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Growth and Instability in oilseed production in Rajasthan

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Abstract

India is the world's second largest importer of vegetable oil after China, third largest consumer after China and the European Union and fourth largest vegetable oil economy with 15,000 oil mills, 650 solvent extraction plants, 250 vanaspati (hydrogenated oil) units and over 1,000 refineries. The industry is highly fragmented and suffers poor economic scale. The process of consolidation, although seen as inevitable is proceeding at a slow pace. The Indian oil and fats industry employs more than one million people and turnover of oilseed based sector is in excess of US$ 11billion per year, while the import and export trade is worth about US$ 2.5bn per year with annual imports averaging 4.5 million tonnes. Oilseeds sector is greatly disappointed with the outcome of the budget. The oilseed production of the country is stagnant around 25 to 26 million tones and productivity at 950 Kg per hectare. The country is heavily dependent on import of several tonnes of oil per year to fulfill the requirement of population. The present study is an endeavor in this direction to examine the growth in area, production and productivity of oilseeds, to measure the instability in area, production and productivity of oilseeds and to estimate the relative contribution of acreage and yield in growth of oilseeds production in India and Rajasthan. Compound growth rates and instability analysis along with decomposition analysis were done to fulfill these objectives. It was observed that there is a huge variation in area and total production over the period of time. To enhance the productivity of total oilseeds, there is an urgent need of technological intervention.

Key words- Oilseeds, Compound Growth Rate, Linear, Exponential

Introduction

The country's production of edible oil such as soybean, groundnut, mustard, sunflower, etc, ranges between 7-7.5 million tonnes against an annual consumption of 13-14 million tones. The per capita consumption of edible oils is 16 g per day as against 18 gm recommended minimum

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required as estimated by Indian Council of Medical Research (ICMR). This is far below world average consumption of 66 g per capita per day (Food Outlook, 2006-07).The country's oilseeds output is expected to rise from 26.71 million tonnes in 2009-10 to around 27.53 million tonnes in 2011-12, i.e. an increase of around 3 per cent. However, demand for oilseeds during the same period is expected to rise from 49.35 million tonnes in 2009-10 to around 53.39 million tonnes in 2011-2012, i.e. an increase of around 8 per cent. The gap between demand and supply of oilseeds is projected to increase from 12.64 million tonnes in 2009-10 to around 25.86 million tonnes in 2011-12. At present, our farm productivity is just 950 - 970 kg per ha, which is almost half of world's average or 1/3 of the highest in the world. Recently in the month of February 2010, Finance Minister of India proposed to spend 3 billion rupee "to organize 60,000 pulses and oilseeds villages" in rain-fed areas during 2010-11. Oilseeds constitute the second largest agricultural commodity in India after cereals accounting for nearly 5% of gross national product and 10% of the value of all agricultural products. The National Research Centre on Rapeseed-Mustard located at Bharatpur, Rajasthan has been striving hard since its inception to further the causes of yellow revolution and upliftment of the resource-poor farmers in the country. It was thought prudent to have monograph for imparting information about the advances in technology to enhance and sustain oilseeds productivity in the country. Keeping in view, the ever increasing importance of oil seeds in cropping scheme and income of the farmers, the present study is proposed with the specific objectives as (1) To examine the growth in area, production and productivity of oilseeds in India and Rajasthan (2) To measure instability in area, production and productivity of oilseeds (3) To estimate the relative contribution of acreage and yield in growth of oilseeds production

Methodology

The present study made use of time series data for Rajasthan and India for the period 1960-61 to 2006-2007. The study was based on information available through secondary sources. The time series data of oilseeds of area, production and productivity were procured from the various issues of Rajasthan Agricultural Statistics and Agricultural Statistics at a glance.

