

Behaviour of Market Arrivals and Prices of Pigeon Pea in Major Markets of Karnataka

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ABSTRACT

The present study was conducted to examine the arrivals and prices behaviour of pigeon pea in Karnataka using the secondary data from January 2007 to December 2020. Kalaburagi, Raichur and Bidar markets for the pigeon pea were selected for the study and computed trend in arrivals and prices with seasonal variations. The result revealed that annual increase in price of pigeon pea was observed to be high in the case of Kalaburagi market with Rs.328.34 per quintal followed by Raichur market with Rs.239.04 per quintal and Bidar market with Rs.203.2 per quintal. The reason for this behavior in arrivals in the selected markets is due to huge transaction in the selected markets. It is because of the selected market doesn't depend on the districts in which highest area under pigeon pea is observed. The prices of pigeon pea showed increasing trend in all the selected markets which may be due to increase in consumption, which in turn increases the demand for pigeon pea coupled with the inflationary trend in the economy. Thus, a positive trend in all the markets under study was observed. Farmers developed a positive attitude and realized the benefits of regulated markets by selling produce in the regulated markets due to higher price realization.

Keywords : Trend, Seasonal indices, Arrivals and price behaviour, Co-efficient of variation

PIGEON pea (*Cajanus cajan*) is an important annual legume crop from the family Fabaceae. It has the status of staple food throughout the country. It acts as the major source of protein for the population in India which is the primary accompaniment to rice or roti. Pigeon peas are cultivated in more than 25 tropical and subtropical countries, either as a sole crop or intermixed with cereals, such as sorghum, pearl millet or maize or with other legumes, such as peanuts. In the world, the total area under pigeon pea in 2019 was 56,16,153 ha, which provided about 44,25,969 tonnes of pigeon pea with a productivity of 788.1 kg/ha (Anonymous, 2020).

In India, the total area under pigeon pea in 2019-20 was 4,532 thousand ha, which provided about 3,892 thousand tonnes of pulses with a productivity of 859 kg/ha. About 60 per cent of total world's production of pigeon pea comes from India. To the country's pigeon pea area, Karnataka accounted for 1,482.95 thousand hectares (2018-19) followed by Maharashtra (1,261.30 thousand ha), Telangana (296 thousand ha). India produced 947.61 thousand metric tonnes of

pigeon pea during 2019-20 with productivity of 639 kg/ha. Among the different states, the highest productivity was observed in Bihar (1,852 kg/ha), followed by Kerala (1,674 kg/ha) and West Bengal (1,543 kg/ha) (Anonymous, 2020).

The fluctuation in prices of pigeon pea is attributable to its seasonal nature of production and variation in demand. Understanding the trends and seasonality in arrivals and prices helps the farmers and stakeholders in supply chain in making decisions to overcome and to sort out price shocks through appropriate choices. This enables farmer's decision on time and place of selling. The knowledge on the inter relations between the arrivals and prices is more important for assessing the extent of price fluctuations over time. Therefore, present study was undertaken to help all the stakeholders in marketing of pigeon pea for taking appropriate decision about place and time of their produce sale. The specific objective of the present study was to analyze the behavior of market arrivals and prices of pigeon pea in different markets of Karnataka.

METHODOLOGY

This study is purely based on secondary data regarding monthly market arrivals and prices of pigeon pea in major APMC's of Karnataka chosen on the basis of quantity of arrivals. Accordingly, Kalaburagi, Raichur and Bidar markets for the pigeon pea were selected. The daily market arrivals and prices information of pigeon pea were compiled from the Krishi Marata Vahini website for the period from January 2007 to December 2020.

Trend Analysis

Trend analysis was performed for arrivals and prices of pigeon pea for the period from 2007 to 2020. Linear trend function of the following form was used for the analysis.

$$Y = a + b_t + e_t$$

Where,

Y = dependent variable for which trend is estimated (arrivals and prices)

a = intercept

b = regression co-efficient

t = time variable

e = error term

The significance of 'b' was tested by 't' statistic :

$$t = \frac{b}{SE(b)}$$

Where,

$$SE(b) = [SS_Y(Y)^2 SS_X] / [(n-2)SS_X]$$

$$SS_Y = \sum (Y)^2 - (\sum Y)^2 / n$$

The critical value (t-table) was considered at n-2 degrees of freedom.

Analysis of Seasonal Indices

According to multiplicative model, price series can be decomposed into four component *i.e.*, (Price = Trend x Cyclical x Seasonal x Random or Irregular components). Trend is the tendency of a series to move in upward or downward direction over the period of time. Cyclical phenomenon repeats itself over the period. Seasonal variations are periodic movements which repeats during the period of 12 months regularly

every year, have their origin in the nature of year itself. The analysis in this study focused on the seasonal component by removing other components *viz*; trend, cyclical and irregular from the price series.

