Growth analysis of oilseed crops in India during pre and post - WTO periods*

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Abstract: The research project was formulated to address the impact of World Trade Organisation (WTO) on domestic oilseeds production. The specific objective was to analyze the temporal growth in area, production and productivity of major oilseed crops in India. The formulated hypothesis was growth rate of area, production and productivity of major oilseed crops in the post-WTO period is less compared to pre-WTO era. The results of the study have shown that area under rapeseed and mustard, soyabean, sunflower and castor increased with an overall annual compound growth rate of 2.13, 17.61, 9.15 and 1.85 per cent respectively. The increase in productivity of all nine selected oilseed crops put together from pre-WTO period to post-WTO period, was 140 kg per ha. The overall growth of productivity was positive in all the oilseed crops except sunflower. The mean production of the nine oilseeds put together had increased from 9.99 million tonnes during Pre-Technology Mission on Oilseeds (TMO) period to 17.68 million tonnes in pre-WTO period and to 22.33 million tonnes in post-WTO period. To attain self sufficiency in edible oils and to achieve nutritional security, State and Central government should map out programmes on the line of TMO to increase and maintain sustainable growth in productivity of all oilseed crops in rainfed areas.

Key words : Growth rate, area, production, productivity, oilseeds

Introduction

Indian vegetable oil economy is the fourth largest in the world, accounting for about 14.5 per cent of the world's oilseeds area and 6.65 per cent of the production next to U.S.A, China and Brazil. Currently, India accounts for 6.8 per cent of the oil meal production, 5.9 per cent of the oil meal export, 6.1 per cent of the vegetable oil export, 9.00 per cent of the vegetable oil import and 9.3 per cent of the edible oil consumption of the world. Oilseeds play the second important role in the Indian agricultural economy, next only to food grains in terms of area and production. They occupy a distinct position after cereals, constituting 14.87 per cent of the country's gross cropped area and accounting for nearly 1.4 per cent of the gross national product and seven per cent of the value of all agricultural products. They occupy an area of 27.86 million ha with 27.98 million tonnes of production registering a productivity level of 1004 kg/ha. About 14 million persons are engaged in production and another one million in processing of oilseeds.

India followed the policy of import substitution in the oilseeds and edible oil sector till 1994-95. This policy of doubling the output in order to stabilise the oilseeds production in the country, led to diversification into new crops such as soyabean and sunflower in the place of rapeseed-mustard and groundnut. India became self-reliant in edible oils almost up to 98 per cent and oilseeds meal occupied major share in exports from India. Imports of oilseeds and edible oils were canalized through the State Trading Corporation (STC) while exports of oil cakes were restricted. Similarly, exports of oil cakes were allowed. The imported oils were passed on to State Governments for sale through Public Distribution System (PDS) at administered prices.

These prices included custom duty and service charges of STC, since 1989. A part of imported oil was also allotted to vanaspati industry at concessional rates. To ease the supply position and to support rapid technological change in the oilseeds sector, certain development programmes were pursued. They were: (i) Oilseed Grower's Cooperative Project, (ii) National Oilseed Development Project, (iii) Technology Mission on Oilseeds and (iv) Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize

In 1960s, India was an exporter of edible oilseeds and oils, while it depends upon imports to the extent of nearly 50 per cent of its edible oils requirements as on date. In this situation, on the one hand it has to protect the consumers and on the other hand it has to protect the interest of the Indian oilseed growers who are mainly small and marginal and any decrease in world market prices is certain to affect the domestic prices of oilseeds and hence the income and levels of livings of these farmers. A majority of oil millers are small entrepreneurs and wide fluctuations in prices of oilseed and edible oils could affect their livelihoods also. Hence, a study to analyze the growth of oilseed crops in India during pre and post-WTO periods was found necessary so as to suggest suitable strategies to increase the production of oilseeds in the country and simultaneously working out measures for taking advantage of trade openness in a dynamic setting without affecting the basic objective of domestic food and nutritional security. With the above background and with broad objective of analyzing the growth rates of domestic oilseeds production, the present study was taken up with the specific objective to analyse the temporal growth in area, production and productivity of major oilseed crops in India. Hypothesis was that growth rate of area, production and productivity of major oilseed crops in the post-WTO period was less compared to that of pre-WTO era.

