

Trend Analysis of Arrivals and Prices of Cashew Nut in Goa State

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ABSTRACT

The time series secondary data on monthly arrivals and prices of cashew nut from January 2010 to December 2021 were used for the current investigation. The data were gathered from the Ministry of Agriculture and Farmer Welfare, Government of India and the Goa Agricultural Produce Livestock Marketing Board (GAPLMB), Goa. Statistical methods like averages, growth rates, coefficient of variation and percentages were utilized to study the data in order to obtain relevant conclusions. From the study, it was observed that prices of cashew nut significantly increased from 2010 to 2021 but the arrivals showed opposite trend i.e. it was decreasing though it was non-significant. More variability was observed in arrivals than prices. There was negative correlation between arrivals and prices of cashew nut but it turned out to be non-significant. From the study, it was also concluded that lagged month price had positive impact on current month's price of cashew nut. The positive magnitude of regression coefficients revealed that if lagged month price was increased by one rupee per kg, the current month price also increased by Rs. 0.78 per kg.

Key words: Arrivals, cashew nut, variation, correlation, GAPLMB

INTRODUCTION

Trend analysis is a statistical technique used to identify patterns or trends in data over a specified period. Such analysis plays a vital role for efficient agricultural market functioning. It empowers stakeholders with the knowledge needed to make strategic decisions, stabilize markets and ensure sustainable agricultural practices. Through this trend analysis, stakeholders are better equipped to make informed decisions regarding crop planning, inventory management, policy formulation and market interventions, ultimately contributing to market stability and the economic well-being of those involved in agriculture. Prices of farm products fluctuate more than those of industrial goods, which lead to instability of prices for agricultural commodities. Price instability affects both producers as well as consumers and also has macro economical implication as well. Price instability affects the economy in general as it ignites the inflation which in turn affects the other sector of economy. The extent of price instability needs to be examined in relation to time in order to reduce the price risk. The study of association between market arrivals and prices is very useful to analyse the arrivals

and price behaviour in study market. In the mixed economy, it would be necessary to study the market arrivals and prices and to know the factors affecting them. The study of the variability, seasonality and forecasting the prices will be of greater importance to the policy makers to improve the income of the farmers by introducing proper policy.

Plantation crops are an integral component of agricultural sector and driving force behind the growth and development of our country. Goa's lateritic soil and warm humid environment make it an ideal place for plantation crops. The state's total cropping area is 144381 ha, of which 87630 ha is covered by plantation crops, which is about 60.7% of total area. Cashew cover 56829 ha area, with annual production of 27366 tonnes. Cashew plays a very important role in economic growth of the nation, through trade, processing and export.

MATERIALS AND METHODS

The study was based on trend analysis of arrivals and prices of cashew nut in Goa. The data required for the investigation were collected from, Agriculture and Farmer Welfare, Government of India and office records of Agricultural Production and Livestock

Marketing Board, Arlem, Goa. Last 14 years of month-wise data in respect of arrivals and prices of cashew nut were collected.

Compound growth rate of arrivals and prices of cashew nut was worked out by using an exponential form of equation as below:

$$Y = ab^t$$

Where,

Y = Monthly prices/arrivals

a = Constant

b = Trend coefficient

t = Time period

Annual compound growth rate (CGR) in percentage was calculated as:

$$\text{CGR (\%)} = (\text{Antilog of } b-1) \times 100$$

Degree of instability in arrivals and prices of selected crops during selected period was calculated by using Cuddy and Della Instability Index. The coefficient of variation is generally used as a measure of instability. Co-efficients of variation in arrivals and prices were computed for all the selected commodities between years. Time series data often contain a trend component, in order to take care of this trend component and for meaningful measurement of instability, CV was modified as proposed by Cuddy and Della called as the Cuddy and Della instability index and given as:

$$CV_t = CV \sqrt{1 - R^2}$$

Where,

CV = Coefficient of variation

R² = Coefficient of determination of trend

To study the relationship between market arrivals and prices, the method of correlation was used. The correlations for the arrivals and prices of cashew nut were calculated. The correlation is the measure of degree of relationship amongst two series i.e. arrival and price. The formula used was the Pearson's coefficient of correlation (r_{xy}).

