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General scenario and trend analysis of Wheat in western Region of Uttar Pradesh

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Abstract

Wheat is grown on more land area than any other commercial food crops in the Uttar Pradesh. In the present study we found that the area of wheat in, Central region, has 1716559 ha, in the year 2014-15 to 2016-17, and the highly cultivated area under the crop wheat in Uttar Pradesh has 11774860 hectare. The highest production of wheat in, Central region, 5685349mt, in the year 2016-17. Under the crop Wheat highly yield qtl/ha in Central region, and Uttar Pradesh 33.12qtl/ha, and 31.92 qtl/ha in the year 2016-17 the increasing trend of area in Central region of U.P. i.e. 0.68 percent in simple growth rate. All U.P. and all India simple growth rate was 1.18 and 0.96 Per cent respectively for the same period. In case of production, the simple growth rate for central region was the highest with 2.27 percent. All U.P. and all India, simple growth rate estimated 1.36 and 2.06 per cent respectively. The productivity of central region with a simple growth rate of 0.96 per cent. The all U.P. and all India simple growth rate was 0.23 and 1.05 respectively. The production of wheat crop has increased with annual rate of about 1.29 per cent respectively, in the Uttar Pradesh during 1997-98 to 2016-17. The production of wheat has increased with annual rate of 2.01 per cent in India. In central region of U.P. area, production and productivity has increase with annual rate of 0.69, 1.69 and 1.88 respectively.

Keywords: General profile, Trend Analysis, Wheat Central Region

Introduction

Wheat (*Triticum aestivum* L.) is the world's most widely cultivated staple food crop being grown since pre historic period and being consumed in various forms by more than one thousands million people in the world. Wheat plays an important role in shaping agriculture and food security mission. India is the second largest producer of wheat next to China. Wheat is processed in different forms like flour, Suzi, Maida and being eaten by number of consumers in different ways as porridge (Halwa), chapatias bread and biscuits etc. Besides wheat straw and wheat bran are good source of feed for animals.

Wheat is grown on more land area than any other commercial food crops. World trade of wheat is greater than all other crops combined. Globally, wheat is the leading source of vegetative protein in human diet, having a higher protein content than Soyabean or the other major cereals, like maize (corn) or rice. Wheat plays a role of key factor enabling the emergence of city based societies at the start of cultivation because it was one of the first crops that could be easily cultivated on a large scale, and had the addition advantage of yielding a harvest that provides long term storage of food.

Uttar Pradesh (UP) located in northern part of India is surrounded by Uttarakhand, Himachal Pradesh, Haryana, Delhi in the North and in west Rajasthan, Madhya Pradesh and Chhattisgarh in the South -West and South; and Jharkhand and Bihar in the East. It is the fifth largest state in India in terms of geographical area covering roughly 240,928 square kilometers. This is nearly 7.33 percent of total area of the country. The state is divided into 4 regions, namely Western (30 districts), Eastern (28 districts), Central (10 districts) and Bundelkhand (07 districts). At present state have 75 districts, 327 tehsils, 822 blocks and 107452 revenue villages. The state is also divided into 9 agro-climatic zones- Tarai Region, Western Plain Region, Central Western Region, South Western Region, Central Plain Region, Bundelkhand Region, North Eastern Plain Region, Eastern Plain Region and Vindhyaal Region the central and western are comparatively much better and well developed to eastern and Bundelkhand regions. The irrigation facilities are also well developed in western and central regions. The cropping intensity, production and productivity of different crops of these two regions are also found much better in comparison to other regions of Uttar Pradesh.

Agriculture is the basis of economy and prosperity of the state. The state produces 31.60% of the nation’s cereals. Main production in the state are Rice and Wheat followed by Potato Sugar, and oil seeds, beside these gram, bajra, barley and maize are also produced at large scale.in the central region of U.P. Important crops include rice, wheat, maize, sugarcane, potato, chick pea, pigeon pea, mustard, lentil, Urad and moong. Majority of the agriculture land is used to grow major cereal crops: rice & wheat.

Material and methodologies

Materials

The time series data pertaining to the period from 1997-98 to 2016-17 on area, production and productivity of different crops i.e. Rice, Wheat and Gram, have been used to study the growth trends. These time series data have been procured from the Bulletins of Directorate of Agricultural Statistics and Crop-Insurance, Krishi Bhawan, Lucknow, Government of Uttar Pradesh and websites like *updes.up.in/spatrika and agricoop.nic.in/agristatisticsnew.htm*. Time series data of India have been procured from the bulletin of *Agricultural Statistics At A Glance, 2018*, Directorate of Economics and Statistics, Govt. of India.

