RESEARCH ARTICLE Agricultural Reviews, Volume 46 Issue 5: 833-837 (October 2025)

Dynamics and Seasonal Fluctuations of Soybean Prices in Domestic and International Markets

R.M. Jadeja[1], K.P. Thakar[1], P.B. Marviya[2], C. Soumya[1]

10.18805/AG.R-2663

ABSTRACT

Background: Soybean, being one of the most widely cultivated crops globally, plays a significant role in global agriculture and food production. However, soybean prices have experienced significant fluctuations over the past few years, causing imbalances in resource allocation and generating demand and supply gaps. Thus, analyzing past price trends is crucial to understand the current scenario and formulate appropriate strategies to improve the marketing system.

Methods: This study examines the trends and seasonal variations in soybean prices in local, national and international markets using compound growth rate, trend and seasonality analysis. Monthly and yearly time series data of soybean prices in selected markets were collected from July 2006 to June 2021. The finding revealed a continuous rise in soybean prices in India over the 15 years.

Result: The results revealed that the rise in soybean price during this period was due to inflation and farmers were not benefited. Furthermore, the study identified seasonal variation in soybean prices, with peak prices observed during may in most markets, when the crop comes to harvest. The study findings can be useful for policymakers and farmers to understand the trends and seasonal patterns in soybean prices.

Key words: CAGR, Price behaviour, Seasonality, Soybean prices, Trend analysis.

INTRODUCTION

Soybean is one of the most widely cultivated crops in the world, playing a crucial role in global agriculture and food production. Soybean, being one of the most extensively grown crops globally, holds a critical position in agriculture and food production worldwide. Over the past few years, significant fluctuations in soybean prices have been observed. During peak arrival months, soybean prices experienced a decline, whereas they rose during the lean period (Patil and Tingre, 2015). The extent and nature of these price fluctuations provide essential guidance to farmers for marketing their products. However, distorted price movements and instability can lead to imbalances in resource allocation and generate demand and supply gaps. Hence, having information on seasonality, seasonal variations, price volatility and price movements across regions and states is crucial for effective marketing of agricultural commodities (Mukim *et al.,* 2009). Analyzing past price trends can help in understanding the current scenario and formulating appropriate strategies to improve the marketing system. The insights gained from such analysis can benefit stakeholders, including farmers, traders, processors and policymakers, in making informed decisions related to soybean production, marketing and trade (Sharma, 2015).

MATERIALS AND METHODS

Local, national and international soybean markets were considered for the study. In the case of local markets, two markets *viz.* Junagadh and Dahod markets were selected. Latur and Akola from Maharashtra, while Indore and Mandsaur from Madhya Pradesh were selected for the present study on the basis of volume of transactions, experts' opinion and availability of data.The soybean markets of United States was also included for the study as international markets based on availability of data.

The monthly and yearly time series data of soybean prices in selected markets were collected from July 2006 to June 2021 for the study. The price data were sourced from Agmarknet (2021) for domestic markets and United Nations Conference on Trade and Development (UNCTAD, 2021) for international market.

Analytical tools and techniques employed

The market trends and seasonal variations was attempted using tests of compound growth rate, trend and seasonality analysis.

[1]Department of Agricultural Economics, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar-385 506, Gujarat, India.
[2]Department of Agricultural Statistics, Sardarkrushinagar-385 506, Gujarat, India.

Corresponding Author: R.M. Jadeja, Department of Agricultural Economics, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar-385 506, Gujarat, India.
Email: rmjadeja@sdau.edu.in

How to cite this article: Jadeja, R.M., Thakar, K.P., Marviya, P.B. and Soumya, C. (2025). Dynamics and Seasonal Fluctuations of Soybean Prices in Domestic and International Markets. *Agricultural Reviews*. **46(5):** 833-837. doi: 10.18805/ag.R-2663.

