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Growth, Instability and Determinants of Oilseed Production in India: A Seven-Decade Analysis

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Abstract— *This paper examines the dynamics of oilseed crops in India, with particular emphasis on trends in area and production, as well as variability and the factors influencing them. The study relies exclusively on secondary data for the period 1950 to 2021 using Compound Annual Growth Rate (CAGR), Coefficient of Variation (C.V.) and Regression Analysis. The study finds that India's oilseed sector has undergone significant structural changes over seven decades but still falls short of meeting domestic edible oil demand. While area under cultivation has increased marginally, growth in production and productivity has been insufficient to close the demand–supply gap. Considerable instability was observed in production, yield and area throughout the period. Production, productivity, irrigation of total food grains and rainfall were identified as key determinants of oilseed acreage, while minimum support prices and irrigation of oilseeds were not significant.*

Keywords— Oilseed economy, edible oil, yield gap, cropping systems, growth rate, instability, MSP.

I. INTRODUCTION

India has achieved self-sufficiency in food grain production due to continued support from policy and technology circles, which have also made a considerable breakthrough in horticulture crops and enhanced livestock and fisheries sector production to ensure nutritional security to some extent (Ramesh & Chand, 2019). However, two areas within food crops—oilseeds and pulses—could not show an impressive performance, resulting in reliance on imports and thereby draining foreign exchange reserves every year. India is one of the major oilseed growers and, paradoxically, an importer of edible oils. India's vegetable oil economy is the world's fourth largest after the USA, China and Brazil (FAO, 2022). The Indian oilseed economy accounts for 13 per cent of the Gross Cropped Area, 3 per cent of Gross National Product and 10 per cent of the value of all agricultural commodities. This sector recorded annual growth rates of area, production and yield at 2.44 per cent, 5.47 per cent and 2.96 per cent respectively during 1999–2009. The Green Revolution focused majorly on the production of rice and wheat. This was to increase staple food grains as an immediate need to prevent starvation and famine and to ensure food security.

It is observed that though acreage under oilseeds and pulses continues to remain the same in the country, there is no appreciable improvement in yield levels. In fact, oilseed growers in major South Indian states, including Andhra Pradesh and Tamil Nadu, show interest in growing paddy instead of oilseeds. As a study on cropping pattern shifts (Ghosh et al., 2022) observed, while farmers prefer to grow oilseeds in Rajasthan, Gujarat and Maharashtra, growers in the South moved away. There are two major sources of oilseeds, i.e., primary and secondary. Primary sources are made by combining the edible group—(groundnut, rapeseed, mustard, soybean, sunflower, safflower, sesame and niger)—and the non-edible group (castor and linseed). Similarly, secondary sources have been established by combining edible groups (seasonal crops: cottonseed, rice bran, maize, coconut

and red oil palm). There has been a continuous increase in the demand for edible oil owing to an increase in population and changes in food consumption patterns.

II. REVIEW OF LITERATURE

India has been importing 55 per cent of its palm oil every year from East Asian countries to meet domestic demand. The annual domestic consumption of edible oil is around 250 lakh tonnes, while domestic production is only 111.6 lakh tonnes. The gap between demand and supply of edible oil is about 56 per cent and is met through imports. The per capita consumption of oil ranges from 19 to 19.80 kg per person per annum over the last five years. An estimate by Kumar and Dey (2022) shows that the compound annual growth rate (CAGR) of per capita consumption is negative, while this may marginally touch 1.5 per cent. Edible oils contain essential nutritive values that are vital for human health, particularly for children under five years of age (Satheswaran, 2017). A greater yield gap among oilseeds is another problem that needs immediate attention for increasing yield levels of oilseeds and optimally utilizing crucial inputs. Many field-based studies show that the yield gap is as high as more than 200 per cent among some oilseeds in India. Perhaps this is due to variations in different agro-climatic conditions, including poor soil fertility, untimely application of critical inputs and ineffective crop management practices. For instance, the yield gap in sesame is one-third of the highest yield obtained in China (GOI, 2002). Some empirical studies (Sharma, 2015; Govindaraj et al., 2015) found that area under major oilseed crops is declining owing to economic constraints, technological shortcomings and agro-climatic conditions, among other factors. However, the production of a few oilseed crops is increasing. In fact, there has been a shift from traditional regions to newer areas. Therefore, an all-round effort is required to improve performance.

