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Relationship between prices and arrivals of pearl millet in Rajasthan

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Abstract

The present study was devoted to an analysis of behaviour of market arrivals and prices of pearl millet in Jaipur, Alwar and Barmer districts of Rajasthan. The districts were selected purposively, as production under pearl millet crop was maximum in these districts and Jaipur district was selected for comparative study. Secondary data were used to compute the correlation co-efficient between arrivals and prices. Monthly data on arrivals and prices were taken for the period 2010-11 to 2020-21. The correlation coefficient between monthly wholesale prices and arrivals of pearl millet during 2010-11 to 2020-21 were -0.333, -0.116 and -0.41, showing that there existed inverse relationship between the two. The correlation between arrivals and price in Jaipur market was negative and statistically significant but in Alwar and Barmer markets negative and statistically not significant. This indicated that prices of pearl millet were not only affected by arrivals, but were also affected by factors such as demand, export-potential and seasonality of the crop. Coefficient of variation was calculated to measure the variability in monthly prices. The measurement of coefficient of variations in monthly prices and arrivals of pearl millet revealed the ranged from 22.00 percent to 24.70 percent and 114.70 to 349.00 percent respectively.

Keywords: Correlation, coefficient of variation, prices and arrivals

Introduction

Pearl millet (*Cenchrus americanus*, commonly known as the synonym *Pennisetum glaucum*; also known as 'Bajra' in Hindi. Pearl millet is well adapted to growing areas characterized by drought, low soil fertility, and high temperature. It performs well in soils with high salinity or low pH. Because of its tolerance to difficult growing conditions, it can be grown in areas where other cereal crops, such as maize or wheat, would not survive. Pearl millet is a summer annual crop well-suited for double cropping and rotations. Pearl millet is one of the most extensively cultivated cereals in the world after rice, wheat, and sorghum, particularly in arid and semi-arid regions. The grain of pearl millet is superior in nutritive value to sorghum grain. It contains 12% of moisture, 5% of protein, 5% of fat, 67% of carbohydrates and 2.7% of minerals. It is also rich in vitamins B, potassium, phosphorus, magnesium, iron, zinc, copper and manganese (Vanisha *et al.*, 2011) [11].

Pearl millet is a descendent of the wild West African grass and was domesticated over 4,000 years ago in the West African Sahel, spreading later to East Africa and India (Sharma *et al.*, 2021) [8]. Now it is being cultivated over 30 million hectares worldwide, with the majority of the crop grown in Africa (>18 million hectares) and Asia (>10 million hectares) (Raheem *et al.*, 2021) [14]. Today pearl millet is grown on over 260,000 km² of land worldwide. It accounts for about 50% of the total world production of millets. West Central Africa is the largest pearl millet-producing region in Africa and the world, accounting for 95% of the total area in West Central Africa. It accounts 49% of the global millet area with great significance. The major millet producing African countries are Niger (12%), Sudan (9%), Nigeria (7%), Mali (6%), Burkina Faso (4%), Ethiopia (3%), Chad (2%) etc (FAOSTAT, 2020) [15].

India is one of the largest producers of Pearl Millet in the world with around 9 million ha area under cultivation. Rajasthan is highest producing state within the country. The crop is grown for a dual purpose - as food for consumption and fodder for livestock. The grain is converted into flour and used for making bread while the stems are used as fodder for cattle. Pearl millet is known for its high nutritive value because of its high iron and zinc content.

In terms of area and production, India is the largest producer of pearl millet. During 2010 - 2012, the average pearl millet area in India was 8.5 million hectares and the average production was 9.4 million tonnes. It is taken up in an area of 6.93 million hectares with an average production of 10.36 million tonnes and 1243 kg/hectares productivity in 2019-20

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(Directorate of Millets Development, 2020) ^[16]. Pearl millet is extensively cultivated in India and is the fourth most extensively grown cereal crop after rice, wheat and maize. Rajasthan, Maharashtra, Uttar Pradesh, Gujarat, and Haryana are the major pearl millet-growing states, contributing 90% of the total production in India. The highest pearl millet producing states in India are Rajasthan (42%), Uttar Pradesh (18%), Haryana (12%), Gujarat (9%), Madhya Pradesh (7%), Maharashtra (6%) and Karnataka (3%) as shown in figure 4.3. Out of this, Rajasthan contributes a maximum of around 4.53 million tonnes, followed by Uttar Pradesh (2.01 million tonnes), Haryana (1.35 million tonnes), Gujarat (0.10 million tonnes), Madhya Pradesh (0.74 million tonnes) Maharashtra (0.64 million tonnes) during 2020-21. In Rajasthan Alwar is the highest pearl millet producing district followed during 2020-21. The production of Alwar district was 7.98 lakh tonnes in that year followed by Barmer with the production of 6.72 lakh tonnes. Pearl millet and cluster bean are grown in the similar areas as both crops are drought resistant and grow well in areas of scanty rainfall. The other pearl millet producing districts in Rajasthan is Jaipur, Sikar, Nagaur, Jodhpur and Bikaner.

