

## An Analysis of Growth, Structural Break and Yield Gap of Oilseeds in Lakhimpur District of Assam

Moondip Sarma<sup>1</sup> and Sarmistha Rani Baruah<sup>2</sup>

<sup>1</sup>Research Scholar, Krishna Kanta Handiqui State Open University, Guwahati-781017, Assam.

<sup>2</sup>Assistant Professor, Krishna Kanta Handiqui State Open University, Guwahati-781017, Assam.

**Abstract:** Globally, India occupies fourth position in oilseed production. Despite this, India has a persistent gap between the demand and supply of oilseed. Assam occupy 1.09 per cent of the total oilseed cultivated area in India, whereas its contribution to national production was only 0.60 per cent. Lakhimpur is a major oilseed-producing district of Assam; the yield of oilseed is comparatively low. Currently, it is observed that the Lakhimpur district yield of oilseeds is steadily increasing. Against this background, the present study systematically examines the growth rate of harvested area, production and yield of oilseeds in the Lakhimpur district of Assam. The study primarily covered the period from 1997-99 to 2024-25, and data were collected from the Indiastat database. The exponential function and compound annual growth rate were used to estimate the growth rate of harvested area, production and yield of oilseeds. To detect the structural break, the time series graph and the Bai-Perron test were used for the study. The oilseed yield gap is examined by using the graphical method and the percentage method. The study revealed that the compound annual growth rate (CAGR) of the harvested area, production and yield of oilseeds was 1.84, 5.94 and 4.04 % respectively. Thus, the study also found that a major statistically significant structural break occurred in the production of oilseed. After the structural break, the CAGR steadily increased. The oilseeds yield gap was found to be - 0.83 %, which indicates Lakhimpur district's oilseed cultivation performance is better than the All-Assam level.

**Keywords:** Oilseeds, Compound Growth Rates (CAGRs), Structural break, Yield gap, Lakhimpur.

### INTRODUCTION

Oilseeds occupy a vital position in Indian Agriculture. They provide nutritional value, energy sources, and protein for the human diet (Dam *et al.* 2023). Globally, India is the fourth-largest oilseed producer, accounting for about 10% of global production, while occupying 20.8% of the global area under oilseed cultivation (India Brand Equity Foundation, 2026). Despite being a major producer of oilseeds, India has consistently faced a demand-supply gap of oilseeds since the mid-1970s, largely due to population growth and changing food habits. As a result, India is heavily dependent on imports to meet domestic demand for edible oils (Dam *et al.* 2023).

Oilseed is a significant crop after rice in terms of acreage in Assam agriculture. It provides a significant source of edible oil, contributing to rural livelihood. Crops are fit for the existing cropping systems due to their short duration and adaptability to diverse agro-ecological environments. Assam occupies 1.09 per cent of the total oilseeds cultivated area in India, whereas its contribution to national production stood at 0.60 per cent in 2024-25 (Indiastat). Despite its economic significance, the productivity has remained comparatively low at 777 kg per hectare, which is below the national average productivity of 1412 kg per hectare. The comparatively low productivity is a major concern, which adversely

affects the production efficiency and limits the state's capacity in terms of domestic demand for edible oils (Devi and Sarma 2025).

Lakhimpur district is primarily an agrarian district of Assam. More than three-fourths of the workforce depends on agriculture for their livelihood (Upadhyai *et al.* 2018). The Lakhimpur district of Assam has a sizeable area under oilseed cultivation and is a major oilseed-producing district. However, the productivity remained low compared to the national average. The reasons for the low productivity of oilseeds are a lack of knowledge about newly released high-yielding varieties, protection technologies and management practices (Dutta 2014). In recent years, the districts have experienced a sharp increase in the productivity of oilseeds. Against this backdrop, the present study aims to examine the growth performance, structural break, and yield gap of oilseeds in Lakhimpur District, Assam. The specific objectives of the study are: a) To examine the growth rate of harvested area, production and yield of oilseeds in the Lakhimpur district of Assam, b) To analyse the structural break in oilseeds production in Lakhimpur district, c) To analyse the yield gap of oilseeds in Lakhimpur district at the All-Assam level.