The Yellow (Oilseeds) Revolution was launched during 1986–1987 to increase the production of edible oil, especially mustard and sesame seeds, to achieve self-reliance. The Yellow Revolution targeted nine oilseeds: groundnut, mustard, soybean, safflower, sesame, sunflower, niger, linseed and castor. The Yellow Revolution package included incentives to farmers such as irrigation, fertilizers, pesticides, transportation facilities, Minimum Support Price (MSP) and warehousing, besides providing processing facilities. Sadly, India's oilseed output does not meet its growing consumption. To meet demand, India started to import oilseeds from other countries. India imported about 5 million tonnes in 2007 from countries such as Malaysia, Brazil, Ukraine and Russia. In 2019, India imported around 15 million tonnes of edible oils, worth approximately Rs 7,300 crore, from Indonesia, Ukraine, Russia, Malaysia and East Asian countries. Time-series data on oilseeds showed that though performance was fairly good, it was sluggish (Swain, 2007). A few studies on oilseed research, such as Rambabu et al. (2014), Govindaraj et al. (2016) and Rao et al. (2012), focused on the performance of oilseeds in terms of area and production. They highlighted that institutional support and technological backup for oilseeds in India are poor.

A disaggregated study on farm power use among different crops, using micro-level data from six villages in Thanjavur, Tamil Nadu, showed that farm power use is less for oilseeds and more for other crops. This study further showed that per-hectare farm power use for sesame stood at 65.1 horsepower, for groundnut it was 246 hp, and for all crops put together it was estimated at 350.6 horsepower in the Cauvery Delta. This clearly shows that farmers do not pay more attention to the cultivation of oilseeds as compared with other crops. This study also brought out another interesting finding: pulses and minor millets also received less use of farm power compared with vegetables, fine cereals, cotton and sugarcane. In terms of per-hectare net returns, groundnut is almost one-third of paddy and one-fifth less than sugarcane. However, net returns of pulses are much lower than those of groundnut. This shows that farmers prefer groundnut to growing pulse crops. Against this scenario, the present paper outlines dimensions such as area, production, productivity and variability in Indian oilseeds.

III. METHODOLOGY

This study exclusively relies on secondary data collected from published documents from different departments. However, in some cases, information on programmes in the oilseed sector was collected from various sources, including published articles, independent studies, news reports, government documents and statistical reports. Depending on availability and accessibility, a comprehensive dataset was used for state-wise analysis of oilseeds. Nine major oilseeds were taken into account in the present paper. While many of them are used in the food industry, some are used in the industrial and pharmaceutical sectors. On certain aspects, data are used for a long period (seven decades from 1950 to 2021). Changes in the area, production and productivity

of individual crops for the country as a whole have been examined for almost seven decades (1950–51 to 2020–21). However, state-wise data for the above period are not available, and hence the period is restricted to 2015–16 to 2020–21 for many crops. Data were analyzed with statistical tools such as percentages, averages, Compound Annual Growth Rate (CAGR), Coefficient of Variation (C.V.) and Regression Analysis. All analyses were performed using standard statistical software.

IV. RESULTS AND DISCUSSION

In this section, the macro dynamics of oilseeds in terms of area, production and productivity are analyzed. An Indian consumer uses edible oil in their daily dietary needs. In addition, food industries also use a sizable quantity of edible oil and seeds for various purposes. A few oilseeds, such as groundnut, mustard, sunflower and coconut, are traditionally preferred in India. More recently, palm oil has also entered the Indian food market, and its demand is growing steadily due to its low price; cultivation of oil palm has been taken up on a large scale.

TABLE 1
TREND IN AREA, PRODUCTION AND YIELD OF OILSEEDS IN INDIA

Year	Area (MHa)	Growth (%)	Production (MT)	Growth (%)	Yield (kg/Ha)	Growth (%)
1950–1951	10.73	—	5.1	—	481	—
1960–1961	13.77	28	6.98	37	507	5
1970–1971	16.64	21	9.63	38	579	14
1980–1981	17.6	6	9.73	1	532	−8
1990–1991	24.15	37	18.6	91	719	35
2000–2001	22.77	−6	18.44	−1	810	13
2010–2011	27.22	20	32.48	76	1193	47
2020–2021	28.79	6	36.1	11	1254	5

Source: GOI (1950–51 to 2020–21).

