



# Status of Rapeseed and Mustard crop in India: Trend and Decomposition Analysis

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## ABSTRACT

The study was conducted to examine the trends, variability and decomposition analysis of rapeseed and mustard crop in major growing states as well as in the India from 1992-93 to 2017-18. The compound growth rates have been estimated with the help of exponential function, variability has been computed by using technique of co-efficient of variation. The study concluded that positive and significant growth occurred in case of production (1.84%) and yield (1.86%) of rapeseed and mustard for India during the study period. Further, there persisted wide fluctuations in the growth of area, production and yield of rapeseed and mustard over the study period. The decomposition analysis suggested that for rapeseed-mustard yield effect was the major source of growth in Production, whereas area effect was found to be negative except for Rajasthan and Utter Pradesh. Thus, the study emphasized on increasing area under rapeseed-mustard oilseed crop in major growing states, dissemination of improved agricultural production technology among farming community for increasing production of these crops.

**Key Words:** Area, Growth, Decomposition analysis, Production, Rapeseed and mustard, Variability.

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## INTRODUCTION

India is one of the largest producers of oilseeds in the world and backbone of agricultural economy of India. It accounted for an estimated production of 32.10 MT with 26.21 thousand hectare of area and 1224 kg/ha in 2016-17 (Anon, 2017) and production of edible oils was about 7.05 Mt (Jha, 2017). Rapeseed and Mustard comes under major edible oilseeds in India. Rapeseed and Mustard oil is consumed in India as food oil and the meal cake left after the extraction of oil forms important cattle feed. It can also be used as manure for various grain crops.

Rapeseed and mustard yields were lower in India compared to other rapeseed and mustard producing countries such as Germany (3811 kg/ha), France (3240 kg/ha), China (1834 kg/ha) and Canada (1769 kg/ha) as well as the world average (1849 kg/ha) (Kaur, 2020). Rapeseed and mustard yields, which were low (about 647 kg/ha on the average) during the early 1980s, witnessed a steady increase

during the last three decades and reached a level of 1121 kg/ha in the recent decade in India. Among the major oilseed producing states, Haryana has the highest yield (1533 kg/ha) followed by Rajasthan (1170 kg/ha) and Uttar Pradesh (1121 kg/ha) while West Bengal (911 kg/ha) has the lowest yield. It is interesting to note that all states witnessed a positive growth in rapeseed and mustard yield during the last three decades but rate of growth was the highest during the decade of 1980's, which decelerated during 1990's but again picked up during the last decade (Sharma, 2014).

In India, although rapeseed and mustard is cultivated in 13 states, production in Rajasthan, Uttar Pradesh, Haryana and West-Bengal with their respective share of 45,13,11 and 8 per cent accounts for 77 per cent of the total production of rapeseed and mustard in the country (Kaur, 2017). This crop accounts for nearly one-third of the oil produced in India, making it the country's

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key edible oilseed crop. This group of oilseed crops is gaining wide acceptance among the farmers because of adaptability for both irrigated as well as rain fed areas and suitability for sole as well as mixed cropping. Besides, it offers higher return with low cost of production and low water requirement. Owing to the importance of the oilseeds i.e. rapeseed and mustard in the country, trend in area, production and yield was studied using compound annual growth rate. In order to study the percent contribution of area effect, yield effect and interaction effect decomposition analysis were carried out in study.

### MATERIALS AND METHODS

The study is based on the relevant secondary data collected from different published sources i.e. India stat (www.indiastat.com), Centre for Monitoring Indian Economy. The data on area, production and yield of rapeseed and mustard crop have been collected from sources like Basic Agricultural Statistics, Hand Book of Statistics etc; published by Directorate of Economics and Statistics, Government of India. For the present study, major producing states i.e. Rajasthan, Haryana, Madhya Pradesh, Uttar Pradesh and West Bengal were selected on basis of last 10 year area, production and yield of rapeseed and mustard. A time period of 25 year from 1992-93 to 2017-18 have been chosen for study. For analytical purpose this entire time period was divided into three decades.

Period I : 1992-93 to 2004-05 (New Economic Policy Era)

Period II : 2005-06 to 2017-18 (Lifting of monopoly and bridging import of edible oils under open general license which began in 2004-05)

Whole Period : 1992-93 to 2017-18

#### Compound Growth Rate

To calculate the compound growth rates (CGR) of area, production and yield of rapeseed and mustard, the following exponential trend equation has been used.

$$Y = ab^t$$

Where Y = the variable for which growth rate is calculated,

t = time variable taking the values 1, 2, 3,... n,

a = intercept,

b = the regression co-efficient of 'Y' on t.