To estimate the seasonal price index of a time series, central moving average (CMA) is estimated using the following formula :

$$CMA_t = \sum_{i=t-1/2}^{t+1/2} \frac{p_i}{n}$$

Where,

CMA = Central Moving Average

P_i = Nominal price

n = number of periods

Central moving average for any given number of periods substitute the observed value in the time series by the average of that value. Consequently, the CMA eliminates random variations and emphasizes systematic movements of variables series. CMA has the same trend as the price, show cyclical fluctuations appearing in the original series. The CMA represents the trend and cyclical components of the original series and eliminates seasonality and randomness.

Seasonality is expressed as 12 indices that represent the ratio of the price for each month to the average annual price. Seasonal Index (SI) can then be written as:

$$SI = TCSE_i / TC_i = SE_i = (P_i / CMA_i) * 100$$

Seasonality index includes seasonal fluctuation in addition to randomness (E). The SI is already deflated as it is calculated by dividing nominal price series (the original price) by another nominal series. To remove the effect of irregular movement from the SI values, the averaging of SI for each month over the different years is used, then adjusting SI figure series by the adjustment factor,

$$Adjustment\ factor = 1200 / \sum_{i=1}^{12} SI$$

Grand Seasonal Index (GSI) was calculated by obtaining the average seasonal index for each month of a given year and then adjusting this series in such a way that it adds up to 1200 specifically:

$$Grand\ Seasonal\ Index = SI * 1200 / \sum_{i=12}^{12} SI$$

Where,

SI= is the average seasonal index for month i

GSI is an average of the seasonal indices that removes all irregular movements of the time series. It represents the pure seasonal average of the series during the period under analysis.

RESULTS AND DISCUSSION

Trend in Arrivals and Prices of Pigeon Pea

Table 1 shows the results related to trend in arrivals and prices of pigeon pea in major markets of Karnataka. Results revealed that the trend in annual arrivals were observed in case of Bidar market with

11,829.34 quintals with the contribution of time variable having the value of 50 per cent which is due to high involvement of wholesalers within the district and from the outsiders. In case of Kalaburagi market, the arrivals of pigeon pea showed a negative trend with decrease in the arrivals of 15,440.79 quintals. The time variable explained 66 per cent variation in the arrivals. With respect to Raichur market, this also exhibited negative trend in arrivals of 6,712.64 quintals which was explained by 47 per cent variations due to the absence of outside purchaser. It could be also seen from the Table 1 the trends in prices of pigeon pea at major markets of Karnataka. Among the study markets, the annual increase in price of pigeon pea was observed to be higher in case of Kalaburagi market (Rs.328.34 per quintal) followed by Raichur market, (Rs.239.04 per quintal) and Bidar market,

TABLE 1
Trend in arrivals and prices of pigeon pea in different markets of Karnataka

Year	Kalaburagi		Raichur		Bidar	
	Arrivals (Quintals)	Prices (Rs./qtl)	Arrivals (Quintals)	Prices (Rs./qtl)	Arrivals (Quintals)	Prices (Rs./qtl)
2007	11,42,982	2,303	2,09,695	2,067	1,48,361	2,346
2008	11,11,345	2782	2,55,183	2,518	1,80,829	2,791
2009	8,89,655	4,366	1,90,546	3,765	1,21,814	4,534
2010	14,00,904	3,723	14,16,716	3,931	2,58,639	3,874
2011	18,21,861	3,442	5,31,087	3,374	4,17,666	3,568
2012	13,13,660	3,943	4,19,212	3,733	2,69,519	4,007
2013	18,03,197	4,234	3,45,915	4,076	3,94,469	4,173
2014	22,27,678	4,491	4,56,674	4,222	3,96,164	4,413
2015	12,22,263	8,027	3,00,262	7,100	2,43,320	7,625
2016	8,73,636	7,591	6,05,008	7,582	2,57,833	7,163
2017	11,62,874	4,043	4,96,233	4,165	4,90,956	3,995
2018	14,43,226	3,965	378925	4,069	3,47,326	3,939
2019	12,56,242	9,533	2,28,838	5,223	1,86,216	5,191
2020	5,78,019	5,630	3,52,772	5,402	3,44,062	5,559
Intercept	14,19,201.76	2,399.73	4,92,278.07	2,580.57	2,01,093.80	2,984.04
Slope	-15440.79	328.34	-6,712.64	239.04	11,829.34	203.82
R ²	0.66	0.50	0.47	0.69	0.50	0.64
F	0.28	9.02 **	0.10	8.92 **	2.96	6.05 **

Note: ** Significant at five per cent level of probability

the (Rs.203.82 per quintal) Thus, prices of pigeon pea showed increasing trend in all the selected markets. This may be due to increased demand for pigeon pea coupled with the inflationary trend in the economy. It shows that farmers developed a positive attitude towards the benefits of regulated markets and selling in regulated markets and indicated realization of higher prices. The similar findings were reported by Shruti and Krishnamurthy (2013), while studying arrivals and prices of maize in Karnataka and Kumar (2017) for arrivals and prices of gram in Rajasthan.