Submitted: 24-08-2023 **Accepted:** 01-11-2024 **Online:** 16-01-2025

Growth rate analysis

The compound growth rates were calculated by fitting the exponential function given below:

$$Y = a\ bt \quad \ldots (1)$$

Where,
Y= Prices
a = Constant
b = Regression Co-efficient
t = Time variable (1, 2..., n) for each period *i.e.* year

Thus, natural log on both the sides of eq. (1) was taken to convert it in to linear form.

$$\text{Log } Y = \log a + t \log$$

and, CGR (%) was worked out using following formula:

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

Trend analysis

Time series data consist of a number of components like trend, cyclical, seasonal and irregular fluctuations.In the conventional method of time series analysis, the above four components are assumed to behave in additive or multiplicative scheme respectively, as under:

$$Y = T + C + S + I \quad \text{or} \quad Y = T \times C \times S \times I$$

Where
Y = Original time series data.
T =Trend.
C = Cyclical.
S = Seasonality.
I = Irregular component of the time series.

The trend component refers to the long-term tendency of prices or arrivals to increase or decrease. It is not based on year-to-year fluctuations, but rather looks at patterns over a larger time frame. Because of the exponential nature of agricultural growth and limitations of the additive scheme, a multiplicative scheme is preferred for analyzing the trend component. Schematically, it can be represented as:

$$Y = T \times S \times C \times I$$

Trend component tracks long-term price or arrival movements, not just year-to-year changes. Multiplicative scheme is preferred due to the exponential nature of agricultural growth and the dependence of each component in additive scheme. The schematic representation is shown below.

$$Y = f(T)$$

Where,
Y = Deseasona_lised prices in Rs/qtl. Or arrivals per month in qtl.
T = Time period in months.
The mathematical form of the model is:

$$Y = a + b_t + U \text{ and } Y = a + B_t + U_t$$

Using ordinary least square estimation model, the parameters are computed as:

$$\hat{a} = \overline{Y} - bT$$

$$\hat{b} = \frac{\sum y_1 t_1}{\sum t_1^2}$$

Where,

$$y_1 = Y_1 - \overline{Y}$$

$$t_1 = T_1 - \overline{T}$$

The reliability of the estimates is tested using t statistics.

Seasonal variation

To measure the seasonal variation in prices, seasonal indices was calculated using the twelve months ratio to moving average method. The indices were calculated in such a way that their sum was equal to 1200.

The formula for seasonal index (SI) can then be written as:

$$SI = \frac{TCSEi}{TCi}$$

Further, the extent of variation in seasonal indices were estimated using the coefficient of average seasonal price variation (ASPV), intra year price rise (IPR) and coefficient of variation (CV) using the following formula:

$$IPR = \left[\frac{HSPI - LSPI}{LPSI}\right] \times 100\%$$

$$ASPV = \left[\frac{HSPI - LSPI}{(HPSI + LSPI)/2}\right] \times 100\%$$

$$CV = \left[\frac{\sigma}{\overline{X}}\right] \times 100\%$$

Where,
LSPI = Lowest seasonal price index.
HSPI = Highest seasonal price index.
σ = Standard deviation.
$\overline{x}$ = Mean.

RESULTS AND DISCUSSION

Trends in soybean prices

A long-term continuous rise in agricultural prices in India is evident due to a slow change in demand and supply conditions that occur over time. Factors such as population growth, changing customer habits and purchasing power may push prices up or in the opposite direction, resulting in gradual price movements. This trend, also known as the secular trend, excludes short-term oscillations and reflects a steady movement over an extended period. To determine the yearly trend in soybean prices, three approaches were used.

Estimation of linear trend

Linear model was used to estimate the linear trend in the wholesale prices of soybean for 15 years (2006 to 2021) in selected markets. Table 1 presents the regression coefficients,

which were all highly significant, indicating that the linear trend explained a significant amount of price variation. Among the selected markets, the highest annual rate of increase was observed in the Dahod market (17.27%), followed by Junagadh market (15.68%), while the USA market had the lowest increase at 9.12%. The coefficient of multiple determinations (R^2) was over 53.00% for all markets, indicating that more than half of the variation in soybean prices could be explained by the linear trend.