Data for over seven decades (Table 1), from 1950–51 to 2020–21, revealed an upward trend in area under oilseeds except for a marginal decrease during 2000–01. With regard to production, a marginal decrease was noticed during 2000–01 as compared with 1990–91. On the other hand, yield levels were also found to be increasing, except for a slight decrease during 1980–81. Thus, overall, for about seven decades, the full potential has not been realized from oilseeds, as the yield gap in India continues to persist. For long periods, oilseeds did not receive much support from either policy or research. Yield levels hovered by and large around less than one tonne per hectare up to 2000–01, and later crossed above one tonne from 2010–11 onwards. After 1980–81, production started increasing faster than the area under oilseeds. Perhaps the government's initiatives in the form of improvements in seed production, introduction of techniques such as drip irrigation, and application of chemical inputs including fertilizer and pesticide all contributed to an increase in yield levels in oilseeds.

The Cluster Front Line Demonstration (CFLD) programme under the National Mission on Oilseeds and Oil Palm (NMOOP) was launched to increase oilseed production across states in India. Under this programme, new HYV seeds, drought-tolerant varieties, pest- and disease-resistant varieties, and supplies of bio-pesticides and bio-fertilizers are provided to oilseed growers for increasing area and yield in the oilseed sector in the country. HYVs of groundnut such as VRI8, CO6, Kadiri9 and GJG9 are some of the cultivars developed and released for increasing domestic production. For sunflower, HYVs such as CO4, PAC334 and Prabha1, among others, were introduced as a means to improve productivity. Similarly, HYVs of castor—HCH6, DCS107 and JI273—were released to increase per-unit yield in India. Even then, it is reported that there is greater scope for further increases in yield levels among oilseed crops.

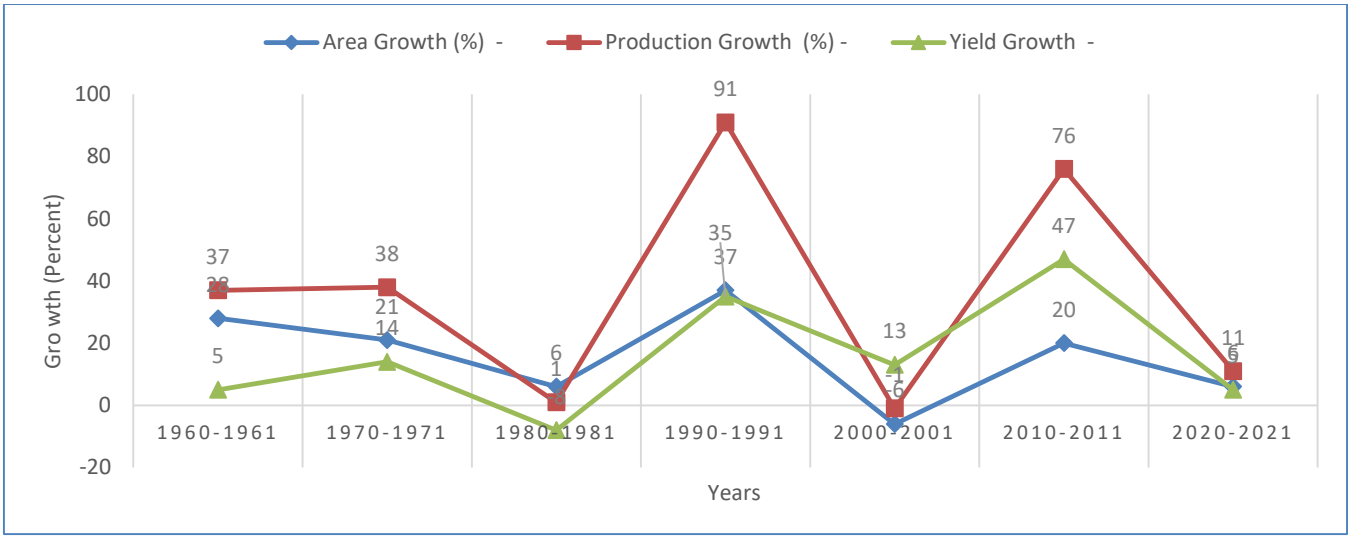


FIGURE 1: Trend in Area, Production and Yield of Total Oilseeds in India

Source: Extracted from Table 1.

