Original Research Article

Trends and Market integration of *Kharif* Sorghum in Beed district of Maharashtra

Abstract

Sorghum cultivation has declined over the period of time farmer's handle to high lucrative cereals such as rice, wheat, corn, pulses and competitive crops like oilseeds and cotton. The District Statistic Board of Beed has reported that the cultivation area for *Kharif* Sorghum in 2020 to 21 will be 7194 hectors. The total amount of *Kharif* Sorghum produced in the Beed district in 2020 to 21 was 34.60 metric tonnes, and productivity was 481 kg per hector. The time series data of arrivals and prices were collected from APMCs in Beed district i.e. Beed, Dharur and Parli markets during study period 2001 to 2020 i.e. 20 years and in the year 2020 from January to December month wise i.e. 1 year. The selected market was based on the quantity of arrivals and prices of *kharif* sorghum of Beed district of Maharashtra state. The trends and annual compound growth rate in arrivals and prices of *Kharif* Sorghum determine by using functional form exponential form respectively. Market integration was worked out by estimating Bivariate correlation coefficient. Analysis of the annually growth rate of arrivals of Kharif Sorghum in Beed market recorded positive and non-significant, While in Dharur and Parli markets recorded negatively significant. Beed, Dharur and Parli markets showed positive and non-significant growth rate in prices of *Kharif* Sorghum. There is strong degree of association in prices between markets.

Keywords: Trends, Market integration, *Kharif* sorghum, Arrivals and Prices.

Introduction

Sorghum cultivation has declined over the period of time farmer's handle to high lucrative cereals such as rice, wheat, corn, pulses and competitive crops like oilseeds and cotton. In *Kharif* cultivation, the high constraints are the lack of better dual purpose variety seeds and hybrids available at reasonable prices and at the appropriate times along with grain mould susceptibility during extended monsoon years at grain maturity and stem-borer vulnerable in dry weather conditions.

According to Economic Survey of Maharashtra, sorghum was widely produced at 381000 million tonnes in 2020 to 21 and will be again in 2021 to 22. One of the major sorghum-producing states in India is Maharashtra. In 2020 to 2021, it was grown over an area of 379000 hectors. The District Statistic Board of Beed has reported that the cultivation area for *Kharif* Sorghum in 2020 to 21 will be 7194 hectors. The total amount of *Kharif* Sorghum produced in the Beed district in 2020 to 21 was 34.60 metric tonnes, and productivity was 481 kg per hector. A study of trend in arrivals and prices assumes special significance in developing economy like India as it can provide fair price to the producers and a long run marketing system would strengthen all corporate activities with an integrated strategy to satisfy the end users.

Objectives

1. To study trends in arrival and prices of *Kharif* Sorghum
2. To analyze the market integration of *Kharif* Sorghum markets in Beed district.

Methodology

The study was based on secondary data. The time series data of arrivals and prices were collected from APMCs in Beed district i.e. Beed, Dharur and Parli markets during study period 2001 to 2020 i.e. 20 years and in the year 2020 from January to December month wise i.e. 1 year. The selected market was based on the quantity of arrivals and prices of *Kharif* sorghum of Beed district of Maharashtra state. The trends in arrivals and prices of *Kharif* Sorghum determine by using functional form given below.

M=a+bt equation1

P= c+dt equation2

Where,

M = Monthly market arrival of *Kharif* Sorghum in quintals

P = Price of *Kharif* Sorghum in rupees per quintals.

a and c = intercepts

t = Time variable in years

b = Regression coefficient (rate of change in monthly market arrivals for a unit change in time (dm/dt))

d = Regression coefficient (rate of change in monthly market prices for a unit change in time (dp/dt))

The annual compound growth rate of arrivals and prices of *Kharif* Sorghum was worked out by using an exponential form as below.

