

Research Paper

# Comparative Growth Performance of Okra in Punjab and Haryana

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## ABSTRACT

The primary objective of this study is to analyse the growth pattern and volatility of okra cultivation in Haryana, Punjab, and India. To achieve this, two methods, namely the coefficient of variation and the Cuddy-Della Valle index, were employed to identify the instability in the areas, production, and productivity of okra. The findings indicate that the CDVI index serves as a more precise indicator of instability in all three aspects of okra cultivation. When considering the area, Punjab exhibits the highest level of instability at 35.88%, followed by Haryana at 14.31% and India at 6.43%. In terms of production, Haryana demonstrates the highest CDVI at 17.47%, with India at 9.31% and Punjab at 7.78%. Regarding productivity, Haryana also showcases the highest CDVI of 18.31%, while Punjab records 11.75% and India 3.60%. Despite the presence of instability, the economic growth, production, and productivity of okra in all three regions display positive trends. Furthermore, Punjab outperforms Haryana and India in terms of compound annual growth rate (CAGR) for the area, production, and productivity of okra.

## HIGHLIGHTS

- Punjab exhibits higher instability in terms of area, while Haryana demonstrates higher instability in production and productivity.
- Punjab shows a greater compound annual growth rate (CAGR) for the area, production, and productivity of okra compared to Haryana and India
- Haryana has the highest CV values for both the area (28.07) and production (36.94), indicating relatively higher variability in these aspects compared to Punjab and India.

**Keywords:** CAGR, Haryana, India, Instability, Okra, Punjab

With 319.56 million tonnes of production from 26.21 million hectares, India is the world's second-largest horticulture crop grower after China (Sudha *et al.* 2006; Suvagiya *et al.* 2017). In the horticultural crop the contribution of vegetables productions is highest i.e. 59.2 % followed by fruits (31.2%), plantation crops (5.8%), spices (2.6%) and flowers & aromatics (1.2%) (Singh *et al.* 2022; Horticultural Statistics at a Glance 2018). Fruit output grew from 50.9 million tonnes to 100.44 million tonnes and vegetable production climbed from 101.2 million tonnes to 189.46 million tonnes between 2004–05 and 2019–20

(Chaudhari *et al.* 2018). In the vegetables, Potato has the largest area under cultivation i.e., 19.93 percent followed by onion (13.87), tomato (7.88%), brinjal (7.01%), peas (5.51%), okra (5.18%) cauliflower (4.45%) and cabbage (3.86%). While the maximum share of production in vegetables is potato i.e., 25.68 percent followed by onion (13.80%), tomato

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(11.19), brinjal (6.52%), cabbage (4.86%), cauliflower (4.67%) and okra (3.36%). India is the largest okra production country in the world i.e. 5.5 million tonnes with 62 percent in the world (Horticultural Statistics at a Glance 2018). Okra (*Abelmoschus esculentus*), is a hairy annual plant in the Malvaceae family that is sometimes referred to as ladies' finger, gumbo, or *Bhindi*. It is commonly farmed in the tropics and subtropics of the Western Hemisphere and is indigenous to the tropics of the Eastern Hemisphere. Okra is grown across the tropics and in milder regions of temperate Asia (Ajayi *et al.* 2017; Maduwanthi *et al.* 2019). Among the nations where it is commercially grown are India, Turkey, Iran, West Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan, West Bengal, and Burma. The crop is a warm-season vegetable. It is an excellent source of fibre, antioxidants, vitamins, and minerals. Dry okra seeds have an oil content of 18–20% and a crude protein content of 20–23%. The dried stems may be used to make paper pulp or fuel, while the foliage can be utilised as biomass. In India, the area under okra during 2019-20 is 0.51 million hectares and production 6.3 million tonnes. West Bengal has the largest area under okra cultivation i.e., 77.55 thousand hectares while Gujrat is the largest producer i.e., 921.72 thousand metric tonnes (Das *et al.* 2018). Haryana is the seventh highest in the okra area and top eighth in production in the country. While Punjab ranks sixteenth in the area under okra cultivation and seventeenth in production. Most of the previous studies were emphasis on yield trials, varietal developments, disease and pest resistant etc. but study on instability in area, production and productivity of okra has been least studied. This study was conducted to analyse the instability in area, production and productivity of okra in Haryana and Punjab in comparison with India as a whole.