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Material and methods

To study the growth analysis of oilseed crops in India during pre and post WTO periods, a reliable source of secondary data is very essential to get the real picture. In the present study, secondary data were collected and analyzed to study the compound growth rates of area, production and productivity of major oilseed crops in India. These data were collected from the sources. viz. Reports of Directorate of Economics and Statistics, Government of India, New Delhi for area, production and productivity of nine annual oilseed crops in India for a period of 37 years from 1970-71 to 2006-07. Oil Seeds Situation - A Statistical Compendium 2007, Directorate of Oil Seeds Research, ICAR, Hyderabad and websites- www.dor-icar.org. www.agricoop.nic.in, www.seaofindia.com and www.indiaagristat.com.

The study period was divided into three *viz.*, (i) Pre-Technology Mission on Oilseeds (Pre-TMO) Period -(1970-71 to 1985-86), (ii) Period of Technology Mission on Oilseeds (TMO) or Pre-World Trade Organization (WTO) Period – (1986-87 to 1994-95) and (iii) Post – World Trade Organization (WTO) Period-(1995-96 to 2006-07). This stratification was done to compare the growth rates of the annual oilseed crops in the pre-TMO, pre-WTO and post–WTO periods.

To arrive at normal year a simple average of estimates for three years namely (a)1970-71, 1971-72 and 1972-73, (b) 1986-87, 1987-88 and 1988-89 and (c) 1995-96, 1996-97 and 1997-98 for each sub period respectively has been done. The normal year was considered as base year for estimating growth rates. By taking time as the independent variable and the area, production and productivity of the concerned oilseed crops as the dependent variable, the compound growth rates were estimated by using the formula:

 $Y = A(1+r)^{t}$

Where,

Y = Dependent variables like area, production and productivity in the year 't' for which growth rate is estimated

A= Constant

r = Rate of annual increment

t = Time element which takes the value of 1,2,3,.....n After transforming the model into a linear form by taking logarithms to base 'e',

ln Y	= ln A + t ln (1 + r)
Let, ln A	= a
ln (1+r)	= b
So, ln Y	= a + bt
(1+r)	=Anti ln of b
r	= (Anti ln of b)-1

The semi log function is linear in parameters (linear relationship between Y and t), and hence, it can be fitted by the method of Ordinary Least Squares (OLS) Technique.

The compound growth rate (r) is obtained by the following formula and generally expressed in terms of percentage.

r = [(Anti ln of b)-1] X 100

The significance of growth rate was tested by applying student 't' test statistic (Laxmanan *et al.*, 2005)

t = [r / S.E.(r)] with (n-2) df

where,

 $S.E.(r) = 100 b X S.E. (log b) / log_{10}e$

r =the Compound growth rate

n = number of year

S.E.(r) = standard error

df = degrees of freedom

t = r / S.E.(r) follows student 't' distribution with n-2 degrees of freedom.

According to log base rule, ln 10 is worked out to be 2.3025 which follows't' distribution with (n-2) degree of freedom, n is number of year considered under study. Pattern of growth rates over the years was identified using the 'b' co-efficient. If coefficient is statistically significant and positive, then growth of the estimated parameters over the years is accelerating. If it is negative, it implied that the growth is decelerating over the years. If it is around zero, it implied that the growth is stagnant over the years.

Results and discussion

During the period from 1970-71 to 2006-07, the area, production and productivity of oilseeds have increased nearly by 1.5 times, 2.5 times and 1.5 times respectively. The two promising nontraditional oilseed crops *viz.*, sunflower and soyabean were introduced in India during 1970's. In 1980-81, the production of major nine oilseeds in India was about 10 million tonnes and it has increased to nearly 23.80 million tonnes in 2006-07. The details of growth rates of nine major oilseeds at national level are presented in Table 1. The growth rates are furnished for four time periods *viz.*, pre TMO period, pre-WTO period, post-WTO period and overall period from 1970-71 to 2006-07.

Area under groundnut ranged from 6.80 million hectares (ha) in 1980-81 to 7.54 million ha in 1983-84 during the pre-TMO period with a growth rate of 0.01 per cent only per annum. In other words, it could be stated that more or less the area remained static during this period at national level.

