

**RESEARCH ARTICLE**

## A Study on Behaviour of Arrivals and Prices of Cotton in Different Markets of Haryana

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**ABSTRACT**

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*The goal of the current study was to examine the growth, seasonal variation, and volatility of cotton prices and arrivals in a few key cotton markets in Haryana. The monthly data on cotton arrivals and prices were gathered from 2005–2006 through to 2021–2022. The study employed the Compound Growth Rate, Moving Average technique, and Coefficient of Variation measure. The results revealed that cotton prices in the selected markets were found on the increasing side which ranged from 7.13 to 8.01. Among the three districts the maximum growth rate of cotton prices was recorded in Adampur (8.01%) followed by Uklana (7.95%) of Hisar district and minimum growth rate of cotton prices was recorded in Uchana (7.13%) of Jind district. Results of a seasonal analysis revealed that cotton arrivals in the targeted markets were higher during the peak period of months from October to January and showed decreasing trend during the subsequent months from February to May. (Lean period). The Coefficient of Fluctuation ranged from 1.11 to 20.97% in the selected cotton markets, demonstrating the presence of not significantly increased volatility during the study period, although the intra-year prices in those markets remained nearly stable with less than 10% of variation. Through stock management and the use of risk management techniques like crop insurance, futures markets, etc., the increased volatility can be reduced. Farmers should sell their cotton in lean period to get better price of cotton.*

**Key words :** Cotton, Growth, Seasonal variation, prices, arrivals, markets. Volatility and coefficient of variation.

Cotton, commonly referred to as "White Gold," is a significant commercial crop and is regarded as the "King of Fibers." It is cultivated for its lint and seed. Many different products in the textile industry use cotton. The major cotton-growing regions in India are the northern zone (Haryana, Punjab, and Rajasthan), the central zone (Gujarat, Madhya Pradesh, and Maharashtra), and the southern zone (Andhra Pradesh, Karnataka, and Tamil Nadu). Cotton cultivation in India typically takes place from October to January. Cotton has an impact on the Indian economy through its production and processing industries as well as through creating direct and indirect employment.

In Haryana total area under cotton was 6.95 lakh hectares producing 20.5 lakh bales with the yield of 500 kgs/ha during the year 2021-22 (Indiastat.com 2021-22). So, as we can see that area under cotton has decreased from the previous year, but production and

yield per ha has gone up indicating towards better farm practices been undertaken by the farmers.

By guaranteeing steady and lucrative prices for farmers, as well as the creation and use of appropriate technologies, a better cotton output can be attained. If inputs and technological factors are made available to farmers in a timely manner in order to improve the cultivation of crops, yield and output may be raised, which can help farmers boost their income and improve their standard of living (Gayathri *et al.*, 2021). In the current competitive economy, the price of the commodities is a crucial marketing signal that informs farmers about the type and quantity of the commodities that should be produced in a certain location at a specific time. Prices have an impact on the inter-sectorial distribution of income and the rate of capital creation in agriculture, as well as on the demand and supply of the product. As a result, developing an effective agriculture strategy necessitates examination

of pricing and market arrivals across time. Seasonal variations in prices are a result of seasonality in output. The income of growers varies significantly from year to year due to price fluctuations. It is necessary to conduct a detailed analysis of price behaviour over time in order to determine the most effective strategies for lowering the price volatility of agricultural commodities. When combined with supply and demand data, seasonal price patterns can be utilised as a guide for developing a marketing strategy. For analysing the seasonal effects, time series data on prices and arrivals for the commodity recorded throughout several months or seasons can be used.

Prices and arrival trends have changed over the years and are related to advancements in production technology, input availability, and infrastructure. Prices trends often correlate with economic inflation or deflation as well as population growth, economic expansion, and improvements in purchasing power. We can figure out the overall direction of change in arrivals and pricing in various markets by studying patterns. It is quite helpful in investigating the connection between market arrivals and prices. Large productions and arrivals have a negative impact on the pricing, which ultimately results in their downfall. The country's cotton cultivation is undergoing major improvements that have the potential to bring the current productivity level close to the world average cotton production per hectare in the coming years. In addition to fulfilling the increasing demand from the domestic textile industry, the nation may have enough extra cotton to satisfy the demands of cotton-importing nations.