CGR (r) = Antilog (b-1) x 100

Market integration of agricultural products gained importance in developing countries due to potential application to develop the national economy. Market integration analysis examines how different markets over space are related. Efficient market integration enhances supply security, reduce price risks, prevent food shortage, reduce market entry barriers and support the effectiveness of macro-level economic policies. Market integration was worked out by estimating Bivariate correlation coefficient (r) between price changes in different selected market. (Acharya and Agarwal-1994)

$$r_{p_1 p_2} = \frac{COV\ (P_1, P_2)}{dp_1, dp_2}$$

Where,

r = Simple correlation coefficient

Cov (p_1, p_2) = Co-variation between p_1 and p_2

P_1 = Price of the commodity in first market

P_2 = Price of the commodity in second market

dp_1 = Standard deviation of prices in first market

dp_2= Standard deviation prices in second market

Student 't' was used to test significance of 'r' which is given as,

$$\mathbf{t\ test} = \mathbf{r}\frac{\sqrt{\mathbf{n-k}}}{\sqrt{\mathbf{1-r^2}}}$$

Where,

r = correlation coefficient,

n = number of observation

k = number of parameter

Standard deviation

Standard deviation is one of the measures of dispersion. This measure of dispersion was estimated by squaring the deviation of each observation from the mean, adding the squares and dividing it by the total number of observation (n) and extracting the square root.

$$\mathbf{Standard\ deviation} = \sqrt{\frac{\sum_1^n (X_i - X)^2}{n-1}}$$

Where,

X_i = arrivals/prices

$\bar{X}$ = Mean of arrivals/prices$_i$= 1,2,3…..n

N = number of years/months

Coefficient of Variation

Coefficient of variation is defined as the "Percentage variation in the mean as the standard deviation being stated as the total variation in the mean". The coefficient of variation of each market was worked out by comparing the variability present in market arrivals and prices.

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

Where,

SD = Standard deviation Mean=Arithmetic mean

CV = Coefficient of variation

Result and Discussion

Trends of arrivals and prices of *Kharif* Sorghum

The trend analysis of annual arrivals and prices of *Kharif* Sorghum in selected APMC's was presented in Table 1. The table reveals that, Beed APMC showed positive trend in arrivals, whereas, Dharur and Parli market showed negative trends. The trends values of arrivals are 497.65, -1161.03 and -1818.53 for Beed, Dharur and Parli APMC markets,

respectively.. The trend of annual prices of *Kharif* Sorghum in Beed, Dharur and Parli markets were positive which are having trend values of prices in Beed 111.27, Dharur 97.43 and Parli 88.36 markets, respectively.

Compound growth rate of arrivals and prices of *Kharif* Sorghum

The Compound growth rate was determined for the annual arrivals and prices of *Kharif* Sorghum by using exponential type of equation depilated in Table 2.

According to table the Beed APMC showed positive compound growth rate significant at 5 per cent level of significance. *Kharif* Sorghum was inadequate at the time of study period in Dharur and Parli markets, which exhibit negatively significant compound growth rate significant at 1 per cent level of significance. Markets of Beed, Dharur and Parli reported compound growth rates of 7.061, -11.82, and -5.469, respectively. Beed, Dharur, and Parli. Values of R^2 for APMC's were 0.189, 0.682, and 0.433, respectively. In the study period, it was viwed that the APMCs for the Beed, Dharur and Parli markets revealed positive compound growth rates, which were significant at 1 per cent level of significance. In comparison to Beed and Parli markets, the annual compound growth rate of arrivals of *Kharif* Sorghum was highest in the Dharur market (11.05) during the study period. For the markets of Beed, Dharur and Parli, the R^2 values were 0.878, 0.961, and 0.913, respectively.