In pre-WTO period, area under groundnut exhibited a compound growth rate of 1.58 per cent with area reaching a maximum of 8.71 million ha during 1989-90. This may perhaps be due to the impact of Technology Mission on Oilseeds (TMO). On the contrary, during post-WTO period, i.e., from 1995-96 to 2006-07, groundnut exhibited a negative growth rate of -2.34 per cent per annum. Even it had reached the minimum of 5.64 million ha in 2006-07. This could be due to the substitution by soyabean, the area of which increased to 8.33 million ha in 2006-07 from 5.04 million ha in 1995-96. The substitution effect could be witnessed in rapeseed and mustard also leading to a negative growth rate of -0.16 per cent in post-WTO period. Sunflower was also one of the major gainers and the area had increased from 1.20 million ha in 1970-71 to 2.34 million ha in 2005-06 and 2.13 million ha in 2006-07. The overall growth rate of sunflower was 9.15 per cent and it was 11.59, 7.93 and 2.00 per cent respectively during the three periods in that order.

Castor was also one of the gainers as far as area is concerned. But the area remained to be always less than one million ha except in 2000-01 during which period it reached the maximum of 1.08 million ha. The annual compound growth rate for three time

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					(Per cent)		
S1.	Oilseed	Periods					
No.	crops	Pre-TMO Pre-WTO		Post-WTO	Overall		
		(1970-71 to 1985-86)	(1986-87 to 1994-95)	(1995-96 to 2006-07)	(1970-71 to 2006-07)		
1.	Groundnut	0.01	1.58	-2.34	-0.26		
2.	Rapeseed and mustard	1.27	5.63	-0.16	2.13		
3.	Soybean	31.75	15.5	4.34	17.61		
4.	Sunflower	11.59	7.93	2.00	9.15		
5.	Safflower	3.42	-3.39	-6.19	-1.33		
6.	Sesame	-0.32	-0.33	-0.44	-1.10		
7.	Linseed	-2.18	-3.09	-6.51	-4.47		
8.	Niger	1.28	-0.28	-3.08	-0.53		
9.	Castor	2.28	3.89	0.63	1.85		
10.	All nine oilseeds	0.90	3.88	-0.15	1.52		

Note: Calculated 't' values of coefficients are significant at one per cent level

periods are 2.28, 3.89 and 0.63 per cent respectively with an overall growth rate of 1.85 per cent for the period from 1970-71 to 2006-07.

Thus the results of the study have clearly shown that rapeseed and mustard, soyabean, sunflower and castor were the major gainers in area under these crops with an overall annual compound growth rate of 2.13, 17.61, 9.15 and 1.85 per cent respectively. The loosers were groundnut, sesame, safflower, linseed and niger with an annual compound growth rate of -0.26, -1.10, -1.33, -4.47 and -0.53 per cent respectively. It has to be noted that India has achieved an overall annual compound growth rate 1.52 per cent for nine oilseeds put together as furnished in Table 1.

It is to be pointed that sesame, safflower, linseed and niger have negative growth rates not only during the post-WTO period but also in pre-WTO period as well. The mean area under total oilseeds was 23.44 m ha during pre-WTO period whereas, it was 25.07 m ha in the post-WTO period. There is no significant difference between these two means statistically. This clearly shows that WTO did not adversely affect the area under oilseeds. The negative growth rate of -0.15 per cent in the post-WTO period for the nine oilseeds put together is due to reduction in the area drastically in 2001-02 and 2002-03 due to drought. Thus, it could be concluded that WTO did not influence the total area under oilseeds in India while it acts as only substitution for sunflower and soybean to a maximum extent.

The details on the annual compound growth rates of productivity of nine oilseeds in India are furnished in Table 2. It could be noted that the overall growth was positive in all the oilseeds except sunflower which exhibited a negative growth rate of 0.43 per cent from 1970-71 to 2006-07. The negative growth rates are seen in pre-TMO and post-WTO periods. During the post-WTO period, negative growth rates were seen in groundnut, soybean, sunflower, niger and castor ranging from -0.04 per cent in soyabean to -2.78 per cent in niger. The recent reports on sunflower revealed that the crop was affected by Necrosis Viral disease and this may be the reason for the reduction in the productivity of this crop in pre-WTO and post-WTO periods. Thus, it could be inferred from the results of the present study that the productivity of the nine oilseeds put together is on the increase over the years and as such WTO had no influence on the same.