**MATERIALS AND METHODOLOGY**

The present study is primarily based on secondary data, mainly collected from the Indiatat database. The study period covered from 1997-98 to 2024-25.

The compound growth rates of harvested area, production and yield of oilseeds in Lakhimpur district of Assam are estimated by using the following exponential growth model forms:

$$Y_t = ab^t \text{----- (1)}$$

$$\ln Y_t = \ln a + t \ln b + u_t \text{----- (2)}$$

Where lnY is the natural logarithmic value of variables (harvested area, production and yield), t is the time period, a and b are the parameters to be estimated, and u<sub>t</sub> is the error term. To estimate the coefficient, the ordinary least squares method is used.

The compound growth rate is estimated as follows:  
 $r = (e^b - 1) \times 100$

Where r is the compound growth rate.

Furthermore, to examine the structural break in the production of oilseeds in Lakhimpur District, Assam, the time series graph and the Bai-Perron multiple structural break test were employed. Various statistical tests are available to detect structural breaks, including the Chow test, the Quant-Andrew test, the CUMSUM test, etc. Among these tests, the Bai-Perron test is widely used in agricultural economics because it is useful for detecting multiple unknown break points within a time series. The following Bai-Perron linear regression model was used to detect the structural break:

$$Y_t = \alpha + \beta X_t + U_t \text{----- (3)}$$

t = 1, 2, ..... n

Where Y<sub>t</sub> refers to the production of oilseeds in the Lakhimpur district of Assam, α and β are the parameters, and X<sub>t</sub> is the time period, U<sub>t</sub> is the disturbance term.

In the present study, the yield gap indicates the difference between the average oilseed yield of Lakhimpur district and the average yield of Assam. This yield gap analysis examines the yield disparity between the Lakhimpur district and the state of Assam. Hence, the yield gap of oilseeds has been analysed in two ways: the graphic method and the percentage yield gap formula. The percentage yield gap formula is as follows -

$$\text{Yield Gap Formula} = \frac{\text{All Assam Yield} - \text{Lakhimpur Yield}}{\text{All Assam Yield}} \times 100$$

**RESULTS AND DISCUSSION**

**Growth Performance of Oilseeds in Lakhimpur District**

The section discusses the growth rate of the harvested area, production and yield of oilseeds in the Lakhimpur district of Assam. The following table 4.1 presents a vivid picture of the oilseeds' performance in the Lakhimpur district of Assam.

**Table 1:** Estimated Compound Growth Rates of Harvested Area, Production and Yield of Oilseeds in Lakhimpur District during 1997-98 to 2024-25

Variables	Compound Growth Rates (CAGR) (%)	t - Value	Significance
Harvested Area	1.84	5.94	p < 0.001
Production	5.96	9.37	p < 0.001
Yield	4.04	8.80	p < 0.001

*Sources:* Author's self-estimated based on the Indiatat database.

Table 1 reveals that the compound annual growth rate (CAGR) of the harvested area under oilseeds in the Lakhimpur district of Assam was 1.84%, significant at the 1% level during the study period. The Front Line Demonstrations (FLDs), favourable agro-climate conditions, sufficient

rainfall, and fertile land have positively influenced the harvested area of oilseeds in the Lakhimpur district (Dutta 2014; Sharma *et al.*, 2021). Likewise, the CAGR of oilseed production cultivation was 5.96, significant at the 1% level. The distribution of seeds, minikits and improved

