

Growth and instability in area, production and productivity of chickpea in India

ABSTRACT :

The performance of chickpea in India was studied with the objectives, to know about growth rates and variability in area, production and productivity. The secondary data on area, production and productivity of chickpea in India were collected from various government publications of agriculture. The data pertained to the period of 30 years i.e. from 1985-86 to 2014-15. The performance of chickpea was examined by estimating the growth rates, co-efficient of variation and Coppocks instability index of area, production and productivity of chickpea. From study, it was revealed that, the area under chickpea in period-II was increased. The growth rates in case of production for period-I was 2.02 per cent which is significant. In period-II, the growth rate was found 5.35 per cent which is significant. It was seen that, the growth rate of productivity of chickpea for the period-I was 1.49 per cent which was significant. In period-II, it was found non significant.

India exhibited low variation in period-I in area under chickpea. India exhibited low variation of production in period-I and high variation in overall period. The co-efficient of variation for chickpea in case of productivity for period-I, period-II and overall period were 9.28 per cent, 9.98 per cent and 11.93 per cent respectively.

(KEY WORDS: Chickpea, Growth rate, Co-efficient of variation, Coppocks instability Index)

Introduction

Chickpea or chana is very important pulse crop in India named *Cicerarietinum* in the leguminaceae family. Chickpea has been known in this country for long time. Chickpea ranks third in world production among peas and beans. It accounts 31.77 per cent of the area and 45.70 per cent of production in India. In 2014-15, the global scenario of chickpea observed that, the area, production and productivity were 8551000 ha, 7332000 Ton and 889 Kg./ha. respectively. In India, major chickpea growing states are Madhya Pradesh, Rajasthan, Bihar, Maharashtra and Uttar Pradesh, etc. Among these states, Maharashtra ranks third in acreage under chickpea after Madhya Pradesh and Rajasthan. Madhya Pradesh produces the major share of 40 per cent in the Indian production. Maharashtra constitutes 1427000 ha area, producing 1088000 tones with the productivity of 762 kg/ha in

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2014-15. The area under chickpea in Maharashtra contributes about 16.68 per cent of total area under chickpea in India, whereas production of chickpea in Maharashtra state accounted 14.83 per cent in the total production of chickpea in India. Pulses have exhibited wide year to year fluctuations in production. The fluctuation may induce inefficiency in production which, in turn, would hamper the pace of growth in production. Pulses are the important crop in India. The different pulses grown in the country are an integral part of subsistence farming. The different pulses play important role in sustainable production system and household nutrition security.

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Chickpea is a major pulse crop grown in India. Release of high – yielding varieties of chickpea and development of other improved production technologies have resulted, increasing in area under this crop and production levels are also increasing. With this view, the present study primarily aims at studying the growth rates in area, production, and productivity of the crop in India. This helps in knowing the trends in the crop production over a period of the study.

Objectives :

1. To study the growth rates of area, production and productivity of Chickpea in India.
2. To study the degree of instability in area, production and productivity of Chickpea in India.

Materials and methods:

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The study is based on 30 years data. Secondary data were collected from various government publications of agriculture sector. Data pertained for the year 1985-86 to 2014-15. The entire study was split up into two sub periods. The growth rates were calculated separately for the overall period (1985-86 to 2014-15), and for two sub periods i.e. period-I (1985-86 to 1999-2000) and period-II (2000-01 to 2014-15). In order to study the variability in area, production and productivity in chickpea, coefficient of variation and Coppocks instability index were estimated for the study period separately

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ANALYTICAL TOOLS:

For the present study, following analytical tools were used.

1) Compound Growth Rate

65 The compound growth rate of area, production and productivity of guava crop were
66 worked out by fitting an exponential function as given below

$$Y = ab^t$$

67 Where,

68 Y= Area, Production and productivity

69 a= Intercept

70 b= Regression coefficient

71 t = Time period (years)

72 From the coefficient values, the rates of compound growths will be work out by using
73 the formula

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

74 Where,

75 r = Compound growth rate in per cent.

76 **2) Coefficient of Variation**

$$C.V. (\%) = \frac{\sigma}{\bar{x}} \times 100$$

77 Where,

78 σ - Standard deviation

79 $\bar{x}$ - Arithmetic mean

81 **3) Coppocks Instability Index**

$$\text{Delta M} = \frac{\sum \log (X_t + 1) - \log (X_t)}{N-1}$$

$$V \log = \frac{\sum [\{\log X_t + 1 - \log X_t\} - m]^2}{N - 1}$$

$$C.I.I = [\text{Antilog}(\sqrt{V \log}) - 1] \times 100$$

Where,

X_t = Value of area, production and productivity

N = No. of years

m = Arithmetic mean of difference between the log of $X_t, X_t + 1, X_t + 2$

V log = Logarithmic variance of the series.