Estimation of quadratic trend

It could be seen from Table 2 that the regression co-efficient associated with time variable (*i.e.* T) was maximum in the USA market. These co-efficient were non-significant in case of other than USA market. Whereas, the coefficients of quadratic term (*i.e.* T^2) found to be non-significant in all markets.

The co-efficient of multiple determinations (R^2) revealed that more than 51.00 per cent of variations in all the markets could be explained by quadratic trend. However, adjusted co-efficient of multiple determination showed that the linear model was a better fit than quadratic model for all domestic and international markets. The rise in soybean price during 2006 to 2021 was due to inflation and farmers were not benefited. Kadam (2016) reported similar results for Latur market

Estimation of compound rate of increase in annual prices

The estimates of the compound annual growth rates of prices of soybean were determined for each market covered under study. For this, exponential function was used for all markets covered under study. Devi *et al.* (2019) also used trend and seasonality analysis for major pulsecrops in Gujarat.

The result revealed that the compound rates of increase in prices in soybean for all markets were statistically significant during the period 2006 to 2021. The prices of soybean in Dahod market registered the highest increasing rate of 7.72 per cent per annum, whereas, it was the lowest in the USA market about 4.91 per cent per annum.

Table 1: Estimation of linear trend in yearly prices of soybean in selected markets.

Markets	Intercept β_0	Co-efficient for Time β_1	R^2	Adjusted R^2
Akola	104.07	16.58***(2.88)	0.70	0.68
Latur	99.55	16.64***(2.91)	0.70	0.68
Indore	100.70	16.65***(2.66)	0.73	0.71
Mandsaur	97.81	16.60***(2.84)	0.71	0.69
Dahod	100.01	17.27***(2.92)	0.71	0.69
Junagadh	94.81	15.68***(2.54)	0.73	0.71
USA	128.24	9.12***(2.13)	0.58	0.53

Note: Fig in the parentheses are standard errors.

*** Significant at 1 per cent probability level.

Table 2: Estimation of quadratic trend in yearly prices of soybean in major markets of India.

Markets	Intercept β_0	Co-efficient for time β_1	Co-efficient for T^2 β_2	R^2	Adjusted R^2
Akola	110.68	14.38 (12.73)	0.12 (0.73)	0.70	0.65
Latur	110.76	12.90 (12.85)	0.22 (0.73)	0.70	0.66
Indore	106.99	14.56 (11.78)	0.12 (0.67)	0.73	0.69
Mandsaur	108.77	12.95 (12.54)	0.21 (0.75)	0.71	0.66
Dahod	112.81	13.01 (12.83)	0.25 (0.73)	0.72	0.67
Junagadh	123.35	6.17 (10.92)	0.25 (0.69)	0.74	0.70
USA	111.11	14.83* (8.60)	0.22 (0.55)	0.87	0.51

Note: Fig in the parentheses are standard errors.

* Significant at 10 per cent probability level.

Table 3: Estimation of compound rate of increase in soybean prices.

Markets	Estimates of β	Compound rate of increase (%)	R^2
Akola	1.07***	7.47	0.70
Latur	1.08***	7.56	0.70
Indore	1.08***	7.62	0.74
Mandsaur	1.08***	7.62	0.71
Dahod	1.08***	7.72	0.72
Junagadh	1.07***	7.33	0.73
USA	1.05***	4.91	0.57

Note:*** Indicates significance at 1 per cent probability level.

Table 4: Seasonal indices of monthly wholesale prices of soybean in selected national and international markets.

