TEMPORAL BEHAVIOUR OF THE CEREALS IN NAGPUR DISTRICT

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ABSTRACT

Share of Agriculture & allied Sectors in total GVA (at current 2011-12 prices) in year 2014-15 has been 17.40 percent. The inflation rate of the cereals has been 3.6 percent in year 2014-15. The Foodgrain production of India is 253.16 million tons in year 2015-16(GoI, 2016). The cereals production in India was 231.6 million tons. The Foodgrains production in Maharashtra has been 11.47 million tons in year 2014-15(GoM, 2016), whereas the cereals production is 9.27 million tons in same year in Maharashtra.

Foodgrains is our daily need. One can survive with other materialistic needs but without food, nobody can survive. Cereals are basic food of human being. The area, productivity and production of theses major cereal crops changes over the time. The production is function of productivity and area. If any crop shows good productivity, its area increases over the time. It can be said if area of any particular crop increases, it may be profitable and assured crop. So decomposition of the area and production data can throw light on various dimension and elements of the changes in economic upliftment of the farmer. With this intension, the present research work is taken. In this paper an attempt is made to find out the growth, instability and mutual effects over the time in Area, Productivity and Production of the cereal crops in Nagpur district.

The objectives of the paper are 1)To estimate the growth rates of the Area, Productivity and Production for cereal crops in Nagpur district; 2)To study the instability in the Area, Productivity and Production of cereal crops in Nagpur district; 3) To find the effect of Area and Productivity on Production of the cereal crops in Nagpur district;

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The data is collected from the Department of Agriculture, Government of Maharashtra on the area, productivity and production of the selected cereal crops for the period from the year 2000-2001 to 2014-15 on Rice, Maize, Kharif Sorghum, Rabi Sorghum, Wheat and Total Cereals.

From the results, it is concluded that the growth in the area, productivity and production of Rice, Wheat and Total Cereals are positive, whereas growth is negative in the area, productivity and production of Maize and Kharif Sorghum. The growth in area of Rabi Sorghum is negative and in Productivity, it is positive. The area, productivity and production have been instable during the selected 15 years ranges from 7 to 24 percent. The past acreage of the cereal crops has contributed positively in current years' production.

1. Introduction

Share of Agriculture & allied Sectors in total GVA (at current 2011-12 prices) in year 2014-15 has been 17.40 percent. The inflation rate of the cereals has been 3.6 percent in year 2014-15. The Foodgrain production of India is 253.16 million tons in year 2015-16(GoI, 2016). The cereals production in India was 231.6 million tons. The Foodgrains production in Maharashtra has been 11.47 million tons in year 2014-15(GoM, 2016), whereas the cereals production is 9.27 million tons in same year in Maharashtra.

Foodgrains is our daily need. One can survive with other materialistic needs but without food, nobody can survive. Cereals are basic food of human being. Cereals are basically grass type crop which are cultivated for its grains production. These grains are good sources of vitamins, minerals, carbohydrates, protein, fats and oils. In some developing nations, grain in the form of rice, wheat, millet, or maize constitutes a majority of daily sustenance. In developed nations, cereals consumption is moderate and varied but still substantial.

The major grown cereals in Nagpur district are Rice, Sorghum, Maize and Wheat. The area, productivity and production of theses major cereal crops changes over the time. The production is function of productivity and area. If any crop shows good productivity, its area increases over the time. It can be said if area of any particular crop increases, it may be profitable and assured crop. So decomposition of the area and production data can throw light on various dimension and

elements of the changes in economic upliftment of the farmer. With this intension, the present research work is taken. In this paper an attempt is made to find out the growth, instability and mutual effects over the time in Area, Productivity and Production of the cereal crops in Nagpur district. This paper will be useful to know the status, trend and stability of the Area, Productivity and Production and it will also point the decision of the farming community to continue the same crop on the basis of past area and productivity in Nagpur district.

2. Objectives

The objectives of the paper are given below

1. To estimate the growth rates of the Area, Productivity and Production for cereal crops in Nagpur district;
2. To study the instability in the Area, Productivity and Production of cereal crops in Nagpur district;
3. To find the effect of Area and Productivity on Production of the cereal crops in Nagpur district;

3. Methodology :

This section will focus on the source of data, period of the data, crops included, methods adopted to achieve the objectives.

3.1. Source of data.

The data is collected from the Department of Agriculture, Government of Maharashtra on the area, productivity and production of the selected cereal crops.

3.2. Period of the data.

The annual data is collected from the year 2000-2001 to 2014-15 on the area, productivity and production of the selected cereal crops.