From Figure 1, it is evident that in the initial stages, area was more and production was less up to 2000–01. Afterwards, both area and production converged and continued the trend until the terminal reference year (2020–21). This shows that there is still scope for increasing production, as output performance can be increased by following different yield-enhancing techniques and technologies in oilseeds. In general, there has been an argument during the initial stages of launching green technology packages that yield levels were very low for many crops. Consequently, more arable area was brought under cultivation, and this was termed "area-led" growth.

Subsequently, yield-enhancing strategies were applied, and this has made positive developments, though not at appreciable levels. In fact, oilseed cultivation has traditionally been carried out in rainfed areas with little water and minimum farm management practices. In large parts of the country, farmers continue to cultivate oilseed crops as intercrops with pulses during the summer season. Only in recent years have improved technologies such as irrigated cultivation, rhizobial seed treatment, usage of inorganic fertilizers and weedicides, and use of gypsum during 40–45 days after sowing, crop booster application and flat-bed cultivation been introduced to enhance oilseed yield. Nonetheless, not much has been done on technological development for reducing post-harvest losses and increasing efficiency in oil extraction.

An attempt was also made to estimate the growth rates and variations in area, production and productivity for a longer period from 1950 to 2021. For each decade, data were collected every year, but analysis was carried out for every decade, as shown in Table 2.

TABLE 2

CAGR AND COEFFICIENT OF VARIATION OF OILSEEDS IN INDIA

Particulars	1950s	1960s	1970s	1980s	1990s	2000s	2010–11 to 2020–21	Overall Period
CAGR (per cent)								
Area	2.66	0.73	0.17	2.62	0.04	1.31	0.51	1.4
Production	2.43	1.03	−0.96	6.09	1.07	3.04	0.96	2.77
Yield	−0.23	0.29	−1.14	3.38	1.02	1.69	0.45	1.36
CV (per cent)								
Area	8.23	3.56	3.13	8.74	3.43	9.43	4.86	27.4
Production	13.89	11.6	9.91	20.95	9.17	18.35	8.84	57.78
Yield	7.83	8.49	8.25	13.03	7.77	12.54	7.48	34.95

Source: Calculated from Agricultural Statistics at a Glance (2021). Note: The 2010–11 to 2020–21 column represents a partial decade.

At the macro level, total oilseed area increased with a CAGR of 1.40 per cent during the entire reference period from the 1950s to the 2010s in the country. A closer look at the growth rates in area under oilseeds shows that the first decade (1950s) accounted for the highest of all decades, followed by the 1980s. The lowest growth rate was registered during the 1990s. This clearly indicates that there was no consistency with regard to CAGR in area under oilseeds. At the same time, there has been no decline in area growth; however, there has been an overall increase. With regard to CAGR in production, it stood at 2.77 per cent for the period from 1950 to 2020. The highest CAGR (6.09 per cent) was noticed during the 1980s, followed by the 2000s. Unlike the growth performance under oilseed area, production shows a declining trend (−0.96 per cent) during the 1970s. Pertaining to the growth performance in yield levels of oilseeds, it is found that the CAGRs are negative during the 1970s and 1950s. Overall, the growth rate in oilseed productivity for the entire study period of seventy years is estimated at 1.36 per cent. This is the lowest level compared with the other two dimensions—area and production—related to oilseeds. In line with the high growth in production during the 1980s, the CAGR for productivity in oilseeds was also very high (3.38 per cent) during the 1980s, as observed from the table.

During the period from 1950 to 2021, area, production and yield of oilseeds witnessed significant variability. Hence, an attempt is made to measure variability with the coefficient of variation, and the results are given in Table 2. The highest instability was observed in production (57.78 per cent), followed by yield (34.95 per cent) and area (27.4 per cent) for the entire study period. Further, it is inferred that during the 1980s, instability was higher than in the other decades in production and yield. However, instability in area, production and yield has declined in recent decades compared with previous decades, as can be seen from the table, although the decline is not monotonic (production CV rose again in the 2000s).

