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RESEARCH PAPER

Impact of e-tendering on arrivals and prices of copra in Tiptur APMC

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ABSTRACT

The study analyzes the impact of e-tendering initiative in Tiptur APMC on the various factors of copra market like arrivals, average prices, minimum and maximum prices, growth of arrivals and prices before and after the initiative, stability of the growth and seasonality of arrivals and prices of copra in Tiptur market. Secondary data relating to arrivals and prices of copra in Tiptur APMC during two periods *viz.,* 2002 to 2010 (pre-intervention period) and 2011 to 2015 (post-intervention period) were used for the study. The annual total arrivals of copra in Tiptur market has increased from 1,43,496 quintals in 2002 to 4,10,877 quintals in 2015, with a compounded annual growth rate of 12.82 per cent which was significant at 1 per cent level. The modal prices of copra have increased at a rate of 9.59 per cent which was significant at 1 per cent level. In the period wise analysis, the total arrivals and average price of copra during pre-intervention period increased at a rate of 13.46 and 7.20 per cent which was not significant. The total arrivals and average prices of copra during post-intervention period increased at a rate of -19.1 and 25.81 per cent which were non-significant. There was a very weak negative relationship (correlation of -0.18) between the total annual arrivals and annual average prices in the pre-intervention period, whereas, there was found to be a strong negative relationship (correlation of -0.91) between total annual arrivals and annual average prices in the post-intervention period. Further, it was observed that the minimum prices in different months during post-intervention period had increased considerably after the introduction of e-tendering. The monthly maximum prices of copra during the post-intervention period had also increased considerably. The variation in prices and arrivals had moderated in the post-intervention period. Overall it could be concluded that the e-tendering initiative has brought in some improvements in the arrivals and prices in terms of reduction in variations, increased minimum and maximum monthly prices. It has also brought more stability to the arrivals and prices of copra in Tiptur market.

KEY WORDS : Tiptur, Copra, E-tendering, Arrivals, Average prices, Compound annual growth rate

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The agricultural sector has been one of the most important sectors of Indian economy and continues to be a main stay of life for majority of the population. The agricultural sector in our country has flourished over the years due to Government's constant thrust on increasing agricultural production. With this in mind, the APMCs have been established in Karnataka under the Karnataka Agricultural Produce Marketing (Regulation and Development) Act, 1966. The main objective of APMCs is to bring in better agricultural and marketing practices in ensuring remunerative prices to farmers for their produce and their accurate weight. Attention is also given to timely payment of sale proceeds to farmers in addition to providing basic infrastructure facilities for trade of agricultural commodities.

There are 155 main market yards in Karnataka and 7557 in India. Yet the objective of passing over of fair share of consumer rupee to producer has remained a distance dream. The benefits of increase in production and productivity, has not percolated down to the farming community due to multilayer marketing system. Indian agriculture is characterized by lack of strong linkages between production and marketing, one of the reasons is inadequate marketing infrastructure. Now, the increase in production and productivity in agriculture has resulted in higher marketable surplus in case of many crops. Therefore, agriculture sector needs scientific infrastructure and efficiently functioning markets to drive growth and economic prosperity in rural areas of the country.

One such innovative scientific infrastructure is the e-tendering system of sale in APMCs. E-mandi is a web-based application with three tier architecture. The e-mandi system is a comprehensive system, meeting all the requirements of the APMCs. It has been built with number of features for easier use by the APMC staff, traders and Commission Agents. E-mandi has been designed by incorporating the rules and regulations defined in APMC Act.

The department of agricultural marketing had requested the national informatics centre (NIC) for the design and development of software for activities of agricultural produces marketing committee (APMC). After studying the requirements and activities in the APMC, national informatics centre (NIC), Karnataka had developed the e-tendering application in 2006 to automate the process of tendering of farmers' agricultural produces in the APMC. Subsequently, this system is improved and called as e-mandi system, which captures all the activities of the APMC, from ingate entry to outgate entry including tendering, billing.

The e-mandi system caters to the need of all the stakeholders of the APMC system. The farmers, who bring the agricultural produces, are particular that they get the best prices for their produces through tendering / auctioning in transparent way. The traders on the other side want to ensure that they get the quality produce for the rate quoted by them. Similarly, the commission agents are interested to ensure that the transactions taking place in their shop are smooth and more number of clients are using their service. APMC / Govt. wants to ensure that the tendering / auctioning process take place smoothly and transparently in the market and maximum number of farmers get the benefits of its service. In the process, they generate more revenue and use it for the betterment of their customers. It also helps the industries to decide / guide in opening the new food processing units around the markets. Agricultural based industries will be benefited in selling their products based on the agricultural produces in the area.