3.3. Major Cereal crops of the Nagpur district

The major cereal crops i.e. Rice, Sorghum, Maize and Wheat are selected for the present research paper and are presented as below.

- Rice
- Maize
- Kharif Sorghum
- Rabi Sorghum
- Wheat
- Total cereals

3.4. Analytical Tools:

The tools are used to estimate growth, instability and effect of area and productivity on production. These tools are as follows

3.4.1. Estimation of Growth

In the present study, the compound growth rates in area, productivity and production of cereals are estimated as follows

The exponential equation of the following type was used.

$Y=ab^t$

Where

Y = Area, productivity and production

(Area in "00" ha, Production in "00" Tonnes, Productivity in Kg /ha.)

t = time period in years

b = trend value (coefficient)

a = intercept.

Compound growth rate= (Antilog b-1) x 100. (Chand and et al. 2012)

The significance of the estimated compound growth rates was tested with the help of 't' test.

For getting normal base year, the triennial averages of the years 2000-01, 2001-02 and 2002-03 are taken as base year.

3.4.2. Estimation of Instability

To estimate the instability of area, productivity and production of cereal, the Coefficient of variation and Cuddy Della Index is used. The formula is as fallows

a) Coefficient of Variation(CV) : Standard Deviation/Mean

To avoid the over estimation of CV, the following Cuddy Della Index (Ix) is used in comparison with CV.

b) Cuddy Della Index (Ix) was calculated as follows:

$$I_x = CV\sqrt{(1-\bar{R}^2)}$$

Where, CV = Coefficient of variation ($\sigma/\bar{X}$)

$\bar{R}^2$ = Adjusted coefficient of multiple determination

3.4.3. Method for effect of Area and Productivity on Production

To estimate the effect of Area and Productivity on Production of cereals in Nagpur district, the Crop Acreage Response Model is used. In this model, the effect of lagged years' area and productivity on the present production of the respective cereal crop is estimated.

$y = a + b_1A_{t-1} + b_2P_{t-1} + u$

y = Production of selected crop (00 tons)

a = Intercept

A_{t-1} = Area under selected crop (00 ha)

P_{t-1} = Productivity of selected crop (Kg/ha)

b_i (1 to 2)= Coefficients of respective variables

4. Results and Discussion

Results regarding the temporal behaviour of the cereals crop in Nagpur districts are presented and discussed in this section on the line of objectives mentioned.

4.1. Growth Rates of Area, Productivity and Production of Cereals in Nagpur district.

The result of the Compound Growth Rates of Area, Productivity and Production of Cereals in Nagpur district are presented in table no. 1. The results show that the area and productivity of Rice is increased over selected 15 years by 5.52 and 0.95 percent per annum respectively. Consequently, the production of Rice is also increased by 6.52 percent significantly from year 2000-01 to 2014-15. In case of Maize, the area, productivity and production declined non-significantly over the 15 years by 0.15, 2.58 and 2.55 percent.

In, the Sorghum(Jowar), due to different performance in Kharif and Rabi season, it is studied in both season separately. In Kharif Sorghum, the area and productivity is declined by 17.74 and 3.31 percent over 15 years, thus the production also declined by 20.45 percent significantly. Same trend is observed in the area and production of the Rabi Sorghum. But the productivity of Rabi Sorghum is improving over the selected period by 3.79 percent.

Table 1. Growth Rates of Area, Productivity and Production of Cereals in Nagpur district from the year 2000-01 to 2014-15.

Sr. No.	Crop	Area		Productivity		Production	
		CGR	Cal t-value	CGR	Cal t-value	CGR	Cal t-value
1	Rice	5.52	10.26***	0.95	0.85	6.52	5.82***
2	Maize	-0.15	0.05	-2.58	1.22	-2.55	0.82
3	Kharif Sorghum	-17.74	13.99***	-3.31	2.93**	-20.45	10.46***
4	Rabi Sorghum	-12.66	10.14***	3.79	2.99***	-9.59	4.52***
5	Wheat	8.90	8.32***	1.67	1.96**	10.72	6.64***
6	Total cereals	2.26	4.79***	2.25	3.02***	4.57	4.31***

Note: * = Significant at 10 percent (table T value is 1.761)

**** = Significant at 10 percent (table T value is 2.145)**

***** = Significant at 10 percent (table T value is 2.977)**

Overall, total cereals including major and minor(Ragi, Bajra etc.) cereal crops shows positive trend in area, productivity and production by 2.26, 2.25 and 4.57 percent respectively and significantly from year 2000-01 to 2014-15.

