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Growth Rate of Wheat Crop in Varanasi division of Eastern Uttar Pradesh, India

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A B S T R A C T

Wheat (*Triticum aestivum* L.) is most important staple crop of the world and is major constituents of Indian agriculture and nutritional security due to their high yield, economic viability, ability to generate on-farm and off-farm employment. The paper analyzes the growth in terms of area, production and productivity of wheat in Varanasi Division of Eastern Uttar Pradesh. The growth was examined by Linear Growth Rate (LGR) and Compound Annual Growth rate (CAGR) for period 2000-01 to 2014-15.

Introduction

Varanasi Division consists of 4 districts of Varanasi, Chandauli, Ghazipur, and Jaunpur.

Wheat (*Triticum* species) is a crop of global significance. It is grown in diversified environments.

It is a staple food of millions of people. Approximately one-sixth of the total arable land in the world is cultivated with wheat is grown in all the continents of the world. It supplies about 20 per cent of the food calories for the world's growing population. Global wheat production touched 729 million tonnes in 2013-14. India is the second largest producer of wheat after China.

Materials and Methods

The present study is primarily based on the time series secondary data- Area, Production and Productivity of Wheat in Varanasi division of eastern Uttar Pradesh.

Based on Sankhikiya Patrika, Agricultural Statistics at a Glance, etc.

Estimation of growth rate

Linear growth rate (LGR) and compound growth rate (CGR) were used for the estimation of growth rates for area, production and productivity of Wheat in Varanasi division of eastern Uttar Pradesh, India.

By linear function

Linear function is given by the equation:

$X_t = at + b$

Where,

t is the time in years, independent variable

X_t is the trend value of the dependent variable (production/area/productivity)

a and b are constants

The above equation is fitted by using the least squares method of estimation.

The linear growth rate is calculated by the formula:

Linear growth rate (LGR %) = $\frac{b}{\bar{y}} \times 100$

By compound function

Compound function is given by the equation:

$X_t = ab^t$

Log X_t = Log a + t log b

Where,

X_t is the characteristic (area or production or productivity)

t is the time in years, independent variable

a and b are constants

The 'a' and 'b' are calculated by applying the method of Least Squares.

Compound growth rate worked out as:
Compound growth rate: CGR (%) = (antilog b - 1) x 100

Results and Discussion

The linear growth rates and compound growth rates for the study period of 2000-01 to 2014-15 are estimated by fitting the linear function and compound function to the area, production and productivity of Wheat.

Growth rates in production, area and productivity of wheat crops in Varanasi division of Eastern Uttar Pradesh

Above graph shows alarming year to year fluctuation in particular period 2013-15 moving average has less year to year fluctuation.

Above graphs shows increasing trend of area indicating importance of wheat crop in the area. Production in year 2013-14 & 2014-15 declined the fact that increased area was under wheat during the period this indicates challenge in production which need to be addressed for sustainable growth

Above graphs shows marked decline of productivity in year 2013-2015 due to severe drought.

Growth rates in production

In Varanasi division the coefficient of variation is 16.93. Linear and compound growth rates were 2.47 and 2.48 per-cent per annum respectively. The production of wheat in Varanasi division of Eastern Uttar Pradesh exhibited a positive trend (Fig. 1).

Fig.1 Trend of production of wheat in Varanasi division of Eastern Uttar Pradesh from 2000-01 to 2014-15