Agricultural marketing plays an important role in accelerating the pace of economic development. An efficient marketing system ensures higher levels of income to farmers and widens the market for the products by taking them to remote corners of the country and world-wide. Analysis of price and market arrivals over time is important for formulating a sound agricultural price policy. Fluctuation in most arrivals largely contribute to the instability of the produce. In order to devise appropriate ways and means for reducing price fluctuations of agricultural commodities, there is a need to have understanding of price behaviour over time and space. Such analysis is helpful to the farmers in order to decide to the proper disposing of the produce to their best advantage (Reddy *et al.*, 2021) ^[4]. The investigation was carried out to examine the correlation co-efficient between arrivals and prices of pearl millet in the selected markets of Rajasthan.

Materials and Methods

The secondary data of prices and arrivals of pearl millet in Rajasthan was collected for the period of eleven years *viz.* 2010-11 to 2020-21. The selection of Alwar and Barmer were done purposively for pearl millet on the basis of rank in production of the selected agricultural commodity in whole Rajasthan. Jaipur district of Rajasthan having biggest market was also selected purposively for the comparative study. The selection of different markets was done purposively on the basis of highest arrivals of selected commodities in selected districts of Rajasthan for pearl millet for the collection of data of prices and arrivals. For pearl millet Alwar and Barmer whereas, Jaipur market were selected for comparative study. Secondary data in respect of arrivals in different markets and wholesale prices of pearl millet for the period of eleven years from 2010-11 to 2020-21 was collected from Directorate of Economics and Statistics, Government of Rajasthan, Jaipur, Mandi offices of selected mandies and AGMARKNET (<https://agmarknet.gov.in>) to study the relationship between prices and arrivals.

Analytical tools

The choice of the statistical and econometric tools of analysis was decided with reference to the objectives of the study and the nature of data collected. The collected data were analyzed

by using the following tools and techniques to achieve the stated objective.

Relationship between prices and arrivals

This objective was divided into two parts *viz.*: Correlation coefficient and coefficient of variation.

1. Correlation co-efficient was obtained to measure the nature and magnitude of association between arrivals and prices of selected commodities of the market.
2. Coefficient of variation was used to study the variability in arrivals and prices of selected agricultural commodities in the study area over the years.

Correlation

Correlation is a measure of intensity or degree of linear relationship between two variables (price and arrivals) for "n" pair of observations. To know the direction and extent of association between arrivals and prices, following formula was used to calculate correlation coefficient (r):

$$r = \frac{\sum (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum (X_i - \bar{X})^2 \sum (Y_i - \bar{Y})^2}}$$

Where,

r = Correlation coefficient

X_i = Quantity of arrivals of selected commodity in i^{th} month/year (quintals)

\bar{X} = Mean quantity of arrivals of selected commodity (quintals)

Y_i = Price of selected commodity (₹. /qt.) in i^{th} month or year

\bar{Y} = Mean value of prices of selected commodity (₹. /qt.)

n = Number of observations.

Coefficient of variation (CV)

The coefficient of variation (CV) is a relative measure of variability that indicates the size of a standard deviation in relation to its mean. It is a standardized, unit-less measure that allows us to compare variability between disparate groups and characteristics. It is also known as the relative standard deviation (RSD).

The co-efficient of variation (CV) was computed to find out the extent of fluctuations in market arrivals and prices of selected commodities in the study market.

Standard Deviation

$$C.V. = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

Result and Discussion

Relationship between Market Arrivals and Prices

The relationship between market arrivals and prices in Jaipur, Alwar and Barmer markets, negative and statistically not significant relationship was noticed for most of the years in pearl millet. Only four years *i.e.* 2010-11, 2011-12, 2013-14 and 2017-18 was found negative and statistically significant relationship between market arrivals and prices in Jaipur market. The positive relationship and statistically not significant relationship found in four years during 2014-15, 2015-16, 2019-20 and 2020-21 in Jaipur market, wherever, for three years out of eleven years *i.e.* 2012-13, 2016-17 and 2018-19 relationship found to be negatively associated and statistically not significant over the study period. The

correlation co-efficient for pearl millet in Alwar market was observed negative and statistically significant in 2011-12 and in 2014-15, while in 2010-11, 2013-14, 2015-16, 2016-17 and 2018-19 were found negative and not significant but correlation co-efficient in 2012-13, 2017-18, 2019-20 and 2020-21 was found non-significant and positively related during study period. In Barmer market the correlation co-efficient for pearl millet in market was observed positive and statistically significant in almost all the years while in 2010-11 and 2020-21 were found positive and statistically significant during study period. The highest negative correlation co-efficients (-0.758) was found during 2011-12 in Jaipur market while in Alwar market (-0.940) in 2011-12 and in Barmer market (-0.327) in 2018-19, respectively. Similar results were found by Shukla and Rai (2014) [9] in onion, garlic and turmeric in selected market of Uttar Pradesh.