Market integration

Market integration is the relationship among the spatially separated markets. APMC's difference in the extent of integration and therefore, there may be a variation in their degree of efficiency. The extent by which price of a commodity move together over a period of time in different markets located at varied distances from each other is an indicator of market integration for the commodity. The relationships between two or more APMC's, which are spatially integrated and indicated by APMC integration. Spatial integration is one of the most important indicators of effective function of APMC. According to the Table 3 of the bivariate correlation analysis of the prices of *Kharif* sorghum in the Beed, Dharur, and Parli markets, there were very high degree of association of prices between these three markets, with Beed, Dharur and Parli each having a Correlation Coefficient of 0.95, 0.93, and 0.95, respectively. This association was highly significant at the 1 per cent level of significance. Due to their proximity, the Beed, Dharur, and Parli market places have a high degree of connectivity with one another. As a result, the price signal spread readily between market places.

The annual price of *Kharif* Sorghum in Beed, Dharur, and Parli APMC is presented in Table 4 along with descriptive information spanning twenty years. Descriptive statistics demonstrate the fundamental components and characteristics of the data being examined. It offers a succinct review of the factors considered as well as the observations that have been noted. When combined with simple graphical analysis, it also serves as the foundation for virtual study of quantitative data. The conclusion was based on descriptive statistical price data for *Kharif* Sorghum in the markets of Beed, Dharur, and Parli. 20 observations in all (from 2001 to 2020) were used for the market analysis. The average cost of *Kharif* Sorghum per quintal in various geographically distinct markets ranged from Rs.1440.66 to Rs.1048.85. The findings showed that, in comparison to Dharur and Parli APMC's, Beed had the highest mean price per quintal. Beed market has the highest standard deviation (738.71), followed by Dharur (661.34) and Parli (649.81), in that order. Market prices are unstable, and the coefficient of variation seems to range from higher to lower in some market places.

Conclusions

Analysis of the annually growth rate of arrivals of Kharif Sorghum in Beed market recorded positive and non-significant, While in Dharur and Parli markets recorded negatively significant. Beed, Dharur and Parli markets showed positive and non-significant growth rate in prices of *Kharif* Sorghum. There is strong degree of association in prices between markets.

References

Abdalla A.M. (2016). Sorghum Price and Markets Integration in Sudan. *International Journal of Economics and Management Science,* Vol.**5**, No.363.

Ali Oumer Wintana, Hilary K. Bett, Symon K. Kiprop and Hillary Korir, (2014). Economics Analysis of Spatial Integration of Pulse Market in Ethiopia; A Case of Selected Pulse Market in Ethiopia. *European Journal of Business and Management*, Vol.**6**, No.33.

Amrendr Reddy, (2012). Market integration of grain legumes in India: The case of the Chickpea market. *SAARC Journal Agriculture,* **10**(2), 11-29.

Anuja, A. R., Khar, A., Jha, G. K. and Kumar, R. (2013). Price Dynamics and Market Integration of Natural Rubber under Major Trade Regimes of India and Abroad. *Indian Journal of Agricultural Sciences,* **83**(5), 19-22.

Bandi S., Deshmukh K.V. and More S.S. (2019). Market Integration of Major Maize Markets in Telangana State. International Journal of Current Microbiology and Applied Sciences,8(12), 1583-1591.

Bannor R. K. and Mathur S., (2016). Integration of mustard markets in Rajasthan State of India, *Agriculture Research Journal*, **53**(4), 571-579.

Basu, J. P., and Dinda, S. (2003). Market integration: An application of error correction model to potato market in Hooghly district, West Bengal. Indian Journal of Agricultural Economics, **58**(4), 742-751.

Blay J.K., Subba Rao D.V. and Kumari R.V. (2015). Price Dynamics and Market Integration of Sorghum and Millet Markets in Ghana, *Research Journal of Agriculture and Forestry Sciences, Hyderabad,* **3**(9), 11-12.

Ddungu, S. P., Ekere, W., Bisikwa, J., Kawooya, R., Okello, D. and Kalule, N. (2015). Market and Market Integration of Cowpea in Uganda. *Journal of Development and Agricultural Economics,* **7**(1), 1-11.

Devi, G., and Parmar, P. (2022). Market integration and price transmission of Soybean in Gujarat. *Indian Journal of Agricultural Marketing*, **36**(2), 35-49.