Methodologies

The statistical tools used for the analysis of time series data to fulfil the objectives of the thesis, are described in the following sub-sections.

The regional general profile of major food grains crops of Uttar Pradesh and India.

(A) Regional Total:

Sum of all districts data under particular region in the particular year.

(B) Moving Average:

A moving average of order mm can be written as,

$$\hat{T}_t = \frac{1}{m} \sum_{j=-k}^k y_t + j,$$

Where $m=2k+1$, that is, the estimate of the trend-cycle at time t is obtained by average values of the time series within k periods of t. Observations that are nearby in time are also likely to be close in value. Therefore, the average eliminates some of the randomness in the data, leaving a smooth trend-cycle component. We call this an m-MA, meaning a moving average of order m.

3.3.2 Trend and growth rate

The trend and growth rate in area, production and productivity of major food grain crops have been worked out by fitting the following five different functions:

1. Simple linear function

$$Y_t = a + b_t + \mu_t$$

2. Compound function

$$\log Y_t = \log a + t \log (1+r) \text{ or } Y_t^* = a^* + bt$$

Where,

Y_t : Time series data on area/production/productivity of different food grain crops i.e. Rice, Wheat and Gram at time t, a & b are parameters of the function to be estimated.

a: Intercept

b: Coefficient of variables

t: Time index ($t= 1,2,\dots,n$)

r: Average compound growth rate per annum.

μ_t : error term at t and is assumed to follow independently distributed

However, before the fitting above functions, the time series data on area and production were smoothed by three years moving-average method.

Computation of growth rate

1. For linear function

After fitting the linear trend function by least-square method, we get the estimate of b denoted by \hat{b} (say). Then, annual linear growth rate is computed as follows

$$r = \frac{\hat{b}}{\bar{Y}} \times 100$$

Where, \bar{Y} is arithmetic mean of Y_t .

2. Compound growth rate

To obtain annual compound growth rate, the third function was first linearised by taking natural log on both side, i.e.

$$\log Y_t = \log a + t \log (1+r) \text{ or } Y_t^* = a^* + bt$$

Where

$$Y_t^* = \log Y_t, a^* = \log a \text{ and } b = \log (1+r)$$

The above linearised function was fitted by least square method and estimate of b as \hat{b} was obtained. The annual compound growth rate is then computed as

$$r = (\text{antilog of } \hat{b} - 1) \times 100$$

All growth rates are expressed in percentage. The best fitted function was judged on the basis of R^2 (coefficient of multiple determinations).

Result and Discussion

Table 1: Area, production and productivity of Wheat in Central region of Uttar Pradesh

Year	Area (ha)	3 yearly Moving Average	Production (mt)	3 yearly Moving Average	Productivity (q/ha)	3 yearly Moving Average
1997-98	1429722		3381531		23.65	
1998-99	1436485	1446774	3526877	3631079	24.55	25.07
1999-00	1474115	1474420	3984829	3797677	27.03	25.74
2000-01	1512660	1504475	3881326	3988163	25.65	26.51

2001-02	1526650	1522252	4098334	3992995	26.84	26.22
2002-03	1527445	1539907	3999324	4148409	26.18	26.93
2003-04	1565625	1555578	4347570	4120821	27.76	26.48
2004-05	1573664	1567272	4015568	4102411	25.51	26.17
2005-06	1562527	1564569	3944095	4141435	25.24	26.47
2006-07	1557517	1569795	4464641	4295279	28.66	27.35
2007-08	1589341	1589669	4477100	4613876	28.16	29.01
2008-09	1622148	1640420	4899888	4809513	30.20	29.30
2009-10	1709771	1679801	5051551	5158042	29.54	30.69
2010-11	1707483	1706442	5522686	5403869	32.34	31.66
2011-12	1702073	1700604	5637369	5528102	33.12	32.50
2012-13	1692255	1697869	5424251	5496728	32.05	32.37
2013-14	1699278	1702697	5428563	4744655	31.94	27.89
2014-15	1716559	1710799	3381152	4409993	19.69	25.79
2015-16	1716559	1716559	4420264	4495588	25.75	26.18
2016-17	1716559		5685349		33.12	

