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General scenario on area, production and productivity of major food grain crops in Bundelkhand region of U.P.

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Abstract

Agricultural production depends on large number of pre sowing and post-harvest factors like - cropping system, irrigation system, fertilizers, electricity, roads etc. Voluminous secondary data on such inputs is published by Uttar Pradesh Government and Government of India. 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 general profile of U.P. 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 Statistical tools such as regional total and moving average used for determining the area, production and productivity of food grain crops in Bundelkhand region of U.P. Highest area (583130 ha), production (515116 mt) and productivity (11.48286 qtl/ha) of gram obtained during the period of 2002-03, 2001-02 and 2012-13 respectively, and minimum area (362432 ha) i.e. same area during the periods of 2014-15 to 2016-17. Highest area (98617 ha), production (161045 mt) and productivity (23.03 qtl/ha) of rice observed during the period of 2001-02, 2013-14 and 2016-2017 respectively; And minimum area (59672 ha) in 2009-10, production (44408 mt) and productivity (5.642857 qtl/ha) in 2007-08. Highest area (925901) of wheat during the periods of 2014-15 to 2016-17, highest production (2802406) and productivity (29.79714) in 2016-17; and minimum area (635966), production (1025237) in 2007-08 and productivity (15.04143) of wheat in 2007-08. Present study pertaining in 2019-20 in titled General Scenario on area, production and productivity of major food grain crops in Bundelkhand region of U.P.

Keywords: statistical tools, regional total, moving average, productivity

Introduction

Agriculture in India has a significant history. Agriculture is the primary source of livelihood for about 58 per cent of India's population. India ranks second worldwide in farm output. During 2019-20 crop year, food grain production was estimated to reach a record 295.67 million tonnes (MT). In 2020-21 Government of India is targeting food grain of 298 MT. Uttar Pradesh (UP) located in northern part of India and divided into four regions i.e. Bundelkhand, Eastern, Central and western region. UP is a large state divided into 75 revenue districts; 312 tehsils, 648 statutory towns, 267 Census towns and 1.06 lakh villages as per Census 2011. It is also among the most densely populated states of India with 829 persons inhabiting every square kilometers. Nearly 77.7 percent of the people in the state live in rural areas making Uttar Pradesh primarily a rural economy. The 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. Rice is the major crop in Uttar Pradesh and is grown in about 5.90 mha which comprises of 13.5% of total rice in India. Bundelkhand region involves seven districts i.e. Jhansi, Lalitpur, Jalaun, Banda, Hamirpur, Mahoba and Chitrakoot. Bundelkhand lies between the Indo-Gangetic plain to the North and the Vindhya Range to the south. Bundelkhand region has been facing severe drought problems.

Methods and 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

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Pradesh. Therefore, the time series data has been classified into four regions of Uttar Pradesh to study the regional Scenario of area, production and productivity of major food grain crops.

Statistical methodologies

The statistical methodologies 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 Bundelkhand region of Uttar Pradesh

(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 averaging 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.

Result and discussion

Table 1: Area, production and productivity of Gram in Bundelkhand region of U.P.

| Year | Area | Moving average (3 yearly) | Production | Moving average (3 yearly) | Productivity | Moving average (3 yearly) |
|---------|--------|---------------------------|------------|---------------------------|--------------|---------------------------|
| 1997-98 | 462204 | | 375811 | | 8.207143 | |
| 1998-99 | 476446 | 158815.3 | 377358 | 125786 | 7.762857 | 2.587619 |
| 1999-00 | 450665 | 150221.7 | 414409 | 138136.3 | 9.117143 | 3.039048 |
| 2000-01 | 486885 | 162295 | 356351 | 118783.7 | 7.23 | 2.41 |
| 2001-02 | 554885 | 184961.7 | 515116 | 171705.3 | 9.112857 | 3.037619 |
| 2002-03 | 583130 | 194376.7 | 478961 | 159653.7 | 8.194286 | 2.731429 |
| 2003-04 | 517950 | 172650 | 514801 | 171600.3 | 9.978571 | 3.32619 |
| 2004-05 | 453218 | 151072.7 | 398682 | 132894 | 9.16 | 3.053333 |
| 2005-06 | 427623 | 142541 | 334652 | 111550.7 | 8.061429 | 2.687143 |
| 2006-07 | 427589 | 142529.7 | 262574 | 87524.67 | 6.445714 | 2.148571 |
| 2007-08 | 337988 | 112662.7 | 186047 | 62015.67 | 5.841429 | 1.947143 |
| 2008-09 | 362003 | 120667.7 | 329244 | 109748 | 9.677143 | 3.225714 |
| 2009-10 | 404020 | 134673.3 | 300508 | 100169.3 | 8.187143 | 2.729048 |
| 2010-11 | 380876 | 126958.7 | 301887 | 100629 | 8.287143 | 2.762381 |
| 2011-12 | 402207 | 134069 | 450352 | 150117.3 | 11.46571 | 3.821905 |
| 2012-13 | 416007 | 138669 | 449401 | 149800.3 | 11.48286 | 3.827619 |
| 2013-14 | 414435 | 138145 | 148408 | 49469.33 | 3.957143 | 1.319048 |
| 2014-15 | 362432 | 120810.7 | 85029 | 28343 | 3.052857 | 1.017619 |
| 2015-16 | 362432 | 120810.7 | 51561 | 17187 | 4.475714 | 1.491905 |
| 2016-17 | 362432 | | 363322 | | 10.51143 | |