Jadhav, M.C., Ulemale, D.H. and Borkar, A.N. (2011). Trends and seasonal variation in arrivals and prices of soybean in Amravati district, *International Research Journal of Agricultural Economics and Statistics,* **2**(2), 232-235.

Jalikatti V. N., Patil, B. L., Yeledhali, R. A. and Kataraki, P. A. (2013). Price integration of onion in major markets of Northern Karnataka. *Karnataka journal of Agricultural Science,* **26**(1), 160.

Kanade A.U., K.V. Deshmukh, S.S. Pachpute and R.D. Shelke (2016). Trends in Arrival and Prices of Wheat in Parbhani District of Maharashtra State. Multi logic in science.**VI** (XVII)

Kaur, N., Kumar, R. and Brar, R. S. (2018). Market integration among major maize markets in India. *Indian Journal of Economics and Development*. **14**(1a), 185-189.

Kumawat Subhita and Singhal (2015). Trend analysis in market arrivals and prices of Moth Bean in Rajasthan. *Indian journal of Economic and Development,* **11**(4), 843-850.

Navasare, D.J., Perke D.S. & Shelke R.D (2018). Performance of Arrivals and Prices of Sorghum, Tur, Soybean, Chickpea and Bajra in Ahmednagar District, India. *International Journal of Current Microbiology and Applied Sciences ISSN,* **7**(07), 3697-3701.

Nayak, A., Lokesha, H., & Gracy, C. P. (2020). Market integration of major oilseeds and vegetable oils in India- Evidence from Karnataka. International Journal of Agriculture, Environment and Biochemistry,**13**(4), 453-460.

Ravikumar, K. N.; K. Sreelakshmi & V. T. Raju, (2001). Trends in arrivals and prices of selected commodities in Anakapalle regulated market of A.P. *Agricultural Marketing*, **43**(4), 26-34.

Sundaramoorthy, C., Girish, K. J., Suresh, P. & Mathur, V. C. (2014). Market integration and volatility in edible oil sector in India. *Journal of the Indian Society of Agricultural Statistics,* **68**(1), 67-76.

Tahir Mukhtar & Muhammad Tariq Javed (2008). Market Integration in whole sale maize markets in Pakistan, *Regional and Sectoral Economic Studies,* **8**(2).

Table 1. Marketwise trends of arrivals and prices of *Kharif* Sorghum

(Per cent)

Variables	Arrivals			Prices		
	Beed	**Dharur**	**Parli**	**Beed**	**Dharur**	**Parli**
A	15699.07	22947.21	53056.61	211.55	-12.05	52.51
B	497.65	-1161.03	-1818.53	111.27	97.43	88.36
R^2	0.047	0.543	0.416	0.879	0.905	0.802
T	0.948	-4.625	-3.587	11.45	13.10	8.548

Table 2. Marketwise compound growth rate of arrivals and prices of *Kharif* Sorghum

(Per cent)

Variables	Arrivals			Prices		
	Beed	**Dharur**	**Parli**	**Beed**	**Dharur**	**Parli**
A	8.933	10.24	10.90	6.089	5.637	5.707
B	0.068	-0.125	-0.056	0.094	0.104	0.096
R^2	0.189	0.682	0.433	0.878	0.961	0.913
T	2.049	-6.215	-3.714	11.42	21.23	13.77
CGR (%)	7.061	-11.82*	-5.469*	9.902*	11.05*	10.15*

*Significant at the 5 per cent level.

Table 3. Market Integration prices of *Kharif* Sorghum

Market	Beed	Dharur	Parali
Beed	1	0.95**	0.93**
Dharur		1	0.95**
Parali			1

**Significant at 1 per cent level

Table 4. Descriptive statistics of price data for *Kharif* Sorghum markets

Markets	Mean (Rs.)	SD	N
Beed	1440.66	738.71	20
Dharur	1076.00	661.34	20
Parli	1048.85	649.81	20