## METHODOLOGY

For the years 2000-2001 to 2019-20 for Haryana and India and 2004-2005 to 2019-20 for Punjab, data on significant factors like area, production, and productivity of okra were compiled from the Department of Horticulture in Haryana and the Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi.

## Coefficient of Variation

The simplest measure of instability is the coefficient of variation (CV), which overestimates the degree of instability in time series data that are defined by long-term trends.

$$\text{Coefficient of Variation (CV)} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

## Cuddy-Della Valle index

The Cuddy-Della Valle Index reverses the yearly trend and displays the precise instability direction (Cuddy and Della, 1978). Consequently, it is a better way to quantify the volatility of agricultural output and yield. Little values of this index represent low price volatility, and vice versa. The CV is corrected by the Cuddy-Della Valle index as:

$$\text{Cuddy – Della Valle Instability Index (\%)} =$$

$$CV \sqrt{(1 - \bar{R}^2)}$$

Where,

CV = coefficient of Variation (%)

$\bar{R}^2$  = adjusted coefficient of determination

Compound growth rates for the area, production, and productivity of okra were calculated by fitting time-series data to the following exponential function:

$$Y = ab^t \quad \dots(1)$$

Where,

Y = Index number of area, production, productivity as the dependent variable

t = Time variable (year) as independent variable

a = Intercept

b = Regression coefficient

Equation (1) can be expressed in logarithmic form as follows:

$$\log y = \log a + t \log b \quad \dots(2)$$

$$\log y = A + B t \quad \dots(3)$$

Where,

$$A = \log a; B = \log b$$

The compound growth rate “r” was computed as:

$$r = (\text{Antilog of } b - 1) \times 100 \quad \dots(4)$$

## RESULTS AND DISCUSSION

Time series data were analysed and presented in Table 1 and Fig. 1-3 to estimate the growth performance of the area, production, and productivity of okra in Haryana and India from 2000-01 to 2019-20 and Punjab from 2004-05 to 2019-20.

**Table 1:** Growth rates in area, production, and productivity of Okra in Haryana, Punjab and India

	Area	Production	Productivity
Haryana	4.31	5.51	1.15
Punjab	7.37	10.21	2.64
India	2.75	4.14	1.34

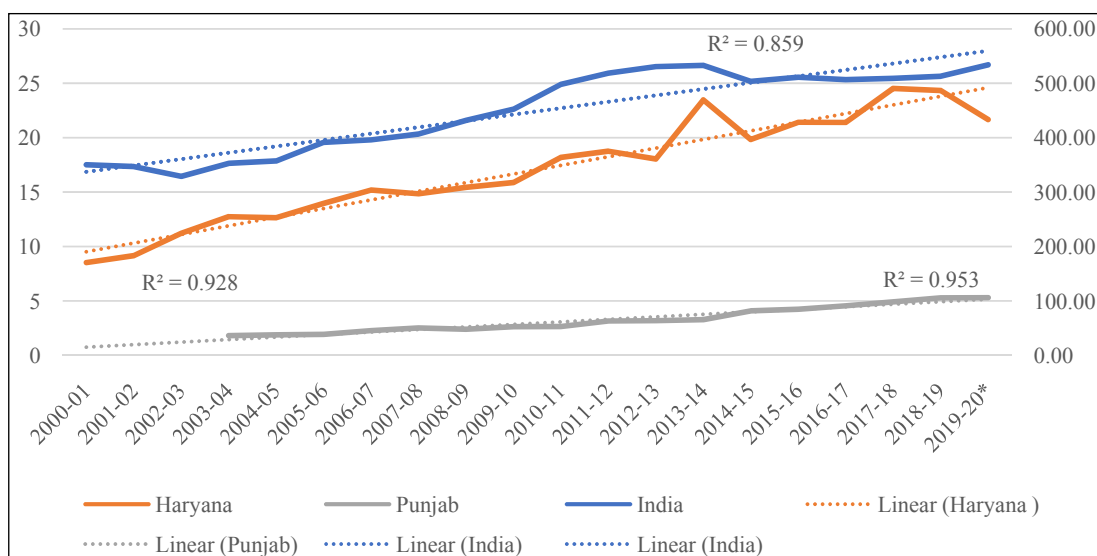
The compound annual growth rate (CAGR) of area during the period was positive in Haryana, Punjab

