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Growth and Instability of Sorghum in Marathwada Region

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Abstract

Sorghum is the fifth most important cereal crop in the world. However in India it is third cereal crop after rice and wheat. It was one of the major cereal staple during 1950 but recently its area came down. The present study based on the last 30 year time series data on area, production and productivity to identify the trend. The compound growth rate and coefficient of variation here analysed for period I (1985-86 to 1999-2000), period II(2000-2001 to 2014-15) and overall 30 years (1985-2015) for the major five districts of Marathwada region.The study indicate that compound growth rate for area, production and productivity for almost all the district where negative. The highest decline in the sorghum area is observed in Jalna district followed by Parbhani and Beed district.i.e -33.93, -24.25 and -22.98 percent per annum respectively during the last 30 years i.e. for overall period and the values are found to be statistically significant at 1 percent level of probability. However, the highest coefficient of variation is observed in Jalna district followed by Beed and Parbhani i.e. 82.36, 44.84 and 44.16 percent for area under cultivation of sorghum. The coefficient of variation for area under cultivation for almost all the district were less in period I as compared to period II. The similar pattern was observed in production. On the other hand the growth rate of productivity for the Sorghum was positive for almost all the district and both the period. Highest compound growth rate for productivity during the overall period was observed in Beed followed by Jalnaand Osmanabad district of Marathwada region of Maharashtra State i.e. about 15 percent per annum with the coefficient of variation range in between 28.44 to 41.30 percent. Thus it is concludedfrom the present study that the area under Sorghum cultivation was declining during the study period. Considering the importance of Sorghum as a low input crop and the staple food it is recommended option for the farmer in operating in any environment where other crop not performing well. On the other hand sweet Sorghum was specially used for bioethanol production which is blended with petrolin the developing and developed economies. Considering the importance of sorghum crop, market demand will be increased. Hence, it is need to concentrate on the crop especially to cultivate under marginal and stress prone areas to attend the sustainability.

Keywords: Sorghum, Instability, CGR

Introduction

Sorghum [*sorghum bicolor(L) ,Moench)]* belongs to family Graminae. Sorghum is considered to be originated in Ethiopia or East Central Africa.One of the main staple foods for the world`s poorest and most food-insecure people across the semi-arid tropics.It is the fifth most important cereal crops in the world. after wheat, maize, rice, barley where as in india sorghum is the third cereal crops after rice and wheat.Inindia ,it was one of the major cereal staple during 1950`s and occupied an area of more than 16 million ha. But recently it`s area has come down (48 percent) to 7.67 million ha. By 2009-10 5% of GCA). However,it is still contributes about 6.98 million tons (3.2%)to India`s total production and around 12.7% to the world`s sorghum production .Sorghum often a recommended option for farmers operating in harsh environment where other crops do poorly, as it is grown with limited rainfall(400 to 500mm) and often without application of any fertilizers or other inputs . However, it is grown for a variety of uses in india as well as in the world. On the other hand, sweet sorghum was especially used for bio- ethanol production which is blended with petrol up to 5-10% in the developing and developed economies. Majority of the crop in India is cultivated under marginal and stress-prone areas of the semiarid tropics.

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The nutritional value of Sorghum grains contain about 74.1% starch, 11.2%protein,37% facts, 2.6%crude fibre,1.5%ash, 0.1%teninis, it is also used for the preparation of syrup and penicillin medicine.

Objective of the Study

The objective of the study are

1. To estimate the annual growth rate of area, production and productivity of sorghum.
2. To work out the instability during last 30 year.

Review of Literature

Shende et al. (2009) reveled that, Cotton crop is grown in the entire State except Konkan and eastern Maharashtra. In this study, the growth and instability were estimated. Also assess the relative contribution of area and yield to change in the, output of cotton in Maharashtra. For the study the secondary time series data for 45 years were collected. The results indicate that the compound growth rate of area under crop was more over one per cent for the entire district of all three regions and also the region as a whole during the overall period.