**METHODOLOGY**

*Selection of markets* : In order to calculate compound annual growth rate, seasonal indices, and price volatility of cotton in the major markets of Haryana, the current study used time series data on cotton prices and arrivals in the market. AGMARKNET was used to gather monthly information on prices and arrivals for the time period 2005-2006 to 2021-2022. The present study pertains to time series analysis of cotton prices and arrivals, market addition and price instability of cotton in the major markets of Haryana. The most important cotton producing districts i.e. Hisar, Jind and Bhiwani were preferred purposely for the study. From each district, two markets were chosen on the basis of arrival of cotton in these markets. Thus, Adampur and Uklana market from Hisar district, Jind and Uchana

from Jind district and Bhiwani and Siwani market from Bhiwani district were preferred.

*Compound growth rate (CGR)* : The Compound growth rate has been worked out to examine the change in inclination of variables to increase, decrease or dormant over a period of time. To inspect the change in prices and influx of cotton in the chosen markets for the period 2005-06 and 2021-22, the compound growth rates were worked out using the subsequent structure of exponential function:

$$Y = ab^t u_t$$

Where,

Y=prices or influx of cotton; t=time in years; u=error term a and b are constraint to be estimated; b=(r+1); r=multiplicative growth rate in per cent annum; Thus,

$$Y = a(r+1)^t u_t \quad 'r' = [\text{Antilog of } (\log b) - 1] \times 100$$

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

$$T = \frac{r}{SE(r)}$$

The standard inaccuracy of CGR is given by

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

Where,

$$\log e = 0.4323$$

*Seasoned behaviour of price and arrivals* : The monthly data on general prices and arrival were used for shaping the seasonal behaviour of price and arrival in the preferred markets. The ratio to moving average method was used to estimation of continuing indices. In markets of Hisar district, the market entrance of cotton had been 9 months in a year i.e. September to May. As a result, 9 months moving average was used to work out the indices. In markets of Jind and Bhiwani district, the market onset had been for 8 months (September to April) and 7 months (September to March), respectively.

The ratio to stirring standard method includes the following steps:

Step 1. The centred 9 months moving average usually were computed from the original data. These centred 9 months data holds the trend and cyclical component.

Step 2. Surplus the original data by the centred moving average data.

$$\frac{Y}{MA} = \frac{T \times S \times C \times 1}{T \times C} = S \times 1$$

Step 3. The irregular component was eliminated by averaging the data for each month over the time as attained the seasonal indices. After averaging the data, they were multiplied by hundred to obtain the seasonal indices,

Step 4. The sum of the recurrent indices should be 900. If not, the figure is accustomed by using a correlation factor i.e.

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

Where, K = correlation factor; S = sum of seasonal indices  
*Price volatility* : To inspect variability of prices from its average in the chosen markets over the time period, the coefficient of variation (%) measure has been engaged. It was calculated by using the following method:

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

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 (2021-22) has been distended by moving average and CV has been expected for each respective market, whereas for intra year, original price series data has been taken.

For each separate market, the price series for the entire period (2005-06 to 2021-22) has been detrended using a moving average, and the CV has been approximated. For the individual years, however, the original price series data have been used.

## RESULTS AND DISCUSSION

*Compound annual growth rate of wholesale prices and arrivals of cotton in selected markets of Haryana:*

The compound annual growth rates of cotton prices in the major markets of major cotton growing districts in Haryana are presented in the Table 1. Growth rates are calculated for the time period of 2005-06 to 2021-22. The results revealed that cotton prices in the selected markets were found on the increasing side which ranged from 7.13 to 8.01. The growth rates of all markets are significant at 1 per cent level of significance. Among the three districts viz., Hisar, Bhiwani and Jind the maximum growth rate of cotton

**Table 1. Compound annual growth rate of cotton prices in Haryana markets during 2005-06 to 2021-22**

Markets	Growth rate (r)%	SE
Adampur	8.01**	1.01(7.93)
Uklana	7.95**	0.898(8.844)
Jind	7.94**	0.88(9.02)
Uchana	7.13**	0.97(7.33)
Siwani	7.82**	0.86(9.06)
Bhiwani	7.67**	0.83(9.21)