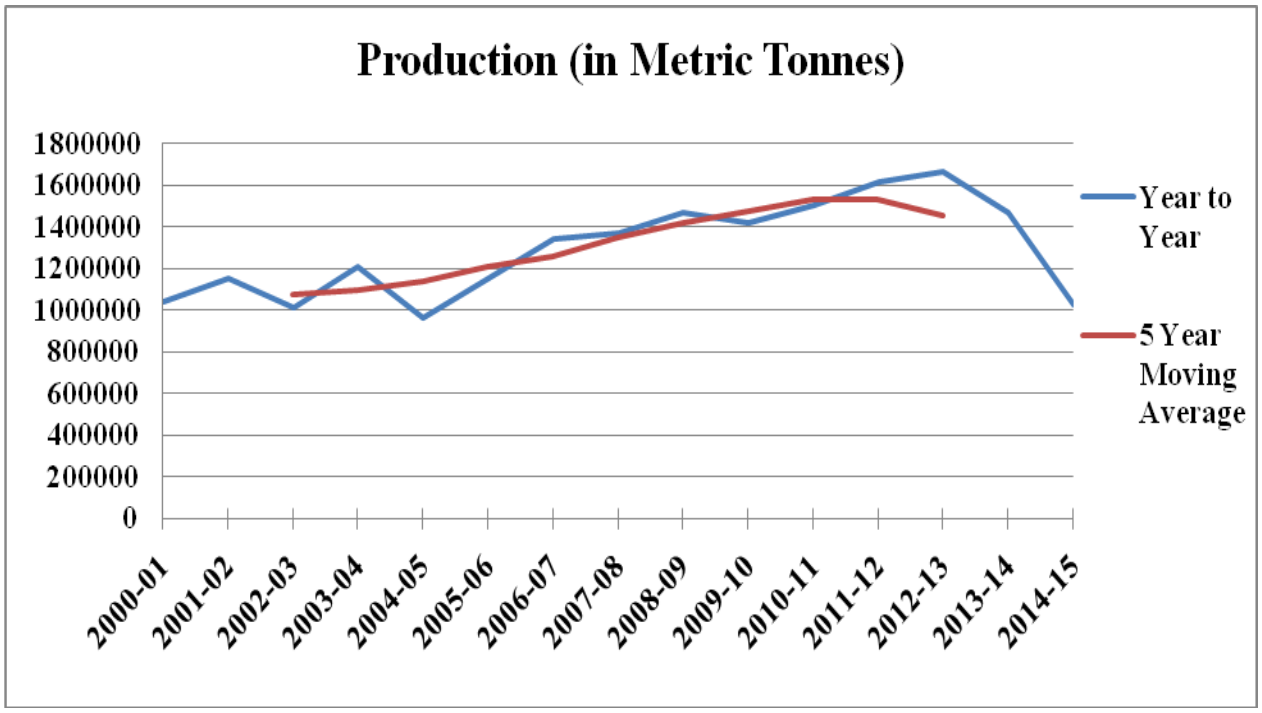

Fig.2 Trend of area under wheat in Varanasi division of Eastern Uttar Pradesh from 2000-01 to 2014-15