Estimation of growth rate

Growth rates were worked out to examine the tendency of variable to increase, decrease or stagnant over a period of time. It also indicates the magnitude of the rate of change in the ariable under consideration per unit of time. The following formula is used to estimate growth rate:

$$r = \sqrt[n]{\frac{P_n}{P_0}} - 1 \; x100$$

where,

r = Growth Rate in per cent
n = Number of Years
P_o = Area, Production and Productivity in Initial Year
P_n = Area, Production and Productivity in End Year

Measurement of instability

The instability in area, production and yield was estimated with help of coefficient of variation. The standard deviation as percentage of mean is called as coefficient of variation.

$$C\ V = \frac{\sigma}{\bar{x}} \times 100$$

Where,

C V = Coefficient of variation
σ = Standard deviation of the variable
$\bar{x}$ = Mean of the variable.

Decomposition analysis

To estimate the contribution of area, yield and interaction of area and yield in total production, the following formula of decomposition was used:

$$P = A_0 (Y_n - Y_0) + Y_0 (A_n - A_0) + \Delta A\ \Delta Y$$

$$1 = [(Y_0\ \Delta A)/P] + [(A_0\ \Delta Y)/P) + [(\Delta A\ \Delta Y)/P)]$$

Where,

P = Change in production
A_o = Area in base year
A_n = Area in current year
Y_0 = Yield in base year
Y_n = Yield in current year
ΔA = Change in area ($A_n - A_0$)
ΔY = Change in yield ($Y_n - Y_0$)

Results and Discussion

In India, the total area under oilseed crops were 13.77 million ha in the year 1960-61 which increased to 25.99 million ha in 2006-07. An analysis of its growth for the period concerned reveals that it increased and registered a significant and positive compound growth rate i.e.1.49 per cent per annum (Table-1).The third and fifth sub periods showed significant and positive growth rate of 2.4 per cent and 3.78 per cent per annum respectively. In Rajasthan, the area under oilseed crops were 0.30 million ha in the year 1960-61 which increased to 3.21 million ha in 2006-07. An analysis of its growth for the period (1960-2006) reveals that it registered a significant and positive compound growth rate i.e. 6.2 per cent per annum. Growth rate of area in Rajasthan showed a declining trend 6.10 per cent later on it was increased at the rate of 12.67 per cent per annum in 1980-89. Among the sub periods the highest compound growth rate was found 16.70 per cent in the fifth sub period.

The total production of oilseed crops in India were 6.98 million tonnes in 1960-61 which increased to 23.26 million tonnes in 2006-07 showing a significant and positive compound

growth rate of 3.16 per cent. The production during third sub period registered a significant and positive growth trend with 5.31 per cent but in fifth sub period observed positive growth 6.42 per cent.

Table 1.Growth rate of area, production and yield of oilseed in India and Rajasthan (1960 - 2006)

Particulars	India			Rajasthan		
	Area	Production	Yield	Area	Production	Yield
Overall period(1960-2006)	1.49*	3.16*	1.68*	6.2*	9.11*	2.87*
Sub period P1 (1960-1969)	0.4	0.29	-0.12	-6.10**	-4.52	2.22
Sub period P2 (1970-1979)	0.4	0.73	0.33	-0.48	-1.81	-1.35
Sub period P3 (1980-1989)	2.4*	5.31*	2.91**	12.67*	15.61*	2.93**
Sub period P4 (1990-1999)	0.17	2.22**	2.05*	3.58*	3.43**	-0.00
Sub period P5 (2000-06)	3.78**	6.42	2.63	16.70*	21.16*	4.48***

*Significant at 1% probability level ** Significant at 5% probability level*** Significant at 10%

The total production of oilseed crops in the state was 0.10 million tonnes in 1960-61 which increased 3.80 million tonnes in 2006-07 showing a significant and positive compound growth rate of 9.11 per cent per annum. During the first and second sub periods it was negative -3.81 per cent and -1.81 per cent but later it was significant and positive compound growth rate (15.61 percent) in third sub period. Among the sub periods, the highest growth rate was observed 21.16 percent in fifth sub period. This is attributed to the fact that during this sub-period, the improved package of practices, high yielding varieties as well as government support injected a new dimension to the production system thus culminating to the increased production, Government launched a number of programmes in 1980's like National Oilseed Development Programme (NODP) in 1985-86, Oilseed Production Thrust Programme (OPTP) in 1987-88 and Technology Mission on Oilseeds (TMO) in May 1986 and also constituted Indian Central Oilseed Committee (ICOC) to raise oilseed production through research programme.