4.1 Determinants of Oilseed Acreage in India

The factors that normally affect total oilseed area are investigated using a regression model. The time-series data used for the present analysis are from the last two decades, i.e., 2001–02 to 2020–21. The regression analysis shows that the relationship between the dependent and independent variables was statistically significant. It can be interpreted from the R^2 value that the endogenous variable was explained by the exogenous variables to the extent of 93 per cent, and the model is statistically significant and hence justified. Farmers' decisions about the allocation of land to oilseed crops depend on various factors such as production (MT), productivity (kg/ha) and irrigated area of total oilseed crops (per cent), MSPs (Rs/quintal) of major oilseeds (groundnut, soybean, sunflower and sesame), area (MHa), production (MT) and yield (kg/ha) of the competing crop, i.e., pulses, total area irrigated of all food grains (per cent) and rainfall (pre-sowing three months, in mm).

In estimating acreage, a simple linear relation of the following equation shows the general form of OLS regression as the factor influencing total oilseed acreage:

$$Y = f(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki} + u) \quad (1)$$

where β_0 is the intercept, Y is the dependent variable, X_i are independent variables, β is the effect of X on Y, and u is the error term.

$$Y = f(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + u) \quad (2)$$

Y denotes total area of oilseeds;

$\beta_1 X_1$, $\beta_2 X_2$, $\beta_3 X_3$ are production, yield and irrigated area of total oilseed crops;

$\beta_4 X_4$ is MSPs of major oilseeds;

$\beta_5 X_5$, $\beta_6 X_6$, $\beta_7 X_7$ are area, production and yield of pulses;

$\beta_8 X_8$ is irrigation of total food grains; and

$\beta_9 X_9$ is rainfall.

TABLE 3
DETERMINANTS OF OILSEED ACREAGE

Variables	Coefficient	t-value	p-value
Intercept	−2.52167	−0.08626	0.933674
Production of oilseeds	0.740074	4.465919	0.002915*
Yield of oilseeds	−0.0195	−3.24715	0.014113*
Irrigation of oilseeds	0.004589	0.088571	0.931904
MSPs of gram	0.001236	0.784358	0.458546
MSPs of groundnut	−0.00093	−0.43719	0.675143
MSPs of soybean	−0.00349	−0.71196	0.499524
MSPs of sunflower	0.000634	0.293993	0.77729
MSPs of sesame	0.000172	0.109487	0.915889
Area of pulses	0.145984	0.120422	0.907532
Production of pulses	−0.15729	−0.09346	0.928154
Yield of pulses	0.004907	0.105887	0.918643
Irrigation of total food grains	0.502595	2.025666	0.052438***
Rainfall	0.02757	2.191095	0.044574**

Source: Calculated from secondary data (GOI, various years). Note: *1% level of significance, **5% level of significance, ***10% level of significance. R^2 = 0.93; adjusted R^2 not reported in original; n = 20.

The above table presents the estimated coefficients and p-values between total area of oilseeds and various factors. The results reveal that the production of oilseeds has a positive influence on the total cultivated area of oilseeds, significant at the 1 per cent level. This may be inferred to mean that if the production of oilseeds increases, farmers tend to allocate more and more area under oilseed crops in coming years. Nevertheless, the yield of oilseed crops has a significant negative effect on the total cultivated area of oilseeds at the 1 per cent level. It is inferred that allocation of small areas under oilseeds obtained more yield through efficient crop management practices. Moreover, several studies have explored that small landholders have been efficient in getting more output from oilseeds. With respect to the other categories of independent variables, such as the irrigation of oilseed area and MSPs of different oilseeds, these could not influence total oilseed area. It is observed that this may be due to the reason that most oilseed crops are cultivated under rainfed conditions in India. Moreover, the central government has been periodically announcing MSPs for different oilseed crops. But many oilseed farmers are not aware of the MSPs and the marketing system. This is the main reason why MSPs did not influence oilseed area during the past two decades. The total area of oilseeds relative to competing crops such as pulses is a better measure of the relative profitability of total oilseeds. The regression indicated that area, production and yield of the competing crops (pulses) did not influence total oilseed area. Perhaps this is due to the fact that oilseed and pulse growers are not serious and sensitive to taking up these crops owing to a lack of strong institutional, technological and organizational backup.

