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Market Arrival and Price Behaviour of Cotton in Haryana

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2018/45493

Editor(s):

(1) Dr. Fotios Chatzitheodoridis, Professor, Department of Agricultural Technology-Division of Agricultural Economics, Technological Education Institute of Western Macedonia, Greece.

Reviewers:

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(2) Virendra Singh, School of Agricultural Sciences & Engineering, India.

(3) R. Shenbagavalli, India.

Complete Peer review History: <http://www.sciedomain.org/review-history/27859>

Original Research Article

Received 14 September 2018

Accepted 30 November 2018

Published 19 December 2018

ABSTRACT

The present study aimed to study the price and arrival of cotton i.e. growth, seasonal variation and volatility among the selected cotton markets in Haryana. The monthly data on prices and arrivals of cotton were collected for the period from 2005-06 to 2016-17. Compound growth rate, Moving average method and Coefficient of Variation measure were used in the study. The results showed a considerable increase in cotton prices for the selected markets, whereas arrivals growth were found to be positive but non-significant in all the markets except Uklana and Fatehabad markets having negative growth due to shift in cropping pattern. Seasonal analysis results showed that the cotton arrivals in the selected markets were higher in the months of October to January (Peak period) and lower in the months of February to May (Lean period). The intra year prices in selected cotton markets during the study period remained almost stable with less than 10 per cent of variation, whereas for the overall period the Coefficient of Variation ranged from 28.50 to 30.88 per cent in the selected cotton markets indicating presence of not much higher volatility during the study period. The increased volatility can be addressed through stock management and by employing risk management strategies like crop insurance, future markets etc.

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Keywords: Cotton; growth; seasonal; volatility.

1. INTRODUCTION

Cotton popularly known as "White Gold" is a major commercial crop and also designated as "King of Fibres". The crop has a global significance which is grown for its lint and seed.

Cotton is used for the number of products in the textile industry. The major cotton growing states in India can be divided into three distinct regions:- the northern zone (Haryana, Punjab and Rajasthan), the central region (Gujarat, Madhya Pradesh and Maharashtra) and the southern part (Andhra Pradesh, Karnataka and Tamil Nadu). In India, the harvesting period of cotton is mainly confined within October to January. The Indian economy is influenced by cotton through its production, processing sectors and by generating direct and indirect employment.

The main cotton cultivating districts in Haryana are Sirsa, Hisar, Bhiwani, Fatehabad and Jind. These districts contribute almost 90 per cent of the area and production of cotton in Haryana. As per estimates, the production of cotton in Haryana for the year 2016-17 was 2050 thousand bales with the productivity of 611 kg/ha (Ministry of Agriculture and Farmers' Welfare of India [1]).

The higher cotton yield can be achieved by ensuring stable and remunerative prices to producers along with development and adoption of appropriate technology (Suresh [2]). In the present competitive economy, price of the commodities is an important signal of marketing system which helps the farmers regarding the type and quantity of the commodity to be produced in a particular place at a particular point of time. Prices help to strike a balance between demand and supply of the commodity and also affect the inter-sectorial distribution of income and rate of capital formation in agriculture. Therefore, analysis of prices and market arrivals over time is necessary for formulating a sound agricultural policy [3].

The study of growth rate enables one to indicate the general direction of change in prices and arrivals over the period in different markets. The seasonality in production causes fluctuations in prices from season to season. The fluctuation in prices causes wide variation in the income of growers from year to year. Seasonal price and arrival pattern can be used as a guide for

developing a marketing plan when they are examined along with supply and demand information. The time series data on prices and arrivals for the commodity recorded over different seasons or months can be used for analysing the seasonal effects.

The study of price volatility is one of the important features of agricultural markets and also the main source of risk in international agricultural trade. Presences of two kinds of volatility are found in the literature (European Commission [4], Matthews [5] for instance): an historical volatility and an implicit future volatility. The historical volatility or realised volatility is based on observed past prices. It reveals the volatility of price has been observed in the past. As for the implicit volatility, it corresponds to the markets' expectation on how volatile a price will be in the future as measured by the value of price options. In this study, volatility is concerned based on the observed market prices.

