Oilseeds Production in India: Trends, instability and the way forward

Juhee Agrawal
Ph.D. Scholar, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012
Corresponding author's e-mail: juheeagrawal1994@gmail.com

ABSTRACT

India's oilseeds sector is crucial to its agricultural economy. Despite varied agro-ecological environments suitable for oilseeds cultivation, low productivity, fragmented processing facilities, and technological gaps have hindered domestic production, leading to heavy reliance on imports. The study analyzes growth rates and instability in the oilseeds sector over three decades, revealing a positive growth rate in production primarily driven by productivity increases. However, the area under oilseed cultivation has shown a negative growth trend in recent years. Instability in production remains high due to factors like price variation, climatic conditions, and policy changes. To meet the increasing demand, there is an urgent need to enhance oilseed crops productivity and promote high-yielding crops such as oil palm. Policymakers must focus on reducing production instability and improving self-sufficiency in edible oil production to reduce import dependency.

Keywords: *oilseeds, instability*

INTRODUCTION

The oilseeds sector is crucial to India's agricultural economy, ranking second only to food grains in terms of acreage, production, and economic value. As the fourth-largest oilseed producer globally, following the USA, China, and Brazil (Reddy and Immanuelraj, 2019), India's oilseed economy includes nine oilseeds: groundnut, castor seed, sesame, rapeseed, mustard, linseed, soybean, sunflower, niger seed, and safflower. Among these, the major oilseeds-groundnut, rapeseed, mustard, soybean, sesame, and sunflower-comprise 89 per cent of the total area and 93 per cent of the total production (Sonnad *et al.,* 2011; Teja *et al.,* 2017; Renjini and Jha, 2019). India's diverse agro-ecological environment supports the cultivation of these oilseeds along with two perennial oilseeds, coconut and oil palm (Burman *et al.,* 2012).

Despite this diversity, India remains a net importer of oilseeds. The country has achieved self-sufficiency in food grains, becoming surplus in rice and wheat with growing food stocks, but faces significant shortages in oilseeds (Govindaraj *et al.,* 2016). In the fiscal year 2022, the export value of oilseeds from India was approximately 83.10 billion Indian rupees, a decrease from 91.56 billion rupees in 2021 (Kalra and Srivastava, 2023). The per capita availability of edible oils in India has risen from 3.5 kg per person per year in 1970-71 to 15.8 kg in 2012-13 (Government of India, 2014) and is projected to reach around 24 kg by 2025. This growing demand, coupled with low productivity and erratic fluctuations in the oilseed sector during 2012-13 to 2016-17, has increased reliance on imports (Joseph, 2020; Singh *et al.,* 2017).

To address this, it is essential to support oilseed growers through research and development, long-term planning, government policies, and remunerative pricing (Reddy and Immanuelraj, 2019). Key factors influencing oilseed production growth and input-use efficiency include irrigation, nutrient supply, availability of quality seeds, and crop-specific production constraints related to technology and institutional infrastructure (Burman *et al.,* 2012). Improving productivity in this sector is vital for conserving valuable foreign exchange and moving towards self-sufficiency.

METHODOLOGY

The secondary data used for this analysis was collected from the website of the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. The study examines the trends in growth and instability in the area, production, and productivity of oilseeds in India over the period from 1989-90 to 2018-19. Compound Annual Growth Rate (CAGR) and instability analysis were estimated using specific formulas. The time period was further divided into distinct phases as follows: Pre-Technology Mission on Oilseeds (Pre-TMO) from 1970-71 to 1985-86, Post-Technology Mission on Oilseeds 1986-87 to 1994-95, Post- Integrated Scheme of Oilseeds, Pulses, Maize and Oil Palm (Post- ISOPOM) from 2005-2013.

