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Decomposition analysis of wheat in Amravati district

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Abstract

In this study an attempt had been made to study the growth and instability of wheat in Amravati District. The study is based on secondary data on area, production and productivity of Wheat collected from the various Government publications. The study revealed that at overall level only the production of Wheat is increased by 1.58 percent per annum while the yield shows stagnant growth the area of Amravati District has declined (i.e. -0.94 percent per annum) the coefficient of variation of Wheat in Amravati with regards to area, production and productivity was 49.55, 65.04, 28.26 percent respectively, while regards to area, production and productivity was 48.91, 63.26 and 18.55 percent respectively. Decomposition analysis of Wheat shows that the area effect was the most responsible factor for increasing the production of Wheat in Amravati District.

Keywords: Growth rate, instability, production, productivity

Introduction

Wheat (*Triticum* spp.) is a cereal grain, originally from the South West Asia, but now cultivated worldwide. In 2010, world production of wheat was 651 million tons, making it the third most-produced cereal after maize (844 million tons) and rice (672 million tons). Wheat was the second most-produced cereal in 2009; world production in that year was 682 million tons, after maize (817 million tons), and with rice as a close third (679 million tons). In 2012-13 the world production of wheat was 654 (Million tons), in India area was 29647 (000'ha), production 92458 (000't), productivity 3119 (kg/ha) and India share out of world production is 13.15%. In Maharashtra area production and productivity is 594 (000'ha), 875 (000't) and 1473 (kg/ha) respectively. In 2011-12 Amravati District area, production and productivity was 325 (00'ha), 598 (00't) and 1840 (kg/ha) respectively. It has been describe as the "King of Cereal". India has second rank in world wheat production.

In 2012-13 Amravati District Area, Production and Productivity was 361(00'ha), 715 (00't) and 1981 (kg/ha) respectively). Since the area under wheat in Amravati District is increased over the period of time.

Methodology

The major aspect of present study was to asses the extent of growth and instability in area, production and productivity of Wheat in Amravati District.

Selection of area

For the present study wheat is a crop of Amravati District

Selection of period

The study was based on secondary data collected from Amravati District. The secondary data on area, production and productivity of wheat will be collected from various Government publications of last 30 years.

Period I	:	1983-84 to 1992-93
Period II	:	1993-93 to 2002-03
Period III	:	2003-04 to 2012-13
Overall Period	:	1983-84 to 2012-13

Nature and Source of Data

Data used for present study was collected from various governments and published source. The time series secondary data on area, production and productivity of selected crop were obtained from various government published source.

Growth rate analysis

The growth rates in area, production and productivity was studied by estimating compound growth rates at different periods.

The growth rate was estimated using following model

$$Y = a.b^t$$

Where

Y = Area / Production / Productivity

a = Intercept

b = Regression coefficient

t = Time Variable

From the estimated function the compound growth rate is worked out by

$$CGR (r) = [\text{Antilog} (\log b - 1)] \times 100$$

Where

r = Compound Growth Rate

Degree of Instability

The degree of instability in area, production and productivity of wheat of different period was measured by using coefficient of variation and coefficient of instability.

$$\text{Coefficient of variation (CV)} = \frac{\sigma}{\bar{X}} \times 100$$

Where

$$\sigma = \text{Standard Deviation} = \sqrt{\frac{\sum (X - \bar{X})^2}{n}}$$

\bar{X} = Arithmetic Means

Coefficient of instability was worked out by using Coppices instability index

$$V = \log \frac{\sum (\text{Log} \frac{X_t + 1}{X_t} - m)}{N}$$

$$\text{The instability index} = [\text{Antilog} (\sqrt{V \log}) - 1] \times 100$$

Where

X_t = Area/ Production / Productivity of crop in year t

N = Number of year minus one

M = Arithmetic mean of the differences between the log of X_t and X_{t-1}, X_{t-2} etc.

V log = Log Arithmetic Variance of series.

Decomposition Analysis

The measure the relative contribution of area and yield to the total output change for the major crops, Minhas (1964). The decomposition analysis model as given below was used. The

method state that if A₀, P₀ and Y₀ respectively area, production and productivity in base year and A_n, P_n and Y_n are values of the respective variable in nth year item.

$$P_0 = A_0 \times Y_0 \text{ and } P_n = A_n \times Y_n \text{ (1)}$$

Where

A₀ and A_n represent the area and Y₀ and Y_n represents the yield in the base year and nth year respectively.

$$P_n - P_0 = \Delta P, A_n - A_0 = \Delta A, Y_n - Y_0 = \Delta Y \text{ (2)}$$

From equation (1) and (2) we can write

$$P_0 + \Delta P = (A_0 + \Delta A) (Y_0 + \Delta Y)$$

Hence

$$P = \frac{A_0 \Delta Y}{\Delta P} \times 100 + \frac{Y_0 \Delta A}{\Delta P} \times 100 + \frac{\Delta Y \Delta A}{\Delta P} \times 100$$

Production = Yield effect + Area effect + Interaction effect

Thus, the total change in production can be decomposed into three components viz. yield effect, area affect and the interaction effect due to change in yield and area.

Growth performance of wheat

In this study, the growth in area, production and productivity of selected crop was estimated using compound growth rates as indicated in the methodology chapter. In this analysis, the general growth performance of the crop in Amravati District were examined by fitting exponential growth function with time normalization on area, production and productivity. The growth performance of the crop pertaining to three periods and overall is discussed for Amravati District as under.