and India but higher was observed in Punjab i.e., 7.37 percent. It has been observed growth rate was higher Punjab due to farmers shifted from traditional agriculture to ruminative agriculture. The value of R<sup>2</sup> is also found in Punjab as compared to Haryana and India. In case of production, CAGR also found higher in Punjab i.e., 10.21 percent as compared to Haryana and India because of area under okra is increasing considerably in Punjab. Similar findings were reported by Majumder and Deka, 2018 and Usha *et al.* 2022, where there was a positive growth rate in area and production of vegetable crops in the Tripura state. The value of R<sup>2</sup> is also found Higher in Punjab as followed by India and Haryana. In productivity the CAGR was higher in Punjab (2.64%) as compared to India (1.34%) and Haryana (1.15%) (Nimbrayan *et al.* 2019).

Table 2 presents estimations of instability in okra area, production, and productivity using two methodologies. The coefficient of variation approach reveals that Punjab experiences greater instability in the area dedicated to okra cultivation, with a percentage of 36.22%, compared to Haryana at 28.07% and India as a whole at 16.66%. Similarly,

**Table 2:** Instability in area, production and productivity of okra in Haryana, Punjab and India

	Area		Production		Productivity				
	CV	CDVI	CV	CDVI	CV	CDVI			
Haryana	28.07	14.31	0.74	36.94	17.47	0.78	19.06	18.31	0.08
Punjab	36.22	35.88	0.02	45.86	7.78	0.97	15.01	11.75	0.39
India	16.66	6.43	0.85	24.41	9.31	0.85	8.52	3.60	0.82