Compound Annual Growth Rate

To estimate the Compound Annual Growth Rate (CAGR), we employed a logarithmic growth model. The growth rate was determined using the following regression equation:

Growth Rate:

$$\ln Y = a + bt$$

Where,

Y= Area/ production/ productivity

a= Intercept

b= Regression Coefficient

t= Time variable

From the estimated function the compound growth rate was worked out by

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

Where,

r= compound growth rate

Instability Analysis

Variability in area, production and productivity of oilseed is measured in relative terms by the Cuddy-Della Valle Index (Cuddy and Della Valle, 1978) which is used as a measure of variability in time-series data. The simple coefficient of variation over-estimates the level of instability in time-series data characterised by long-term trends whereas the Cuddy Della Valle Index corrects the coefficient of variation by:

$$CV = (CV^*) \sqrt{1 - \text{Adj.}R2}$$

Where CV is the Cuddy Della Valle Index i.e., corrected coefficient of variation (CV). A low value of this index indicates low instability and vice-versa.

RESULTS AND DISCUSSION

Trends in Area, Production and Yield of oilseed crops

To increase the oilseeds production and to achieve self-sufficiency, the country has implemented various policies and production incentives like Technology Mission on Oilseeds (Acharya, 1993, Renjini and Jha, 2019). This has increased the area dedicated to nine major oilseeds from 17.60 M ha in 1980-81 to 27.14 M ha in 2019-20. During the same period, production also grew from 9.37 MT to 33.22 MT, with a yield improvement from 532 kg/ha to 1224 kg/ha (Figure 1). Figure 1 illustrates the trends in the area under cultivation, production, and yield of oilseeds from 1951 to 2019. Initially, from 1951 to the late 1980s, the area grew at a modest pace with occasional fluctuations. From the late 1980s onward, there is a noticeable increase in the area under cultivation, indicating expansion in oilseed farming. Production of oilseeds has followed an upward trajectory similar to the area under cultivation. There are marked increases in production starting from the late 1980s, with some fluctuations. Yield, measured in terms of output per unit area, has also increased significantly over the period. The yield curve shows a steady rise from 1951 to the early 1980s, followed by a more rapid increase.

This trend underscores the importance of continued investment in agricultural technology and practices to sustain and further enhance oilseed productivity in the future.

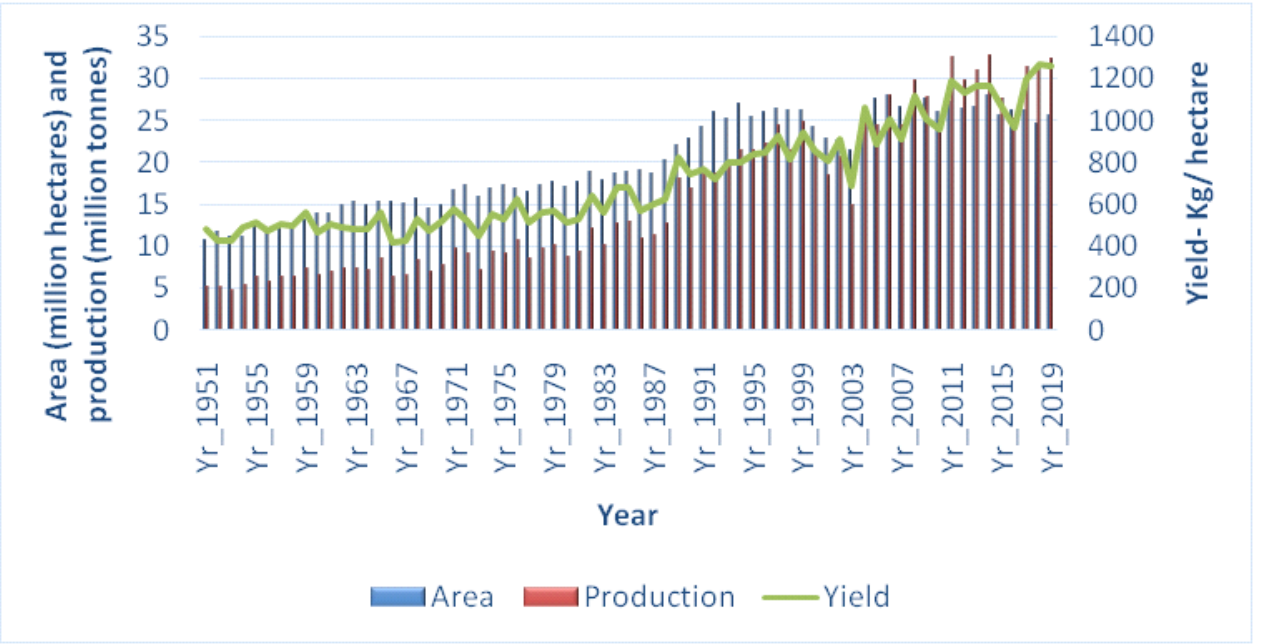

Figure 1: Trend in area, production and yield of oilseed

Source: Agricultural statistics at a glance, 2020

Compound annual growth rate

The data on the area, production, and productivity of oilseeds, along with other relevant information, was collected from the website of the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. The growth rate in area, production and yield for the period 1989-1990 to 2018-2019 are presented in Table 1.