Moreover, the total irrigated area of food grains has positive significance at the 10 per cent level. It is true that in most cases, an oilseed crop like sesame is followed by the cultivation of water-intensive crops like rice. Normally across India, oilseeds (with the exception of groundnut) are grown after a primary crop. Oilseeds are raised as a second crop with lesser inputs, including fertilizer and water. Scattered rainfall or slight moisture content in the soil is sufficient to grow these crops with little care. The moisture in the soil is retained for at least six weeks—sufficient to grow up to flowering. Mild showers are sufficient for the crop to thrive up to harvest. Rainfall and the total area of oilseeds and other crops are correlated variables of the basic

economy of agriculture. Rainfall has a prominent effect on area allocation to crops and has an impact on yield. For most oilseeds, which are normally grown under rainfed conditions, cultivation takes place in the kharif season; rainfall during the pre-sowing months is an important determinant of crop choice. Therefore, rainfall data from March to May have been included in the present analysis. The above regression analysis shows that rainfall and total oilseed area have a positive relationship at the 5 per cent level.

TABLE 4
DISTRIBUTION OF AREA, PRODUCTION AND YIELD OF OILSEEDS AMONG MAJOR STATES

State	2015–16 A	2015–16 $	2015–16 P	2015–16 $	2015–16 Y	2020–21 A	2020–21 $	2020–21 P	2020–21 $	2020–21 Y	#
Rajasthan	4.83	18.5	5.71	22.57	1181	5.19	18.04	7.94	22	1529	29.46
Maharashtra	4.19	16.04	2.38	9.39	566	4.81	16.7	6.69	18.52	1391	145.75
Madhya Pradesh	7.34	28.07	6.24	24.68	851	8.13	28.23	6.68	18.5	822	−3.40
Gujarat	2.56	9.79	4.1	16.21	1603	3.35	11.65	6.18	17.11	1842	14.91
Haryana	0.53	2.02	0.85	3.36	1608	0.65	2.27	1.3	3.63	2005	24.68
Uttar Pradesh	1.29	4.94	0.86	3.41	668	1.2	4.16	1.26	3.49	1054	57.78
Karnataka	1.33	5.09	0.87	3.43	651	1.19	4.13	1.2	3.33	1012	55.45
West Bengal	0.79	3.04	0.94	3.7	1181	0.93	3.23	1.17	3.24	1260	6.68
Tamil Nadu	0.41	1.58	0.92	3.63	2230	0.48	1.65	0.99	2.73	2073	−7.04
Others	2.86	10.93	2.44	9.62	@	2.87	9.95	2.69	7.44	938	@
All India	26.13	100	25.3	100	968	28.79	100	36.1	100	1254	29.54

Note: Nine oilseeds are groundnut, castor seed, niger seed, sesame seed, rapeseed & mustard, linseed, safflower, sunflower and soybean. A—Area in MHa; P—Production in MT; Y—Yield in kg/ha. @—Since area/production is low in individual states, yield rate is not worked out. $—Percentage share to country. #—Percentage change in yield levels of total oilseeds from 2015–16 to 2020–21. Source: GOI (2015–16 to 2020–21).

The distribution patterns of growth in area, production and yield during 2020–21 have shown a phenomenal improvement. Around 2.63 MHa of additional area has been allocated to oilseed crops in the country. This has resulted in an increase of 10.8 MT in oilseed production, with an improvement of 266 kg per hectare in productivity during 2020–21. By and large, the share in the magnitude of area allocated by each state remains the same. But in terms of production, there is a shift in some states; during 2020–21, aggregate production is higher in Rajasthan, followed by Maharashtra. However, there are slight changes in the productivity of oilseeds among different states. Similar to 2015–16, Tamil Nadu ranks number one, but the second rank goes to Haryana. The lowest increase in the yield level of oilseeds was found in Madhya Pradesh. Overall, around a 30 per cent increase in per-hectare productivity is found between 2015–16 and 2020–21, which is an impressive performance. At the same time, there is deceleration in the productivity of total oilseeds in two states—Tamil Nadu and Madhya Pradesh. It is noted that Tamil Nadu is a potential state to outperform in oilseed productivity due to its diverse environment, the innovative nature of its farmers and the penetration of extension activities. But though its productivity is the highest among all states, it declined compared with the earlier reference period—an issue that needs careful scrutiny to stabilize productivity.