**Fig. 1:** Trends of area under okra in Haryana, Punjab and India

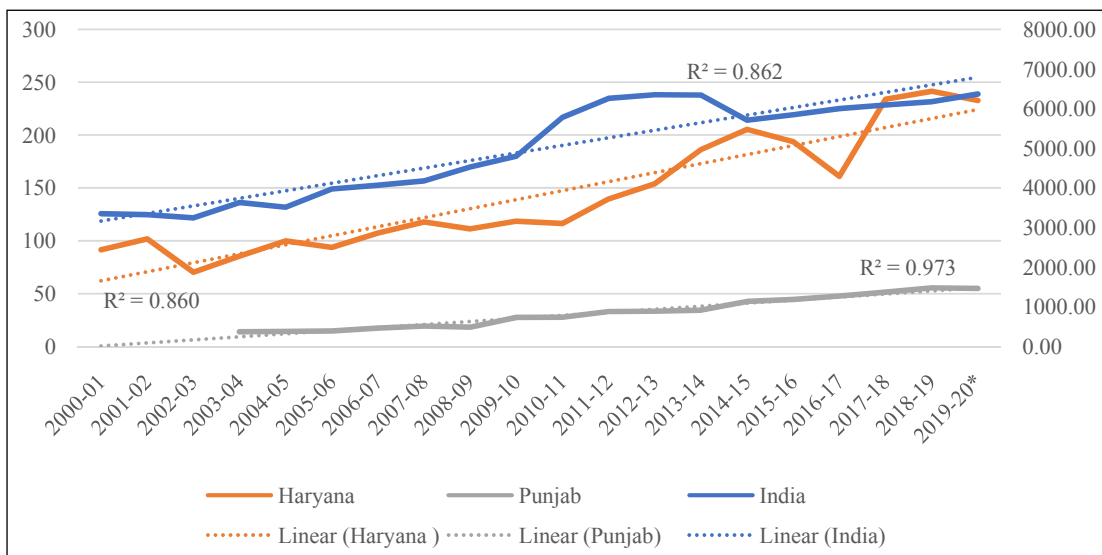


Fig. 2: Trends of production under okra in Haryana, Punjab and India

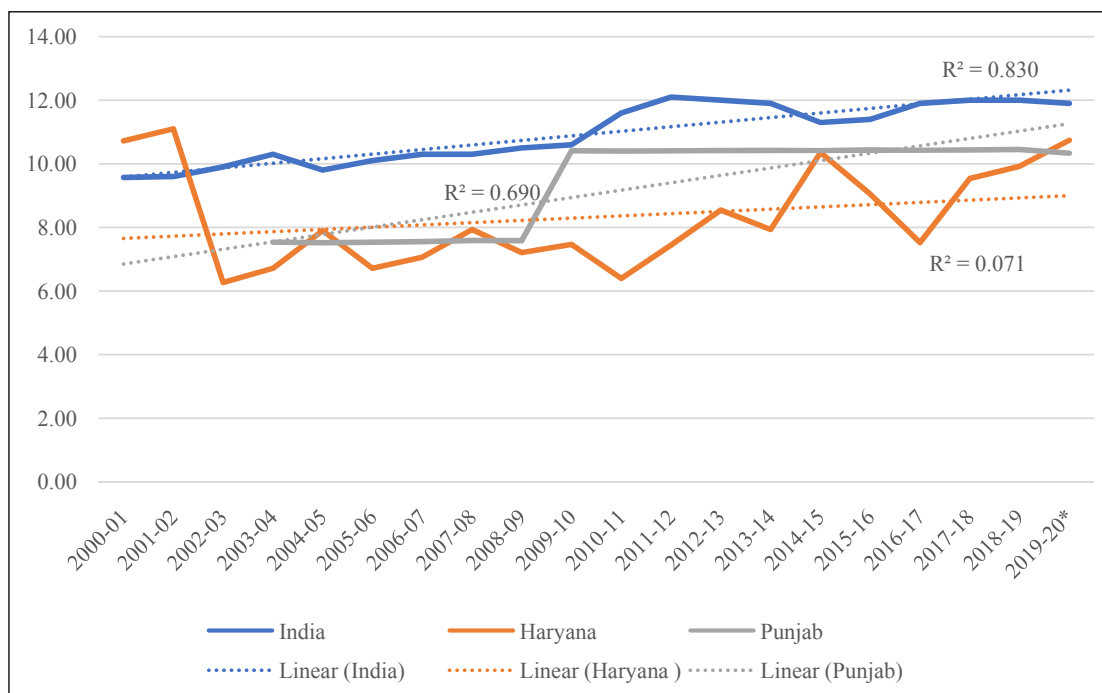


Fig. 3: Trends of productivity under okra in Haryana, Punjab and India

when considering the Cuddy-Della Valle instability index (CDVI) for okra, Punjab demonstrates the highest level of instability at 35.88%, followed by Haryana at 14.31% and India at 6.43%. It has been observed that instability in area in Punjab was higher than Haryana because of availability of labour and change in effective demand in okra (Nimbrayan *et al.* 2020; Punia *et al.* 2021).

In Production, the instability through first method observed that Punjab (45.86%) has more instability as compared to Haryana (24.41%) and India

(24.41%). In the case of production instability through second method higher instability was found in Haryana (17.47%) followed by India (9.31%) and Punjab (7.78%) (Nimbrayan *et al.* 2019; Kumar *et al.* 2019; Punia *et al.* 2019). The okra growers in Haryana influenced by the other state growers which impact the market price of okra in nearby potential market.

Instability in productivity was recorded higher in Haryana (19.06%) followed by Punjab (15.01%) and India (8.52%) in first method. According to CDVI the

Haryana has the higher instability i.e., 18.31 percent as compared to Punjab (11.75%) and India (3.60%). In case of productivity of okra Haryana and Punjab noticed almost same level of instability because of frequent incidence of insect and pests.

## CONCLUSION

CV and CDVI were the two approaches employed in this study to identify instability in the okra area, production and productivity. In all approaches, the CDVI index was discovered to be a more accurate indicator of the area, production, and productivity instability of the okra crop. In case of area the instability is higher in the Punjab (35.88%) followed by Haryana (14.31%) and India (6.43%). In Production, the CDVI found higher in Haryana (17.47%) followed by India (9.31%) and Punjab (7.78%). In case of productivity, CDVI higher in Haryana i.e., 18.31 percent as compared to Punjab (11.75%) and India (3.60%). Economic growth, production, and productivity of okra in Haryana, Punjab, and India shown good tendencies. In comparison to Haryana and India, Punjab has a greater CAGR for area, production, and productivity. Government should ensure the procurement of okra to establish the price fluctuation in market. Government should also provide more financial support to the okra growers as okra being more susceptible to pest and diseases.

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