Trends in the production of Rabi pulses in the Raigarh district of Chhattisgarh

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Abstract

The study was conducted on trends in the production of Rabi pulses in the Raigarh District of Chhattisgarh. The study mainly covers the major pulses grown in the Raigarh district during Rabi season namely Moong, Urd, and Lathyrus. Data for the present study was collected from the Chhattisgarh Revenue Department and the Agri portal of the Chhattisgarh website. The average Compound Annual Growth Rate (CAGR) of area, production, and productivity of Moong in Chhattisgarh are -3.27%, -1.30%, and 2.01, respectively. In the Raigarh district, the CAGR of area, production, and productivity of moong is 4.28%, 0.09%, and 4.33% respectively. The urd CAGR of area, production, and productivity in Chhattisgarh are -5.86%, -4.17%, and 1.82%, respectively, and in terms of Raigarh district, the CAGR of area, production, and productivity of urd is -2.69, -5.10%, and 10.96% respectively. The estimated further CAGR of area, production, and productivity of lathyrus in Chhattisgarh is -3.53%, -2.25%, and 1.01%, respectively, and the CAGR of area, production, and productivity of lathyrus is -8.29%, -8.12%, and 0.60%, respectively in Raigarh district.

Keywords: CAGR, Rabi, area, production, and productivity

Introduction

Pulses are an excellent source of vitamins, minerals (including iron), fiber, and protein. In comparison to other protein sources, pulses offer a higher protein content at a lower cost. Pulses contain 20 to 25 percent protein by weight. This is twice wheat's protein content and three times rice's protein content. From the viewpoint of agricultural science, Rhizobium bacteria are found in the roots of leguminous crops. These bacteria stabilize the atmospheric nitrogen in the soil, thereby increasing the fertility of the soil. Generally, nitrogen fertilizers are reduced in the field where leguminous crops are cultivated in the next season. India is the world's second-largest agricultural commodities producer country. The Indian Economic Survey 2020-21 states that 20.2% of India's GDP comes from agriculture, which employs more than 50% of the labor force of the nation. India is the largest producer and consumer of pulses in the world. In terms of production, China, Australia, and South Africa come after India respectively. India produces 25% of the pulses in the world, consumes 27%, and imports 14%. The country exported 775,024.48 metric tons of pulses to the world worth Rs. 5,397.86 Crore in 2022-23. Main export destinations in 2022-23 are Bangladesh, China, Arab countries, the United States and Nepal. The cultivation of pulses contributes greatly to Chhattisgarh's agriculture and economy, and the state government is promoting sustainable agricultural methods and supporting their production. The total area under pulses in Chhattisgarh in the year 2021-22 was 5.40 lakh hectares whereas in the year 2020-21, it was 5.19 lakh hectares. In the year 2021-22, total pulses production was 3.76 lakh metric tons and productivity was 698 kg per hectare recorded by Chhattisgarh Land Record Department. Chhattisgarh state has also received the “Krishi Karman Award” from the Central Government for record pulse production in the year 2014-15.

Materials and Methods

Compound annual growth rate

Growth in area, production & productivity of pulses in Raigarh district was calculated using the following formula:-
Y = ab^t  \hspace{1cm} (1)

Where Y Refers to area/ production/ productivity in 1st year
a = Refers to intercept
t = Refers to year (time period), (say t = 1, 2, 3,…n)
b = 1 + r/100,

Where 'r' refers to the percentage rate of compound growth rate of area, production, productivity per annum

By taking logarithms both side of the equation, it have been reduced to following linear form with log 'Y' as dependent variable and ‘t’ as independent variable:

Log Y = log a + t log b

For convenience, if we put ‘log a’ = A and ‘log b’ = B, then this can be written as:-

Log Y = A + B t  \hspace{1cm} (2)

This is semi log function with time ‘t’ as independent variable. Then by using OLS technique, we have normal equations of the type.

\[ \sum \log Y = nA + B \sum t \]
\[ \sum \log Y t = A \sum t + B \sum t^2 \]  \hspace{1cm} (3)

Where ‘n’ is the number of observations (years) By solving equation (3), the values of ‘A’ and ‘B’ have been computed. For deriving compound growth rate from the computed regression coefficients, the following procedure has been adopted. When ‘B’ has positive value, anti-log of ‘B’ has been obtained and then one was subtracted from anti log value of ‘B’. Thereafter the B-1 value has been multiplied by hundred. Thus, it gave the compound growth rate (CGR) of increasing type, when ‘B’ had negative value, the procedure of calculating CGR is the same, but the value of growth rate will be negative. This negative CGR indicates the decreasing growth rate over time.