The e-tendering system was first introduced in 2006-07 on pilot basis for paddy in the Mysore regulated market; it was further extended to 11 commodities in 2010. It is now operational in 42 regulated markets in the state. After the success of a pilot project at Mysore, electronic tender system has been taken up at 42 APMCs in the state. The APMCs where the project was implemented in the first phase are Tumkur, Shimoga, Sagar, Chitradurga, Gulbarga, Sedam, Yadgiri, Kanakagiri in Gangavathi, Bellary, Kottur, Bijapur, Haveri, Byadagi, Ranebennur, Hubli, Bagalkot, Sirsi and Kumta.

The electronic tender system was introduced in the selected APMCs of the state mainly with following objectives:

–To ensure competitive price for the farmers' produce.
–To bring in transparency in the sale transaction.
–To complete the process of sale in a shorter possible time
–To reduce the marketing cost and increase efficiency in the operation of sale procedures.
–To help quick generation of market reports and timely dissemination of market information.

Of the many notable benefits of e-tendering system, one notable development is that of copra in Tiptur APMC.

Since the inception of e-tendering, the prices of copra have shot upto the range of 16000-17000 per quintal, prompting all other stakeholders to take note of this and to replicate the same success elsewhere for all other crops. Hence, this study has been taken upto assess the effect of e-tendering system on the various parameters of copra in Tiptur market.

METHODOLOGY

Secondary data has been used for the present study. Data on arrivals and prices of copra in Tiptur APMC has been collected for the period 2002 to 2015. Since the e-tendering system was introduced in Tiptur in October 2010, the time period has been divided into two period *viz.*, pre-implementation period and post-implementation period. Years 2002 to 2010 have been considered as pre implementation period and years 2011 to 2015 have been considered as post-implementation period. The secondary information was collected from Krishimaratavahini website and various publication of the Karnataka State Agricultural Marketing Board (KSAMB) and selected APMCs.

Selection of market and crop :

Tiptur APMC has been purposively selected for the study as this market has witnessed huge success under the e-tendering platform with respect to copra. Hence, an upto date detailed study on this market can bring out a good report which other stakeholders can utilize for further utilization. Copra was selected for the study in Tiptur market as it is the major crop in Tiptur in terms of arrivals and it is the only crop being traded through e-tendering in Tiptur market since 2010.

Analytical tools :

Simple descriptive statistical techniques like averages, percentages, compounded annual growth rates; graphical analysis, etc. have been used to analyze the secondary information collected. Descriptive statistics has also been utilized to analyze the secondary information on prices and arrivals.

In addition, an index, used by Shalendra (2012) in his study on impact assessment of e-tendering has also been used to assess the impact, if any, of the e-tendering on prices in the pre and post initiative period. The index measures the degree of closeness of the prevailing modal price from the maximum price. The modal price being closed to the maximum price is assumed to be a favourable situation. This is reflected by a high value of index *viz.*, nearer to 1. The index as defined below, measures the distance of modal price from maximum price wrt the total variation in the prices *i.e.* difference between maximum and minimum price.

$$\text{Index value} = \frac{\text{Maximum price} - \text{Modal price}}{\text{Maximum price} - \text{Minimum price}}$$

Seasonal indices :

A seasonal index is a measure of how a particular season compares with the average season. Seasonal indices have been used to deseasonalize the data to find out the variation in arrivals and prices during the different seasons/ months. If the value of the index falls between 95 and 105, the data is presumed to be stable. If the value falls out of range, it can be presumed that the data is not stable and the seasonal variation might have some effect on the variable.

$$\text{Seasonal index} = \frac{\text{Value during a particular month}}{\text{Average of value during all months}}$$

Deseasonalising is the process that is used to remove the seasonal effects from a set of data. This allows any underline trend to be made clearer

$$\text{Deseasonalized figure} = \frac{\text{Actual value during a particular month}}{\text{Seasonal index}} \text{x100}$$

ANALYSIS AND DISCUSSION

The results obtained by utilizing the various tools have been discussed in this chapter. It deals with the assessment of impact of e-tendering on prices and arrivals of copra in Tiptur market.