Among South Indian states, only Karnataka and Tamil Nadu occupy a prominent place in oilseed cultivation. Efforts shall be made to motivate farmers from the eastern and north-eastern states to cultivate oilseed crops on a large scale with the support of government programmes. Major oilseeds like mustard, groundnut, soybean and rapeseed are climate-sensitive and hence are

concentrated more in the northern and western states. Likewise, sesame and sunflower are tropical crops that are ideally suitable for growing in South Indian states. However, with the advent of improved technologies, these crops can now be grown in any part of India, and necessary backup support is extended by individual state governments through proper advisory services issued to farmers, and new varieties of high-yielding oilseeds, bio-fertilizers and gypsum are distributed to growers with subsidies to encourage cultivators to expand area under oilseeds and improve productivity. The next aspect is to rank the major states on the basis of yield performance (Table 5). This would give an idea about where focus is required for intervention.

TABLE 5
RANKING OF STATES BY YIELD (kg/ha)

Phase I (2005–06)		Phase II (2010–11)		Phase III (2015–16)		Phase IV (2020–21)	
State	**Yield**	**State**	**Yield**	**State**	**Yield**	**State**	**Yield**
Manipur	7000	Tamil Nadu	2077	Tamil Nadu	2290	Tamil Nadu	2073
Goa	2394	Haryana	1855	Goa	2126	Gujarat	1842
Tamil Nadu	1600	Gujarat	1692	Gujarat	1627	Punjab	1544
Gujarat	1544	Maharashtra	1394	Haryana	1589	Rajasthan	1529
Rajasthan	1134	Punjab	1336	Punjab	1318	Maharashtra	1260
Mizoram	1125	Rajasthan, Mizoram	1203	Rajasthan	1182	West Bengal	1254
All India	1004	All India	1193	All India	968	All India	1254

Source: GOI (2005–06 to 2020–21).

Necessary exploration has been done on this dimension for the period of 15 years from 2005–06 to 2020–21, for which comparative data are available. Among all major oilseed-growing states, the yield level for all oilseeds put together, Manipur stands first, followed by Goa and Tamil Nadu, during the first phase under analysis. It is to be noted that none of these states came to occupy first place in the earlier disaggregated analysis. Other promising states in this phase are Gujarat, Rajasthan and Mizoram. During the second phase (2010–11), Tamil Nadu stood first, followed by Haryana and Gujarat. There has been a major shift among the states that occupied top positions during Phase I. Manipur and Goa did not find a place during the second phase. Again, during Phase III, Tamil Nadu comes first with a high yield level of 2290 kg/ha, followed by Goa and Gujarat. Other states like Haryana, Punjab and Rajasthan also performed well in getting more yield. Overall, the yield level of total oilseeds during this phase stood at less than one tonne per hectare. Only Tamil Nadu showed better performance, with a maximum of 2073 kg/ha. Gujarat, Punjab, Rajasthan, Maharashtra and West Bengal demonstrated good yield levels of total oilseeds surpassing the all-India average of 1254 kg/ha during the terminal phase (Phase IV).

Overall, yield levels increased significantly from 1004 kg/ha during the first phase to 1254 kg/ha in the fourth phase. As outlined earlier, the agro-climatic conditions, in addition to various institutional support measures, greatly influenced the production and yield levels of oilseeds. In addition, farmers' decisions, management practices, timely application of essential inputs, assured markets through the MSP, the magnitude of competing crops and the local environment also contributed to influencing the production of edible oilseeds in different states. Due to administrative and other reasons, some states would have supported the required levels, a few would have supported partially, and a few would have been indifferent due to exogenous reasons. Like many crops, oilseeds are also season-sensitive. Some crops are grown as sequential crops, such as during the first crop season when a main crop like paddy or maize is grown.

Following this, the next dimension is to analyze and unfold the issues in cultivating different edible oilseed crops in India. Annual growth rates for area, production and output have been worked out for nine major oilseeds in India for two decades, from 2000–01 to 2019–20, and relevant data (Table 6) are furnished here, with the following section taking a look at this aspect.