2. MATERIALS AND METHODS

2.1 Selection of Markets

The present study utilised time series data of cotton prices and arrivals in market to compute the growth, seasonal indices and price volatility of cotton in the state of Haryana. Monthly data on prices and arrivals for the years 2005-06 to 2016-17 were collected from AGMARKNET. The major cotton producing districts i.e. Hisar, Sirsa, Fatehabad, Jind and Bhiwani were selected purposively for the study. These districts contribute almost 90 per cent of the area and production of cotton in Haryana. From each district, two markets were selected purposively on the basis of arrivals of cotton in these markets. Thus, Adampur and Uklana market from Hisar district, Sirsa and Dabwali market from Sirsa district, Fatehabad and Bhattukalan market from Fatehabad district, Jind and Uchana from Jind district and Bhiwani and Siwani market from Bhiwani district were selected. The area, production and productivity of cotton in major districts of Haryana are presented in Table 1.

2.2 Methodology

2.2.1 Compound growth rate (CGR)

To examine the change in prices and arrivals of cotton in the selected markets for the period

2005-06 to 2016-17, the compound growth rates were worked out using the following form of exponential function-

$$Y = ab^t u_t$$

Where,

Y = prices or arrivals of cotton

t = time in years

u = error term

a and b are parameters to be estimated

b = (r+1)

r = compound growth rate in per cent per annum

Thus,

$$Y = a(r+1)^t u_t$$

$$'r' = [\text{Antilog of } (\log b) - 1] \times 100$$

The significance of compound growth rate (CGR) was tested by using student 't' test:

$$t = \frac{r}{\text{SE}(r)}$$

The standard error of CGR is given by:

$$\text{SE}(r) = \frac{(100 \times b)}{\log e} \text{SE}(\log b)$$

Where,

$$\log e = 0.4323$$

2.2.2 Seasonal behaviour of price and arrivals

The ratio to moving average method was used to estimate the seasonal indices. The arrivals of cotton had been nine months in a year i.e. September to May in Hisar, Sirsa and Fatehabad

districts. Therefore, nine months moving average was used to work out the seasonal indices. In markets of Jind and Bhiwani district, the market arrivals had been for eight months (September to April) and seven months (September to March), respectively. Hence, eight months and seven months moving average were used to work out the seasonal indices in these districts.

The ratio to moving average method included the following steps:

Step 1: The centred nine months moving averages were computed from the original data. These centred nine months moving average data contain the trend and cyclical component.

Step 2: Divide the original data by the centred moving average data.

$$\frac{Y}{\text{MA}} = \frac{(T \times S \times C \times I)}{T \times C} = S \times I$$

Step 3: The irregular component was eliminated by averaging the data for each month over the years as obtained in step 2. After averaging the data, they were multiplied by hundred to obtain the seasonal indices.

Step 4: The sum of the seasonal indices should be 900. If not, the sum is adjusted by using a correction factor i.e.

$$K = \frac{900}{S}$$

Where,

K = Correction factor

S = Sum of seasonal indices

Table 1. Area, Production and Productivity of cotton in major districts of Haryana

Particulars	2014-15			2015-16		
	Area (000' ha)	Production (000' bales)	Productivity (Kg/ha)	Area (000' ha)	Production (000' bales)	Productivity (Kg/ha)
Sirsa	189 (29.17)	695 (35.77)	625	175 (28.46)	303 (30.51)	295
Hisar	155 (23.92)	340 (17.50)	373	131 (21.30)	212 (21.35)	276
Fatehabad	80 (12.35)	307 (15.80)	652	73 (11.87)	89 (8.96)	207
Jind	76 (11.73)	214 (11.01)	476	72 (11.71)	75 (7.55)	177
Bhiwani	96 (14.81)	252 (12.97)	446	93 (15.12)	183 (18.43)	334
Haryana	648 (100.00)	1943 (100.00)	510	615 (100.00)	993 (100.00)	274

Figure in parenthesis indicate percentage

Source: Department of Economic and Statistical Analysis, Haryana [6]

2.3 Price Volatility

To examine the variability of prices from its average in the selected markets over the time period, the coefficient of variation (%) measure has been employed. It was computed by using the following formula:

$$CV = \frac{SD}{AM} \times 100$$

Where,

CV = Coefficient of Variation;

SD = Standard Deviation of price series

AM = Arithmetic Mean of price series

The price series of overall period (2005-06 to 2016-17) has been detrended by moving average and CV has been estimated for each respective market, whereas for intra year, original price series data have been taken.