Arrivals and prices of copra in Tiptur APMC :

The results revealed that the annual total arrivals of copra in Tiptur market has increased from 143496 quintals in 2002 to 410877 quintals in 2015, with a compounded annual growth rate of 12.82 per cent which was significant at 1 per cent. The arrivals were quite inconsistent till 2008 and stabilized between 2009 and 2013 followed by a decrease of 30 per cent in 2014. Overall we can see an increasing trend in the arrivals except in the year 2015 (Table 1).

If we consider the pre and post e-tendering periods, the annual arrivals and annual average prices increased at a rate of 13.46 per cent and 7.2 per cent, respectively.

Table 1: Year wise arrival and prices of copra in Tiptur market (Arrival in quintals and prices in Rs./qt)

Year	Total arrivals	Average price
2002	143496	2188
2003	216626	2762
2004	123601	4883
2005	48612	6906
2006	144100	4672
2007	156430	3745
2008	161379	4240
2009	338108	4394
2010	446633	4652
2011	550750	6507
2012	567806	5363
2013	594925	5318
2014	410877	12879
2015	225644	13236
CAGR	12.82*	9.59*
CV	63.22	56.58
R^2	0.48	0.58

* indicates significance of value at P=0.05

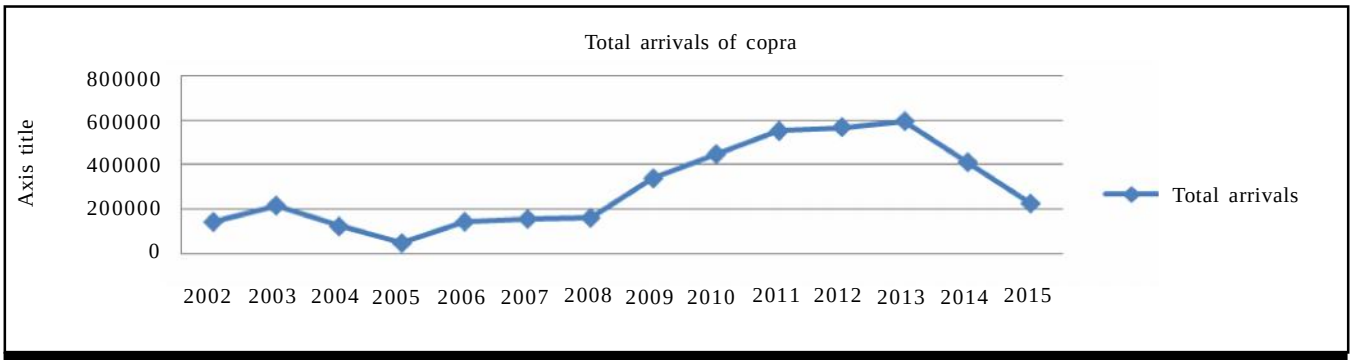

Fig. 1 : Total arrival of copra in Tiptur between 2002 and 2015 (in qtl)

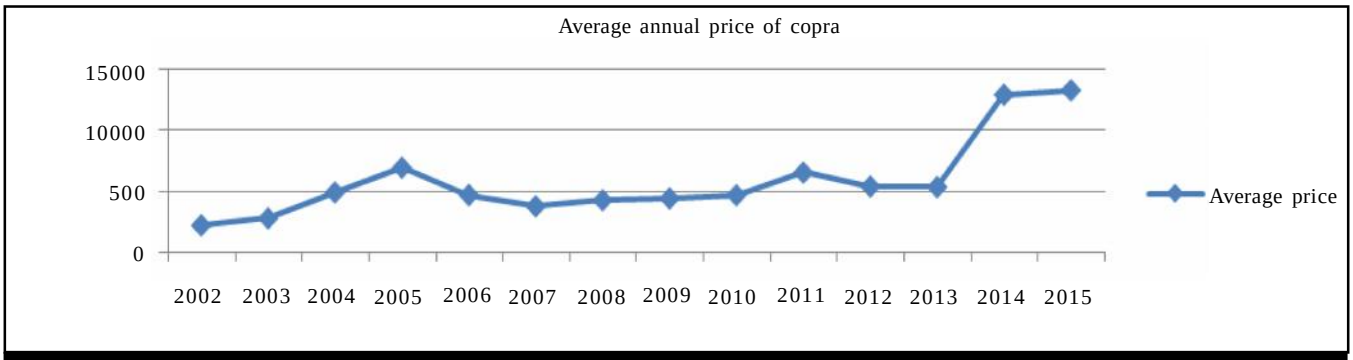

Fig. 2 : Average annual price of copra in Tiptur between 2002 and 2015 (in qtl)

