

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 5; May 2026; Page No. 532-535

Received: 14-02-2026
Accepted: 19-03-2026

Indexed Journal
Peer Reviewed Journal

Growth trend analysis of soybean and groundnut in Maharashtra: A compound growth rate approach

¹SJ Shinde, ²RB Hile, ³KY Khairnar, ⁴SJ Shinde, ⁵PR Kolhe and ⁶AS Gadakh

^{1, 5}Research Scholar, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

²Associate Professor, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

³Research Assistant, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

⁴Research Scholar, Institute of Water Education, Delft, Netherlands

⁶Senior Research Fellow, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahilyanagar, Maharashtra, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i5g.3621>

Corresponding Author: SJ Shinde

Abstract

Groundnut and soybean are important oilseed crops in India. Studying their growth trends helps assess crop performance and support oilseed development policies. The study analyzed 20 years of data (2004–05 to 2023–24) for Maharashtra state. To assess decadal trends, the period was divided into Period I (2004–05 to 2013–14), Period II (2014–15 to 2023–24), and the overall period (2004–05 to 2023–24). Compound growth rates of area, production, and productivity were estimated using an exponential function for CAGR analysis. The compound growth analysis revealed a positive trend in soybean cultivation in Maharashtra, with significant increases in area and production across all periods, indicating that growth in output was mainly driven by expansion in cultivated area, while productivity showed non-significant improvement. In contrast, groundnut cultivation exhibited a declining trend with significant reductions in area and production over the study period, although productivity recorded a marginal positive growth, suggesting that technological improvements and better production practices partially compensated for the reduction in cultivated area.

Keywords: Soybean, groundnut, Compound Growth Rate (CGR), area, production, productivity, oilseed crops, growth trend analysis

Introduction

Groundnut (*Arachis hypogaea* L.) and soybean (*Glycine max* L.) are one of the most important oilseed crops cultivated worldwide and play a vital role in agricultural economies by contributing to edible oil production, nutritional security, and farmers' income. Oilseed crops occupy a significant position in Indian agriculture due to their importance in food, feed, industrial applications, and export potential. Groundnut is commonly known as the "King of Oilseeds" because of its high oil content and nutritional value, while soybean is often referred to as the "Golden Bean" because of its rich protein and oil composition.

India is one of the major producers of oilseeds in the world. Soybean occupies nearly 112–119 lakh hectares with production ranging from 130–151 lakh tonnes and productivity of about 983–1063 kg/ha. Groundnut occupies approximately 60–65 lakh hectares with production of about 118–119 lakh tonnes and productivity around 1900–2000 kg/ha. Maharashtra is one of the important oilseed-producing states, where soybean occupies nearly 45–52 lakh

hectares with production ranging between 50–73 lakh tonnes and productivity of about 1100–1169 kg/ha. Groundnut in Maharashtra occupies around 2.5–3.0 lakh hectares with production ranging from 3.0–4.5 lakh tonnes and productivity of approximately 1200–1500 kg/ha. ((UPAg), SOPA, Research studies, 2025) ^[20, 19].

Growth analysis of agricultural commodities is an important tool for understanding trends in area, production, and productivity over time. Estimation of growth rates helps in evaluating the performance and progress of crops and provides insights into the impact of technological and institutional factors on agricultural development. Compound growth rate analysis specifically helps identify whether observed changes in production are mainly due to expansion in cultivated area or improvements in productivity.

In recent years, fluctuations in oilseed production have raised concerns regarding self-sufficiency in edible oil production and dependence on imports. Therefore, understanding the growth patterns of major oilseed crops such as groundnut and soybean is essential for designing appropriate policy measures.

Materials and Methods

Data Resources

The present study utilized time series data on three major variables, namely area, production, and productivity, for selected edible oilseed crops in India. The study was based entirely on secondary data collected from various published sources such as the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers' Welfare, Government of India, *Agricultural Statistics at a Glance*, and official websites including India Agri Stat, Department of Agriculture and Farmers Welfare.

Methodology

The study includes a 20-year duration from 2004-05 to 2023-24, focusing on Maharashtra state as a whole. To identify decadal trends in growth rates, the time-series data was categorized into two sub periods, each period of ten-years and overall period of twenty years respectively, and results are presented under the category of cereals, pulses and oilseeds respectively.

- A. Period I: 2004-05 to 2013-14
- B. Period II: 2014-15 to 2023-24
- C. Overall (Entire period): 2004-05 to 2023-24

The compound growth rates of area, production and productivity were estimated by using exponential function. The function was applied in many other studies for the

computation of CAGR (Ahabana and Madhulika, 2018). Equation to compute CAGR is

$$Y_t = a b^t e^u \quad (\text{equation -1})$$

Where,

Y_t = area/ production /productivity

t = time period (in years)

a = Intercept value (value of y when $t = 0$)