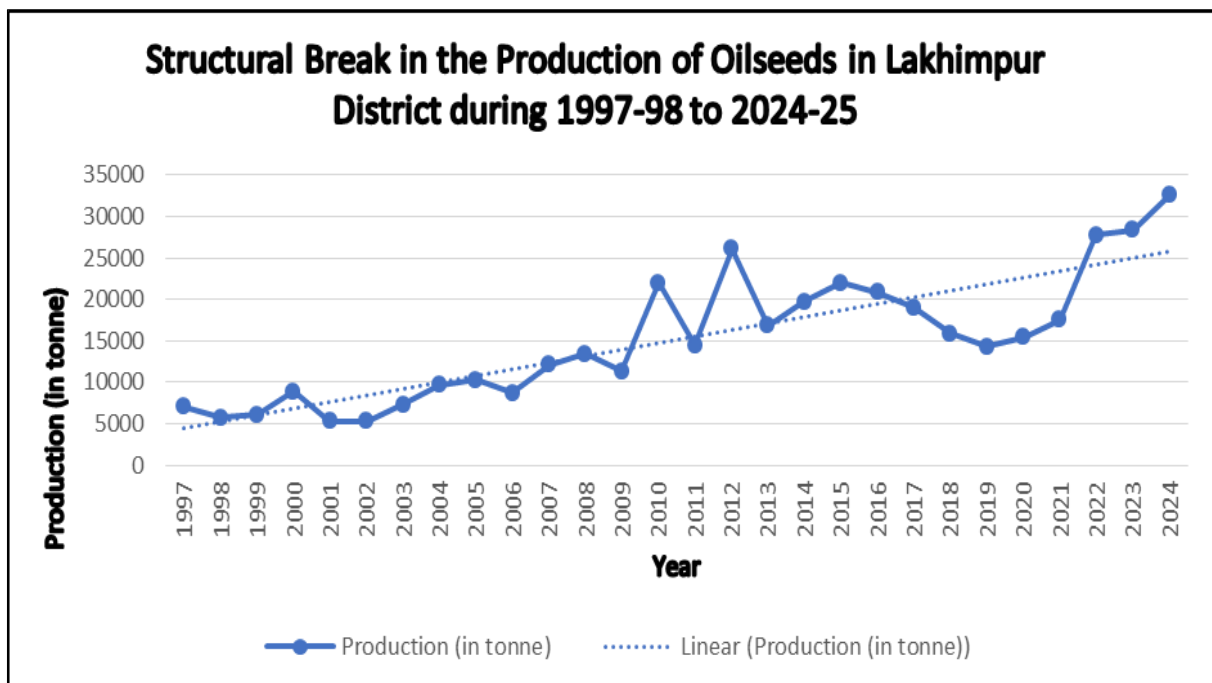
farm implements, the front-line demonstrations (FLDs), is likely to be the cause of an increase in oilseed production in the study area (Sharma *et al.*, 2021; Dutta, 2014). The compound growth rate of the oilseed yield is 4.04%, which is highly significant at the 1 % level of significance. The use of improved variety seeds, line sowing, balanced application of fertilisers, and control of aphids may be the possible causes for the increased yield of oilseeds in Lakhimpur district of Assam (Dutta 2014).

### Structural Break in Oilseeds Production in Lakhimpur District of Assam:

A Structural break generally occurs due to an unexpected shift in a time series. With the rise of

structural breaks, the value of parameters in the linear regression model changed. In agricultural economics, this break may be caused by external forces or major policy changes (Bodhanwala *et al.* 2020). In the present study, structural break analysis was carried out in two ways for oilseed production in Lakhimpur district of Assam: i) The Time series graphical method, ii) The Bai-Perron multiple structural break test.

The time series graphical method provides preliminary insights into the major changes in oilseed production in the Lakhimpur district of Assam.



**Figure 1:** The Time Series Graphical Method

From Figure 1, it is observed that there are multiple structural breaks in the production of oilseed in the Lakhimpur district of Assam. The significant upward shift of the graph was observed in the years 2009 and 2011. Another two structural changes were observed in the trend line for the years 2017 and 2021. However, the graphical method provides only preliminary evidence about the structural changes. Consequently, the Bai-Perron econometric structural break test was adopted to determine whether the breaks were statistically significant or not.