Regression analysis revealed that these growth rates were not significant. The variability was high in case of annual arrivals (CV of 73.11%) and moderate in case of average prices (CV of 33.92%). The high variability in total arrivals is because of the bumper harvest realized in 2006-07 and 2009. During the post intervention period, the total arrivals and average annual prices increased at a negative rate of -19.01 per cent and 25.81 per cent, respectively. The negative growth in arrivals can be attributed to low coconut production due to low rainfall and consecutive drought years from 2013 to 2015. Regression analysis revealed that these growth rates were non-significant. The variability was moderate with CV of 32.77 per cent and 46.69 per cent, respectively (Table 2).

Relationship between arrivals and prices :

The reason for this sharp increase in prices can be attributed to many factors. The general perception is that it may be because of the variations in arrivals, *viz.*, a decrease in arrivals would increase the prices. To ascertain this, the relationship between arrivals and prices during pre and post e-tendering periods was analyzed using a correlation analysis. It revealed that there was a very weak negative relationship (correlation of -0.18) between the annual total arrivals and annual average prices during the pre-e-tendering period. However, there was a very strong negative relationship between annual average arrivals and annual average prices (correlation of -0.91) in the post e-tendering period, meaning, the increase in prices is majorly because of the decrease in arrivals to the tune of 91 per cent. Therefore, it can be concluded that the price rise is mainly because of the decrease in arrivals and partly because of the introduction of online trading in the market (Table 3).

Table 2 : Growth in total arrival and average prices of copra in Tiptur market during pre and post intervention periods

	Pre- intervention period (2002-2009)		Post -intervention period (2010-2015)	
	Total arrivals	Average price	Total arrivals	Average price
CAGR	13.46	7.20	-19.01	25.81
CV	73.11	33.92	32.77	46.69
R^2	0.44	0.12	0.69	0.67

Table 3 : Correlation between annual total arrivals, annual average arrivals and annual average prices of copra during pre and post intervention period

	Pre-intervention period		Post-intervention period	
	Total arrivals	Average price	Total arrivals	Average price
Total arrivals	1	-	1	-
Average price	-0.18	1	-0.91	1

Table 4 : Comparison of arrival and prices in pre and Post e-tendering period in Tiptur market (Arrivals in quintals and prices in Rs./qtl)

Months	Pre-e-tendering period (2002-2010)				Post-e-tendering period (2011-2015)			
	Arrival	Min. average price	Max. average price	Modal price	Arrival	Min. average price	Max. average price	Modal price
Jan.	18186	1561	7350	4426	43026	4964	14548	7897
Feb.	7830	2727	7249	4694	39471	4901	13466	7753
Mar.	5289	1335	6977	4051	26052	4726	12915	7546
April	7716	1819	6986	3800	28302	4644	13150	8054
May	9736	808	6728	3607	28364	4493	13158	8360
June	12909	1956	6122	3856	34299	4904	13173	8586
July	20707	2501	6786	4407	47870	4943	14943	8984
Aug.	20989	2797	6281	4398	48110	5069	17975	9611
Sept.	29565	2269	7179	4727	48705	5089	17178	9361
Oct.	31324	1603	7498	4809	73310	5084	16482	8554
Nov.	16031	2810	7396	4739	43529	5052	13943	8082
Dec.	17382	1098	7498	4480	40414	4978	14247	8154