$b = (1 + r)$, ' r ' being the growth rate

e = Error term

After log transformation of equation (1);

$$\text{Log } Y_t = \text{Log } a + t * \text{Log } b$$

And

Compound Annual Growth Rate (CAGR) is given by:

$$\text{CAGR (\%)} = \{ \text{Antilog (Log } b) - 1 \} * 100$$

Where,

b = antilog of slope of area/ production/ productivity. Regression coefficient was tested for significance by using student's t-test

Results and Discussion

Table 1: CAGR of the area, production and productivity of soybean in Maharashtra

Crop	Period	CGR		
		Area	Production	Productivity
Soybean	Period I (2004-05 to 2013-14)	4.84 ***	8.98 ***	3.96 ^{NS}
	Period II (2014-15 to 2023-24)	4.34 ***	8.94 **	4.41 ^{NS}
	Overall (2004-05 to 2023-24)	4.11 ***	4.42 ***	0.3 ^{NS}

The compound growth rates of area, production, and productivity of soybean in Maharashtra during different periods of the study are presented in Table X. The findings indicate a positive growth trend in soybean cultivation across all periods, highlighting its increasing importance in the agricultural economy of the state.

During Period I (2004–05 to 2013–14), the area under soybean cultivation increased significantly at an annual growth rate of 4.84 per cent, while production recorded a higher significant growth rate of 8.98 per cent. The relatively higher growth in production compared to area suggests that factors other than area expansion, such as improved crop management practices, adoption of better varieties, and technological interventions, might have contributed to increased production. However, productivity registered a positive growth rate of 3.96 per cent, although it was found to be non-significant, indicating that yield improvements were not statistically consistent during this period.

Similarly, during Period II (2014–15 to 2023–24), soybean continued to exhibit significant growth in both area and production, with annual growth rates of 4.34 per cent and 8.94 per cent, respectively. The continued expansion in area indicates increasing preference among farmers towards soybean cultivation due to its economic profitability and growing market demand. Productivity also showed a positive growth trend of 4.41 per cent, although the growth

remained statistically non-significant. This suggests that despite technological advancements and improved agricultural practices, productivity gains were not sufficiently stable over the period. Over the overall study period (2004–05 to 2023–24), soybean maintained a significant positive growth in area and production, which increased at 4.11 per cent and 4.42 per cent per annum, respectively. However, productivity increased marginally at 0.30 per cent and remained non-significant.

Table 2: CAGR of the area, production and productivity of groundnut in Maharashtra

Crop	Period	CGR		
		Area	Production	Productivity
Groundnut	Period I (2004-05 to 2013-14)	-5.14 ***	-3.25 *	1.99 ^{NS}
	Period II (2014-15 to 2023-24)	-3.78 **	-2.77 ^{NS}	1.04 ^{NS}
	Overall (2004-05 to 2023-24)	-2.59 ***	-1.63 ***	0.99 ***

The compound growth rates of area, production, and productivity of groundnut in Maharashtra during different periods of the study are presented in Table 2. The results indicate a declining trend in the cultivation of groundnut over the study period, although productivity showed some improvement.

During Period I (2004–05 to 2013–14), the area under groundnut cultivation declined significantly at an annual growth rate of 5.14 per cent, while production also recorded a significant decrease of 3.25 per cent. The decline in production was relatively lower than the decline in area, which may be attributed to improvements in productivity. Productivity showed a positive growth rate of 1.99 per cent; however, the increase was statistically non-significant, suggesting that yield improvements during this period were inconsistent.

During Period II (2014–15 to 2023–24), the declining trend in area under groundnut cultivation continued, with a significant reduction of 3.78 per cent per annum. Production also decreased by 2.77 per cent, although the decline was statistically non-significant. Productivity increased at a rate of 1.04 per cent; however, the growth remained non-significant. This indicates that while yield performance showed a slight improvement, it was not sufficient to offset the decline in cultivated area and maintain production levels.

Over the overall study period (2004–05 to 2023–24), groundnut cultivation recorded a significant decline in both area and production, with annual growth rates of –2.59 per cent and –1.63 per cent, respectively. In contrast, productivity exhibited a significant positive growth rate of 0.99 per cent.

Discussion

The compound growth analysis revealed contrasting trends in soybean and groundnut cultivation in Maharashtra. Soybean showed a significant increase in area and production during all periods, indicating its growing importance in the state's agricultural economy. The higher growth in production compared to area suggests the influence of improved technologies, better varieties, and enhanced management practices. However, the non-significant growth in productivity indicates unstable yield improvements. In contrast, groundnut recorded a declining trend in area and production, possibly due to farmers shifting towards more profitable crops such as soybean. Although productivity showed a positive trend, the improvement was not sufficient to offset the decline in cultivated area. These findings indicate the expanding importance of soybean and emphasize the need for strategies to enhance the productivity and profitability of groundnut cultivation in Maharashtra.