Percentage rate of compound growth per annum has been calculated as:-

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

This represented a uniform rate of change from observation to observation.

Result and Discussion

Table 1 shows the compound annual growth rates of Moong which is considered as primary pulse of the state. The area and production are shrinking, but productivity is still increasing mainly due to using good quality high yielding variety seeds. CAGR of area, production, and productivity of Moong is -3.27%, -1.30%, and 2.01%, respectively in the state. In Raigarh district area, production and productivity of moong are -4.28%, 0.09%, and 4.33%, respectively. It indicates area is significantly decreasing in Raigarh district as well as in State, production has non-significant positive growth in Raigarh district but overall in Chhattisgarh state it has negative growth rate and productivity registered a positive and significant rate of growth. Figures 1 and 2 also show these trends.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Particular</th>
<th>Area</th>
<th>Production</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chhattisgarh</td>
<td>-3.27***</td>
<td>-1.30</td>
<td>2.01***</td>
</tr>
<tr>
<td>2</td>
<td>Raigarh</td>
<td>-4.28**</td>
<td>0.09</td>
<td>4.33***</td>
</tr>
</tbody>
</table>

Note: ***, ** and * denotes significance at 1%, 5% and 10% levels

![Fig 1: Area, production, and productivity of Moong in Chhattisgarh.](image-url)
The compound annual growth rates of urd in Chhattisgarh and Raigarh are shown in Table 2. CAGR of area, production, and productivity of urd in Chhattisgarh are -5.86%, -4.17%, and 1.82%, respectively, and in Raigarh district the CAGR of area, production, and productivity are -2.69%, -5.10%, and 10.96%. Which depict that in Chhattisgarh state and Raigarh district productivity is rising significantly despite of declining area and production, Figures 3 and 4 also show these trends.

Table 2: CAGR of Urd in Chhattisgarh and Raigarh (in %)

<table>
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Note: ***, ** and * denotes significance at 1%, 5% and 10% levels
The compound annual growth rates of lathyrus in Chhattisgarh and Raigarh are shown in Table 3. CAGR of area, production, and productivity of lathyrus is -3.53%, -2.25%, and 1.01%, respectively in Chhattisgarh, and in Raigarh district area, production, and productivity of lathyrus is -8.29%, -8.12%, and 0.60% respectively. The table further revealed that although the area and production is significantly declining, productivity is increasing non significantly. Figures 5 and 6 also show these trends.

Table 3: CAGR of Lathyrus in Chhattisgarh and Raigarh (in %)

<table>
<thead>
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Note: ***, ** and * denotes significance at 1%, 5% and 10% levels.
### Conclusion

CAGR of production of moong over 24 years shows negative growth in Chhattisgarh state whereas this trend analysis shows positive growth in the Raigarh district. In the context of the productivity of moong, it shows positive and significant growth in both Chhattisgarh state and Raigarh district. This trend analysis indicate that the productivity of urd during 1999-2022 positive and significant growth in both Chhattisgarh state and Raigarh district and on the other hand area and production are decreasing in both Chhattisgarh state and Raigarh district. Use of low quality input materials and lack of awareness of appropriate production technology may be the reasons for negative growth rate of production. The compound growth rate indicated in the context of lathyrus productivity is positive growth and area and production are negative significant growth during the period of 1999-2022 in Chhattisgarh and Raigarh districts.

When the CAGR for the crops moong is compared between Chhattisgarh and Raigarh, it can be seen that the latter has a greater area, productivity, and production than the former. This indicates that Raigarh is a major moong-producing district in Chhattisgarh state.

### References