Table 1
Compound annual growth rate in area, production, and productivity of nine oilseed crops in India

Decade	Growth Rate %		
	Area	Production	Productivity
1990s (1990-1999)	1.15	3.07	2.52
2000s (2000-2009)	2.44	5.38	2.86
2010s (2010-2019)	-0.61	0.93	1.56
Overall period (1990-2019)	0.23	1.96	1.72

Source: Author's calculation

The data in Table 1 shows that in the 1990s, there was a modest annual growth in the area under cultivation (1.15%), a healthy growth in production (3.07%), and strong productivity growth (2.52%), suggesting improvements in agricultural efficiency. The 2000s saw significant increases in area (2.44%), production (5.38%), and productivity (2.86%), indicating a period of agricultural expansion and intensification. However, the 2010s faced a decline in cultivated area (-0.61%), with slower growth in production (0.93%) and productivity (1.56%), highlighting challenges in maintaining previous

growth levels. Over the entire period from 1990 to 2019, there was minimal growth in cultivated area (0.23%), moderate growth in production (1.96%), and steady productivity growth (1.72%), underscoring long-term trends in agricultural development. The analysis shows that the second decade of the study period experienced the highest growth in area, production, and productivity, while the third decade saw the least growth and even negative growth in area. The declining CAGR of production across the three decades and fluctuating trends in area and productivity emphasize the need for urgent measures to boost productivity, as the potential for increasing cultivated area is limited. Enhancing productivity is crucial for sustaining long-term agricultural benefits.

Table 2
Compound annual growth rate in area, production, and productivity of nine oilseed crops in India

Policy period	Growth rate%		
	Area	Production	Productivity
Pre TMO (1971-1986)	0.95	2.19	1.23
Post TMO (1987-1995)	4.26	7.71	3.29
Post WTO (1996-2004)	-2.31	-2.18	0.133
Post ISOPOM (2005-2013)	-0.49	2.62	3.13

Source: Author's calculation

To evaluate the impact of various development policies, the data were divided into different periods: Pre-TMO (1970-71 to 1985-86), Post-TMO (1986-87 to 1994-95), Post-WTO (1995-96 to 2003-04), and Post-ISOPOM (2004-05 to 2012-13) which is presented in Table 2. During the Pre TMO period, there was modest annual growth in the area (0.95%), production (2.19%), and productivity (1.23%), with the highest growth seen in production. The compound annual growth rate (CAGR) in area, production and yield of oilseeds indicated in Table 2 shows that only during post TMO (1987-1995), was there a substantial increase in the production of oilseeds with both area and yield showing relatively higher growth rates. Perhaps, the yellow revolution, through Technology Mission on Oilseeds launched in 1986, coupled with price support, made India self-reliant for a brief period during the 1990s. Such momentum seems to have been lost after the withdrawal of price support under WTO agreements, trade reforms and availability of cheaper imports led to the re-emergence of domestic shortage, and the gap between domestic production and import has been widening (Chand *et al.,* 2004; Renjini and Jha, 2019).The Post TMO period experienced significant growth across all parameters, particularly in area (4.26%) and production (7.71%), indicating agricultural expansion and intensification. In contrast, the Post WTO period faced declines in both area (-2.31%) and production (-2.18%), with nearly stagnant productivity growth (0.133%), suggesting challenges in maintaining agricultural output and efficiency. The Post ISOPOM period saw a slight decline in area (-0.49%), moderate growth in production (2.62%), and strong growth in productivity (3.13%), reflecting a recovery and substantial improvements in agricultural practices. These growth patterns, influenced by various factors such as policy changes, technological advancements, market conditions, and environmental factors, highlight the impact of different policy interventions and global trade agreements on agricultural growth and stability.