The Bai-Perron multiple structural break test identified that the year 2018 is a statistically significant structural break in the production of

oilseeds in the Lakhimpur district of Assam. The government schemes, such as re-vamped National Food Security Mission (NFSM) with National Mission on Oilseeds and Oil Palm (NMOOP), price support, are likely the possible causes of the structural break in oilseeds production in Lakhimpur district of Assam (Directorate of Agriculture, Government of Assam, 2026; Directorate of Economics and Statistics, 2021).

### Pre and Post Break Growth Rate of Oilseed Production in the Lakhimpur District of Assam.

The Bai-Perron structural break was identified in 2018 as a significant structural break in the production of oilseeds in the Lakhimpur district of Assam. Therefore, the study was further

subdivided into two phases: pre- and post-growth rate of oilseed production in the district. The following Table 2 provides a clear picture of

growth performance pre and post structural break in oilseed production of the Lakhimpur district of Assam.

**Table 2:** Estimated compound annual growth rate of production of oilseeds in Pre and Post Structural Break

Variable	Pre-Break (1997-2018) of (CAGR) %	Post-Break (2018-2024) of (CAGR) %
Production	7.87***	15.86***

*Sources:* Author’s self-estimated based on the Indiastat database.

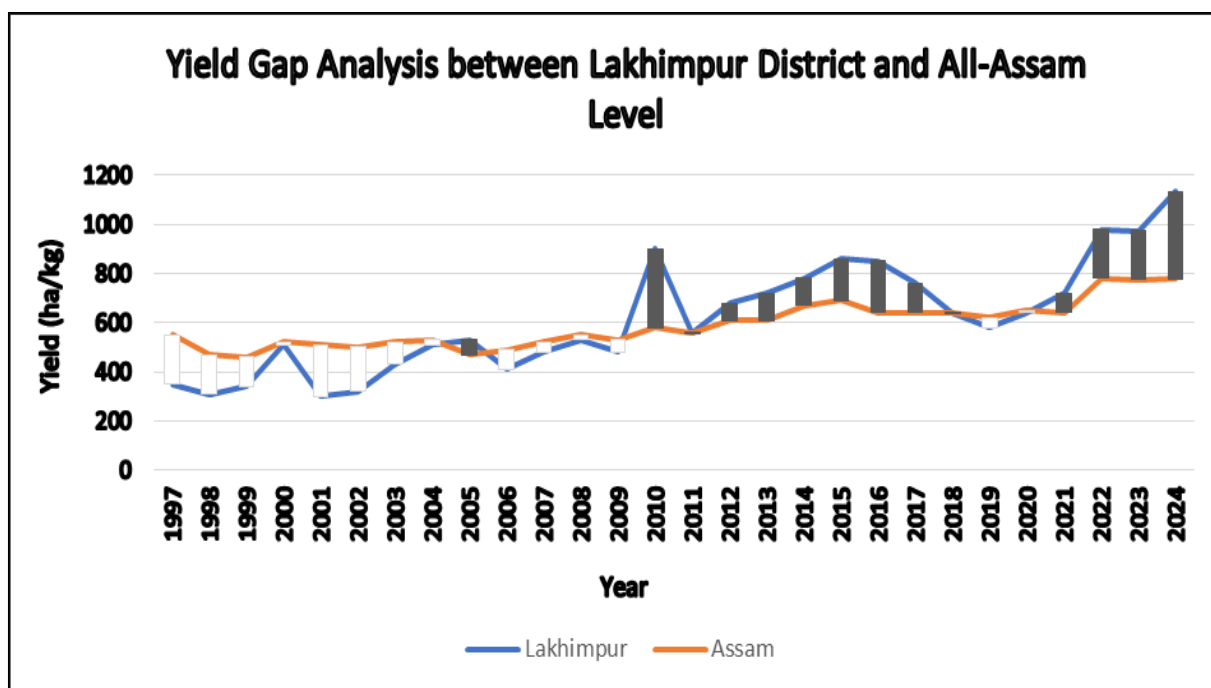
**Note:** \*\*\*, \*\* and \* indicate the 1 %, 5% and 10 % level of significance.