The above exponential equation can be expressed in terms of log form as follows:

$$\text{Log} Y = \text{Log} a + t \text{Log} b$$

Now, CGR per cent can be expressed as:

$$\text{CGR per cent} = (\text{Antilog } b - 1) \times 100$$

To test the significance of compound growth rate t test has been used as follows:

$t = \frac{r}{SE(r)}$  with (n - 2) degree of freedom, where r is CGR per cent and n is the number of observations (years) and

$$SE(r) = \frac{100 \cdot b \cdot SE(\log b)}{0.4343}$$

#### Co-efficient of variability

To measure the variability of area, production and yield the following formula has been used.

$$CV = (\text{standard deviation} / \text{mean}) \times 100$$

Where: CV = Co-efficient of variation in per cent.

#### Decomposition Analysis

Decomposition analysis was carried out to assess the relative contribution of area, yield to the growth of rapeseed and mustard production in India. The model is as under:

$$\Delta Q = \Delta P \cdot Y_0 + \Delta Y \cdot P_0 + \Delta P \cdot \Delta Y$$

Where,  $\Delta Q = Q_t - Q_0$ ,  $\Delta P = P_t - P_0$ , and  $\Delta Y = Y_t - Y_0$

Where  $\Delta P \cdot Y_0$  represents the area effect,  $\Delta Y \cdot P_0$  represents the yield effect, and  $\Delta P \cdot \Delta Y$  represents the interaction effect. Q, Y and P present production, yield and area, respectively; subscripts 0 and t represents the base year and terminal year, respectively.

## RESULTS AND DISCUSSION

Over the years, the trend of area, production as well as yield of rapeseed and mustard oilseed's in India has shown a continuously ups and down trend. The graphical representation of trend in area, production and yield of rapeseed-mustard in India from 1992-93 to 2017-18 has shown more variation in production that in the area of rapeseed-mustard over the years. In 1992-93, total area under rapeseed and mustard was 48.03 million ha with a production of around 7.76 million tonnes, whereas in 2017-18 the area under rapeseed mustard in India increased to 59.77 Mha with production of 84.30 Mt of the reasons for this fluctuation in production was that oilseeds were largely grown under the rain fed conditions in India. Further oilseeds production has been given impetus by various policies *i.e.* National Oilseed development project, Technology Mission on Oilseeds, Oil Palm Development Programme under Technology Mission on Oilseeds and Pulses and Mini Mission-I of National Mission on Oilseeds and Oil Palm (NMOOP) aiming at achieving self-sufficiency in term of oilseeds.

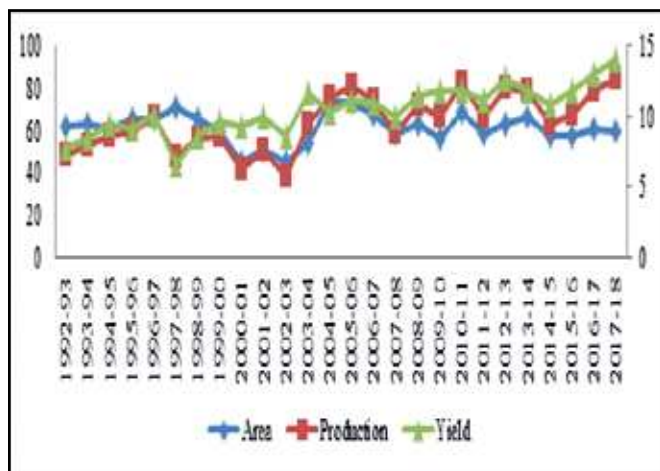


Fig 1. Trends in area, production and yield of rapeseed-mustard in India from 1992-93 to 2017-18.

### Performance of rapeseed-mustard oilseed crop

The data (Table 1) showed that in the first period only West Bengal has experienced a positive and significant growth in area, production and yield but

Uttar Pradesh shown the opposite trend in term of area as well as in production of rapeseed-mustard. There was significant positive growth rate *i.e.* 1.86 per cent in term of yield at all India level but negative in area (1.40 %) and lowest in production. It was due to liberalization of oilseed sector by remaining the quantitative restriction on the import of palm oil at cheaper rate from other countries. This led to the fall in prices of oilseeds grown by domestic farmers. Hence, there was a shift in area under oilseeds to other competing crops which led to the decline in production.