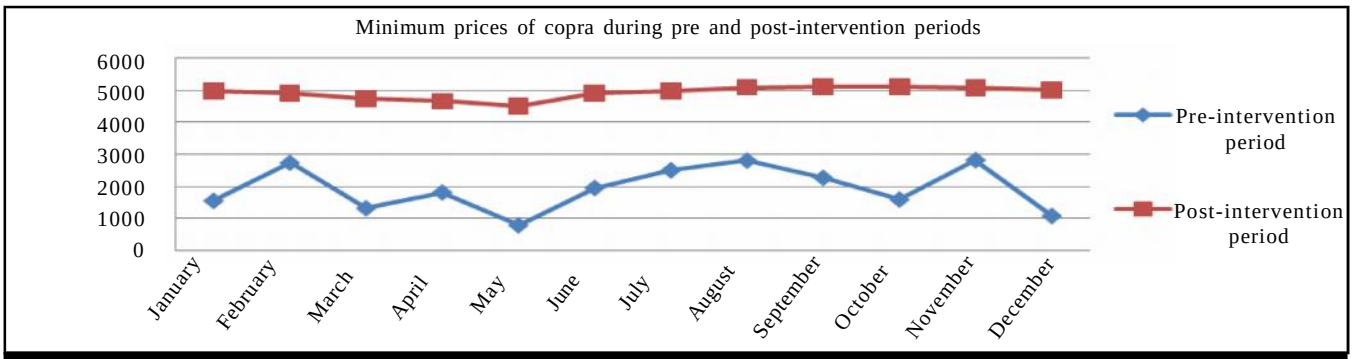

Fig. 3 : Comparision of month wise minimum prices of copra in Tiptur during pre and post-intervention periods

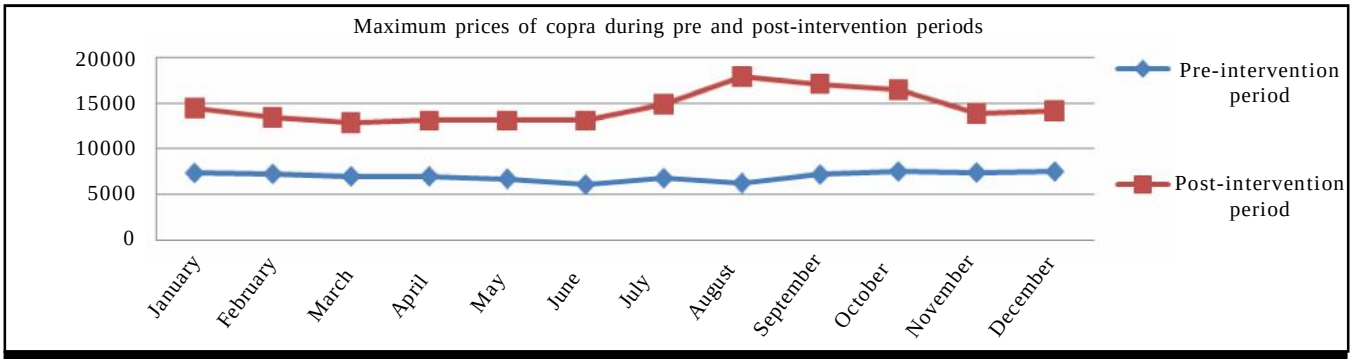

Fig. 4 : Comparision of month wise maximum prices of copra in Tiptur during pre and post-intervention periods

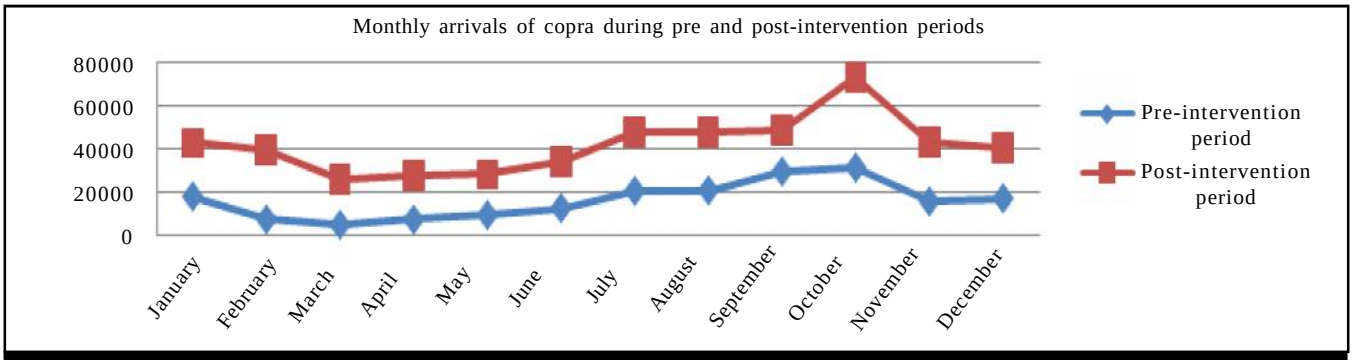

Fig. 5 : Comparision of month wise average arrivals prices of copra in Tiptur during pre and post-intervention periods

Comparison of monthly arrivals and monthly prices of copra in pre and post- e-tendering period in Tiptur market :

The results revealed that the minimum prices in different months during post intervention period had increased considerably and had very less variations compared to pre-intervention period. The monthly maximum prices of copra during the post-intervention period had also increased considerably but with much more variations than during the pre intervention period. It can be inferred that e-tendering process can protect the farmer from fluctuations in lower end of prices *viz.*, minimum prices, at the same time giving him the benefit of higher prices.