From Table 2, it is observed that the compound annual growth rate of the pre-break was 7.87, which was statistically significant at a 1 % level. However, the post-structural break compound annual growth rate was 15.86, which was significant at the 1 per cent level. The post-structural break CAGR of oilseed production was comparatively double that of the pre-structural break. The implementation of the National Food Security Mission – Oilseeds and Oil Palm (NFSM - OS & OP) may have contributed to enhancing

oilseed production in the Lakhimpur district of Assam (Press Information Bureau, 2019).

**Yield Gap Analysis of Oilseeds in Lakhimpur District and All- India Level.**

The yield gap of oilseeds between the Lakhimpur district of Assam and the All -Assam level indicates whether the district's performance in oilseed cultivation is below or above the average level of the state. Figure 2 illustrates the yield gap of oilseeds between the Lakhimpur district and the All-Assam level.



**Figure 2:** Yield Gap of Oilseeds between Lakhimpur district and All-Assam Level.

From Figure 2, it is observed that, during the period 1997 to 2009, the yield of oilseeds in Assam is higher compared to the district yield of Lakhimpur. However, in the year 2010, the yield of oilseeds in Lakhimpur district was higher than that of the state. During the period 2012 to 2018, the Lakhimpur district oilseed yield was higher. Similarly, from 2021, the yield of oilseeds in the Lakhimpur district has consistently increased compared to the state of Assam due to the

implementation of the National Food Security Mission – Oilseeds and Oil Palm (NFSM – OS & OP) (PIB, 2019).

The percentage yield method refers to the oilseed yield performance disparities between the Lakhimpur district and the All-Assam level during the study period. Table 3 clearly provides a yield gap disparity between the district and the state of Assam.

**Table 3:** Estimated Yield Gap

All- Assam Yield of Oilseed	Lakhimpur District Yield of Oilseed	Yield Gap
16173	16308	-0.83

*Sources:* Author's estimation based on the Indiastata database

If the yield gap of oilseeds is negative, it denotes that the district productivity of oilseed is higher than the All-Assam level. On the other hand, the yield gap is positive, which implies the yield of Assam is greater than the district level. The yield gap was found to be -0.83, which indicates that the Lakhimpur district oilseed yield is higher than the Assam oilseed yield during the study period. The adoption of high-yielding varieties (HYVs) through Front Line Demonstrations (FLDs), improved sowing methods, balanced fertiliser use, timely intercultural operations, and extension support are probable causes for the increase in oilseed yields in Lakhimpur district of Assam (Dutta 2014; Devi & Sarma 2025).

## CONCLUSION

Oilseeds are a significant crop in Assam, as well as in the Lakhimpur district agricultural map. The CAGR of the harvested area of oilseeds in Lakhimpur district was found to be 1.84 %, from the period 1997-98 to 2024-25. During the same period, the CAGR of oilseed production was 5.9 % due to improved farm implementation and front-line demonstration. The yield of oilseed was also increased due to the use of improved variety seeds, line sowing, and balanced application of fertilisers. Further, a structural break was observed in the production of oilseeds in 2018. After the structural break, the growth rate of oilseed production consistently increased. The yield gap of oilseeds was found to be -0.83, indicating that the Lakhimpur district's oilseed yield performance is better than that of Assam's oilseed yield. The higher yield under improved technology may indicate the growing dependence of agriculture on state-supported schemes and modern improved technologies. While productivity has increased, it raises critical concerns regarding unequal access to schemes among all farmers, declining traditional practices, input dependency, and the long-term sustainability of crops.

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