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Dynamic Growth Performance of Oilseeds in India

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ABSTRACT

The study is an attempt to know the growth performance and instability in oilseeds sector using secondary data. The results of the study indicated that negative and significant growth rates were observed in the area and production of majority of oilseeds, except soybean, castor seed. Where growth rate in production was positive and non-significant in groundnut and sesamum. Growth rates of productivity were positive and significant in case of groundnut, castor seed, linseed, sesamum, Niger and rapeseed mustard. Area and production of soybean and sunflower were highly unstable when compare to other oilseed crops. The overall oilseed crops production and productivity in the country has registered a positive and significant growth during the study period, whereas slight significant decline in area under oilseeds in the country. It may due to low productivity of oilseed crops, fragmented and underutilized processing facilities and lack of technological inputs hampered the oilseeds area under cultivation in the country, resulting the shift in cultivational practices towards cereals and other crops and heavy reliance on import of oilseeds. Area was found to be the major contributor to the production of soybean and castor seed, whereas productivity was found to be the major remarkable contributor to the production of groundnut, rapeseed and mustard and castor seed. Both area and productivity together influence the production of castor seed and soybean in the present study.

***Key words*:** Oilseeds, Trends, Growth, Production, Yield

India is a paradise for oilseed crops, country has its range of perennial and annual oilseeds compare to other countries. The Indian vegetable oil economy is the world's fourth largest after the USA, China and Brazil [1-2]. India accounts for about 14 per cent of global oilseeds area, 8 per cent of oil crops production, 6-7 per cent of vegetable oils production, 13.5 per cent of vegetable oils import, 6.5 per cent of oilcakes export and 10.7 per cent of the global edible oils consumption [3-5]. The per capita availability of edible oils had increased from 3.5 kg/person/year in 1970-71 to 15.8 kg in 2012-13 [6]. Oilseeds are significant following only to food grains in terms of area and production. India accounted for 19% of oilseeds area, and 2.7% of oilseeds production in the world [7]. In terms of value of output as well as employment potential, the oilseed sector is far more important than any other industry [8-9]. The domestic demand for vegetable oils and fats has also been rising rapidly at an increasing rate due to increase in per capita income and increase in standard of living. Thus, annual demand is increasing at the rate of 6% while our domestic output has been increasing at just about 2% [10-11]. At the national level, the domestic achievements in oilseeds production are unparallel when we observe that six times increase in oilseeds production during the period of 1950-2011 was achieved under predominantly rain fed (72%) agro-ecological conditions, which is even higher than the production increase in total food grains during the corresponding period [12].

The efforts were continuously being diverted by government towards increasing the production and productivity of oilseeds in the country to enhance availability of edible oils. The efforts includes both developmental policies targeted towards increasing and sustaining yield levels of oilseeds through technological interventions, and through trade policies to meet the growing edible oil demand of the consumers as the demand of edible oils is highly income elastic, the increase in per capita income pushes demand significantly [13-14]. The range of percentage of CV (Coefficient of Variation) in post futures period for castor was less (3.35% to 12.05%) as compared to the pre-futures period (2.74% to 15.95%). Price trend is also found in spot and futures prices and in the year 2011-12 prices were high due to export coupled with weakness in Indian rupee, attracted the exporters [15].

Lack of appropriate technologies, nurturing under input-starved conditions, combating the biotic and abiotic stresses are some of the major causes for the poor productivity of oilseeds. The huge drain on the import bill tied with the above factors led to the establishment of the

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Technology Mission on Oilseeds (TMO) in 1986 for enhancing the domestic production of edible Oils. A major breakthrough in increasing oilseeds production was achieved through an integrated approach by introducing new crop production technologies, better supply of inputs and extension services support for marketing, post-harvest technologies and excellent coordination/cooperation between various concerned organizations/ departments and Ministries. As a result of concerted efforts by the TMO [16-18]. The country recorded the highest ever production of 324.79 lakh tones of oilseeds during 2010-11 with a record productivity level of 1193 kg ha^{-1} due to favorable weather conditions and support given by the government of India to the Oilseeds production and related developmental programmers and policies [19-20].