Wheat is major Rabi crop and its area and productivity is increased by 8.90 and 1.67 percent significantly, as a result the production is increased by 10.72 percent significantly from year 2000-01 to 2014-15.

4.2. Instability of Area, Productivity and Production of Cereals in Nagpur district

The table no.2 shows the instability of Area, Productivity and Production of Cereals in Nagpur district from year 2000-01 to 2014-15. Coefficient of Variation and Cuddy- Della Index are showing instability in area, productivity and production.

The instability indicates the variation in the selected indicator over the period of the study. The Cuddy Della Index indicates instability at controlled level. The area under Maize crop was highly unstable(31.02 percent). The area of the rice was little bit stable as compared to other major cereal crops, it is 9.30 percent. The instability of Kharif sorghum and wheat was almost same i.e. 14.12 and 14.89 percent respectively. Overall, the area of the total cereals was unstable by 7.29 percent.

Table 2. Instability of Area, Productivity and Production of Cereals in Nagpur district from the year 2000-01 to 2014-15.

Sr. No.	Crop	Area		Productivity		Production	
		CV	Cuddy – Della Index	CV	Cuddy – Della Index	CV	Cuddy – Della Index
1	Rice	25.90	9.30	17.88	17.41	32.91	17.43
2	Maize	31.34	31.02	31.65	30.25	42.53	42.04
3	Kharif Sorghum	67.59	14.12	20.41	15.76	72.53	19.99
4	Rabi Sorghum	60.59	24.58	29.08	22.52	46.62	24.37
5	Wheat	39.02	14.89	15.84	13.79	48.16	24.82
6	Total cereals	12.57	7.29	15.73	12.22	25.41	15.91

In Productivity, the productivity of Maize crop was highly untable i.e. 30.25 percent. The instability of Rice, Kharif Sorghum, Rabi Sorghum and Wheat was 17.88, 15.76, 22.52 and 13.79 percent per annum respectively. Overall the instability of the all total Cereals was 12.22 percent.

In Production, as above Maize is found more unstable i.e. 42.04 percent. The instability of Rice, Kharif Sorghum, Rabi Sorghum and Wheat was 17.43, 19.99, 24.37 and 24.82 percent respectively. Overall the instability in production of the all total cereals was 15.91 percent.

The Coefficient of Variation shows that variation of the almost all parameters is higher than the variation showed by Cuddy Della Index.

4.3. Effect of Area and Productivity on Production of Cereals in Nagpur district

The table.3 depicts the effect of Area and Productivity on Production of Cereals in Nagpur district from the year 2000-01 to 2014-15. The results indicate that the effect of lagged values of area has made positive contribution in production of almost all crops (significantly). The regression coefficient of lagged value of area was 0.98, 0.38, 1.04, 0.63, 0.96 percent in case of Rice, Maize, Kharif Sorghum, Rabi Sorghum and Wheat respectively and it has positive and significant parity with current years' production. While the productively performance of the past years has declined the production in current year, but the results are non-significant. Overall, in the total cereals, the lagged area contributed positively i.e. 0.99 percent per annum and significantly. Whereas lagged productivity series has negative effect on present production. It indicates that the farming community is continuing the same cereal crops on the basis of the past years' area sown and its stability. The area sown of a cereal crop in past year will be more or less positively continued in next year.

Table 3. Effect of Area and Productivity on Production of Cereals in Nagpur district from the year 2000-01 to 2014-15.

Sr. No.	Crop	Intercept	Area		Productivity	
			b1	T value	b2	T value
1	Rice	120.55	0.98	8.17***	-0.06	-0.86
2	Maize	2.07	0.38	1.19	00	0.00
3	Kharif Sorghum	52.22	1.04	20.80***	-0.12	-2.00
4	Rabi Sorghum	25.92	0.63	2.52**	-0.03	-0.75
5	Wheat	213.98	0.96	5.05***	-0.12	-0.60
6	Total cereals	405.05	0.99	3.09***	-0.31	-1.07

Note: * = Significant at 10 percent (table T value is 1.761)

**** = Significant at 10 percent (table T value is 2.145)**

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5. Conclusion

From the results, it is concluded that the growth in the area, productivity and production of Rice, Wheat and Total Cereals are positive, whereas growth is negative in the area, productivity and production of Maize and Kharif Sorghum. The growth in area of Rabi Sorghum is negative and in Productivity, it is positive. The area, productivity and production have been instable during the selected 15 years ranges from 7 to 24 percent. The past acreage of the cereal crops has contributed positively in current years' production.

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