For the testing significance of correlation coefficient (r) formula used was:

$$t \text{ test} = \frac{\sqrt{n-k}}{\sqrt{1-r^2}}$$

Where,

r = Correlation coefficient

n = Number of observations

K = Number of parameters

Simple linear regression equation was used to ascertain the response of prices to the given change in arrivals and previous month's prices of cashew nut in GAPLMB, Goa.

$$Y_i = a + b_1X_1 + b_2X_2 + u_t$$

Where,

Y_i = Prices of cashew nut (Rs./q)

X₁ = Market arrivals of cashew nut (q)

X₂ = Previous month's price of cashew nut (Rs./q)

a = Intercept

b_i's = Regression coefficients

RESULTS AND DISCUSSION

The data of 12 years (2010-21) of the cashew nut arrivals and prices were collected for the present study. The arrivals of cashew nut were from February till June because it is seasonal in nature. The maximum arrivals were found in April (1065.77) which was mid of harvesting season due to which prices were least (Table 1). The prices of cashew nut were high at the beginning of the season February (Rs. 110.33/kg) when the arrival was least. The arrivals in the post-harvest period were the maximum and during the lean period were the least

Table 1. Monthly average arrivals and prices of cashew nut in Goa (2010-21)

Months	Arrivals ('000' kg)	Prices (Rs./kg)
January	-	-
February	13.16	110.33
March	439.71	107.66
April	1065.77	104.12
May	606.20	105.12
June	87.60	104.13
July	-	-
August	-	-
September	-	-
October	-	-
November	-	-
December	-	-

(Navadkar *et al.*, 2016). The highest average price was observed in the month of October-November (Sarkar *et al.*, 2021).

The compound annual growth rate (CAGR) of cashew nut arrivals was negative and non-significant (-2.981), whereas prices were highly significant (7.436) as evaluated by fitting an exponential type equation. Cashew nut prices showed positive growth rate which was highly significant in nature but the growth in cashew nut arrivals was negative and non-significant (Dhende *et al.*, 2020). The prices of potato significantly increased over the last 10 years compounded annually in all the selected markets (Sreepriya and Sidhu, 2020). The highest in case of coriander (7.55%) followed by soybean (7.24%) and lowest in jeera with (5.69%), respectively (Kachroo and Nazir, 2021). Cashew nut arrivals showed the decreasing trend over the year. The highest arrivals were observed in the year 2013 i.e. 3042.43 thousand kg which were around 16.8% more over base year. While the lowest were found in 2021 i.e. 52.59% less than base year, which was drastic fall during the study period (Table 2). The prices of cashew nut showed increasing trend over base year. The highest prices were obtained during the 2018 and lowest during the year 2013. There was decrease in the price of cashew nut during recent years which may be due to import of raw cashew nut from other states and country. In the selected APMCs in Nagpur district, highest arrivals were found in months of March, April and May i.e. post-harvesting period and lowest in October, November and January due to lean period (Virkar *et al.*, 2017). In case of prices, highest prices were observed during the year 2021 which were (249.69%) higher than base year and lowest in the year 2012 (Phadte *et al.*, 2023).

Table 2. Changes in arrivals and prices of cashew nut in Goa

Year	Arrivals ('000' kg)	% change over 2010	Prices (Rs./kg)	% change over 2010
2010	2604.00	-	56.80	-
2011	2501.41	-3.94	79.50	39.96
2012	1911.82	-26.58	77.60	36.62
2013	3042.43	16.84	75.00	32.04
2014	2147.94	-17.51	89.30	57.22
2015	1998.20	-23.26	100.90	77.64
2016	1535.05	-41.05	126.60	122.89
2017	2915.19	11.95	149.10	162.5
2018	1796.45	-31.01	159.40	180.63
2019	2236.54	-14.11	125.70	121.3
2020	2625.81	0.84	113.80	100.35
2021	1234.66	-52.59	121.60	114.08

No cyclical trend was observed for cashew nut variation in arrivals and prices of cashew nut in Goa during the study period (Table 3 and Fig. 1). Similarly, no definite trends were observed in the market during the study period (Kumar *et al.*, 2015).

Table 3. Cyclical and irregular trends in prices of cashew nut in Goa

Year	Cyclical	Irregular
2011	0.94672	1.11909
2012	0.94983	0.99658
2013	0.90719	0.92974
2014	0.91882	1.01384
2015	1.0222	0.96016
2016	1.13761	1.01404
2017	1.24023	1.03027
2018	1.1766	1.09582
2019	1.026534	0.937814
2020	0.87735	0.943252
2021	0.83468	1.00852

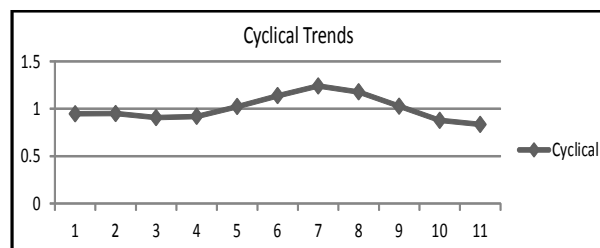


Fig. 1. Cyclical trends in prices of cashew nut.

