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A Study on Price Behaviour of Soybean in Southern Rajasthan

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ABSTRACT

The present investigation was conducted on price behaviour of soybean in selected district of Southern Rajasthan. For workout the trend, secondary data was collected from 2000 to 2014 from publish government sources. Four markets were selected from four selected district namely Pratapgarh, Chittorgarh, Bhilwara and Banswara. Exponential trend for annual wholesale prices was found to be best fit for all the markets. The time element alone explained 89.3% to 93.0% variations in annual wholesale prices in the selected markets. The result of compound growth rates revealed that wholesale prices of soybean recorded significant growth rates in selected markets of Southern Rajasthan. The compound growth rates ranged from 9.91% per annum in Banswara to 10.08% annum in Pratapgarh market. The extent of intra year price rise varied from 15.62% in Banswara to 17.52% in Nimbahera market. In majority of the markets, the extent of intra year price rice was from 15 to 18%. The smaller magnitude of coefficient of variations (4.57% to 5.61%) indicated that there was greater consistency and smaller variability in the monthly prices of soybean in the selected markets of Southern Rajasthan.

Keywords: Price, trend, soybean , market and growth

Soybean (*Lysine Max L.)* is one of the important oilseeds as well as a pulse crop. It belongs to family Leguminoseae, sub-family Papilionoideae and genus Glycine. It is mainly grow in Kharif season. Soybean reported to have originated in Eastern Asia or China has been over known for over 5000 years. Soybean contains good quality dietary fibre, which enables the human body to fight against diabetes (Anita *et al.*, 2007). Rajasthan is at the third position in area and production of soybean. Rajasthan occupied an area of 1.17 million hectare with the production of 0.97 million tonnes during *kharif* 2014 and productivity was 829 kg ha^{-1} (Agricultural Statistics, 2014).

In order to device appropriate ways and means for reducing price fluctuations of agricultural commodities, there is a need to have a thorough understanding of price behaviour over time and over space. Such an analysis is also useful to farmers in order to decide the optimum time for disposing off their produce to their best advantage.

METHODOLOGY

The present investigation is based on soybean which is major oilseed crop cultivated in Southern Rajasthan. Southern Rajasthan has seven districts. Four districts out of these selected purposively based on highest area under soybean crop. One regulated market from each district of selected region having the highest arrivals of soybean selected for the study. These markets were Pratapgarh, Nimbahera, Bhilwara and Banswara. Secondary data on annual wholesale prices of soybean in Southern Rajasthan were collected from the year 2000 to 2014, from the published records and reports of the Directorate of Economics and Statistics (DES), Directorate of Agriculture (DOA) and Rajasthan State Agricultural Marketing Board (RSAMB) Government of Rajasthan. Time series data on monthly arrivals and wholesale prices of soybean obtained from the offices of the respective regulated markets.

Analysis of Data

The collected data analyzed by using the following tools and techniques to achieve the stated objectives.

Trends in Annual Prices

The trend in annual wholesale prices worked out using linear as well as compound growth rates.

Linear Model

$$P_t = \beta_0 + \beta_1 T_t + U_t \quad \ldots(i)$$

Where,

P_t = Annual wholesale prices of soybean in year't', where t = 1……15

T_t = Time (year) which takes value 1, 2, 3, 4……15

U_t = Disturbance term with usual assumptions

β_0 and β_1 are regression coefficients to be estimated.

Compound Growth Model

$$P_t = \beta_0 \beta_1^T U_t$$

Where,

P_t = Annual wholesale prices of soybean in year't' where t = 1…..15

T = Time (year) which takes the value 1, 2, 3, 4…

U_t = Disturbance term with usual assumption.

β_0 and β_1 are regression coefficients to be estimated.

On taking logarithms of both the sides, the equation takes the form,

$$\text{Log } P_t = \text{Log } \beta_0 + T \text{ Log } \beta_1 + \text{Log } U_t \quad \ldots(i)$$

This equation estimated by the ordinary least squares technique. The compound growth rate (g) estimated as:

$$(g) = (\text{Antilog } \beta_1 - 1) \times 100 \quad \ldots(ii)$$

't' test used to test the significance of the estimated compound growth rate.

Analysis of Seasonal Component

For determining the seasonal behaviour, data of monthly wholesale price was used. Below mentioned approaches were used in order to study the seasonal price behavior.

Computation of Seasonal Indices

The seasonal price indices were computed by taking 12 months moving average of the original data with the following multiplicative model of time series analysis.