3. RESULTS AND DISCUSSION

3.1 Growth Rates of Wholesale Prices and Arrivals of Cotton in Selected Markets of Haryana

The compound annual growth rates of wholesale cotton prices and arrivals in selected markets of cotton producing districts in Haryana are presented in the Table 2. The results revealed that prices of cotton in the selected markets recorded significant compound growth rates which ranged from 9.09 to 10.05 per cent per annum. The growth rates of all markets were significant at one per cent level of significance. The highest growth in prices was registered in Jind market (10.05 per cent) and least in Dabwali (9.09 per cent) market. Similar results were obtained by Suresh [2].

The higher growth in arrivals was found in Siwani and Bhiwani markets recorded 21.78 and 13.58 per cent annual compound growth rate respectively and they are significant. Growth rates in other selected markets i.e. Bhattività, Dabwali, Uchana, Adampur, Jind and Sirsa markets were 6.24, 4.71, 3.01, 1.73, 0.19 and 0.08 per cent per annum, respectively but non-significant. Uklana and Fatehabad markets witnessed significant negative growth rates of 12.83 and 6.92 per cent per annum, respectively. Such an observation may be on account of decline in area under cotton in the Uklana and Fatehabad markets in favour of paddy. In

Fatehabad, shift in cropping pattern has been observed by Kumar et al. [7] and concluded that cropping changed from less intensive crops i.e. cotton, pearl millet and sorghum to more intensive crops like paddy. Yadav et al. [8] witnessed a fall in water level in Narnaud and Uklana and quoted reason that shifting of cotton fields to paddy in these two blocks.

The above growth findings are in line with the finding of Devi et al. [3], Muthuraj [9], Sundaramoorthy [10] and Suresh [2].

Table 2. Compound annual growth rate of cotton prices and arrivals (2005-06 to 2016-17) in Haryana markets

Markets	Prices	Arrivals
Adampur	9.62*** (1.58)	1.73 ^{NS} (5.60)
Uklana	9.38*** (1.53)	-12.83*** (2.46)
Sirsa	9.40*** (1.63)	0.08 ^{NS} (4.05)
Dabwali	9.09*** (1.55)	4.71 ^{NS} (4.99)
Fatehabad	9.80*** (1.66)	-6.92** (2.75)
Bhattività	9.75*** (1.66)	6.24 ^{NS} (4.53)
Jind	10.05*** (1.51)	0.19 ^{NS} (7.18)
Uchana	9.99*** (1.49)	3.01 ^{NS} (4.36)
Bhiwani	9.83*** (1.54)	13.58* (6.94)
Siwani	9.71*** (1.44)	21.78** (10.41)

Figure in parentheses indicates standard error

***, ** and * indicates significance at 1, 5 & 10 per cent probability level

NS – Non-significant

3.2 Seasonal Indices of Cotton Prices and Arrivals

The seasonal indices estimated for cotton prices and arrivals in the selected markets of Haryana are presented in Table 3 and Table 4, respectively. The results showed the presence of seasonality in prices and arrivals of cotton in all the selected markets. Table 4 revealed that the peak period of cotton arrivals in the selected markets was October to January. However, maximum arrivals were observed in the months of November and December irrespective of the markets. Data of table 3 revealed that the price indices of cotton in most of the selected markets

were lesser during the peak arrivals (i.e. less than 100) and higher during lean period between February and May (i.e. more than 100) with a few exceptions. Awasthi et al. [11] also noticed that the price indices of soybean in the selected markets of central India were high in the lean period and low in the peak period. The low price in the month of September may be attributed to the lack of competition in the absence of traders in the markets. The inverse relationship existed between price and arrivals in the selected markets as also represented in Figs. 1 and 2.