MATERIALS AND METHODS

Nature and source of data

India has a diversified cropping pattern across regions based on rainfall pattern, soil type, and climatic conditions. The present article attempts to study the growth performance of all the nine oilseeds viz., groundnut, rapeseed– mustard, soybean, sunflower, sesame, safflower, Niger seed, castor and linseed. The required, secondary data for the period from 2004-05 to 2019-20were collected from various published sources viz. Agricultural Statistics at a Glance, Handbook of Statistics on Indian Economy and website of the Directorate of Economics and Statistics (DES). The historical performance of oilseeds has been assessed for different states and the country.

Analytical tools

The growth performance of the study crops was attempted using the compound growth usingthe following form of an exponential form of the function.

$$Y = ab^t e^u$$

Where, Y is the Dependent variable (area/production/productivity), a is Intercept, b is the Regression coefficient, t denotes the Time period in years and e^u is the error term

The above function was estimated by transforming into the logarithmic form as follows and its coefficients were estimated using the Ordinary Least Squares (OLS) procedures.

$$\log Y = \log a + t \log b + u$$

The Compound annual growth rate (g) was then computed using the following formula and expressed in percent.

$$g = (r - 1)*100$$

Where g is the compound annual growth rate (%) and 'r' is the antilog of log b. The significance of the CAGR was tested using 't' test.

Further to examine the stability in the growth of oilseeds across states, the Coefficient of Variation (CV) was estimated using the following procedure.

$$CV = \frac{SD}{\mu} \times 100$$

SD = Standard deviation

μ = mean

To measure the contribution of area and productivity towards increased production of oilseeds concerned, the following methodology was used

$P = A_o (Y_n - Y_o) + Y_o (A_n - A_o) + A.Y$

$P = (P_n - P_o)$ = change in production

A_o = Area in the base period

Y_o = Yield in the base period

A_n = Area in the current period

Y_n = Yield in the current period

$A = (A_n - A_o)$ = Change in area

$Y = (Y_n - Y_o)$ = Change in yield

$P = A_o . Y + Y_o . A + A.Y$

Where the first term on the right-hand side indicates productivity contribution, the second term indicates area contribution and the last term shows interaction.

RESULTS AND DISCUSSION

Present status of oilseeds in India

The analysis of area, production and yield level of crops is very useful for making any farm policy. In the present paper, an attempt has been made to assess the growth rates in the area, production and yield of oilseeds in India, using the data for fifteen years period and results are presented in below tables.

The present study encompassing the period from 2004-05 to 2019-20, showed negative growth in case of all the oilseed crops area (except soyabean and castor), significant decrease in production of sunflower, safflower, linseed and niger, shows positive growth in productivity of all the oilseed crop, but apart from soybean.

The crop wise area growth rates are presented in (Table 1). It evident from the table that, the area under sunflower registered the lowest growth rate of -15.44 percent per annum followed by safflower (-12.14%), which were highly significant at one per cent level. While growth rates of area under castor (1.52%) was non-significant. Even though groundnut is leading oilseed crop it registered a negative growth of (-2.24) per cent per annum, but it was highly significant at one per cent, so similar results in case of linseed (-6.94%) and Niger (-5.3%) area. The area under sesamum decrease by 0.98 per cent, where area under mustered also decrease by 0.69 per cent, but it was non-significant. There was significant annual decrease in 5.3 are under linseed, but smaller area allocated to these crops because they are of the least importance in human consumption.

The spill in the decrease of area under sunflower can be attributed to its thermo and photo insensitive nature, which is affected by adverse climatic changes globally, lack of availability of HYV and hybrids with different durations, high seed multiplication rate and drought tolerance along with revivability after prolonged period of drought, leads decline in area under oilseeds. The increase in area under soybean and castor oilseed crops could be attributed to the introduction of the technology mission on oilseeds, institutional support given by the Govt and increasing prices.

Groundnut, soybean, castor, sesamum and mustard stood out with high growth in production. The castor registered highest growth in production 4.84 per cent followed by soybean (2.47%), groundnut (1.46%), mustard (1.18%) and sesamum (0.65%) and all were statistically significant (except groundnut and sesamum), significant negative growth as noticed in case of sunflower and safflower, where as non-significant increasing trend was noticed in case of groundnut and sesamum production. The growth of oilseed production can be attributed to improvement in productivity and the decline in area might have come out with millets and other unremunerative crops

and partly from slight decrease in cropping intensity, apart from this the co-operation of oilseed production and the market intervention operations of the national dairy development board, Karnataka oilseed federations, are created a conducive macro policy environment to oilseed production.