Seasonal Variations in the Arrivals and Prices of Pigeon Pea

The seasonal indices of pigeon pea arrivals and prices within a year over different months in the major markets of Karnataka are presented in Table-2. Results revealed that for the Kalaburagi market, the highest arrivals indices were observed in the month from December to April. Among these months, January (180.32) recorded highest arrivals and the least arrivals was found in the month of September (46.47). With respect to Raichur market, the highest arrivals indices were observed in the month from November to March with the highest arrivals in the

month of December (449.52) and the lowest arrivals in the month of October (1.45). Similarly in the case of Bidar market, the highest arrivals were found during the period from January to April months with the lowest arrivals in the month of October (5.98). This behavior in arrivals in the selected markets may be due to huge transaction in the selected markets as the selected market doesn't depend on the districts in which highest area. The seasonal indices of pigeon pea arrivals are shown in Fig. 1. The market selection was completely based on highest arrivals with the main motive to bring about the transaction of products to the different markets irrespective to its area under production.

Results for Kalaburagi market revealed the highest indices of prices in the month of June (164.83) and the least in the month from January to March. In cases of Raichur market, the highest prices were observed in the month of December (112.50) and lowest prices in the month of October (90.70). With respect to Bidar market, the highest indices of prices were noted in the month October (106.56) and least was observed in the month of February (95.35). The seasonal behavior in prices in the selected markets (Fig. 2.) is on account of more area under pigeon pea near the selected markets and huge quantities of products were

TABLE 2
Seasonal indices of monthly arrivals and prices of pigeon pea in major markets of Karnataka
(January 2007 to December 2020) (Per cent)

Month	Kalaburagi		Raichur		Bidar	
	Arrivals	Prices	Arrivals	Prices	Arrivals	Prices
January	180.32	93.28	316.27	103.89	239.61	96.45
February	143.90	93.22	196.14	100.57	276.90	95.35
March	136.86	93.35	102.15	100.90	207.22	95.58
April	132.73	96.49	61.82	99.53	162.30	98.36
May	98.28	97.99	23.96	97.82	96.10	98.83
June	88.60	97.34	17.71	98.92	72.06	99.04
July	78.76	102.64	10.51	96.98	42.96	102.64
August	61.40	104.08	6.31	96.60	29.55	104.19
September	46.47	105.39	4.09	94.69	12.49	102.74
October	49.46	110.20	1.45	90.70	5.54	106.56
November	48.17	104.88	10.08	106.88	7.39	99.13
December	135.05	101.14	449.52	112.50	47.87	101.12

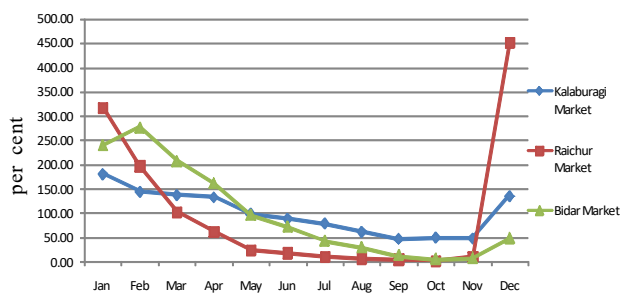


Fig. 1 : Seasonal indices of pigeon pea arrivals in different markets

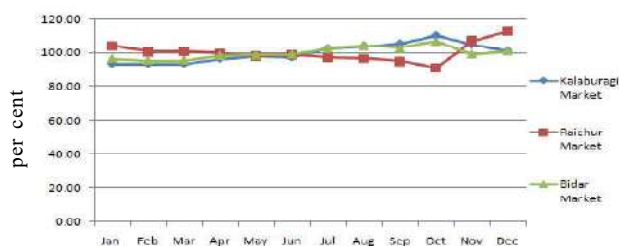


Fig. 2 : Seasonal indices of pigeon pea prices in different markets

transacted through the selected market. The selected markets have large number of local buyers and also outsiders and existence of nearly competitive market. The lack of competition during lean months may cause sharp fall in prices in the selected markets. From the foregoing discussion it is clear that there is seasonality in the behavior of pigeon pea in all the selected markets mainly due to seasonality in production and arrivals of pigeon pea. Similar findings were noted in the study Makhare and Tarpara (2019) for cotton crop in Saurashtra region of Gujarat and Padmashri *et al.* (2014) for sunflower and groundnut at Challakere.