Parenthesis contains t value. \*Significance at 5% level, \*\*Significance at 1% level

**Table 2. Compound annual growth rate of cotton arrivals in Haryana markets during 2005-06 to 2021-22**

Markets	Growth rate (r)%	SE
Adampur	7.09***	3.39(2.09)
Uklana	-7.71**	1.78(4.34)
Jind	5.06 <sup>NS</sup>	4.11(1.23)
Uchana	2.62 <sup>NS</sup>	2.29(1.14)
Siwani	20.77**	5.04(4.12)
Bhiwani	12.75**	3.85(3.31)

Parenthesis contains t value. \*Significance at 5% level, \*\*1% level and \*\*\*10% level; NS- Non significant

prices was recorded in Adampur (8.01%) followed by Uklana (7.95%) of Hisar district and minimum growth rate of cotton prices was recorded in Uchana (7.13%) of Jind district.

The compound annual growth rates of cotton arrivals in the major markets of cotton in three major districts of Haryana are presented in the Table 2. Growth rates are calculated for the time period of 2005-06 to 2021-22. The higher growth in arrivals was found in Siwani and Bhiwani markets of Bhiwani district at 20.77 and 12.75, respectively. Growth rates in other markets Adampur from Hisar district was recorded 7.09 percent significantly per annum whereas, Jind (5.06%) and Uchana (2.62%) was found no significant. Uklana market of Hisar district was recorded significant negative growth rates of 7.71 percent per annum. The results are in accordance with *Bhat et al. (2014)* and *Naidu et al. (2014)*.

*Seasonal indices of cotton prices and arrivals in major markets of Haryana* : The most widely used 'method of moving averages' was used for estimating seasonal indices of cotton prices and arrivals in the major markets of Haryana for the time period (2005-06 to 2021-22). The cotton arrivals in the selected markets were during the months of September to May, excepting Jind and Uchana (September to April) and Bhiwani and Siwani markets (September to March).

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

**Table 3. Seasonal indices of cotton prices and arrival in major markets of Hisar, Jind and district Bhiwani**

Month	Adampur		Uklana		Jind		Uchana		Siwani		Bhiwani	
	Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price
September	25.26	89.42	27.08	89.14	27.22	94.10	7.29	85.97	75.25	87.60	21.51	96.17
October	104.09	94.61	115.87	94.42	81.61	96.91	90.67	96.93	122.40	98.58	125.07	100.16
November	167.19	95.36	151.80	96.98	109.26	98.90	143.70	97.55	154.45	101.33	167.35	100.52
December	195.16	95.48	203.17	96.62	197.80	96.82	175.64	97.94	155.88	100.61	161.32	97.76
January	127.63	99.75	175.44	101.77	138.83	99.93	162.26	103.10	99.65	104.80	90.17	94.92
February	88.75	101.06	111.00	101.72	125.22	103.61	115.98	108.47	46.94	98.73	60.39	104.47
March	90.23	104.36	83.54	102.75	102.51	104.70	83.67	107.52	45.43	108.35	74.19	106.00
April	52.33	107.30	22.76	106.19	17.54	105.02	20.79	102.51	-	-	-	-
May	49.35	112.67	9.33	110.41	-	-	-	-	-	-	-	-
Total	900	900	900	900	800	800	800	800	700	700	700	700

selected markets was lesser during the peak arrivals (*i.e.* <100) and higher during lean period (*i.e.* >100) with few exceptions. Thus, the inverse relationship existed between price and arrivals in the selected markets.

The price indices varied from 89.42 to 112.67, 89.14 to 110.41, 94.10 to 105.02 and 85.97 to 102.51 of Adampur, Uklana, Jind and Uchana markets, respectively presented in Table 3, whereas the arrival indices varied from 25.26 to 195.16, 22.76 to 203.17, 27.22 to 197.80 and 7.29 to 175.64 in the Adampur, Uklana, Jind and Uchana markets, respectively. The price indices was highest in the month of May (Adampur and Uklana), April (Jind ) and in February (Uchana) market and arrival found was highest in the month of December for the above markets.