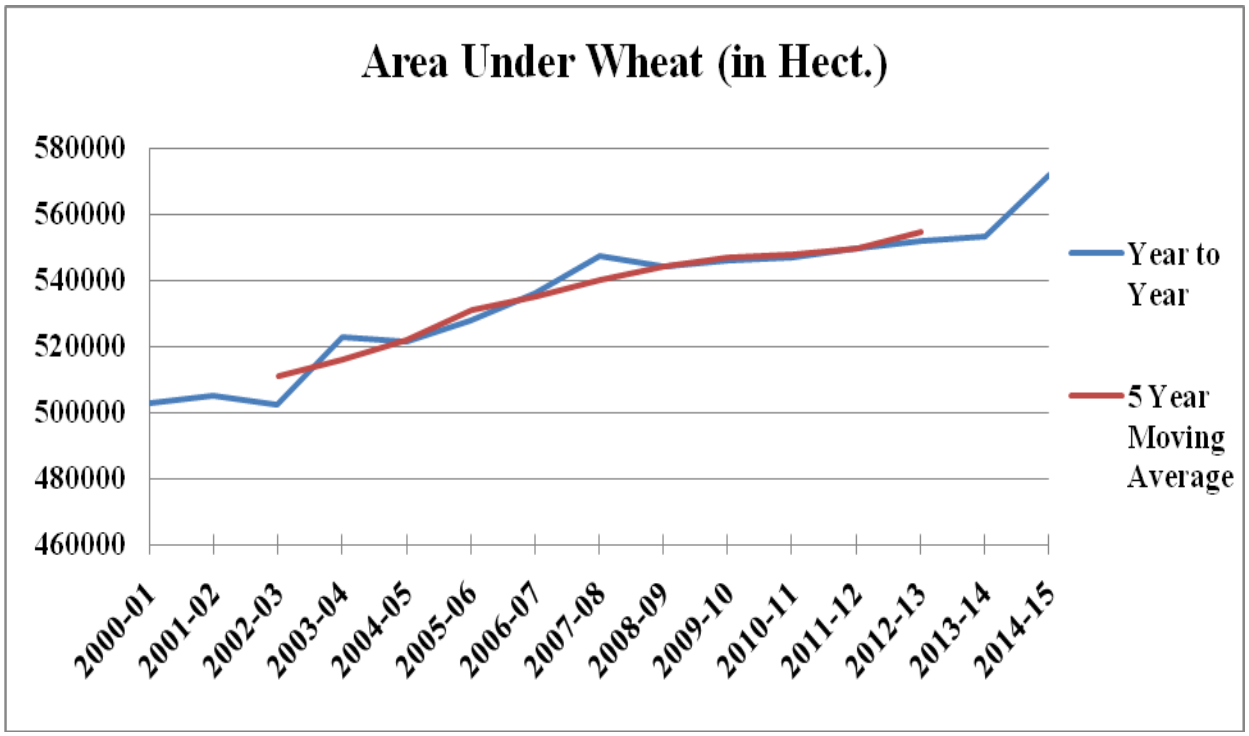

Fig.3 Trend of productivity of wheat in Varanasi Division of Eastern Uttar Pradesh from 2000-01 to 2014-15