The per ha yield of oilseed crops in India was 507 kg per hectare during the year 1960-61 which increased to 895 kg per ha in 2006-07. An analysis of its growth for the period concerned reveals that at increased with positive compound growth rate i.e.1.68 per cent per annum which is significant at one percent probability level (Table-1). The positive growth trend were found similar in sub periods viz. third (2.91 per cent), fourth (2.05 per cent) and fifth (2.63 per cent). During this period, farmers started paying much attention towards the oilseed cultivation because of day by day increasing demand for edible oil as a result of population increase and change in feeding pattern with the increase in salary package. The per ha yield of oilseed crops in the state was 363 kg per ha in 1960-61 which increased to 1185 kg per ha in 2006-07. An analysis of its growth for the period concerned (1960-2006), reveals that it increased with positive compound growth rate i.e. 2.87 per cent per annum. The analysis of productivity growth trend in different sub-periods (1980-89 and 2000-06) registered significant and positive compound growth rate 2.93 per cent and 4.48 per cent, respectively.

Variability in area, production of oilseed in India and Rajasthan -
Instability in area, production and productivity of total oilseeds in India and Rajasthan in the whole study period and in different sub periods has been examined through coefficient of variation.

Variability in Area

Among the sub periods the area under oilseeds observed maximum variability in P5 i.e. 2000-01 to 2006-07 (10.35%) followed by P3, P4 and P1 in that order (Table-2). P2 observed lowest variability in total oilseeds area in India. In Rajasthan, the same trend was observed as it was in India.

Table 2. Variability in area of oilseed in India and Rajasthan (1960-61 to 2006-07)

Particulars	Overall period (1960 - 2006)	Sub periods				
		1960-61 to 1969-70 PI	1970-71 to 1979-80 P2	1980-81 to 1989-90 P3	1990-91 to 1999-2000 P4	2000-01 to 2006-07 P5
	India					
S.D.	4.418	0.5311	0.5290	1.6987	0.8923	2.5436
Mean	20.02	14.196	16.192	19.43	25.641	24.5614
C.V.	22.06	3.74	3.26	8.74	3.48	10.35
Rajasthan						
S.D.	10.8931	0.8012	0.7490	4.1045	3.5068	9.9374
Mean	13.161	3.15	4.073	10.825	26.307	25.00
C.V.	82.76	25.43	18.39	37.91	13.33	39.74

Table 3. Variability in production of oilseed in India and Rajasthan (1960-61 to 2006-07)

Particulars	Overall period (1960 - 2006)	Sub periods				
		1960-61 to 1969-70 PI	1970-71 to 1979-80 P2	1980-81 to 1989-90 P3	1990-91 to 1999-2000 P4	2000-01 to 2006-07 P5
India						
S.D.	6.487	0.721	2.352	2.800	2.064	7.315
Mean	14.041	7.305	9.193	12.679	21.344	22.102
C.V.	46.20	9.87	25.56	22.08	9.67	33.09
Rajasthan						
S.D.	11.671	0.298	0.5612	3.993	6.165	12.992
Mean	11.214	1.059	2.062	8.261	21.807	27.885
C.V.	104.07	28.20	27.21	48.33	28.27	46.59

Variability in production

In India, among the sub-periods, P5 observed maximum variability (33.09%) followed by P2 and P3 in case of production in India and in Rajasthan P3 and P5 observed maximum variability (48.33%) and (46.59%) respectively, followed by similar variability in P1, P2 and P4 in order (Table-3).

Variability in yield

In case of productivity, maximum variability was observed in sub period P3 followed by similar variability observed in P1, P2 and P4 in order and in overall period observed (25.63%) in India (Table-4) In Rajasthan maximum variability was observed in P2 (32.59%) followed by P1, P5 and P3 in order and lowest in P4 (10.97%).

