



## TRENDS IN THE AREA, PRODUCTIVITY AND PRODUCTION OF PULSES CROP IN NAGPUR DISTRICT

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### **ABSTRACT**

*Foodgrains is our daily need.. Pulses have been basic part of our daily food. Pulses are good sources of proteins Fibres, Minerals and carbohydrate. In India, pulses are used in daily consumption. The Pulses plant help in nitrogen fixation in the farm. The major grown Pulses in Nagpur district are Pigeon Pea, Green Gram, Black Gram, Chickpea. A 100 gram serving of cooked chickpeas contains 18% of the for protein, 30% of dietary fiber, 43% for folate and 52% DV for manganese.*

*The area, productivity and production of theses major Pulse 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 Pulse 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.*

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

*The data is collected from the Department of Agriculture, Government of Maharashtra on the area, productivity and production of the selected Pulse crops for the period from the year 2000-2001 to 2014-15 on Pigeon Pea, Green Gram, Black Gram, Chickpea and Total Pulses.*

*From the results, it is concluded that the area and production of Total Pulses is increased by 3.69 and by 3.94 percent respectively and significantly. The green gram area declined significantly by 5.65 percent which result in significant declined in production by 4.01 percent. Almost, the positive growth is observed in area and production of all crops. The crop Green Gram, Chickpea, Other Kharif Pulses and Other Rabi Pulses have instability in Area, Productivity and Production in Nagpur district during the period from year 2000-01 to 2014-15. Overall the instability of the Total Pulses was 8.53 percent in Area, 20.15 percent in Productivity and 25.30 percent in Production during selected 15 years. As the area under particular pulse crop was more in past, it is continued in next year significantly. The total pulses area also increased in present with respect to increase in 0.83 percent over 15 years.*

## **1. Introduction**

The share of Agriculture & allied Sectors in total GVA (at current 2011-12 prices) in year 2014-15 has been 17.40 percent. The food supply management policy of the government has been successful in controlling food inflation despite the below average monsoon this year and it results increase in the prices of pulses and a few other essential commodities in the second half in year 2014-15. The foodgrain production of India is 253.16 million tons in year 2015-16 (GoI, 2016). The Pulses production in India was 17.2 million tons The foodgrains production in Maharashtra has been 11.47 million tons in year 2014-15 (GoM, 2016), whereas the Pulses production is 1.68 million tons in same year in Maharashtra.

The foodgrains consumption is our daily need. Pulses have been a part of basic food of human being. Pulses also been a burning news for prices in past. Pulses are good sources of proteins Fibres, Minerals and carbohydrate. In India, pulses are used in daily consumption. The Pulses plant help in nitrogen fixation in the farm. The major grown Pulses in Nagpur district are

Pigeon Pea, Green Gram, Black Gram and Chickpea. A 100 gram serving of cooked chickpeas contains 18% of the DV for protein, 30% of dietary fiber, 43% for folate and 52% DV for manganese.

The area, productivity and production of these major Pulse 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 Pulse 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 Pulse crops in Nagpur district;
2. To study the instability in the Area, Productivity and Production of Pulse crops in Nagpur district;
3. To find the effect of Area and Productivity on Production of the Pulse 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 Pulse 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 Pulse crops.

### 3.3. Major Pulse crops of the Nagpur district

The major Pulse crops selected for the present research paper are as follows.

- Pigeon Pea
- Green Gram
- Black Gram
- Chickpea
- Other Kharif Pulses
- Other Rabi Pulses
- Total Pulses

### 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 Pulses 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 Pulse, the Coefficient of Variation and Cuddy Della Index is used. The formula is as follows

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 Pulses 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 Pulse crop is estimated.

$$y = a + b_1 A_{t-1} + b_2 P_{t-1} + u$$

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 Pulses 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 Pulses in Nagpur district.

The result of the Compound Growth Rates of Area, Productivity and Production of Pulses in Nagpur district are presented in table no. 1.

**Table 1. Growth Rates of Area, Productivity and Production of Pulses 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       | Pigeon Pea          | 1.37***      | 5.57        | -2.39        | -1.40       | -1.07      | -0.64       |
| 2       | Green Gram          | -<br>5.65*** | -3.43       | 1.94         | 1.04        | -4.01*     | -1.82       |
| 3       | Black Gram          | -3.59*       | -1.76       | 1.30         | 0.72        | -2.93      | -1.48       |
| 4       | Chickpea            | 7.54***      | 6.33        | 2.57**       | 2.90        | 10.29***   | 5.91        |
| 5       | Other Kharif Pulses | -<br>8.20*** | -3.49       | 1.36         | 1.03        | -7.70**    | -2.44       |
| 6       | Other Rabi Pulses   | 9.76**       | 2.41        | -0.03        | -0.01       | 10.14*     | 1.89        |
| 7       | Total Pulses        | 3.69***      | 6.75        | 0.23         | 0.19        | 3.94**     | 2.52        |

**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)

The Compound Growth Rate indicates that the area under Pigeon Pea cultivation in Nagpur district is increased significantly over the 15 years by 1.37 percent. Whereas, the productivity and production declined over the same period but the results are non-significant. The green gram area declined significantly by 5.65 percent which result in significant declined in production by 4.01 percent. The Black gram area also reduced by 3.59 percent in Nagpur district from year 2000-01 to 2014-15, consequently production also went down. The area under Chickpea is increased by 7.54 percent significantly and very strongly the production also increased by 10.29 percent per annum. The area and production significantly declined of Kharif pulses while it is increased significantly in Rabi pulses. The area and production of Total Pulses is increased by 3.69 and by 3.94 percent respectively and significantly.