The price indices varied from 95.15 to 104.88, 93.73 to 104.04, 94.37 to 105.63, 97.30 to 105.63, 94.53 to 106.72, 97.07 to 103.82, 96.46 to 102.12, 96.45 to 104.97, 96.09 to 102.30 and 98.20 to 100.64 in the Adampur, Uklana, Sirsa, Dabwali, Fatehabad, Bhattukalan, Jind, Uchana, Bhiwani and Siwani markets, respectively (Table 3). The price indices were lowest in the month of September in all the selected markets except Bhattukalan, Jind, Bhiwani and Siwani where price indices were lowest in the month of December. The price indices were highest in the month of May for the selected markets except Bhiwani (March), Siwani (November) and Jind and Uchana (April).

The arrival indices varied from 18.68 to 236.78, 3.64 to 230.22, 15.15 to 237.02, 3.94 to 223.40, 6.58 to 274.01, 11.73 to 227.05, 11.01 to 227.05, 7.39 to 195.99, 16.07 to 241.65 and 12.96 to 215.41 in the Adampur, Uklana, Sirsa, Dabwali, Fatehabad, Bhattukalan, Jind, Uchana, Bhiwani and Siwani markets, respectively (Table 4). The harvest period of cotton in Haryana usually commences in October, but late sowing of crop extends it to November. The arrival indices were

highest in the month of December in all the selected markets except Bhiwani (November). The reasons for highest arrivals in December are usage of late season varieties and holding of crop in anticipation of higher prices by traders and farmers. The arrival indices were lowest in the month of May in Uklana, Sirsa, Dabwali, Fatehabad and Bhattukalan markets and September in case of Adampur, Uchana, Bhiwani and Siwani markets.

Present finding is in conformity with finding of Biradkar [12], Rao and Katkade [13], Singh and Sekhan [14] and Suresh [2].

3.3 Price Volatility

The results of coefficient of variation in cotton prices of selected markets are presented in Table 4. The intra-year CV of prices in Haryana had been less than 10 per cent in the study period except 2007-08 and 2010-11. Thus the results of the study clearly show that the intra-year cotton prices in the selected markets have been almost stable over years. The table 5 also showed that CV values of cotton prices for the overall period i.e. 2005-06 to 2016-17 in the selected markets ranged from 28.50 to 30.88 per cent indicating presence of not much higher volatility in the study period. The CV value was highest in the Siwani market (30.88 %) indicating the presence of relatively higher volatility in cotton prices and lesser in Dabwali (28.50 %) market. The coefficient of variance results of groundnut prices in selected markets by Bannor and Sharma [15] indicated Sikar market with the lowest volatility of 18.17 per cent compared to 34.78 per cent in Niwai market which is the highest.

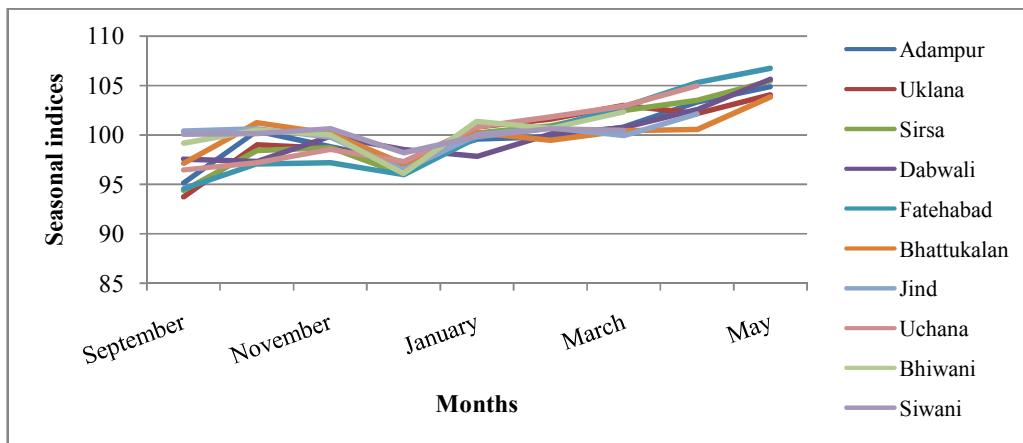


Fig. 1. Seasonal indices of cotton price in selected markets

Table 3. Seasonal indices of cotton prices in Haryana markets (2005-06 to 2016-17)