Table 1 Compound growth rates of area, production and productivity oilseed crops in India

Crops	Per cent growth rates of		
	Area	Production	Productivity
Groundnut	-2.24***	1.46 ^{NS}	3.78***
Soybean	2.83***	2.47**	-0.34 ^{NS}
Rapeseed and Mustard	-0.69^{NS}	1.18*	-1.16***
Sunflower	-15.40***	-13.50***	1.72 ^{NS}
Safflower	-12.42***	-11.99***	0.44 ^{NS}
Castor seed	1.52^{NS}	4.84***	3.35***
Sesamum	-0.98**	0.65 ^{NS}	1.83***
Linseed	-5.30***	-4.83**	3.78***
Niger	-6.94***	-5.65***	1.40***
Total	-0.45**	1.34**	2.19***

Area in lakh ha, production in lakh tones and productivity in kg ha^{-1}
***, **, * and ^{NS} indicates significance at one per cent, five per cent, ten per cent and non-significant, respectively

It is also clear from (Table 1) that, there had been an increase in productivity of all the oilseed crops, except soybean. Groundnut and linseed registered the highest significant growth rates of 3.78 per cent, followed by castor (3.35%) mustard (1.89%) and sesamum (1.83%), on the other side over the period groundnut, linseed and castor performed well in terms of productivity growth. The decrease in productivity of soybean may be due to large scale cultivation of low yielding varieties under rainfed situations, however there was an improvement in the productivity of oilseeds which can be attributed to increase in irrigated area under these crops, adoption of improved varieties and other components of production technology such as quality seeds, fertilizers and nutrient management.

Agriculture sector, as it depends on climatic factors, subjected to a large degree of uncertainty, though it is said that growth with stability is ideal but growth with instability is more often the reality. Growth rates generally fail to explain fluctuation or instability in the time series data, so the co-efficient of variation (CV) was used as a measure of instability in area, production and productivity and the results are presented in (Table 2).

Table 2 Instability of area, production and productivity of oilseed crops

Crops	Instability of		
	Area	Production	Productivity
Groundnut	12.92	21.66	24.89
Soybean	1.07	199.28	15.04
Rapeseed and Mustard	8.76	12.91	125.11
Sunflower	71.00	65.23	19.93
Safflower	50.97	52.73	16.04
Castor seed	23.47	317.79	15.93
Sesamum	9.21	11.73	12.15
Linseed	26.62	71.89	19.05
Niger	31.68	26.46	9.26
Total	3.85	10.52	11.85

Instability was noticed in all the oilseed crops; the production instabilities were higher compared to yield and area instabilities for majority of oilseed crops. The area instability was found to more in sunflower (71%) followed by safflower (50.97%), linseed (26.6%) and castor (23.47%), while groundnut, soybean, sesamum, Niger and mustard showed lesser instability. The instability ai area could be attributed to the climatic conditions, allocation of land and other production resources among various crops depending on the price structure of the crop and its competing crops grown in the region. With respect to production, all the crops showed instability, the magnitude of production instability was found to be highest in the case of soybean (199.28%) followed by linseed (71.86%), sunflower (65.23%) safflower (52.73%) and castor (31.97%). This production instability was due to variability in both area and productivity of different oilseed crops.

It was found that the productivity of all the oilseed crops was instable. The highest yield instability of 24.89 per cent was noticed for groundnut followed by sunflower (19.93%), linseed (19.05%), safflower (16.04%) castor (15.93%) and soybean (15.04%). In other crops it was comparatively less, these instabilities may be attributed to climatic variations, modern cultivation practices, irrigation facility, quantity and quality of inputs such as seeds, fertilizers and chemicals, incidence of insect pest and diseases, so production inputs and improved seeds if used under the condition of assured irrigation may promote growth with stability.

Contribution of area and productivity towards production were worked and results are presented in (Table 3). It was found that the area was major contributor in case of soybean (41.58%) and castor (32.36%), while in the rest of the oilseed crops contribution of area was negative. The contribution of productivity was remarkable for groundnut (692.50%), followed by mustard (214.53%) and castor (55.13%), both the area and productivity together influenced the production in case of and castor and soybean to the extent of 22.48 and 0.92 per cent respectively [21-22].