Gajbhiye et al. (2010) reveled that , The present study is an attempt to evaluate the growth and instability of important crop i.e. chickpea. For the present study Vidarbha region of Maharashtra state was chosen .The study was base on secondary data pertained to the year 1980-81to 2007- 08. The results revealed that the growth rates for area and production of chickpea were found significant. Instability studied in chickpea indicated that productivity under chickpea exhibited less variation.

Narala et al. (2011) examined that, The present paper analyzes the growth and instability in cotton area, production and productivity during the period 1951-52 to 2010-11. Growth and instability of cotton during preintroduction (1993-94-2001-02) and post- introduction of Bt cotton periods (2002-03-2010-11) was also analyzed. For this purpose compound growth rates were estimated by fitting the exponential function and coefficient of variation was worked out to find out instability associated. It was found that growth of cotton area and production was significant during 1950s, 1990s and 2001-10.

Paltasingh et al. (2013) examined that, The paper has analyzed the performance of agriculture in terms of growth and instability of yield, area and production of major crops in Odisha. The growth analysis has shown a gloomy picture in the postreform era, as instability has augmented during this period, rendering the agricultural sector of Odisha as unsustainable. The various causes of low growth rate have been identified. The study has discarded the hypothesis of direct relation between high growth and high instability

Methodology

In this study, for the analysis of growth and instability. The period was divided into breakup of 15 years and overall as shown.

Period I : 1985-86 to 2000-01
Period II : 2001-02 to 2014-15
Overall : 1985-86 to 2014-15

The compound growth rate of area, production and yield for Sorghum for each Sorghum growing district of Marathwada region (Maharashtra State) were estimated to study the growth. It was estimated with the following exponential model.

$$Y = a\,b'$$
$$CGR = (Antilog\ b-1) \times 100$$

The 't' test was applied to test of significance of 'b'

To measure the instability in area, production and productivity, and index of instability was used as measure of variability. The coefficient of variation (C.V) will be calculated by the formula-

$$CV(\%) = \frac{Standard\ Deviation}{Mean} \times 100$$

The simple Coefficient of Variation (C.V) often contains the trend component and thus over estimates the level of instability in time series data characterized by long term trend.

Result & Discussion

Growth Performance in Sorghum

The growth performance of Sorghum pertaining to two periods and overall is discussed separately for each region as under

Table No.:1
District wise Compound growth rates for MarathwadaRegion

Period		Aurangabad	Jalana	Beed	Latur	Osmanabad	Nanded	Parbhani	Marathwada Region
I	A	-26.38	-41.18	-10.20	2.38	-2.35	1.45	-20.44	-13.81
	P	-26.53	-46.43	-17.47	3.05	-8.55	-8.03	-3.85	-15.40
	Y	9.68	0.69	7.70	10.66	2.94	-0.65	3.98	5.00
II	A	-9.87	-8.42	-6.60	-3.85	-6.90	-3.69	-1.53	-5.83
	P	7.51	4.13	12.18	22.70	9.11	16.37	-16.44	7.93
	Y	15.19	11.20	21.29	25.13	20.01	18.05	17.87	18.39
Overall	A	-27.27	-33.93	-22.98	-20.53	-19.71	-21.48	-24.25	-24.30
	P	25.89	-33.27	-22.93	-16.58	-19.43	-20.71	-22.26	-15.61
	Y	-13.64	15.21	-15.83	-11.34	-15.32	-14.06	-13.41	-14.11

Note: A-Area, P-Production, Y-Yield, * Significant at 5% level and ** Significant at 1% level.

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Compound growth rate

The district-wise compound growth rates of area , production and productivity of Sorghum in Marathwada region of Maharashtra Sate for two periods and overall were also worked out and presented in Table1.which reveals that during period I, the compound growth rate were negative for almost all the districts and also region as a whole except Latur district. whereas highest declining trend in area was registered in Jalana (-41.18 % per annum) followed by Aurangabad (-26.38 % per annum) . Almost same trend was observed in terms of production and productivity in the region.

