Shivamogga APMC from 2007-2019

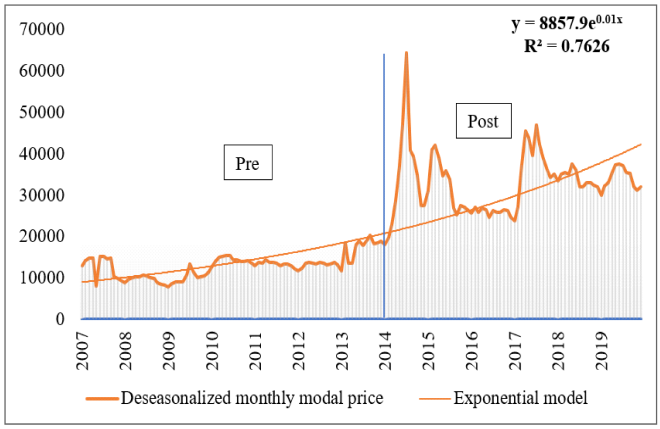

Figure 2: Trend in monthly modal arecanut (Rashi) prices in Bheemasamudra APMC from 2007-2019

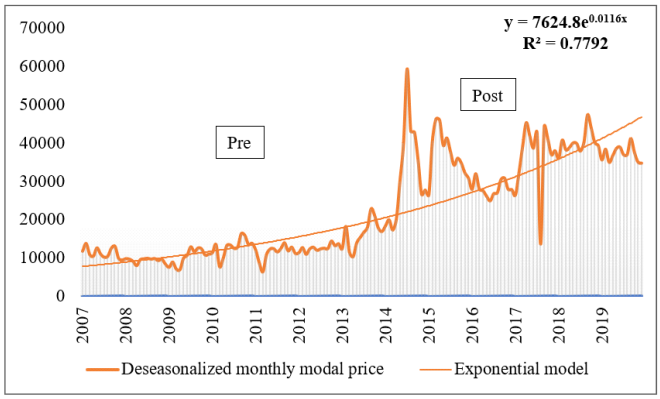

Figure 3: Trend in monthly modal arecanut (Bette) prices in Shivamogga APMC from 2007-2019

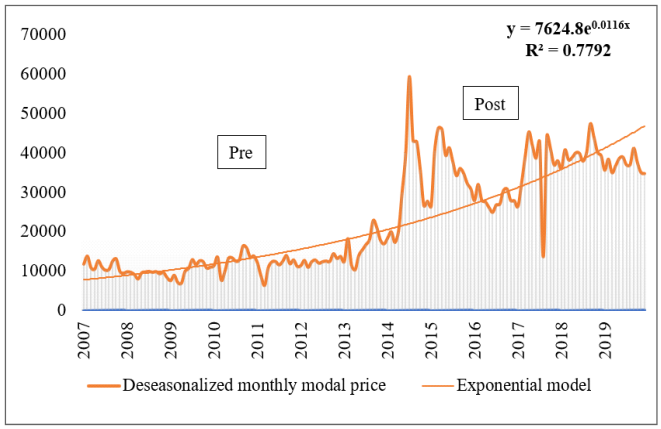

Figure 4: Trend in monthly modal arecanut (Bette) prices in Bheemasamudra APMC from 2007-2019

the Malanad belt due to the spread of fruit rot disease in the year 2014-15. Further, a decline in import from Indonesia, Thailand and Malaysia because of high import tariff and increased demand for arecanut from the pan masala industry could also be some of the possible reasons for such a rising trend in arecanut prices. The results were in accordance with the findings of the study conducted by Shambhavi (2016), where she reported a monthly rise of Rs. 125.31 in arecanut prices in the Shivamogga district. Further, Sreepriya and Sindhu (2020) also reported that the prices of potato exhibited a significant positive exponential trend with an annual growth rate of 11.50 per cent in Agra market followed by 10.50 per cent in Ahmadabad.

During the post e-tendering period, the compound monthly growth rate of prices of Rashi and Bette varieties in Shivamogga APMC increased from 0.34 per cent to 1.06 per cent & 0.44 per cent to 0.89 per cent, respectively. Whereas in case of Bheemasamudra APMC, the compounded monthly price of Rashi and Bette variety increased from 0.45 per cent to 0.80 per cent and 0.26 per cent to 0.76 per cent, respectively (Table 3).

Table 3: Compound monthly growth rate of monthly modal arecanut prices during pre and post e-tendering system

Market	APMC, Shivamogga		APMC, Bheemasamudra	
CMGR (%)	Rashi	Bette	Rashi	Bette
Before	0.34	0.44	0.45	0.26
After	1.06	0.89	0.80	0.74

Increase in the arecanut prices after the implementation of e-tendering might be due to the increased number of traders participating in the tendering process and the improved transparency of the system that prevents all sorts of malpractices which existed during the pre e-tendering period. In a similar study, Pavithra *et al.* (2018) revealed that the modal price for Pigeon pea has increased to by 12-14 per cent in Gulbarga APMC as compared to Chittapur and Sedam APMCs. Further, the findings were in concurrence with the studies conducted by Reddy (2016), Girish (2017), Chandana (2018), Tyngkan (2018) and Geethavani (2019).

CONCLUSION

In the selected APMCs, the arecanut prices exhibited a significant positive exponential trend over the years and intra year variations in prices were observed. Further, during the post e-tendering period, there was a significant increase in the monthly model prices of arecanut in comparison to the pre e-tendering period in both the selected markets. Thus, the e-tendering system has the potential to improve farmers income because of the increased number of traders participating in the tendering process and improved transparency of the system. Hence, it is highly recommended to extend the system of e-tendering to other APMCs in the state, which still follows the closed tendering system and also for other notified commodities after ensuring adequate infrastructure facilities.

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