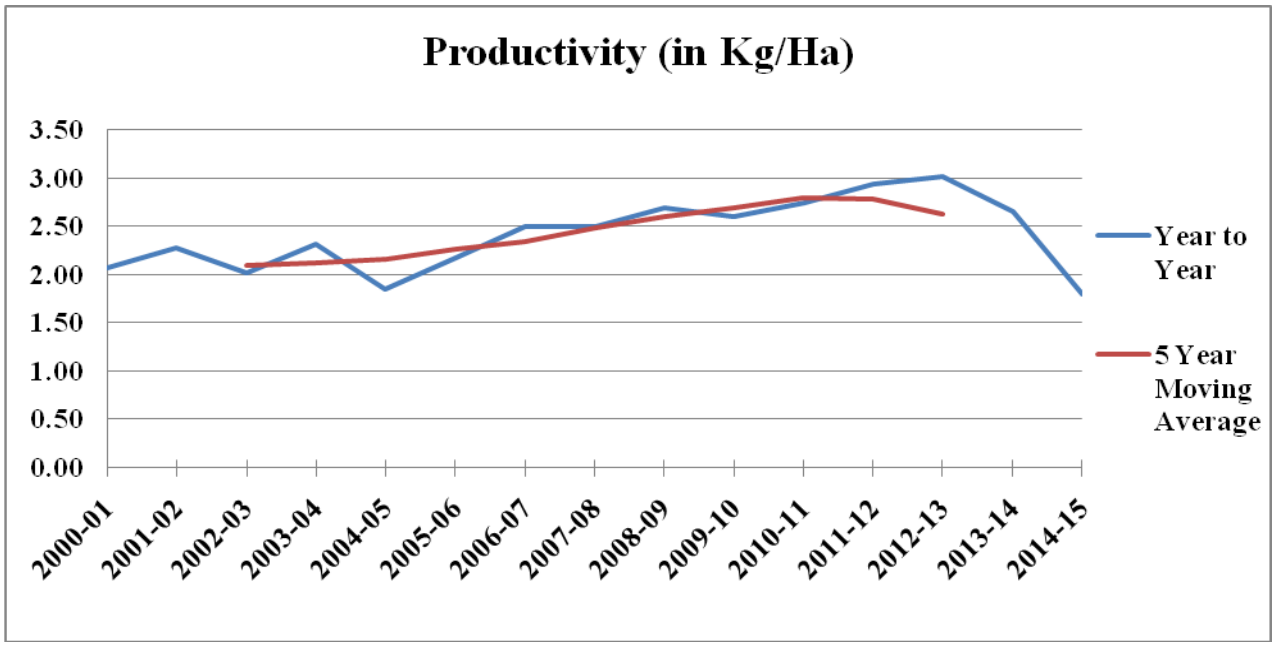

Table.1 LGR, CGR and C.V. of Varanasi Division in respect to production, area and productivity 2000-01 to 2014-15

Year	Production (in metric Tonnes)	Area (in Ha.)	Productivity (in Kg/Ha)
2000-01	1199336	502907	2064.34
2001-02	1151304	505274	2278.12
2002-03	1012173	502519	2014.67
2003-04	1208873	522930	2312.23
2004-05	960843	521391	1843.08
2005-06	1148264	527823	2176.56
2006-07	1340350	536060	2504.14
2007-08	1365277	547371	2524.95
2008-09	1465526	544050	2694.43
2009-10	1415290	545933	2593.36
2010-11	1500676	547052	2744.57
2011-12	1612846	549816	2934.71
2012-13	1663273	551832	3015.42
2013-14	1466648	553129	2652.51
2014-15	1026271	571909	1794.45
Maximum	**1663273**	**571909**	**3015.42**
LGR (%)	**2.48**	**0.83**	**1.72**
CGR (%)	**2.48**	**0.84**	**1.63**
CV (%)	**16.93**	**3.88**	**15.69**

Table.2 Productivity and CGR of production

	Productivity (Kg/Ha.)	CGR of Production (%)
Varanasi	2407.76(Max:3015)	1.63
Eastern UP	3206.00	1.88
UP	3113.00	1.05
Punjab	4693.00	1.00
India	3075	2.56

Growth rates in area

In Varanasi division the coefficient of variation recorded for the study period was 3.88 per-cent and the linear and compound growth rates recorded during study period were 0.83 and 0.84 per-cent per annum respectively (Table 1).The area of wheat in Varanasi division of Eastern Uttar Pradesh exhibited a positive trend which indicates preference of farmers for wheat cultivation (Fig. 2).

Growth rates in productivity

Regarding the productivity of wheat in Varanasi division of eastern Uttar Pradesh during the study period (2000-01 to 2014-15) the maximum productivity was 3015 kg/ha which is close to level of UP and India. How it is much less than Punjab productivity. Productivity of Varanasi division of Eastern Uttar Pradesh showed a coefficient of variation 15.69 per-cent. Linear and Compound growth rate observed were 1.72 and 1.63 per-cent respectively. The productivity growth rates of wheat in the division exhibit positive but decline in 2014-15 due to severe drought (Fig. 3).

As a whole, the growth rates of production were higher than area and productivity.

Year to Year fluctuation is alarming and indicates that Irrigation system, though published figure show more than 90% area is irrigated-is not robust and effective when there is severe drought. Years (2014-2015) had severe drought and production, productivity reached below the level of Year 2001 which strongly indicates vulnerability of production system even where Irrigated Area is more than 90 percent. This implies that requisite irrigation is not possible which needs to be addressed as early as possible.

Table 2 shows that productivity of Varanasi division is less than Eastern UP, UP, India, Punjab. Growth Rate of production of Varanasi division is 1.63 per cent and can further go up by intervention of Technology and improved Irrigation System. The study shows that Varanasi has production and productivity more suffered badly in drought year which calls for strengthening of Irrigation resources along with adoption of modern technology practices.

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