Results and Discussion:

The findings of the present study as well as relevant discussion have been presented under following heads :

Growth performance of chickpea in India:

The compound growth rates of area, production and productivity of Chickpea in India is presented in Table 1.

Table 1: Compound growth rates of area, production and productivity of chickpea in India

Sr. No.	Particulars	CGR (%)		
		Period-I (1985-86 to 1999-2000)	Period-II (2000-01 to 2014-15)	Overall
1.	Area	0.52	3.51***	0.94***
2.	Production	2.02*	5.35***	2.06
3.	Productivity	1.49***	1.77	1.11***

Note: Significant at 1% ***, 5% **, 10% *

An attempt was made to estimate the growth rates of area, production and productivity of chick pea with the help of growth rate model explained in methodology. The results obtained are shown below,

Area :

It was observed from Table 1 that, the growth rate of area was found non significant in period-I. In period-II and overall period, the growth rate was found 3.51 per cent and 0.94 per cent respectively which was both significant at 1 per cent level. From

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this, it indicates that, the area under chick pea in period-II was increased. (Hazell, 1982 and Rangiet *al.*, 2002).

Production :

It was observed that, the growth rates in case of production for period-I was 2.02 per cent which is significant at 10 per cent level. In period-II, the growth rate was found 5.35 per cent which is significant at 1 per cent level. In overall period, it was found non significant. From this, it indicates that, the production is significant in India has been bought by the increased yield in which the returns were made possible due to adoption of modern techniques.

Productivity :

It is most important criteria of measuring the growth of any crop output. The success or failure of any improvement in the art of agriculture is measured by the resultant increase or decrease in the productivity. It was seen that, the growth rate of productivity of chickpea for the period-I was 1.49 per cent which was significant at 1 per cent level. In period-II, it was found non significant. In over all period, it was 1.11 per cent which was significant at 1 per cent level.

Instability in chickpea :

The degree of instability in area, production, and productivity of chickpea in different periods was measured by using co-efficient of variation and Coppocks instability index, which measures the absolute variation. The higher the co-efficient of variation, the greater is the instability and *vice versa*. Table 2 presents the co-efficient of variation and Coppocks instability index in area, production and productivity of chickpea in India.

Table 2 : Co-efficient of variation and Coppocks Instability Index in area, production and productivity of chickpea in India

Sr. No.	Particulars	Period-I (1985-86 to 1999-2000)		Period-II (2000-01 to 2014-15)		Overall Period	
		C.V	C.I.I	C.V	C.I.I	C.V	C.I.I
1.	Area	11.87	18.41	16.47	11.96	15.12	15.27
2.	Production	17.38	24.21	24.78	19.80	25.27	22.50
3.	Productivity	9.28	11.43	9.98	10.07	11.93	10.79

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Co-efficient of variation

Area :

It was revealed from Table 2 that, the co-efficient of variation for chickpea for period-I, period-II and overall period were 11.87 per cent, 16.87 per cent and 15.12 per cent respectively. From this, it was seen that, India exhibited low variation in period-I.

Production :

It was seen from Table 2 that, the co-efficient of variation for chickpea for period-I, period-II and overall period were 17.38 per cent, 24.78 per cent and 25.27 per cent respectively. From this, it was observed that, India exhibited low variation in case of production in period-I and high variation in overall period.

Productivity :

It was revealed from Table 2 that, the co-efficient of variation for chickpea for period-I, period-II and overall period were 9.28 per cent, 9.98 per cent and 11.93 per cent respectively. From this, it was seen that, India exhibited low variation in all periods. From the above discussion, it is clear that the extent of variation was highest during the period-II as compared to period-I in area, production and productivity.

Coppocks Instability Index:

The coefficient of variation measures the relative variation including trend, while Coppocks instability index measures the variation around the trend. The instability index was computed using Coppocks instability index are as follows,

Area:

It was observed from Table 2 that, Coppocks instability index for the period-I, period-II and overall period were 18.41 per cent, 11.96 per cent and 15.27 per cent respectively.

Production:

It was observed from Table 2 that, Coppocks instability index for the period-I, period-II and overall period were 24.21 per cent, 19.80 per cent and 22.50 per cent respectively.

Productivity:

It was observed from Table 2 that, Coppocks instability index for the period-I, period-II and overall period were 11.43 per cent, 10.07 per cent and 10.79 per cent respectively.

Conclusion :

From study it was concluded that, area under chick pea in period-II was increased. The growth rates of production for period-I was 2.02 per cent which is significant. In period-II, the growth rate was found 5.35 per cent which is significant. It was seen that, the growth rate of productivity of chickpea for the period-I was 1.49 per cent which was significant and in period-II, it was found non significant.

India exhibited low variation in period-I in area under chickpea. Low variation in case of production in period-I and high variation in overall period. The co-efficient of variation for chickpea in case of productivity for period-I, period-II and overall period were 9.28 per cent, 9.98 per cent and 11.93 per cent respectively.

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