Table 1: Correlation between prices and arrivals of Pearl millet in selected mandies of Rajasthan from year 2010-11 to 2020-21

Years	Jaipur	Alwar	Barmer
2010-11	-0.570**	-0.442 ^{NS}	0.630*
2011-12	-0.758**	-0.940**	-0.023 ^{NS}
2012-13	-0.081 ^{NS}	.026 ^{NS}	-0.282 ^{NS}
2013-14	-0.735**	-0.743 ^{NS}	0.205 ^{NS}
2014-15	0.231 ^{NS}	-0.629*	0.279 ^{NS}
2015-16	0.098 ^{NS}	-0.414 ^{NS}	-0.129 ^{NS}
2016-17	-0.377 ^{NS}	-0.332 ^{NS}	-0.124 ^{NS}
2017-18	-0.812**	.047 ^{NS}	-0.269 ^{NS}
2018-19	-0.325 ^{NS}	-0.458 ^{NS}	-0.327 ^{NS}
2019-20	0.293 ^{NS}	0.099 ^{NS}	-0.286 ^{NS}
2020-21	0.352 ^{NS}	0.572 ^{NS}	0.734**

** Correlation is significant at 0.01 (1%) level

* Correlation is significant at 0.05 (5%) level

^{NS} Correlation is not significant

The degree of relationship between market arrivals and prices of pearl millet was also studied by computing correlation coefficients over the years. The results of correlation analysis, given in Table 2. The results revealed the negative correlation between prices and arrivals in Barmer and Alwar market but these correlation coefficients were statistically non-significant. However, in Jaipur market, the correlation between arrivals and price was negative and statistically significant. Similar results were found by Sharma and Singh (2014) [7], that the relationship between prices and arrivals showed the negative and statistically not significant in Jaipur and Nagaur markets of pearl millet and positive and statistically significant in Jodhpur market.

Table 2: Correlation between prices and arrivals of pearl millet in selected mandies of Rajasthan over the years (2010-11 to 2020-21)

	Jaipur	Alwar	Barmer
Correlation	-0.333**	-0.116 ^{NS}	-0.41 ^{NS}

** Correlation is significant at 0.01 (1%) level

^{NS} Correlation is not significant

Variations in Arrivals and Prices of pearl millet

The variability in arrivals and prices of pearl millet in Jaipur, Alwar and Barmer markets from the year 2010-11 to 2020-210 was analyzed and depicted in Table 3. Results revealed that the market arrival was highest in Jaipur market with a mean of 3206.32 quintals and lowest in the Barmer with 849.65 quintals. Coefficient of variation was computed to study the variations in market arrivals and prices of pearl millet for 2010-11 to 2020-21. It is witnessed from the table 3 that the coefficient of variations in prices of pearl was found to be highest (24.70%) in Barmer, (21.80%) and (22%) in Jaipur during the year 2010-11 to 2020-21. The lowest variation in arrivals was in Barmer (114.70%), in Jaipur (200%) and Alwar (349%).

Table 3: Coefficient of variation of prices and arrivals of pearl millet in selected mandies of Rajasthan during 2010-11 to 2020-21

Parameters	Jaipur		Alwar		Barmer	
	Prices	Arrivals	Prices	Arrivals	Prices	Arrivals
Mean	1307.618	3206.317	1249.738	2356.979	1494.576	849.651
Standard Deviation	288.0278	6419.917	273.306	8227.686	369.788	974.327
Coefficient of Variation (Percent)	22.00	200.00	21.80	349.00	24.70	114.70

Conclusions

The study has concluded that the extent of variability in market arrival of pearl millet was lower in Barmer market but higher in Alwar market. Its prices variability was lower in Alwar market and higher in Barmer market. The study has confirmed the negative relationship between market arrivals prices of pearl millet, in Jaipur, Alwar and Barmer over the years in all three markets. However, across different years, there have been several instances of negative relationship between market arrivals and prices in Jaipur, Alwar and Barmer markets.

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