The growth performance of wheat pertaining to three periods and overall was presented in the Table 1, which revealed that during period I, the compound growth rate of area, production and productivity of what positive and significant. In the period I, the area under wheat has increased by 3.10 per cent per annum with increased in production (i.e. 3.91 per cent per annum) and productivity (i.e. 4.72 per cent per annum) The table also revealed that, in period II and period III the area production and productivity shows increasing.

At overall level, the Table 1 shows that, during period 1982-83 to 2012-13, the area of Amravati District declined (i.e. - 0.94 per cent per annum) and non significant and production (i.e.1.58 per cent per annum) and productivity (i.e.2.55 per cent per annum) at overall level, only productivity at wheat shows positive and significant growth.

Table 1: Growth Performance of Wheat

Sr. No.	Particular	Period I	Period II	Period III	Overall
1	Area	3.10***	1.87*	4.16***	-0.94
2	Production	3.91*	3.76	28.95***	1.58
3	Productivity	4.72**	5.80	7.55***	2.55***

(Note: ***, ** & * denotes significances at 1%, 5% & 10% level of significances)

Instability in Wheat

In order to know the instability in area, production and yield of wheat fluctuation measured with the help of coefficient of variation. The results are presented in Table 2 and discussed as under for the period with ten years breakage and overall also. Fluctuation in area, production and productivity due to the uncontrollable factors like climatic conditions can cause upward bios in coefficient of variation.

Table 2: Coefficient of variation in area, production and productivity at wheat in Amravati District.

Sr. No.	Particular	Coefficient of variation (%)			Overall
		I	II	III	
1	Area	29.56	19.50	57.17	49.55
2	Production	30.48	35.28	69.81	65.04
3	Productivity	20.64	19.22	23.11	28.26

As seen from Table 2, the coefficient of variation in area for overall period was 49.55 percent during the period I, there was highest variation as compared to second period value of coefficient of variation of period I and period II (i.e. 29.56 per cent and 19.50 per cent) respectively.

During III period Amravati District recorded highest variation as compared to I and II period coefficient variation of III period is 57.17 per cent.

It is cleared that this District exhibited less variation in second period and highest variation in area during third period of study.

As revealed from Table 2 the District witnessed very high instability of production as indicated by high coefficient of variation of 65.04 percent for overall period.

Among periods under study the first period has coefficient of variation in production. Value of 30.48 percent, while during the second period it was 35.28 percent and third period it was 69.81 percent. Thus, it is cleared from the study that the production of wheat in Amravati District was increased during the period of study.

Results on coefficient of variation of productivity were presented in Table 2 as revealed from this table, the productivity of wheat over the entire period shows low coefficient of variation of 28.66 percent. The first period witnessed coefficient of variation of 20.64 percent while in second period, the instability in productivity of wheat decreased to 19.22 percent and third period the instability in productivity of what is increasing by 23.11 percent.

From above it is cleared that the instability in wheat was decreased during second period and productivity were decreased over period at time. Coefficient of variation overall period was (i.e. 28.26 per cent per annum).

Table 3: Cop pocks Instability Index of area, production and productivity of wheat in Amravati District.

Sr. No.	Particular	Coefficient of variation (%)			Overall
		I	II	III	
1	Area	18.57	16.47	30.66	48.91
2	Production	26.56	32.48	31.82	63.26
3	Productivity	15.29	18.87	9.10	18.55

From Table 3 that the instability index of area under wheat for overall was 48.91 percent.

During first period the instability in area was comparatively low which means that there was instability in area under wheat. This was increased during period third (30.66 percent)

Above table present instability index for production the instability index of production for the overall period was 63.26 percent.

During first period the instability index was 26.56 percent while in second period the instability index witnessed 32.48 percent and third period instability index was 31.82 percent. Revealed from table 3, that the instability index during overall period 18.55 percent during first period instability index 15.29 percent while in second period instability index was 18.87 percent and third period instability index was 9.10 percent.

Decomposition analysis of wheat

The decomposition of wheat production in area, yield and interaction effect is presented in Table 4 and results demonstrate that per cent contribution of area, yield and their interaction for increasing production of wheat in Amravati District.

The decomposition of wheat production in area, yield and interaction effect is presented in Table 3 and results demonstrate that per cent contribution of area, yield and their interaction for increasing production of wheat in Amravati District and overall also.

Table 4: Percent contribution of area, yield and their interaction for increasing production of wheat.

Period	Particulars	Amravati
Period I	Area effect	-96.99
	Yield effect	12.45
	Interaction effect	72.47
Period II	Area effect	38.21
	Yield effect	45.10
	Interaction effect	16.67
Period III	Area effect	17.47
	Yield effect	43.16
	Interaction effect	39.35
Overall	Area effect	13.91
	Yield effect	-14.39
	Interaction effect	-24.71

During Period I, the results clearly indicated that, the area effect (-96.99 per cent) was declined while yield effect (i.e. 12.45) and interaction effect (72.47) whereas yield effect and interaction effect were positive for Amravati District.

On the contrary in period II it was noticed that the area effect was 38.21 per cent which has been responsible for increasing production of wheat, whereas yield and interaction effect was 45.10 per cent 16.67 per cent respectively.

In period III area effect 17.47 per cent which has been responsible for increasing production of wheat, whereas yield and interaction effect was 43.16 per cent and 39.35 per cent respectively.

During overall period the area effect was most responsible factor for increasing wheat production in Amravati District, whereas yield effect and interaction effect -14.39 per cent and -24.71 per cent respectively.

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