Particulars	Adampur	Uklana	Sirsa	Dabwali	Fatehabad	Bhattukalan	Jind	Uchana	Bhiwani	Siwani
September	95.15	93.73	94.37	97.53	94.53	97.12	100.38	96.45	99.17	100.06
October	100.39	98.99	98.39	97.30	97.07	101.23	100.64	97.19	100.46	100.16
November	98.82	98.65	98.70	99.87	97.17	100.15	99.77	98.54	99.98	100.64
December	97.26	97.07	96.00	98.51	95.96	97.07	96.46	97.27	96.09	98.20
January	99.56	100.80	100.22	97.81	99.73	100.22	99.98	100.82	101.35	99.86
February	99.82	101.58	100.90	100.08	100.71	99.44	100.73	101.83	100.65	100.63
March	100.80	102.98	102.46	100.71	102.83	100.40	99.92	102.93	102.30	100.45
April	103.32	102.16	103.50	102.56	105.28	100.55	102.12	104.97	-	-
May	104.88	104.04	105.46	105.63	106.72	103.82	-	-	-	-
Total	900.00	900.00	900.00	900.00	900.00	900.00	800.00	800.00	700.00	700.00

Table 4. Seasonal indices of cotton arrivals in Haryana markets (2005-06 to 2016-17)

Particulars	Adampur	Uklana	Sirsa	Dabwali	Fatehabad	Bhattukalan	Jind	Uchana	Bhiwani	Siwani
September	18.68	23.37	44.52	49.21	25.29	20.01	33.25	7.39	16.07	12.96
October	111.21	111.19	136.24	146.00	124.87	122.83	87.74	86.03	136.53	140.01
November	211.43	174.40	183.63	151.23	169.63	202.48	168.67	154.09	241.65	170.76
December	236.78	230.22	237.02	223.40	274.01	227.05	232.05	195.99	195.19	215.41
January	119.98	163.89	103.06	170.42	135.23	131.92	165.79	166.17	61.96	100.56
February	76.66	100.73	85.55	92.79	81.21	93.82	70.85	93.60	29.62	32.07
March	67.40	72.05	67.90	44.68	58.86	62.41	30.65	77.91	18.98	28.23
April	37.91	20.51	26.93	18.33	24.32	27.76	11.01	18.83	-	-
May	19.95	3.64	15.15	3.94	6.58	11.73	-	-	-	-
Total	900.00	900.00	900.00	900.00	900.00	900.00	800.00	800.00	700.00	700.00

**Table 5. Coefficient of variation (CV) in cotton prices in Haryana markets
(In Per cent)**

Particulars	Adampur	Uklana	Sirsa	Dabwali	Fatehabad	Bhattukalan	Jind	Uchana	Bhiwani	Siwani	Haryana
2005-06	4.54	4.89	8.77	7.11	6.03	4.52	3.14	3.71	3.71	4.48	5.30
2006-07	8.94	10.32	10.95	10.54	11.91	6.37	3.83	8.46	3.33	2.79	9.23
2007-08	10.49	10.33	12.41	9.87	11.74	10.04	9.77	11.13	13.82	5.08	11.29
2008-09	10.10	7.81	3.16	5.28	3.99	3.96	5.76	4.28	7.86	3.65	2.71
2009-10	5.11	8.39	5.06	8.08	9.22	4.34	6.42	10.87	3.74	8.57	5.95
2010-11	24.56	19.51	24.20	17.39	22.96	23.43	16.40	21.62	18.16	21.34	21.47
2011-12	6.58	5.35	7.05	6.50	7.19	6.37	7.43	6.09	5.44	2.28	5.01
2012-13	4.47	5.35	6.29	8.08	7.01	6.20	6.95	6.40	6.67	4.36	5.48
2013-14	3.10	3.32	4.40	2.56	4.50	3.88	2.77	3.78	4.44	5.06	2.91
2014-15	6.13	3.07	6.02	4.03	5.98	5.67	3.76	3.89	4.25	2.49	5.02
2015-16	3.27	4.40	4.39	1.81	3.71	2.74	4.45	3.85	4.53	3.47	3.57
2016-17	6.47	9.51	8.92	8.97	7.59	9.90	7.08	6.95	7.74	10.59	7.17
Overall period	30.34	29.78	28.85	28.50	29.83	30.25	30.38	30.01	29.68	30.88	29.22