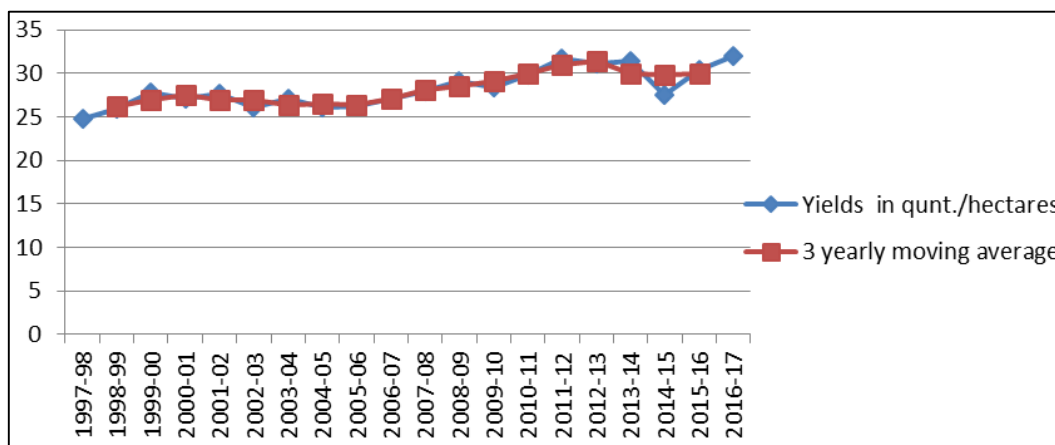
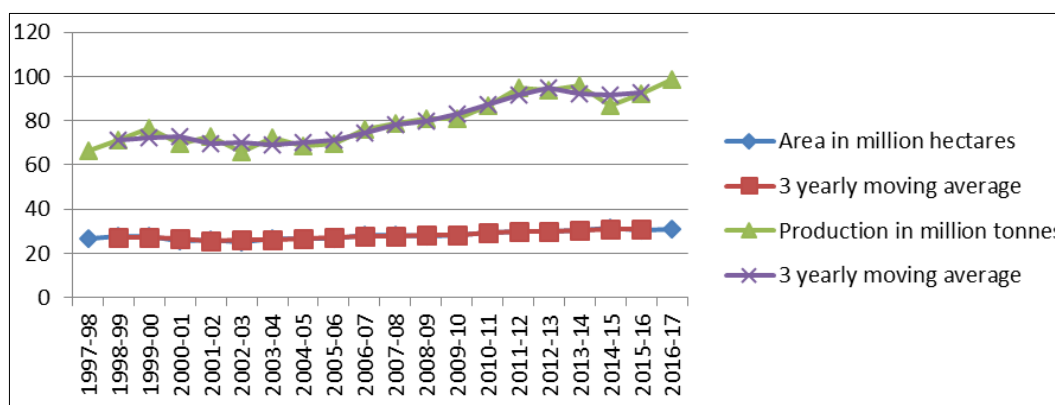


Table 1: Depicted that area, production and productivity of wheat in Central Region of Uttar Pradesh during the period of 1997-98 to 2016-17. Table- revealed that highest area (1716559ha) were found in 2014-15 to 2016-17, and production (5685349 mt) and productivity (33.12 qtl/ha) were

found highest in 2016-17. It also revealed that both minimum area (1429722 ha), and production (3381531 mt) in 1997-98 and minimum productivity (423.65 qtl/ha) in 2014-15. Same result of table 1. Presented in graph 1.

Table 2: Area, production and productivity of Wheat in Uttar Pradesh

Year	Area (ha)	3 yearly Moving Average	Production (mt)	3 yearly Moving Average	Productivity (q/ha)	3 yearly Moving Average
1997-98	8750342		22251120		25.42	
1998-99	8889014	8908561	22714170	23464642	25.55	26.32
1999-00	9086326	9066866	25428636	24432536.67	27.98	26.93
2000-01	9225258	9183199	25154804	25365059	27.26	27.62
2001-02	9238012	9198167	25511737	24798758	27.61	26.95
2002-03	9131232	9265353	23729733	25193183.33	25.98	27.18
2003-04	9426816	9304900	26338080	24493671	27.93	26.31
2004-05	9356653	9347834	23413200	24611566.33	25.02	26.32
2005-06	9260032	9303053	24083419	24474400	26.00	26.31
2006-07	9292474	9352284	25926581	25499843.33	27.90	27.25

2007-08	9504345	9470010	26489530	27313757.33	27.87	28.82
2008-09	9613212	9604256	29525161	28158762	30.71	29.31
2009-10	9695211	9721145	28461595	29464613.33	29.35	30.30
2010-11	9855012	10160517	30407084	30326769.67	30.85	29.86
2011-12	10931327	10853733	32111630	31307013.67	29.37	28.96
2012-13	11774860	10817785	31402327	31144869.67	26.66	28.91
2013-14	9747169	10770488	29920652	27077672.33	30.69	25.27
2014-15	10789436	10439514	19910038	25433940.67	18.45	24.56
2015-16	10781936	10784536	26471132	26934313.33	24.55	24.97
2016-17	10782236		34421770		31.92	