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

Where,

P = Price T = Trend Value C = Cyclical Movement

S = Seasonal Component I = Irregular variation

Coefficient of average seasonal price:

The magnitude of seasonal variations in wholesale prices were estimated with the help of coefficient of average seasonal price variation and coefficient of variations using the following formulae:

$$\text{ASVP} = \frac{\text{Highest Seasonal Price Index} - \text{Lowest Seasonal Price Index}}{\text{Highest Seasonal Price Index} + \text{Lowest Seasonal Price Index}}$$

$$\text{Coefficient of Variation} = \frac{\sigma}{\bar{X}}$$

Where σ is estimated value of standard deviation of seasonal price indices and X is the arithmetic mean of seasonal price indices. Since the arithmetic mean of seasonal price indices is always 100, the standard deviations in its self was the coefficient of variations. The standard deviations and arithmetic mean were calculated by the following formula:

$$\sigma = \sqrt{\frac{\Sigma\left(Xi - \bar{X}\right)^2}{n-1}}$$

$$\bar{X} = \frac{\Sigma Xi}{n}$$

Where is the seasonal index for the ith month (i= 1 to 12) and n is the number of months, *i.e.* = 12

RESULTS AND DISCUSSION

Trend in Wholesale Prices of Soybean in Southern Rajasthan

In all the four regulated markets, based on the

significance of the coefficient, value of R^2 and shape of the function, exponential trend function seems a better fit over linear function for the wholesale prices of soybean.

Exponential Trend in Wholesale Prices of Soybean in Southern Rajasthan

The estimates of exponential trend in wholesale prices of soybean in regulated markets of selected districts of southern Rajasthan are presented in Table 1. It is obvious from the table the regression coefficient (β_1) associated with the time element (T) was positive and highly significant at 1% level of significance for all the regulated markets. The value of regression coefficient for the time was estimated to be highest in regulated market of Pratapgarh market (0.096) followed by Bhilwara market (0.095), Nimbahera market and Banswara market (0.094).

The estimate of the coefficient of determination (R^2), a measure of goodness of fit of the regression line to the given data, ranged from as low as 0.893 for Pratapgarh market to as high as 0.930 for Banswara market indicating that time element alone explained 89.3% to 93.0% variation in whole sale prices of soybean in the markets during the study periods.

Table 1: Estimates of Exponential Trend in Wholesale Prices of Soybean in Southern Rajasthan (2000 to 2014)

Sl. No.	District	Regulated Markets	Estimated Exponential Trend Function	R^2
1	Pratapgarh	Pratapgarh	$P_t = 799.3 \times 0.096^{T**}$ (.066)	0.893
2	Chittorgarh	Nimbahera	$P_t = 805.2 \times 0.094^{T**}$ (.059)	0.911
3	Bhilwara	Bhilwara	$P_t = 751.3 \times 0.095^{T**}$ (.064)	0.901
4	Banswara	Banswara	$P_t = 798.0 \times 0.094^{T**}$ (.052)	0.930

*Figures in parentheses are the standard errors; **Significant at the 0.01 level of significance.*

Compound Growth Rates of Wholesale Prices of Soybean in Southern Rajasthan

The estimated compound growth rates of wholesale prices of soybean in regulated markets of selected district in southern Rajasthan are presented in Table 2. The estimates of growth rates presented to the years 2000 to 2014. The compound growth rates varied from 9.91% per annum in regulated market of Banswara district to 10.08% per annum in regulated market of Pratapgarh district during the period 2000 to 2014. All the growth rates were estimated to be significant at 1 and 5% level of significance.

From the ongoing discussion, it may be concluded that wholesale prices of soybean recorded significant growth in all selected markets of southern Rajasthan.

Table 2: Estimates of Compound Growth rates of Wholesale Prices of Soybean in Southern Rajasthan (2000-2014)

Sl. No.	District	Regulated markets	Compound Growth Rate	(R^2)
1	Pratapgarh	Pratapgarh	10.08** (1.01)	0.89
2	Chittorgarh	Nimbahera	9.93** (0.89)	0.91
3	Bhilwara	Bhilwara	10.07** (0.96)	0.90
4	Banswara	Banswara	9.91** (0.78)	0.93

*Figures in parentheses are the standard errors; ** Significant at the 0.01 level of significance.*

Seasonal Behaviour of Prices of Soybean in Southern Rajasthan

The results of seasonal indices of wholesale prices of soybean and market arrivals in selected markets of Southern Rajasthan during the study period are presented in Table 3 and 4. The inter year price rise is presented in Table 5 and depicted in panel of graphs (Fig. 1 to 4). The results of Table 3 indicated that in Pratapgarh market seasonal index for soybean prices were lowest (91.68) during the month of October and highest (106.26) in the month of July. In Nimbahera market seasonal index was lowest (91.88) in the month of October and highest (107.97) in the month of July. In Bhilwara market seasonal index was lowest (92.08) in the month of October and highest (107.36) in the month of July. In Banswara market seasonal index was lowest (93.59) in the month of October and highest (108.21) was in the month of July.

There was a consistent increase in price index from January to August and there after a sharp decline upto the month of October and again rise in prices up to December in all markets. Thus, in all markets similar trend in price movement was observed.