Month	Akola	Latur	Indore	Mandsaur	Dahod	Junagadh	USA
January	99.50	98.90	100.84	101.93	100.92	103.23	101.08
February	100.24	100.41	101.58	101.74	101.45	103.22	99.93
March	101.12	101.03	100.90	101.82	101.20	101.58	99.29
April	105.57	106.05	105.63	102.66	105.35	102.36	97.99
May	106.77	107.02	106.97	107.46	104.33	104.52	98.45
June	103.12	103.58	103.33	104.80	102.59	99.58	100.97
July	106.07	105.80	103.32	102.94	102.73	101.31	101.79
August	102.56	103.30	102.16	97.81	101.11	97.16	101.38
September	96.30	96.39	92.94	94.57	97.77	94.72	100.85
October	90.64	89.68	90.18	91.41	92.48	93.52	98.49
November	92.72	93.19	95.73	95.36	93.94	99.37	99.50
December	95.39	94.67	96.41	97.48	96.13	99.43	100.27

Table 5: Coefficients of average seasonal price variation.

Market	Magnitude of variation (%)		
	IPR	ASPV	CV
Akola	17.79	16.33	32.59
Latur	19.33	17.63	33.24
Indore	18.63	17.04	32.73
Mandsaur	17.56	16.14	32.89
Dahod	13.91	13.00	33.10
Junagadh	11.13	10.54	31.69
USA	3.88	3.81	24.74

The prices of soybean in Akola, Latur, Indore, Mandsaur and Junagadh markets increased at the rate of 7.47, 7.56, 7.62, 7.62 and 7.33 per cent per annum, respectively (Table 3). Thus, on an average the soybean prices in major markets of India was significantly increased annually at the rate of 7.50 per cent per annum during 2006 to 2021.

Seasonal variation in soybean prices

The seasonal indices of market prices of soybean in the selected markets are presented in Table 4. Among the markets under study, the price index in Akola market was the highest in the month of May (106.77 points) and relatively higher during the months of July (106.07 points) and April (105.57 points). The minimum value of price index was observed in October (90.64 points) in Akola markets. Similarly, Latur market witnessed peak prices during May (107.02 points). The indices in other months in Latur varied from 89.68 points (October) to 106.05 points (April). In similar terms, Walke *et al.* (2020) observed soybean price indices was highest during may months in Maharashtra.

A peak of 106.97 points in index was observed during May in Indore market followed by April (105.63 points) and June (103.33 points). Similarly, the highest seasonal price index of soybean in Mandsaur market was observed during the month of May (107.46 points). However, the price index of other months was between in 91.41 to 104.80 points in Mandsaur market.

The price index of Dahod market indicated that it was at the maximum level in April (105.35 points) and then it started to decline and reached to minimum in October (92.48 points). After that, prices started gradually to increase and reached at the maximum level. Junagadh wholesale market witnessed highest price index in May (104.52 points) and comparatively higher indices during January (103.23 points) and February (103.22 points). Similar types of results were also reported by Devi (2020) and Devi and Parmar (2022).

The highest seasonal price indices of soybean in the USA market was observed in the month of July (101.79 points), then after prices decline during August to October months. Afterward, prices of soybean gradually increase till January month (101.08 points) then price index decreased and reached at lowest in April (97.99 points). Thus, soybean showed two intra-year cycles in the USA market.

Soybean crop were sown in the month of June-July. It comes to harvest during October-November. The price movement also demonstrates significant seasonal fluctuations in the selected markets. As a short-term fluctuation, one will notice a general finding that the price is low during harvesting season. The values of higher price indices due to very low arrivals, while that of the lowest price indices were found during post-harvest in selected market.

The study measured seasonal variations in soybean prices using IPR, ASPV and C.V. Results in Table 5 show that the difference between the lowest and highest intra-year price rise ranged from 3.88 per cent in the USA market to 19.33 per cent in Latur market. Latur also had the highest ASPV (17.63%) and coefficient of variation (33.24%), indicating lower price stability. Soybean prices were relatively stable across selected markets and higher variation decreased price stability. Factors such as fresh arrivals, product stock and demand affect prices. Growers can get better prices by matching supply to market requirements during high seasonal price index periods. The above findings are in line with findings of Devi *et al.* (2016), Dudhat *et al.* (2021) and Horo (2021).