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

The table no.2 shows the instability of Area, Productivity and Production of Pulses 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.

**Table 2. Instability of Area, Productivity and Production of Pulses 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       | Pigeon Pea          | 7.40  | 4.11                | 28.63        | 27.11               | 27.22      | 26.96               |
| 2       | Green Gram          | 35.45 | 23.25               | 29.77        | 28.64               | 37.04      | 30.63               |
| 3       | Black Gram          | 31.44 | 27.04               | 27.93        | 27.50               | 34.27      | 30.54               |
| 4       | Chickpea            | 32.83 | 17.05               | 18.29        | 14.29               | 46.01      | 27.21               |
| 5       | Other Kharif Pulses | 41.69 | 25.96               | 21.54        | 20.73               | 38.26      | 30.83               |
| 6       | Other Rabi Pulses   | 53.48 | 47.57               | 27.90        | 27.81               | 68.21      | 61.81               |
| 7       | Total Pulses        | 17.56 | 8.53                | 20.19        | 20.15               | 30.28      | 25.30               |

The instability of CD index shows that the area(4.11 percent) of the Pigeon pea was less instable as compared to its productivity(27.11 percent) and production(26.96 percent). The crop; Green Gram, Chickpea, Other Kharif Pulses and Other Rabi Pulses have instability in Area, Productivity and Production in Nagpur district during the period from year 2000-01 to 2014-15. Other Rabi Pulses were more instable ad compared other pulses. Overall the instability of the Total Pulses was 8.53 percent in Area, 20.15 percent in Productivity and 25.30 percent in Production during selected 15 years.

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

The table.3 depicts the effect of Area and Productivity on Production of Pulses in Nagpur district from the year 2000-01 to 2014-15.

The results show that the growth in Production of almost all selected pulses has increased as an effect of the increase in past years' area under cultivation. As the area under particular pulse crop was more in past, it is continued in current year significantly. The area in Pigeon Pea increased due to lagged area by 0.79 percent significantly over the selected 15 years. Same way the area under Green Gram and Black Gram and Chickpea is increased due to lagged area in past year by 0.87, 0.95 and 0.65 percent significantly from year 2000-01 to 2014-15. Area under Kharif and Rabi also increased in same period due increase lagged area. The total pulses area also increased in present with respect to increase in 0.83 percent over 15 years. The significant contribution of lagged productivity is observed Black Gram and Other Rabi Pulses over the same year.

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

| Sr. No. | Crop       | Intercept | Area    |         | Productivity |         |
|---------|------------|-----------|---------|---------|--------------|---------|
|         |            |           | b1      | T value | b2           | T value |
| 1       | Pigeon Pea | 257.54    | 0.52    | 1.71    | 0.02         | 0.26    |
| 2       | Green Gram | 0.94      | 0.79*** | 4.03    | 0.00         | 0.47    |



|   |                     |        |         |      |             |       |
|---|---------------------|--------|---------|------|-------------|-------|
| 3 | Black Gram          | -5.18  | 0.87*** | 4.44 | 0.01*       | 1.76  |
| 4 | Chickpea            | 227.51 | 0.95*** | 6.00 | -0.26       | -1.06 |
| 5 | Other Kharif Pulses | -1.29  | 0.65**  | 2.39 | 0.02        | 0.66  |
| 6 | Other Rabi Pulses   | 40.70  | 0.73*** | 3.24 | -<br>0.07** | -2.43 |
| 7 | Total Pulses        | 291.85 | 0.83*** | 5.92 | -0.09       | -0.39 |

**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)

## 5. Conclusion

From the results, it is concluded that the area and production of Total Pulses is increased by 3.69 and by 3.94 percent respectively and significantly. The green gram area declined significantly by 5.65 percent which result in significant declined in production by 4.01 percent. Almost, the positive growth is observed in area and production of all crops. The crop Green Gram, Chickpea, Other Kharif Pulses and Other Rabi Pulses have instability in Area, Productivity and Production in Nagpur district during the period from year 2000-01 to 2014-15. Overall the instability of the Total Pulses was 8.53 percent in Area, 20.15 percent in Productivity and 25.30 percent in Production during selected 15 years. As the area under particular pulse crop was more in past, it is continued in next year significantly. The total pulses area also increased in present with respect to increase in 0.83 percent over 15 years.

## 6. References:

- GoI, 2016, Sectoral Development: Agriculture, Economic Survey of India-2015-16, Vol-2, page-22
- GoI, 2016, Prices, Agriculture and Food Management, Economic Survey of India-2015-16, Vol-2, page-89-123
- GoM, 2016. Economic Survey of Maharashtra-2015-16. Page. 3
- Chand Prem, R. Sharma, M. Sharma, 2012, Performance of Vegetables crops in different Agro-Climatic Zones of Rajasthan, Indian Journal of Agricultural Marketing, Vol26(no.1), pages 67-80.