Table 3: Indices of Seasonal Price Variation of Soybean in Selected Markets of Southern Rajasthan (2000 to 2014)

Sl. No.	Months	Pratapgarh	Nimbhara	Bhilwara	Banswara
1	Jan.	96.15	92.32	95.92	92.82
2	Feb.	95.74	98.09	99.33	94.24
3	Mar.	98.63	97.95	96.91	96.98
4	Apr.	102.19	102.48	102.43	100.54
5	May	104.30	104.66	102.74	104.92
6	June	103.84	104.38	106.99	105.24
7	July	106.26	107.97	107.36	108.21
8	Aug.	104.78	107.27	104.55	102.66
9	Sept.	96.10	93.59	96.39	99.03
10	Oct.	91.68	91.88	92.08	93.59
11	Nov.	97.84	97.56	97.25	99.78
12	Dec.	102.49	101.85	98.05	101.99
	Total	**1200.00**	**1200.00**	**1200.00**	**1200.00**

The seasonal index for soybean arrivals in Pratapgarh market were lowest (18.51) during the month of March and highest (351.18) in the month of October. In Nimbahera market seasonal index was lowest (15.54) during the month of April and highest (296.72) in month of October. In Bhilwara market seasonal index was lowest (21.41) during the month of July and highest (232.24) in month of October. In Banswara market seasonal index was lowest (6.59) during the month of June and highest (478.69) in month of October (Table 4). Thus, there was dissimilarity in lowest market arrivals index in selected markets but the highest arrival index was observed in the month of October in all the markets.

Dissimilarity of lowest market arrivals indices in selected market were seen because off various factor behind this which discussed in a brief firstly storage facility, marketed surplus, economic condition of farmers and lack of processing facility , finally lack of awareness of market price.

The results of intra year price rise (Table 5) revealed that the magnitude of lowest seasonal price index ranged from as low as 91.68 for Pratapgarh market (in the month of October) to as high as 108.20 for Banswara market (in the month of July). The extent of intra year price rise varied from as low as 15.62 percent in Banswara market to as high as 17.52% in Nimbahera market. In majority of the markets, the extent of IPR was around 15 to 18%. The coefficient of average seasonal price variation was recorded during the study period from 14.72 to 16.11% and revealed high consistency. The coefficient of variation for all selected soybean markets of Southern Rajasthan was estimated and observed to vary from 4.57% to 5.61%. The small magnitude of coefficient of variation revealed that there was greater consistency or smaller variability in the monthly prices of soybean in the selected markets of Southern Rajasthan.

Table 4: Seasonal Indices of Monthly Arrivals of Soybean in Selected Market of Southern Rajasthan (2000 to 2014)

Sl. No.	Months	Pratapgarh	Nimbhara	Bhilwara	Banswara
1	Jan.	80.62	135.31	180.35	123.33
2	Feb.	32.96	88.36	110.69	72.49
3	Mar.	18.51	42.29	56.48	22.17
4	Apr.	26.25	15.54	26.77	8.66
5	May	31.60	25.66	23.71	6.97
6	June	38.87	34.67	33.63	6.59
7	July	44.67	39.21	21.41	11.46
8	Aug.	23.73	32.16	32.93	52.47
9	Sept.	32.22	47.47	71.33	115.37
10	Oct.	351.18	296.72	232.24	478.69
11	Nov.	349.06	253.17	226.30	221.02
12	Dec.	170.33	189.46	184.16	80.78
	Total	**1200.00**	**1200.00**	**1200.00**	**1200.00**

Table 5: Intra Year Price variations of Soybean in Selected Markets of Rajasthan (2000 to 2014)

Markets	Lowest seasonal price index		Highest seasonal price index		Intra year price rise (Percent)	Coefficient of average seasonal price variations	Coefficient of variations
	Months	Seasonal index	Months	Seasonal index			
Pratapgarh	October	91.68	July	106.25	15.89	14.72	4.57
Nimbhara	October	91.87	July	107.97	17.52	16.11	5.61
Bhilwara	October	92.08	July	107.35	16.58	15.31	4.77
Banswara	October	93.58	July	108.20	15.62	15.29	4.76

From the foregoing discussion, it may be concluded that the prices of soybean were highest in the month of July and lowest in the months of October. On the other hand market arrivals were higher in the month of October, which resulted lower returns to the producer farmer.

CONCLUSION

Annual wholesale prices of soybean increased significantly in all the selected markets of Southern Rajasthan during the study period. The rate of compound growth in annual wholesale prices ranged from 9.91% to 10.08% in the four selected markets of Southern Rajasthan. Annual wholesale prices of the crop exhibited significant exponential trend over time in all the selected markets. The time element alone explained 89.3% to 93.0% variations in annual wholesale prices in the selected markets. Seasonal indices revealed that soybean prices remained the lowest in the month of October and the highest in the month of July in all selected markets of the southern Rajasthan during the study period. Having reached the peak in the month of July the seasonal price indices continued to decline up to the month of October. The extent of intra year price rise varied from 15.62% in Banswara to 17.52% in Nimbahera market. In majority of the markets, the extent of intra year price was around 15 to 18%. The smaller magnitude of coefficient of variations (4.57% to 5.61) indicated that there was greater consistency and smaller variability in the monthly prices of soybean in the selected markets of Southern Rajasthan.

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