Table1: Shows area, production and productivity of Gram in Eastern region of Uttar Pradesh during the period of 1997-98 to 2016-17. Table- revealed that highest area (583130 ha), production (515116 mt) and productivity (11.48286 qtl/ha) during the period of 2002-03, 2001-02 and 2012-13 respectively, and minimum area (362432 ha) i.e. same area during the periods of 2014-15 to 2016-17. Highest area gram obtained in 2002-03 followed by 2001-02 and 2003-04. Highest production were obtained in 2001-02 followed by 2002-03 and 2003-04 and

highest productivity obtained in 2012-13 followed by 2011-12 and 2016-17 It also revealed that minimum production (51561 mt) of gram in 2016-17 and minimum productivity (3.052857qtl/ha) during the period of 2014-15. It depicted from fig.1 that highest area in 2002-03, highest production in 2001-02 and productivity in 2012-13. It also depicted from fig. minimum area during the periods of 2014-15 to 2016-17. Minimum production and productivity of gram during the period of 2016-17 and 2014-15 respectively.

Table 2: Area, production and productivity of Rice in Bundelkhand region of Uttar Pradesh

| Year | Area | Moving Average | Production | Moving average | Productivity | Moving average |
|---------|-------|----------------|------------|----------------|--------------|----------------|
| 1997-98 | 86968 | | 92270 | | 8.675714 | |
| 1998-99 | 92108 | 30702.67 | 129146 | 43048.67 | 12.32286 | 4.107619 |
| 1999-00 | 94997 | 31665.67 | 116302 | 38767.33 | 10.07429 | 3.358095 |
| 2000-01 | 95883 | 31961 | 96040 | 32013.33 | 9.422857 | 3.140952 |
| 2001-02 | 98617 | 32872.33 | 124838 | 41612.67 | 10.45 | 3.483333 |
| 2002-03 | 76758 | 25586 | 57194 | 19064.67 | 6.288571 | 2.09619 |
| 2003-04 | 71162 | 23720.67 | 96609 | 32203 | 10.95333 | 3.651111 |
| 2004-05 | 90906 | 30302 | 92491 | 30830.33 | 8.501429 | 2.83381 |
| 2005-06 | 67981 | 22660.33 | 59378 | 19792.67 | 9.901429 | 3.300476 |
| 2006-07 | 74006 | 24668.67 | 60523 | 20174.33 | 7.002857 | 2.334286 |
| 2007-08 | 72737 | 24245.67 | 44408 | 14802.67 | 5.642857 | 1.880952 |
| 2008-09 | 80167 | 26722.33 | 105763 | 35254.33 | 12.18 | 4.06 |
| 2009-10 | 59672 | 19890.67 | 60778 | 20259.33 | 9.967143 | 3.322381 |
| 2010-11 | 62840 | 20946.67 | 77688 | 25896 | 13.29857 | 4.432857 |
| 2011-12 | 79249 | 26416.33 | 117900 | 39300 | 13.81 | 4.603333 |
| 2012-13 | 73597 | 24532.33 | 124398 | 41466 | 15.45429 | 5.151429 |
| 2013-14 | 92945 | 30981.67 | 161045 | 53681.67 | 12.47571 | 4.158571 |
| 2014-15 | 88055 | 29351.67 | 145821 | 48607 | 14.81286 | 4.937619 |
| 2015-16 | 88055 | 29351.67 | 86864 | 28954.67 | 12.14286 | 4.047619 |
| 2016-17 | 88055 | | 147063 | | 23.03 | |

Table-2 revealed that highest area (98617 ha), production (161045 mt) and productivity (23.03 qtl/ha) during the period of 2001-02, 2013-14 and 2016-2017 respectively, and minimum area (59672 ha) in 2009-10, minimum production (44408 mt) and productivity (5.642857 qtl/ha) in 2007-08. Highest area of rice obtained in 2001-02 followed by 2000-01 and 1999-2000. Highest production of rice observed in 2013-

14 followed by 2014-15 and 2016-17. Highest productivity of rice observed in 2016-17 followed by 2012-13 and 2014-15. Fig. 2 It depicted from fig. that highest area in 2001-02, highest production and productivity during the periods of 2013-14 and 2016-17 respectively. It also depicted that minimum area of rice in 2009-10, production and productivity both minimum during the period of 2007-08.