The results also showed that the monthly average arrivals had increased considerably after the introduction of e-tendering. However, there was more variation in the arrivals, mainly during the months of September,

October and November. Hence, we can infer that after the introduction of e-tendering, there has been an increase in arrivals of copra in all the months, especially between September and November (Table 4).

Degree of closeness of the prevailing modal price from the maximum price :

The results showed that the average index value had increased from 0.53 during pre intervention period to 0.64 during post intervention period (Table 5). This indicated that in Tiptur market, more number of transactions was taking place towards the maximum price, which was beneficial to the farmers.

Variations in arrivals and prices of copra in Tiptur APMC :

It was observed that in the pre- intervention period, the minimum prices were in the months of May, April and June, with index values of 83.25, 87.7 and 88.9 respectively, whereas the maximum prices were observed in the months of October, November and September with index values of 110.98, 109.38 and 109.09, respectively.

In the post intervention period, the minimum price was observed in the month of February with index value of 89.71 and maximum prices were observed in the month of August with index value of 114.26. It was evident that the variation in prices was more in the pre-intervention period compared to the post intervention

Table 5 : The index value representing the distance of modal price of copra from its maximum price in Tiptur market

Sr. No.	Months	Index values in pre-intervention period	Index values in post- intervention period
1.	January	0.51	0.69
2.	February	0.57	0.67
3.	March	0.52	0.66
4.	April	0.62	0.60
5.	May	0.53	0.55
6.	June	0.54	0.55
7.	July	0.56	0.60
8.	August	0.54	0.65
9.	September	0.50	0.65
10.	October	0.46	0.70
11.	November	0.58	0.66
12.	December	0.47	0.66
	Average	0.53	0.64

Table 6 : Seasonal indices for copra prices

Sr. No.	Months	Pre-period	Post-period
1.	January	102.15	93.88
2.	February	108.34	92.16
3.	March	93.49	89.71
4.	April	87.70	95.74
5.	May	83.25	99.38
6.	June	88.99	102.07
7.	July	101.71	106.81
8.	August	101.50	114.26
9.	September	109.09	111.28
10.	October	110.98	101.69
11.	November	109.38	96.08
12.	December	103.41	96.93

period. Also, it is advisable for farmers to sell their produce in the months of June to September, when the prices are comparatively higher. This can be observed in Table 6.

The seasonal indices of arrivals revealed that the variations in arrivals had improved in the post-intervention period compared to the pre-intervention period. The minimum arrivals were observed in the month of March, April and February with values of 32.11, 46.84 and 47.54, respectively. The maximum arrivals were observed in the months of October and September, with values of 190.17 and 179.49, respectively. In the post-intervention

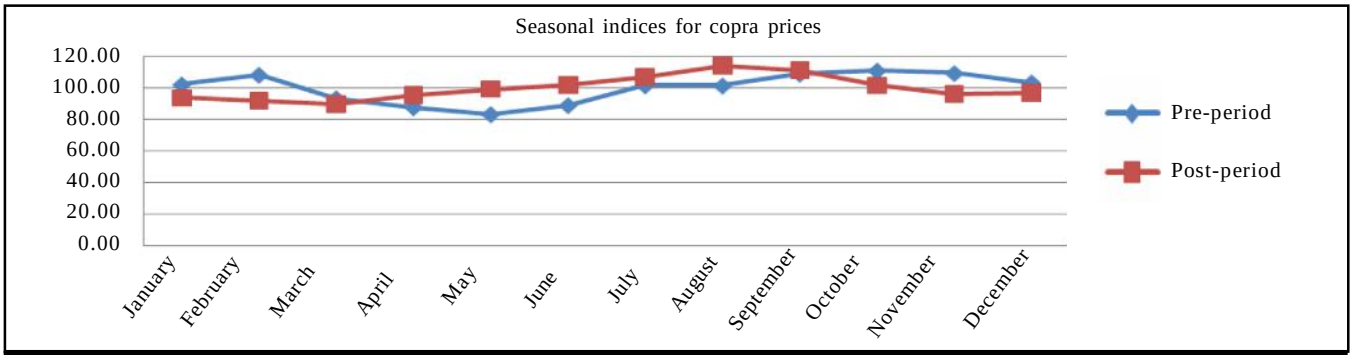

Fig. 6 : Seasonal indices for copra prices in Tiptur market (Months-wise)