Table 4: Variability in yield of oilseed in India and Rajasthan (1960-61 to 2006-07)

Particulars	Overall period (1960 - 2006)	Sub periods				
		1960-61 to 1969-70 PI	1970-71 to 1979-80 P2	1980-81 to 1989-90 P3	1990-91 to 1999-2000 P4	2000-01 to 2006-07 P5
	India					
S.D.	171.10	43.818	47.235	88.887	67.79	122.27
Mean	667.51	489.6	542.9	646.67	831.9	894.57
C.V.	25.63	8.94	8.70	13.74	8.14	13.66
	Rajasthan					
S.D.	268.49	71.6193	169.2769	90.5487	91.597	151.78
Mean	683.042	356.00	519.30	742.20	834.30	1083.57
C.V.	39.30	20.11	32.59	12.20	10.97	14.00

Decomposition analysis

The decomposition of oilseeds production growth into area, yield and interaction effects for India and Rajasthan are presented in table-5

Table 5. Area effect, yield effect and interaction effect on production growth of oilseed in India and Rajasthan (1956-57 to 2006-07)

Location	Particular	Area effect $\Delta A1.Y1$ (%)	Yield effect $\Delta Y.AI$ (%)	Interaction effect $\Delta Y.\Delta A$ (%)
India	Oilseeds	40.78	27.77	31.44
Rajasthan	Oilseeds	26.34	8.66	65.00

A perusal of the above table indicates that the effects of various component of decomposition analysis i.e. area effect, yield effect and interaction effect have been positive for India and Rajasthan. Area effect was more pronounced than the yield effect in India and Rajasthan as well. The yield effect in Rajasthan was found to be very low (8.66%) in growth of the total output in the referred periods. On the basis of the above table, it may be concluded that for increasing the production there is urgent need of adoption of improved technology along with the use of high yielding varieties of this crop at the state level. The interaction effect though positive for India and Rajasthan but it has ranged between 31.44 to 65.00 per cent.

Conclusion

It was observed that compound growth performance in production of oilseed crops in different sub-periods (1960-2006) in India and Rajasthan. Area was found to be the main source of growth, yield being a secondary source. In India, there has been significant growth in area (1.49%), production (3.16%) and yield (1.68%) in the overall period (1960-2006) but highest growth rate was observed in the case of area (3.78%) and production (6.42%) in sub period P5 (2000-06). Comparability to India, Rajasthan observed highest growth rate in area (6.2%), production (9.11%) and yield (2.87%) in overall period 2000-06. But among the sub periods in Rajasthan, P3 (1980-89) registered highest growth trend (24.26%) and (32.91%) in case of area and production, respectively. The study reveals that the growth rate was found much higher in the sub periods P3 (1980-89) and P5 (2000-06) among the sub-periods mainly because of government intervention and consistent weather conditions.

In India, instability in area, production and yield of oilseed crops in overall period (1960-2006) were registered (22.06%), (46.20%) and (25.63%) respectively. Among the sub-periods, P5 observed maximum variability in area and production i.e. (10.35%) and (33.09%) respectively. But in Rajasthan, instability trend in area, production and yield in overall period were observed (82.86%), (104.07%) and (39.30%), respectively. Among the sub periods, P5 observed maximum variability in area (39.74%) followed by P3 sub period (37.91%). But in P3 sub period, production registered maximum variability (48.33%) followed by P5 sub period (46.59%). In India, overall period (1960-2006) productivity trend registered (25.63%) variability but among the sub periods, P5 observed (13.66%) variability followed by P3 and P1 sub periods. But in the case of Rajasthan in overall period the productivity observed (39.30%), variability among the sub periods, P2 registered (32.59%) variability followed by P1and P5 sub periods.

The decomposition analysis showed that the production growth of oilseed crops, during the study period in India, area effect is more (40.78%) followed by yield effect (27.77%) and interaction effect (31.44%). In Rajasthan, area effect is (26.34%) followed by yield effect which is very low (8.66%) and interaction effect is much high (65.00%). The analysis reflects that productivity (technologies and management) as well as interaction effect were responsible for growth in production of oilseed crops during the study period but not higher enough to cater the requirement of the burgeoning population and income hike.

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