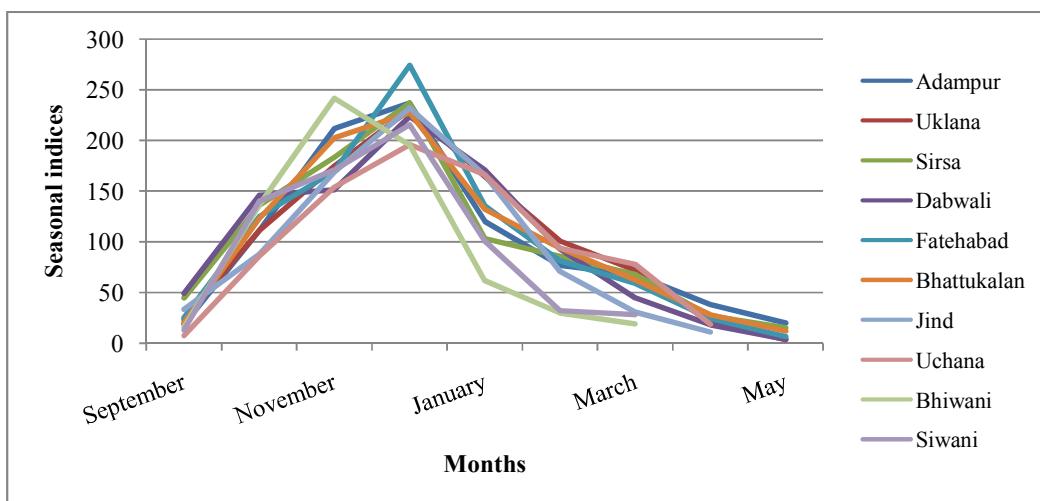


Fig. 2. Seasonal indices of cotton arrivals in selected markets

The results revealed that volatility in cotton prices of selected markets was relatively higher in the year 2010-11 with CV ranging from 16.40 to 24.56 per cent. The reason for high volatility of cotton in this year may be export ban by India's Director General of Foreign Trade (DGFT). The country exported excess quantity than available surplus which led to the shortage in availability of cotton for domestic textile industries. To fulfil the domestic demand, exports had been restricted. As India is the second largest exporter of cotton, the high demand of importers also led to global price rise.

4. CONCLUSION

The growth values in cotton prices were positive and significant for all the selected markets during the period from 2005-06 to 2016-17. Thus, there was a considerable increase in cotton price in selected markets over the study period. The growth and trend values in cotton arrivals were negative and significant for the Uklana and Fatehabad markets, while in other markets, where positive but non-significant in Adampur, Sirsa, Dabwali, Bhattukalan, Jind and Uchana markets. The unstable area and yield of cotton in the state has affected the growth of arrivals in the markets. In general, the peak period of cotton arrivals in selected markets was October to January and lean period was February to May. The price and arrivals had an inverse relationship in the selected markets. The intra year prices of cotton in the selected markets of Haryana have been almost stable over the study period with less than 10 per cent of variation. In the overall study period, volatility in cotton prices was not

much higher in the selected markets with Coefficient of Variation ranging from 28.50 to 30.88 per cent. The volatility is associated with the uncertainty of production and demand of the commodity. The increased volatility can be addressed through stock management and by employing risk management strategies like crop insurance, future markets etc (Sundaramoorthy et al. [16]).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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The peer review history for this paper can be accessed here:
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