TABLE 6
AGR OF CROP-WISE AREA, PRODUCTION AND PRODUCTIVITY OF OILSEEDS

Oilseed crop	Area in '000 ha (2000–01)	Area in '000 ha (2019–20)	AGR in %	Production in '000 MT (2000–01)	Production in '000 MT (2019–20)	AGR in %	Productivity in kg/ha (2000–01)	Productivity in kg/ha (2019–20)	AGR in %
Groundnut	6559	4825	−26	6410	9952	55	977	2063	111
Castor seed	1080	1046	−3	880	1842	109	815	1761	116
Niger seed	440	136	−69	110	41	−62	250	303	21
Sesame	1720	1623	−7	520	658	26	302	405	34
Rapeseed & Mustard	4477	6856	53	4190	9123.6	118	936	1331	42
Linseed	580	180	−69	200	121	−40	345	671	95
Safflower	425	52	−88	200	44	−78	471	843	79
Sunflower	1074	228	−79	649	213	−67	605	931	54
Soybean	6417	12192	90	5280	11226	113	823	921	12

Source: GOI (2000–01 and 2019–20). Note: AGR—Annual Growth Rate.

Between 2000–01 and 2019–20, the growth in area of many oilseeds showed a negative growth rate except for two crops, rapeseed & mustard and soybean. The largest deceleration in the growth of area is noticed for safflower, followed by sunflower, niger seed and groundnut. More growth in area was witnessed for soybean (90 per cent) and rapeseed & mustard (53 per cent). Changes in the growth of production depicted an impressive performance in rapeseed & mustard (118 per cent), followed by soybean (113 per cent) and castor seed (109 per cent). On the other hand, a drastic decline in production was witnessed in safflower, followed by sunflower (67 per cent), niger seed and linseed, in that order. From the above discussion, it is evident that four crops showed negative growth in both area and production. Conversely, two crops (soybean and rapeseed & mustard) showed an increasing trend in area and production between 2000–01 and 2019–20. However, with regard to changes in yield levels among the reference years, all oilseed crops have shown an increasing trend. The maximum increase was observed in castor seed, followed by groundnut, linseed, safflower and sunflower.

Among different oilseeds, the major ones are sesame, groundnut, mustard and soybean. Oil palm is receiving much support in recent times. In general, farmers pay more attention to fine cereals and other crops like cotton and sugarcane. Unfortunately, oilseeds and pulses are grown during the second crop season without much attention and care. Further, farmers do not apply scientific farm techniques like intense ploughing, leveling of fields, application of organic manure, fertilizers, HYVs, irrigation and synthetic inputs including pesticides and weedicides. All these indicate that farmers give step-motherly treatment to oilseed cultivation. Further, during interactions with agronomists and extension officials, it was confessed that oilseed growers do not use advanced implements and farm machinery to carry out operations like sowing/transplanting, weeding and pesticide application. Only for groundnut is a pod-peeling machine in practice. By and large, for all other oilseed crops, farmers use indigenous techniques with locally available implements. Even during harvesting, threshing, cleaning and processing, oilseed cultivators do not carry out operations with much care. Many oilseed growers dry their harvested crops, such as sesame, on the roadside, thereby causing a sizeable loss of grains and oil content. Therefore, yield levels are always very low for these crops.

Unlike the very liberal and comprehensive support given to cereal crops, oilseeds continue to suffer, and only now are these "orphan crops" receiving some attention. Following a macro understanding of oilseeds in terms of area, production and yield at the all-India level and among major states, an exploration across major states by individual oilseed crops is taken up. In India, groundnut oil is a preferred edible item. Besides, kernels are used to make sweet bars with jaggery. From the above discussion, it is evident that there has been some variation in growth performance in area, production and productivity at the macro level. The following section explores the above aspects by major crops.

V. CONCLUSION

The study shows that India's edible oilseed sector has expanded steadily in area, production and yield, with productivity as the major growth driver, but structural and institutional bottlenecks continue to constrain performance. Variability was highest in production, followed by yield and area, though fluctuations have reduced in recent years due to policy interventions. Production, productivity, irrigation of total food grains and rainfall were key determinants of oilseed acreage, while irrigation of oilseeds and minimum support prices were not significant, reflecting the rainfed nature of oilseed cultivation and farmers' limited awareness of MSPs. Despite being a major global oilseed producer, India remains heavily dependent on edible oil imports, reflecting gaps in domestic production, market efficiency and value addition. Farmers' low interest in oilseed cultivation—due to weak price assurance, market uncertainty, irrigation constraints and high risk—further limits self-sufficiency. Strengthening the sector requires a coordinated strategy focusing on high-yielding and climate-resilient varieties, technology dissemination, better institutional support and improved access to credit, insurance and soil and water testing to enhance productivity, farm income and edible oil security.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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