Conclusion

The study revealed contrasting growth patterns in major oilseed crops in Maharashtra during the study period. Soybean recorded significant positive growth in area and production across all periods, indicating its increasing importance in the state's oilseed economy. However, productivity growth remained positive but non-significant, suggesting that the increase in production was mainly driven by expansion of cultivated area rather than improvements in yield. This expansion may be attributed to factors such as higher profitability, increased market demand, and wider adaptability of soybean in regions like Vidarbha and Marathwada. In contrast, groundnut exhibited a declining trend in both area and production throughout the study period. The reduction in groundnut cultivation may be

associated with a shift of farmers towards comparatively more remunerative crops such as soybean and cotton. However, productivity showed some improvement, indicating the contribution of improved technologies and management practices despite the reduction in cultivated area.

Efforts should be made to enhance soybean productivity through the development and adoption of high-yielding and climate-resilient varieties and improved crop management practices. For example, the promotion of improved soybean varieties such as JS-335, MAUS-71, and Phule Kimaya, along with balanced fertilizer use, drip irrigation, and integrated pest management practices, can help improve yield levels. For groundnut, emphasis should be given to increasing productivity through improved seed varieties and modern production technologies. For instance, the adoption of varieties such as TAG-24, JL-501, and Phule Bharati, along with efficient water management and mechanized cultivation practices, may enhance productivity. Further, suitable policy support and crop diversification strategies should be encouraged to maintain sustainability and balance in the oilseed sector of Maharashtra.

References

1. Acharya SP, Basavaraja H, Kunnal B, Mahajanashetti SB, Bhat ARS. Growth in area, production and productivity of major crops in Karnataka. *Karnataka Journal of Agricultural Sciences*. 2012;25(4):431-436.
2. Government of India, Ministry of Agriculture & Farmers Welfare, Department of Agriculture & Farmers Welfare, Economics & Statistics Division. *Agricultural Statistics at a Glance 2022*. New Delhi: Government of India; 2022.
3. Anjum A, Madhulika. Growth and instability analysis in Indian agriculture. *International Journal of Multidisciplinary Research and Development*. 2018;5(11):119-125.
4. Arun JV, Premkumar A. Sugarcane growth in India: problems and prospects. *SAARC Journal of Agriculture*. 2023;20(2):133-144.
5. Chandrashekharagowda BP, Nirmalnath J, Shiney Ammannna, Mati Wade PS, Jagadeesh KS. Suppression of *Orobanche* spp. in tobacco by native arbuscular mycorrhizal fungi. *International Journal of Current Microbiology and Applied Sciences*. 2018;7(4):1890-1896.
6. Cuddy JA, Valle PD. Measuring the instability of time series data. *Oxford Bulletin of Economics and Statistics*. 1978;40(1):79-85.
7. Dey A, Gautam Y. An assessment of export competitiveness of Indian groundnut. *Indian Journal of Agricultural Marketing*. 2023;37(1):1-9.
8. Dutta J. Comparative economics of production of jute and mesta in Dakshin Dinajpur district of West Bengal. *Journal of Crop and Weed*. 2012;8(2):91-96.
9. Kumari K, Devegowda SR, Kushwaha S. Trend analysis of area, production and productivity of jute in India. *The Pharma Innovation Journal*. 2018;7(12):58-62.
10. Meena AK, Mohan Kumar NV, Katageri IS, Methre R, Bheru LK. Molecular markers in cotton improvement. *International Journal of Current Microbiology and*

- Applied Sciences. 2017;6(5):2627-2644.
11. Rahman F, Bee N. Trends and pattern of sugarcane production in Shahjahanpur district, Uttar Pradesh: a geographical analysis. *Economic Affairs*. 2019;64(3):537-545.
 12. Raju R, Kumar TMK. Trend analysis of area, production and productivity of sugarcane in India. *Agro Economist*. 2019;6(1):7-13.
 13. Ramasundaram P, Gajbhiye H. Constraints to cotton production in India. *CICR Technical Bulletin No. 19*. Nagpur: Central Institute for Cotton Research; 2001.
 14. Rana MJ, Islam S, Kamruzzaman M. Growth and instability in area, production and productivity of major spices in Bangladesh. *Journal of Agriculture and Food Research*. 2021;6:1-8.
 15. Reddy VK, Kingsly IT. Area, production, yield trends and pattern of oilseeds growth in India. *Economic Affairs*. 2017;62(2):327-334.
 16. Shukla SK, Sharma L, Awasthi SK, Pathak AD. Sugarcane in India: package of practices for different agro-climatic zones. *AICRP(S) Technical Bulletin No. 1*. 2017:1-64.
 17. Shwetha M, Shakuntala Devi NI, Lavanya T, Suhasini K, Meena A. Growth in area, production and productivity of cotton crop in India: a state wise analysis. *International Journal of Environment and Climate Change*. 2022;12(11):51-57.
 18. Sonnad JS, Raveendaran N, Ajjan N, Selvaraj KN. Growth analysis of oilseed crops in India during pre and post-WTO periods. *Karnataka Journal of Agricultural Sciences*. 2011;24(2):184-187.
 19. SOPA. Ministry of Agriculture & Farmers Welfare. 2025.
 20. Unified Portal for Agricultural Statistics (UPAg). Government of India. 2025.
 21. Wani BK. Role of irrigation in agriculture productivity in drought prone district. *Third Concept*. 2020;34(402):73-78.