However the picture has changed during the period II. The compound growth rate for production and productivity have been positive almost all district in the region except Parbhani .It was further interestingly noted that the production and productivity had increased more than 2 % in almost all districts in Marathwada as well as the region as a whole except Parbhani. In the Laturdistict highest growth for production was estimated i.e. 22.70 followed by

Nanded(16.37 % per annum) also in Marathwada region (7.93 % per annum) .

The growth rates were also worked out for overall period of 30 years, and it was observed that almost all regions had declining growth rate along with the region as a whole.

Instability in Sorghum

One should not be obvious of instability by taking the growth rate only. Because the growth rates will explain only the rate of growth over the period, whereas instability will judge whether the growth performance is stable or unstable for the period for the pertinent variable. To facilitate better understanding of the magnitude and pattern of changes in the level of production, cropped area and productivity of Sorghum in the different Sorghum growing district growth rates and instability has been worked out. An attempt was made to study fluctuations in area, production and yield Sorghum across the major Sorghum growing districts in Marathwada region for two period and overall. The results are presented in Table 2 and discussed as under

Table No.2
Districtwise Instability of Sorghum in Marathwada Region.

Sr. No	Division & District		Period I			Period II			Overall		
			A	P	Y	A	P	Y	A	P	Y
I)	**Div: Aurangabad**	CV	20.84	27.35	29.25	72.05	60.62	31.35	68.96	70.27	29.80
1.	Aurangabad	Mean	468.40	594.20	1371.93	114.60	148.33	1381.80	291.23	371.26	1376.90
2.	Jalna	CV	27.71	30.17	29.96	83.65	85.84	25.82	82.36	83.09	28.44
		Mean	655.80	748.53	1226.60	104.93	123.13	1087.33	380.36	435.83	1156.96
3.	Beed	CV	15.10	38.29	43.50	41.29	54.78	28.54	44.84	60.09	37.94
		Mean	1019.86	1029.20	1065.53	459.53	435.33	924.26	739.70	732.26	994.90
II)	**Division: Latur**	CV	11.14	44.91	44.17	20.22	28.31	20.36	23.10	43.18	33.37
1.	Latur	Mean	1862.80	2419.80	1268.30	1308.20	1740.30	1329.30	1585.53	2080.10	1298.83
2.	Osmanabad	CV	17.93	46.54	39.77	22.06	50.16	36.52	25.86	56.64	41.30
		Mean	964.13	890.86	948.40	679.20	492.46	701.80	821.66	691.66	825.10
3.	Nanded	CV	8.43	36.52	39.50	21.13	38.91	28.61	26.46	49.81	35.53
		Mean	2362.40	3199.33	1259.20	1497.73	1667.33	1087.60	1930.06	2433.30	1173.40
4.	Parbhani	CV	9.23	38.59	36.42	20.98	34.51	24.77	44.16	60.19	30.95
		Mean	1984.33	2350.60	1172.73	817.26	925.13	1121	1400	1637.80	1146.80

Note: cv- Coefficient of variation (per cent per annum) . M- Mean. (Area: 00ha, Production: 00 tonne, Productivity: kg/ha).

Conclusion

The results of this study lead to the conclusion that:

1. The compound growth rates for area, production and productivity were negative for almost all the Sorghum growing districts in the study during the first period. But the picture was changed and

the growth rate estimated positive during second period.

2. The compound growth rate of area under crop that values are statistically significant at 1 per cent level of probability, the coefficient of variation for area, production and productivity of first and second period was negative but other hand the growth rate of productivity for the

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sorghum was positive foe almost all the district of all period. It was proof the fact that the sorghum crop was traditional crop in the region as well as the state. Hence, there is a very big need to concentrate on this crop by policy maker and researchers.

3. The production and productivity instability in Sorghum crop were observed in almost the entire district in the state. It may be because the crop largely depends on vagaries of nature and Sorghum production is subject to fluctuation from year to year and thus, causing heavy losses. Farmer cannot bear risk due to scare resources and small holding. A crop failure means not only the loss of farmer's income but also the loss of investment in the next crop season. This leads farmer to indebtedness. In order to maintain stability in production of Sorghum. Concerned efforts should be made in the state.

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