Table 3
Instability in the area, production, productivity of the oilseeds crops during different decades

Decade	Instability Index		
	Area	Production	Productivity
1990s (1990-1999)	3.51	5.15	4.96
2000s (2000-2009)	6.51	13.30	11.30
2010s (2010-2019)	3.23	8.59	8.83
Overall Period (1990-2019)	6.21	11.89	9.02

Source: Author's calculation

Table 3 presents the instability index of the area, production, and productivity of oilseed crops in India over three decades: the 1990s, 2000s, and 2010s, as well as for the overall period from 1990 to 2019. In the 1990s, the instability indices for area, production, and productivity were relatively low at 3.51, 5.15, and 4.96, respectively. However, in the 2000s, these indices increased significantly, with area at 6.51, production at 13.30, and productivity at 11.30, indicating higher instability. The 2010s saw an improvement in stability, with the indices decreasing to 3.23 for area, 8.59 for production, and 8.83 for productivity. Over the entire period from 1990 to 2019, the overall instability indices were 6.21 for area, 11.89 for production, and 9.02 for productivity, reflecting moderate to significant fluctuations, with production exhibiting the most considerable variability, followed by productivity and area. This data indicates that the 2000s experienced the highest instability, while the 2010s showed a marked improvement in the stability of oilseed crop metrics.

Table 4
Instability in the area, production, productivity of the oilseeds crops across different policy periods

Policy periods	**Instability Index**		
	Area	**Production**	**Productivity**
Pre TMO (1971-1986)	3.18	11.81	9.58
Post TMO (1987-1995)	4.66	8.19	7.8
Post WTO (1996-2004)	4.30	15.64	12.71
Post ISOPOM (2005-2013)	2.15	8.60	7.38

Source: Author's calculation

The data in Table 4 outlines the instability index for agricultural parameters (Area, Production, and Productivity) across different policy periods: Pre TMO (1971-1986), Post TMO (1987-1995), Post WTO (1996-2004), and Post ISOPOM (2005-2013). The instability index measures the variability or fluctuation in these parameters, with higher values indicating greater instability. During the Pre TMO period, the area had a relatively low instability index of 3.18, indicating stable land usage, while production (11.81) and productivity (9.58) showed significant variability. In the Post TMO period, area instability increased to 4.66, but production (8.19) and productivity (7.8) showed slight improvements in stability. The Post WTO period saw a slight decrease in area instability to 4.30, but production (15.64) and productivity (12.71) experienced notable increases in instability, indicating high variability in

crop yields. In contrast, the Post ISOPOM period achieved the lowest area instability index at 2.15, suggesting significant stability in land usage, while production instability decreased to 8.60 and productivity instability to 7.38, showing improvements yet still reflecting ongoing variability. These fluctuations can be attributed to various policy changes, technological advancements, climatic conditions, and other socio-economic factors influencing agriculture during these periods. The Technology Mission on Oilseeds (TMO) played a critical role in the late 1980s and early 1990s, driving substantial growth through technological and infrastructural advancements. The World Trade Organization (WTO) reforms in the mid-1990s introduced new challenges, leading to a decline in growth and increased instability. Post-ISOPOM initiatives contributed to moderate recovery and improved stability, emphasizing the importance of continuous policy support and innovation.

CONCLUSION

The oilseed sector is a vital part of India's agricultural economy, second only to food grains in terms of acreage, production, and economic value. However, India remains a net importer of oilseeds due to significant challenges and inconsistent productivity. This study, covering nine oilseed crops, highlights the need for sustained investment in agricultural technology and practices to enhance productivity. To achieve self-sufficiency and reduce import reliance, it is crucial to support oilseed growers through continuous research, development, long-term planning, and effective government policies. Boosting productivity is essential to meet domestic demand, and conserve foreign exchange. The government must adopt strategies and technological advancements to improve oilseed yields to match those of food grains. Socio-economic impact assessments, supply chain management studies, and value chain analyses should be conducted from an agricultural economic perspective. Coordinated research and value addition measures should be implemented to enhance revenue from oilseeds. By addressing challenges and leveraging strengths, India can achieve a stable and prosperous oilseed economy.

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