Variability in the Market Arrivals and Prices of Pigeon Pea

The area and production of pigeon pea have made rapid strides in the country during recent years; the area has increased from 3726 thousand hectares in 2007-08 to 4532 thousand hectares in 2019-20 and the production surged from 3076 to 3892 thousand tonnes. It is in this context that an understanding of the pattern of market arrivals and price behaviour of vegetable crops both over the years and across months assumes significant importance.

The pattern of market arrivals and price behaviour of pigeon pea over the period 2007-08 to 2020-21 was examined using the mean value and the coefficient of variation for each of the twelve months. The crop-wise analysis across different markets showed that in the Raichur market (Table 3), the variability in market arrivals of pigeon pea was relatively more (115.94 to 172.77 %) during the months of July to December and low during January (36.96 %). The average volume of pigeon pea received in Raichur market was lowest (533.79 tonnes) in the month of October and maximum (1,65,549 tonnes) during the peak season month of December. In the Kalaburagi market, the variability in the arrivals of pigeon pea in terms of coefficient of variation was more pronounced; it ranged from 26.06 per cent in June to 74.60 per cent (November) and was high during the period from August to December period. The average market arrivals ranged from 50,474 tonnes in September to 1,95,862 tonnes in January. The extent of variability in the arrivals of pigeon pea in the Bidar was ranged from 40.44 per cent in January to 126.24 per cent in September. Similar findings were noted in the study Bera *et al.* (2017) for potato crop in West Bengal and Chouhan and Gupta (2016) for wheat crop in Madhya Pradesh.

The extent of monthly price variability in different markets for pigeon pea has been brought out in Table 4. The price variability, measured in terms of coefficient of variation, in the Bidar market was more pronounced in November (53.77 %) and was lower during the month of September (32.95 %) The pattern was not uniform in the Kalaburagi market, where price variability was noted high for October (47.36 %) and in case of Raichur market it is in the observed in the month of November (49.12 %). Thus, the price for pigeon pea was relatively more stable in the Kalaburagi and Raichur market with not much variation in the pattern of price behaviour among these markets. Similar findings were noted in the study Bhat *et al.* (2014) for citrus crop in Jammu and Gupta *et al.* (2018) for major pulses in Chhattisgarh.

TABLE 3
 Variability in the market arrivals of pigeon pea in major markets of Karnataka
 (January 2007 to December 2020)
 (Quintals)

Month	Bidar Market		Kalaburagi Market		Raichur Market	
	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)
January	57868.43	40.44	195862.29	43.23	116475.50	36.96
February	66874.64	42.66	156296.64	44.56	72233.79	51.17
March	50046.29	51.19	148653.64	68.53	37620.57	62.32
April	39197.36	57.21	144170.71	66.98	22766.07	112.33
May	23209.86	66.93	106744.29	36.87	8822.57	85.68
June	17404.21	59.52	96234.93	26.06	6521.93	99.38
July	10375.00	81.69	85545.93	36.42	3868.79	115.94
August	7137.07	104.71	66694.71	63.07	2323.86	136.97
September	3016.29	126.24	50474.07	64.20	1506.57	155.61
October	1338.43	106.46	53716.29	66.67	533.79	115.24
November	1785.71	120.77	52315.14	74.60	3711.21	130.93
December	11560.57	77.32	146687.21	63.95	165548.64	172.77

TABLE 4
 Variability in the prices of pigeon pea in the major markets of Karnataka
 (January 2007 to December 2020)
 (Rs./Qtls)

Month	Bidar Market		Kalaburagi Market		Raichur Market	
	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)
January	4352.71	38.14	4257.71	40.43	4543.57	38.29
February	4302.71	34.54	4255.00	35.14	4398.50	34.99
March	4313.43	33.30	4261.14	34.87	4412.79	37.20
April	4438.86	38.13	4404.50	38.45	4352.64	41.54
May	4459.93	39.00	4473.14	39.03	4278.21	42.52
June	4469.43	38.60	4443.29	38.83	4326.14	40.86
July	4631.93	35.61	4685.29	37.54	4241.50	36.64
August	4701.86	34.67	4751.00	37.31	4224.71	32.27
September	4636.29	32.95	4810.64	38.67	4141.14	37.20
October	4808.64	41.00	5030.36	47.36	3966.71	41.50
November	4473.50	53.77	4787.36	41.39	4674.43	49.12
December	4563.07	37.25	4616.64	39.57	4920.07	34.66

The result revealed that annual increase in per quintal price of pigeon pea every year was observed to be higher in the case of Kalaburagi market (Rs.328.34) followed by Raichur market (Rs.239.04) and Bidar market (Rs.203.2). The prices of pigeon pea showed increasing trending in all the selected markets which may be due to increased demand coupled with the inflationary trend economy. Thus, a positive trend in all the markets under study was observed. Farmers developed a positive attitude and realized the benefits of regulated markets by selling produce in the regulated markets due to higher price realization.

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