Results showed that the price indices varied from 87.60 to 108.35, and 88.53 to 97.58 in Siwani and Bhiwani markets, respectively in (Table 3). While the arrival seasonal indices varied from 45.43 to 155.88 and 21.51 to 167.35, respectively. The price indices were highest in the month of March and December Siwani and Bhiwani, respectively whereas arrival found was highest in the month of December and November for the above given markets. This result is in line with the findings of Mahesh *et al.* 2018 and Ali *et al.* (2018).

**Price volatility :** The volatility of cotton prices in the selected markets of Haryana was measured by the simplest measure *i.e.* Coefficient of variation (CV). It measures the instability or fluctuations around the central value in price series data of the selected markets are presented in the Table 4. The results showed that

the CV values of cotton prices for the overall period *i.e.* 2005-06 to 2021-22 in the selected markets ranged from 1.91 to 24.56 per cent in Adampur market. The CV value was the highest in the Adampur market (24.56) indicating the presence of relatively higher volatility in cotton prices, followed by Uchana (23.54 percent), Siwani (21.34 per cent), Uklana (20.70 per cent), Bhiwani (18.16) and Jind (16.40%).

The results also 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, whereas volatility in cotton prices was found lower in the year 2019-2020 with CV ranging from 1.22 to 4.03 percent. The results also revealed that the

**Table 4. Coefficient of variation (CV) in cotton prices in Haryana markets for the period 2005-06 to 2021-22**

Particulars	Adampur	Uklana	Jind	Uchana	Bhiwani	Siwani	Haryana
2005-06	4.54	4.89	3.14	3.71	3.23	4.48	5.29
2006-07	8.94	10.32	3.83	8.46	3.33	2.79	9.23
2007-08	10.49	10.33	9.77	11.13	13.82	5.08	11.29
2008-09	10.10	7.81	5.76	4.28	7.86	3.65	2.70
2009-10	5.11	8.39	6.42	10.87	3.74	8.57	5.95
2010-11	24.56	19.51	16.40	21.62	18.16	21.34	21.47
2011-12	6.58	5.35	7.43	6.09	5.44	2.28	5.01
2012-13	4.47	5.35	6.95	5.31	6.67	4.36	5.48
2013-14	3.10	3.32	2.77	3.78	4.44	5.06	2.91
2014-15	6.13	3.07	3.76	3.89	4.25	2.49	5.02
2015-16	3.27	4.40	4.45	3.85	4.53	3.47	3.57
2016-17	6.47	9.51	7.08	6.95	7.74	10.59	7.17
2017-18	5.91	7.24	2.20	23.54	0.95	6.92	7.19
2018-19	6.39	7.15	2.48	2.65	3.42	3.57	4.33
2019-20	1.91	4.03	3.05	1.98	6.19	1.22	1.11
2020-21	9.36	9.60	4.26	4.93	4.00	0.35	6.84
2021-22	19.30	20.16	11.71	12.25	2.89	12.22	20.97

volatility of cotton prices in Haryana was higher in the years of 2010-11(21.47%) to 2010-11 and lowest was recorded in 2019-2020 (1.11%). 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 result is similar to the research conducted by Paul *et al.* (2020). Also, Yogi *et al.*, (2021) reported that price signals are propagated across geographies, showing that price changes in one market are continuously related to price changes in other markets and can impact prices in other markets. However, the direction and magnitude of price fluctuations may be influenced by the dynamic relationships between the commodity demand and supply.

## CONCLUSION

Cotton price values were positive and considerable for all of the markets that were chosen from 2005–2006 to 2021–2022. As a result, over the course of the study, cotton prices significantly increased in a number of markets. The growth and trend values for cotton arrivals were negative and statistically significant for the markets of Uklana while they were positive but not statistically significant for the markets of Jind and Uchana. The growth of arrivals in the markets has been impacted by the state's unpredictable cotton production area and yield. In particular markets, cotton arrivals peaked from October to January and dipped from February to May. In the chosen markets, there was an antagonistic relationship between price and arrivals. Over the study period, there was less than 10% volatility in the intra-annual pricing of cotton in the targeted Haryana

markets. Cotton price volatility was not significantly higher in the chosen markets for the whole study period, with a Coefficient of Variation ranging from 1.11 to 21.47 per cent. The commodity's production and demand are unclear, which contributes to the volatility.

## CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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