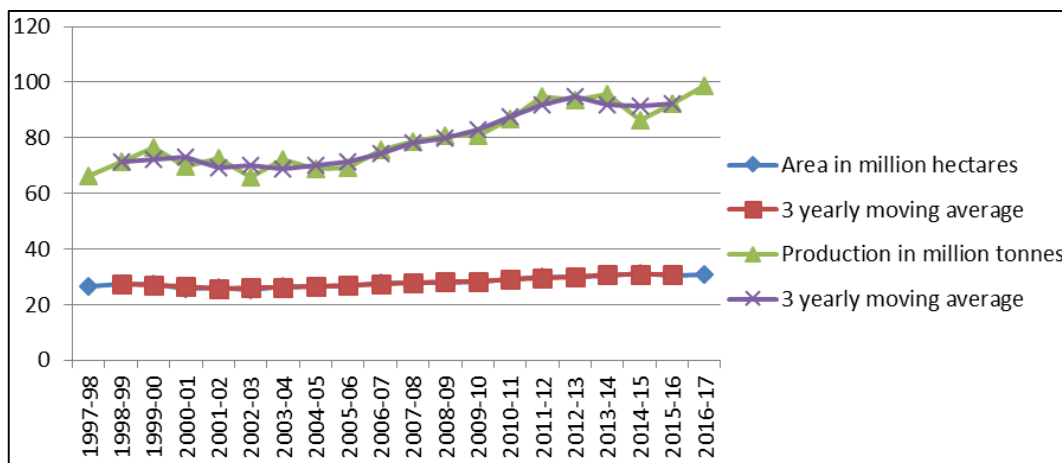


Table 2 depicted that area, production and productivity of wheat in Uttar Pradesh. In U.P. highest area (11774860 ha) under wheat obtained in 2012-13 followed by 2011-12 and 2013-14. Highest production (34421770 mt) obtained in 2016-17 followed by 2011-12 and 2012-13; and highest productivity (31.92 qtl/ha) in 2016-17 followed by 2010-11 and 2008-09. Table 4.1.11 also depicted that minimum area (8750342ha) obtained in 1997-98. Minimum production (19910038 mt) and productivity (18.45 qtl/ha) were observed in 2014-15. Area, production and productivity of gram during the period of 1997-98 to 2016-17 also present in the graph 3.2

Tables 3: Annual average simple and compound growth rates of area, production and productivity of wheat in different region of Uttar Pradesh and India (1997-98 to 2016-17).

Central	S.G.R	0.68	2.27	0.96
	C.G.R	0.69	1.69	0.88
All U.P.	S.G.R	1.18	1.36	0.23
	C.G.R	1.16	1.29	0.12
All India	S.G.R	0.96	2.0262	1.05
	C.G.R	0.96	2.01	1.04

The table 3 depicted the annual growth rates of area, production and productivity of wheat in Central regions of U.P. and all India for period of 1997- 98 to 2016 – 17. Let points out that the simple and compound growth functions provided consistent estimates for analysis of growth rates. It shows the increasing trend of area in Central region of U.P. i.e. 0.68 percent in simple growth rate. All U.P. and all India simple growth rate was 1.18 and 0.96 Per cent respectively for the same period.

In case of production, the simple growth rate for central region was the highest with 2.27 percent. All U.P. and all India, simple growth rate estimated 1.36 and 2.06 per cent respectively. The productivity of central region with a simple growth rate of 0.96 per cent. The all U.P and all India simple growth rate was 0.23 and 1.05 respectively. The registered positive combined growth rate in central region 0.69. The all

U.P. and all India combined rate estimated was to be 1.26 and 0.96 per cent respectively. In the same period, production recorded a combined growth rate in central region is 1.69. All U.P. and India combined growth rate was 1.29 and 2.01 per cent respectively. In case of productivity the combined growth rate of central region 0.88 per cent. All U.P. and all India combined growth rate was 0.12 and 1.04 per cent respectively.

Summary

The area of wheat in, Central region, has 1716559 ha, in the year 2014-15 to 2016-17, and the highly cultivated area under the crop wheat in Uttar Pradesh has 11774860 hectare The highest production of wheat in, Central region, 5685349mt, in the year 2016-17. Under the crop Wheat highly yield qtl/ha in Central region, and Uttar Pradesh 33.12qtl/ha, and 31.92 qtl/ha in the year 2016-17.

The production of wheat crop has increased with annual rate of about 1.29 per cent respectively, in the Uttar Pradesh during 1997-98 to 2016-17. The production of wheat has increased with annual rate of 2.01 per cent in India. In central region of U.P. area, production and productivity has increase with annual rate of 0.69, 1.69 and 1.88 respectively.

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