CONCLUSION

Study on trends in soybean prices in selected markets of India and the USA between 2006 and 2021 showed a long-term secular rise in agricultural prices in India. The linear model provided a better fit than the quadratic model, as more than half of the variation in soybean prices could be explained by the linear trend. The Dahod market had the highest annual rate of increase, while the USA market had the lowest. The rise in soybean price during the period was due to inflation and farmers were not benefited. The study highlights the importance of monitoring the trends in soybean prices for effective agricultural policies to help farmers cope with market fluctuations.

The study shows that the price of soybean in the selected markets fluctuates significantly, with the highest price index observed during the months of May and the lowest during October. The study also demonstrates that the price of soybean in the selected markets is low during the harvesting season, with the lowest price indices found during the post-harvest period. The study's findings are valuable to stakeholders in the soybean industry, particularly farmers and traders, as it provides insights into price patterns and trends that can help them make informed decisions.

The study reveals a persistent increase in soybean prices in India due to inflation, which has not resulted in benefits for farmers. The study also highlights seasonal variations in prices, lowest price indices during the post-harvest period. Therefore, policy-makers and stakeholders should develop and implement effective price stabilization policies, provide valuable insights to farmers regarding prices of soybean, invest in infrastructure, provide technical assistance and training to farmers, encourage value addition and promote research and development in the soybean.

ACKNOWLEDGEMENT

The authorsexpress sincere gratitude to the anonymous reviewers for their valuable feedback and insightful comments on original draft.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

REFERENCES

Agmarket (2021). Information and Data retrieved on July 8. 2021. from https://www.agmarknet.nic.in.

Devi, Bhavani I., Srikala, M. and Ananda T. (2016). Price behaviour of chillies in Guntur market of Andhra Pradesh, India. *Indian Journal of Agricultural Research*. **50(5):** 471-474. doi: 10.18805/ijare.v50i5.3750.

Devi, G. (2020). Marketing of turmeric production in middle Gujarat. *Guj. J. Ext. Edu*. **31(2):** 36-41.

Devi, G. and Parmar, P. (2022). Trend of market price and seasonality of soybean in Gujarat. *Guj. J. Ext. Edu*. **33(2):** 97-101.

Devi, G, Jadav, K.S. and Changela, Priyanka. (2019). Pattern of prices and market integration of major pulse crops in Gujarat. *J. Plant Dev. Sci*. **11(4):** 229-235.

Dudhat, A.S., Yadav. P. Shiyani R.L. (2021). Growth and instability in oilseed prices - A case of Amreli Market in Gujarat. *Bhartiya Krishi Anusandhan Patrika*. **36(1):** 41-46. doi: 10.18805/R-2309.

Horo, A. (2021). Market integration and price transmission amongst the major wholesale and retail markets of lentil (*Lens culinaris* / *Lens esculenta*) in India. *Agricultural Science Digest*. **41(Special Issue):** 137-143.

Kadam, S.K. (2016). Behaviour of arrivals and prices of soybean in Latur regulated market in Maharashtra. *International Journal of Multifaceted and Multilingual Studies*. **4(12):** 1-4.

Mukim, M., Singh, K. and Kanakaraj, A. (2009). Market integration, transaction costs and the Indian wheat market: A systematic study. *Economic and Political Weekly*. **44(22):** 149-155.

Patil, V.K. and Tingre, A.S. (2015). Soybean price movement across major markets of Maharashtra. *International Research Journal of Agricultural Economics and Statistics*. **6(1):** 67-73.

Sharma, H. (2015). Applicability of ARIMA models in wholesale wheat market of Rajasthan: An Investigation. *Economic Affairs*. **60(4):** 687-691.

UNCTAD (2021). Information and data retrieved on July 8, 2022 from http://www.unctad.org.

Walke, S.S., Sahu, C.R., Takale, R.M. and Kale, A.R. (2020). Trends and seasonal variation in prices of soybean in major Markets of Maharashtra State, India. *Int. J. Curr. Microbiol. App. Sci*. **9(5):** 2912-2915.