To estimate the variability, Cuddy and Della instability index was used. The variability in arrivals of cashew nut was more (Table 4). The maximum variability was observed in the year 2020 (128.04%) and minimum in the year 2019 (74.32%). The instability indices for the crops were at par during 2010 to 2019 but increased sharply during 2020 and 2021. This might be the COVID-19 effect which hampered the market very hardly.

There was no wide variation in the prices of cashew nut. The maximum variability in

Table 4. Inter year variability in arrivals and prices of cashew nut

Year	Arrivals		Prices	
	Average ('000 kg)	Instability index	Average (Rs./kg)	Instability index
2010	520.799	82.49	56.8	2.98
2011	500.282	82.15	79.5	5.08
2012	382.364	84.56	77.6	7.45
2013	608.486	91.32	75.0	6.07
2014	429.588	94.59	89.3	3.77
2015	399.64	96.73	100.9	0.58
2016	307.01	78.22	126.6	7.29
2017	583.039	79.65	149.1	3.70
2018	359.291	90.07	159.4	1.46
2019	447.308	74.32	125.7	2.67
2020	525.162	128.04	113.8	15.48
2021	246.931	121.11	121.6	5.74

prices was observed in the year 2020 (15.48%) and minimum in the year 2015 (0.58 %). This was due to the steady supply of the cashew nut in Goa from locals as well as imported from other state and country. Variability in arrival was highest in Agra market and in price variability was highest in Azadpur market (Saha *et al.*, 2020). There was high degree of variation in arrivals (CV = 159%) compared to variation in prices (9.9%) indicating more fluctuations in arrivals than price (Meena *et al.*, 2021).

As cashew nut is seasonal in nature, market arrivals were restricted to only from February to June. The maximum variability was observed during the February (73.48%) month when the harvesting season started and during the mid of the harvesting season, that is in May (25.00%). The least variability was observed due to steady arrivals (Table 5). In case of prices, it showed maximum variability during May (21.08%) and minimum during the month of March (13.56%). Variability in prices showed very small fluctuations, this may be

due to the steady supply of cashew nut in state. The extent of intra year price rise varied from 15.62% in Banswara to 17.52% in Nimbahera market (Verma *et al.*, 2017).

The relationship between market arrivals and prices of cashew nut showed negative correlation between arrivals and prices of cashew nut, but it was non-significant (-0.55). The prices of vegetables move contrary to arrivals i.e. prices increased with decreasing arrivals in the market hence negatively correlated (Chaudhary *et al.*, 2019). The prices and arrivals series showed significant negative correlation in all the markets (Sreepriya and Sidhu, 2020).

The fluctuation in arrivals of produce in the market is a major factor for the unstable price of the produce. Prices and seasonality are directly related. Analysis of pricing, prices from the previous month and market arrivals all play a key role in the creation of agricultural policy. To reduce the fluctuation in prices of agricultural commodities and reduce the price risk, one needs to employ proper strategies,

Table 5. Intra year variability in arrivals and prices of cashew nut in Goa

Month	Arrivals		Prices	
	Average (kg)	Instability index	Average (Rs./kg)	Instability index
January	-	-	-	-
February	13.16	73.48	110.33	14.1
March	439.71	64.79	107.66	13.56
April	1065.77	29.08	104.12	18.96
May	606.20	25.00	105.12	21.08
June	87.60	71.26	104.12	19.79
July	-	-	-	-
August	-	-	-	-
September	-	-	-	-
October	-	-	-	-
November	-	-	-	-
December	-	-	-	-

regarding prices over time and space. In the peak season, the arrival of commodity is high which tends to make prices low at that time and farmers receive the low income for their produce, so proper planning of disposing the produce is must to increase the income without incurring much additional cost. For analytical framework, Linear Regression Equations were used to study the trend of the time series data on prices and arrivals (Ali *et al.*, 2018). Price function of cashew nut in Goa was:

$$Y = 45.93 - 3.9 X_1 + 0.78X_2 \text{ with } R^2 \text{ as } 0.78.$$

The negative regression coefficient of arrivals for cashew nut indicated that as the arrivals in the area increased, whereas the price tended to decrease but it was non-significant. Crop's lagged month prices had positive impact on current month prices which means if lagged month price increased by one rupee per 1000 nuts, the current prices led to increase minimum by Rs. 0.78/1000 nut.

CONCLUSION

The study revealed that the cashew nut arrivals decreased by 2.98% but turnout was non-significant. In case of prices, 7.43% of significant increase was noticed. The inter year variability and intra year variability of prices was less compared to the arrivals. It was observed that there was no particular cyclical trend for cashew nut prices during the study period. There was negative correlation in arrivals and prices of cashew nut (0.55) but it was also non-significant. Negative regression coefficient of arrivals for cashew nut indicated that as the arrivals in the area increased, the prices tended to decrease and crop's lagged month prices had positive impact on current month prices.

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