The compound growth rates of production of nine oilseeds for the three time periods and overall time period are furnished in Table 3 Soyabean had the maximum overall growth rate of 19.48 per cent followed by sunflower, castor and rapeseed and mustard with 8.72, 5.88 and 4.60 per cent respectively. The total production of all the nine oilseeds put together exhibited a growth

Table 2 Growth rates of productivity of oilseed crops in India

Table 2.	Growth rates of productiv	(Per cent)				
Sl.	Oilseed					
No.	crops	Pre-TMO	Pre-WTO	Post-WTO	Overall	
		(1970-71 to 1985-86)	(1986-87 to 1994-95)	(1995-96 to 2006-07)	(1970-71 to 2006-07)	
1.	Groundnut	0.61	0.88	-0.23	0.95	
2.	Rapeseed and mustard	1.75	2.13	2.26	2.47	
3.	Soybean	3.04	5.53	-0.04	1.87	
4.	Sunflower	-3.64	5.39	-1.80	-0.43	
5.	Safflower	6.22	2.50	1.25	1.97	
6.	Sesame	1.28	2.69	1.83	1.95	
7.	Linseed	0.39	1.55	1.33	1.46	
8.	Niger	1.07	2.75	-2.78	0.70	
9.	Castor	4.60	11.91	-1.30	3.73	
10	All nine oilseeds	4 80	2.92	0.60	1 89	

Note; Calculated 't' values of coefficients are significant at one per cent level

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Table 3. Growth rates of production of oilseed crops in India

Table 3. Growth rates of production of oilseed crops in India (Per cent)							
Sl.No.	Oilseed		ds				
	crops	Pre-TMO	Pre-WTO	Post-WTO	Overall		
		(1970-71 to 1985-86)	(1986-87 to1994-95)	(1995-96 to 2006-07)	(1970-71 to 2006-07)		
1.	Groundnut	0.62	2.46	-2.57	0.69		
2.	Rapeseed and mustard	3.02	7.76	2.10	4.60		
3.	Soybean	34.79	21.03	4.30	19.48		
4.	Sunflower	7.95	13.32	0.20	8.72		
5.	Safflower	9.64	-0.89	-4.94	0.64		
6.	Sesame	0.96	2.36	1.39	0.85		
7.	Linseed	-1.79	-1.54	-5.18	-3.01		
8.	Niger	2.35	2.47	-5.86	-0.17		
9.	Castor	6.88	15.80	-0.67	5.58		
10.	All nine oilseeds	3.90	6.80	0.45	3.41		

Note: Calculated 't' values of coefficients are significant at one per cent level

rate of 3.41 per cent for the overall period with 3.90, 6.80 and 0.45 per cent in pre-TMO, pre-WTO and post-WTO periods respectively. Negative growth rate in groundnut, safflower, linseed, niger and castor were responsible for the limited positive growth rate of 0.45 per cent as such in the post-WTO period for the nine oilseeds put together. The negative growth rate of production in these crops are mainly due to the negative growth rates of the area of the crops concerned. Linseed exhibited negative growth rates in all the three time periods while safflower had a negative growth rate in both pre-WTO and post-WTO period. The mean production of the nine oilseeds put together has increased from 9.99 million tonnes during pre-TMO period to 17.68 million tonnes in pre-WTO period and to 22.33 million tonnes in post-WTO period. Thus similar to area, the production has increased in post-WTO period with substitution by rapeseed and mustard, sunflower and soyabean.

The hypothesis is that the growth rate of area, production and productivity of major oilseed crops in the post-WTO is less as compared to that of pre-WTO era. The results revealed that the total production of all the nine oilseeds put together exhibited a growth rate of 3.41 per cent for the overall period

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with 3.90, 6.80 and 0.45 per cent in pre-TMO, pre-WTO and post-WTO periods respectively. Negative growth rates in groundnut, safflower, linseed, niger and castor were responsible for the small positive growth rate of 0.45 per cent as such in the post-WTO period for the nine oilseeds put together. Hence, the hypothesis is accepted. But one can not expect continuous and same growth for oilseeds only given the constraints on land available for cultivation.

Policy implications include to attain self sufficiency in edible oils and to achieve nutritional security, Central and State government should map out programmes on the line of Technology Mission on Oilseeds to increase and maintain sustainable growth in productivity of all oil seed crops in rainfed areas; Government should encourage research and development programmes to evolve high yielding varieties suited to all agro ecological conditions and by giving tax holidays which is demanded by the oil seed industry; and for future WTO negotiations, Government of India should take into account the attributes that are threatening the food security and livelihoods of millions of marginal and small farmers who entirely depend upon monsoon

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