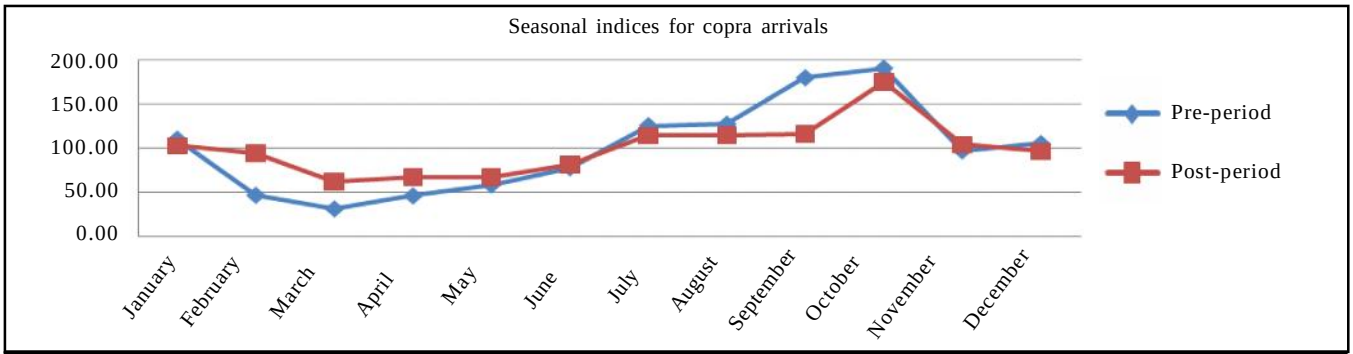

Fig. 7 : Seasonal indices for copra arrivals in Tiptur market (Months-wise)

Table 7: Seasonal indices for copra arrivals

Sr. No.	Months	Pre-period	Post-period
1.	January	110.40	102.96
2.	February	47.54	94.46
3.	March	32.11	62.34
4.	April	46.84	67.73
5.	May	59.11	67.88
6.	June	78.37	82.08
7.	July	125.71	114.55
8.	August	127.42	115.13
9.	September	179.49	116.55
10.	October	190.17	175.43
11.	November	97.32	104.17
12.	December	105.52	96.71

period, the minimum arrivals were observed in the month of March, April and May with index values of 62.34, 67.73 and 67.88, respectively. The maximum price was observed in the month of October with values of 175.43. (Table 7). Srikanth *et al.* (2015) also worked on the same topic and the results found were more or less similar to the present investigation.

Conclusion :

The annual arrivals of copra have increased considerably during the whole period. However, in the post-e-tendering period, the total arrivals of copra has decreased mainly because of the fall in coconut production, attributed to the recent drought condition in the state for three consecutive years. As a result, the prices of copra have increased considerably. However, there were some positive effects of the e-tendering process on the prices of copra as well. The reason may be because of the benefits of e-tendering like more transparency, better price discovery, time saving process, reduced transaction costs and increased efficiency.

The e-tendering initiative has brought in many notable and positive chages in the Tiptur market in terms of consistency in prices across all months. There are a few exceptions to this consistency, but they are on the positive side, *viz.,* the arrivals and prices have increased more during peak periods. The peak periods for arrivals were found to be September to November, whereas the peak periods for prices were found to be June to November. Moreover, the variations in arrivals and prices have moderated after the e-tendering process was initiated.

The e-tendering initiative has also brought more stability to the arrivals and prices as shown by the seasonal indices analysis. Prices were more stable during April to June, without much variation. The arrivals were more stable during the months of November to January. The policy makers can take note of this finding to inform and educate the farmers about the best time to bring their produce to the market to get the maximum benefit.

Overall, e-tendering initiative in Tiptur market has brought in a few positive changes for all stakeholders *viz.,* farmers, processors, traders, commission agents and the APMC as a whole. It is important to note that there needs to be further studies to assess the exact impact of this new initiative, as the recent data were more prone to weather extremities and it made it difficult to analyze the impact of market forces and the intervention. This models is being adopted and implemented across many APMCs in the state and should be further supported across all states of the country with suitable changes with respect to different commodities so that the producers can derive the maximum benefit.

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