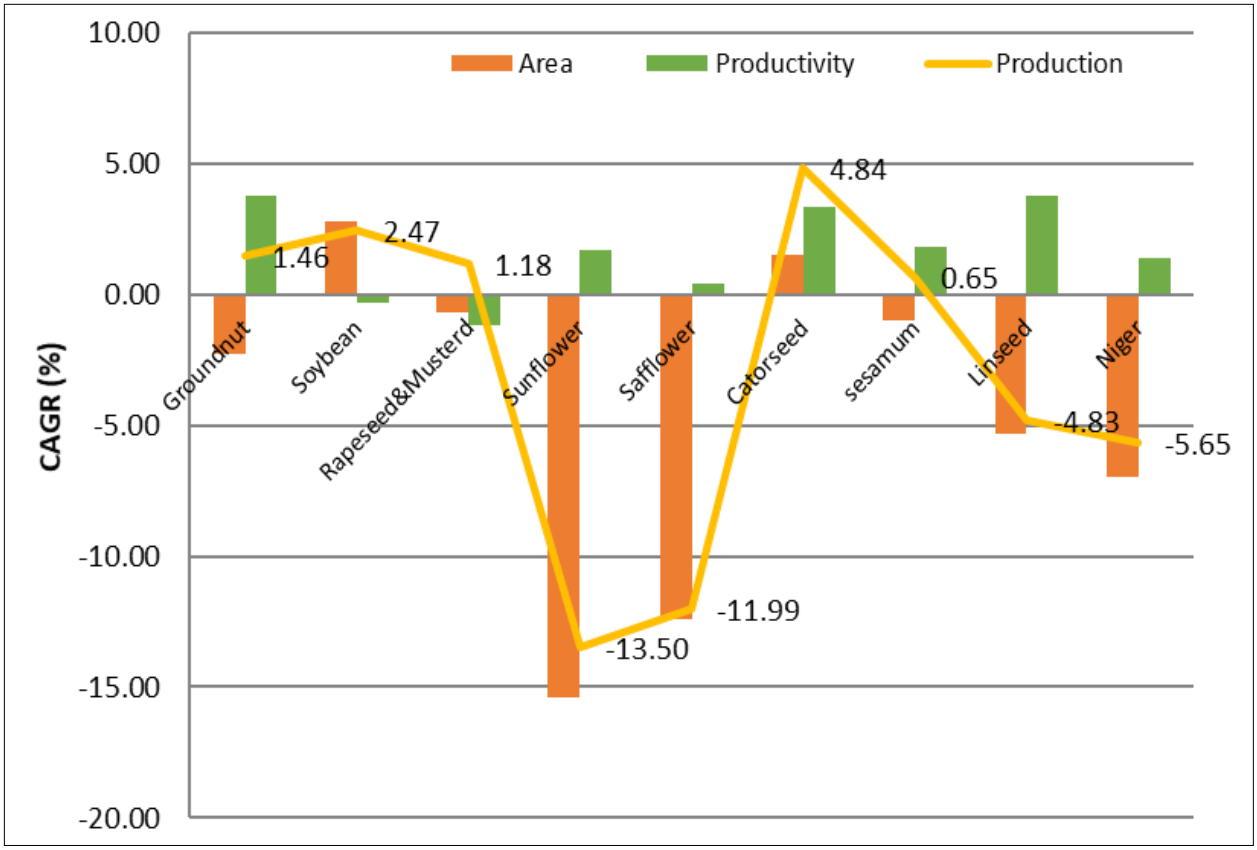

Fig 1 Growth performance of oilseeds in India (2004-2020)

Table 3 Contribution of area and productivity towards production of oilseeds

Crops	Area	Productivity	Interaction
Groundnut	-185.13	692.5	-189.30
Soybean	41.58	1.51	0.92
Rapeseed and Mustard	-47.74	214.53	-13.47
Sunflower	-9.80	9.93	-8.88
Safflower	-1.46	1.40	-1.15
Castor seed	32.36	55.13	22.48
sesamum	-0.79	0.73	-0.08
Linseed	-0.81	1.38	-2.38
Niger	-0.76	0.17	-0.11

CONCLUSION

The study highlights that, the productivity of almost all the oilseeds showed positive growth rate except soybean and mustard, whereas the productivity growth rates were fairly good, in some of the crops such as groundnut, linseed, castor, sesamum and sunflower. Productivity was the major contributor towards production. Supply of various inputs and provision of good marketing facilities are important to provide remunerative prices to farmers.

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