Table 3: Area, production and productivity of Wheat in Bundelkhand region of U. P.

| Year | Area | Moving average (3 yearly) | Production | Moving average (3 yearly) | Productivity | Moving average (3 yearly) |
|---------|--------|----------------------------|------------|----------------------------|--------------|----------------------------|
| 1997-98 | 692226 | | 1272635 | | 18.31571 | |
| 1998-99 | 663307 | 221102.3 | 1369925 | 456641.7 | 20.71429 | 6.904762 |
| 1999-00 | 706819 | 235606.3 | 1623925 | 541308.3 | 22.84429 | 7.614762 |
| 2000-01 | 672634 | 224211.3 | 1309873 | 436624.3 | 18.77429 | 6.258095 |
| 2001-02 | 689507 | 229835.7 | 1608746 | 536248.7 | 22.53429 | 7.511429 |
| 2002-03 | 656314 | 218771.3 | 1395170 | 465056.7 | 20.49 | 6.83 |
| 2003-04 | 696366 | 232122 | 1578843 | 526281 | 22.06714 | 7.355714 |
| 2004-05 | 644409 | 214803 | 1335653 | 445217.7 | 20.09857 | 6.699524 |
| 2005-06 | 636335 | 212111.7 | 1248109 | 416036.3 | 18.92714 | 6.309048 |
| 2006-07 | 692895 | 230965 | 1389768 | 463256 | 18.73143 | 6.24381 |
| 2007-08 | 635966 | 211988.7 | 1025237 | 341745.7 | 15.04143 | 5.01381 |
| 2008-09 | 713310 | 237770 | 1712104 | 570701.3 | 22.92714 | 7.642381 |
| 2009-10 | 737679 | 245893 | 1662490 | 554163.3 | 21.86143 | 7.287143 |
| 2010-11 | 754934 | 251644.7 | 1795101 | 598367 | 22.51571 | 7.505238 |
| 2011-12 | 862871 | 287623.7 | 2346145 | 782048.3 | 26.44714 | 8.815714 |
| 2012-13 | 862770 | 287590 | 2281520 | 760506.7 | 25.96 | 8.653333 |
| 2013-14 | 846361 | 282120.3 | 1849016 | 616338.7 | 21.56571 | 7.188571 |
| 2014-15 | 925901 | 308633.7 | 1252705 | 417568.3 | 12.93857 | 4.312857 |
| 2015-16 | 925901 | 308633.7 | 1170537 | 390179 | 15.23714 | 5.079048 |
| 2016-17 | 925901 | | 2802406 | | 29.79714 | |

Table-3 revealed that highest area (925901) of wheat during the periods of 2014-15 to 2016-17, highest production (2802406) and productivity (29.79714) in 2016-17. Highest area, production and productivity of wheat obtained in 2014-15 to 2016-17 followed by 2011-12 and 2012-13; highest productivity obtained in 2016-17 followed by 2011-12 and 2012-13. And Productivity observed in 2016-17 followed by 2008-09 and 2009-10. Table 3. Also revealed that minimum area (635966), minimum production (1025237) in 2007-08 and minimum productivity (15.04143) of wheat in 2007-08. Fig. 3 depicted that highest area in 2014-15 to 2016-17, production in 2016-17 and productivity in 2007-08. Area, production and productivity obtained minimum in 2007-08.

Summary and conclusion

Highest area (583130 ha), production (515116 mt) and productivity (11.48286 qtl/ha) of gram obtained during the period of 2002-03, 2001-02 and 2012-13 respectively, and minimum area (362432 ha) i.e. same area during the periods of 2014-15 to 2016-17. Highest area (98617 ha), production (161045 mt) and productivity (23.03 qtl/ha) of rice observed during the period of 2001-02, 2013-14 and 2016-2017 respectively; And minimum area (59672 ha) in 2009-10, production (44408 mt) and productivity (5.642857 qtl/ha) in 2007-08. Highest area (925901) of wheat during the periods of 2014-15 to 2016-17, highest production (2802406) and productivity (29.79714) in 2016-17; and minimum area (635966), production (1025237) in 2007-08 and productivity (15.04143) of wheat in 2007-08.

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