In the period II, only west Bengal shown significant and positive growth rate of 2.03 per cent in term of area, 4.79 per cent in term of production and 2.69 per cent in term of yield. Haryana, Rajasthan as well as overall in India was found negative but non-significant. All states shows positive and significant trend in term of yield and Haryana only showed significant growth rate of 1.88 per cent in yield. In overall period *i.e.* 1992-93 to 2017-18, the major producing state included in study had positive and significant growth trend in term of yield. The production of rapeseed and mustard showed negative and significant trend in case of Uttar Pradesh in selected states.

It was observed that in period I, there was improvement in growth rate which can be credited to the implementation of technology mission on oilseeds in 1985-86. However, before green revolution India was a net exporter of edible oil and oilseeds which became net importer in the 1970's as a result of vast area expansion under food grains particularly rice and wheat. After experiencing a dramatic growth during 1990's due to the opening of oilseed sector in 1994 as a part of economic reform (Sharma, 2014).

### Decomposition Analysis

The result of decomposition analysis showed that in the period I there was positive change in area, production and yield of rapeseed and mustard in India. Area effect was found more in Uttar Pradesh, West Bengal whereas in Madhya Pradesh, Haryana

**Table 1. Compound growth rate and variability in area, production and yield of major rapeseed-mustard producing states in India.**

State	Compound Growth Rate (CAGR)			Variability (CV)		
	Area	Production	Yield	Area	Production	Yield
Period I (1992-93 to 2004-05)						
Rajasthan	-1.23	1.43	3.06***	26.55	34.26	17.69
Haryana	0.29	1.60	1.30	13.90	23.87	19.39
Madhya Pradesh	-2.91*	-1.63	1.32	19.11	25.92	16.27
Uttar Pradesh	-3.63*	-2.69**	0.93	15.40	18.30	14.79
West Bengal	2.63**	3.63***	1.58**	16.54	21.15	10.41
India	-1.40	0.04	1.86*	14.71	18.44	13.50
Period II (2005-06 to 2017-18)						
Rajasthan	-2.28*	-0.24	2.08**	17.16	16.95	12.14
Haryana	-1.20*	1.88*	3.12**	10.81	15.28	17.08
Madhya Pradesh	-0.07	1.71	1.79***	9.34	15.41	10.04
Uttar Pradesh	-2.23**	-1.71	0.52	14.52	17.39	10.08
West Bengal	2.03***	4.79***	2.69***	12.29	23.30	12.59
India	-0.96*	0.58	1.57***	8.33	11.41	8.93
Overall Period (1992-93 to 2017-18)						
Rajasthan	0.43	2.76***	2.50***	22.35743	31.31341	21.23842
Haryana	-0.28	1.63***	1.91***	12.37919	21.19734	21.18382
Madhya Pradesh	0.70	2.65***	1.94***	16.46824	28.75042	18.17375
Uttar Pradesh	-2.87***	-1.50***	1.41***	24.31489	19.5501	15.87365
West Bengal	1.34***	3.04***	1.67***	15.43314	28.39318	15.36432
India	-0.024	1.84***	1.86***	11.80093	20.22727	16.31526

\*, \*\* and \*\*\* significant at 10, 5 and 1 per cent level of significance

and at all India level yield effect dominated. In period II, there was a negative absolute change in area of Madhya Pradesh, Uttar Pradesh and Haryana and also at India level whereas yield effect in Rajasthan. During entire period, area effect was found positive only in West Bengal and Madhya Pradesh where Rajasthan, Haryana and Uttar Pradesh shown negative effect. The interaction effect of area and yield was observed negative effect in Rajasthan, Haryana, Uttar Pradesh and overall India.

Hence, it can be seemed that the source of change in production varied in different states in

different period. There was negative change in area as well as production at all India level during second period. Overall, during the study period it was recorded that change in production was attributed due to yield effect.

### CONCLUSION

It was observed that growth rate has slowed down in area over the years in rapeseed-mustard crop. In order to encourage the area under oilseeds various development programme has been launched by government of India to improve the area or self-

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**Table2. Classification of states according to growth rates in area, production and yield of rapeseed-mustard during different period.**

Category	Period I	Period II	Overall Period
<b>Area</b>			
Positive and significant growth in area	West Bengal	-	West Bengal, Rajasthan
Positive but non-significant growth in area	Haryana	Rajasthan, Haryana	Haryana, Madhya Pradesh, Utter Pradesh
Negative and non-significant growth in area	Rajasthan	Madhya Pradesh	-
<b>Production</b>			
Positive and significant growth in production	West Bengal	Haryana, West Bengal	Haryana, Madhya Pradesh, West Bengal, Rajasthan
Positive but non-significant growth in production	-	Madhya Pradesh	Utter Pradesh
Negative and non-significant growth in production	Madhya Pradesh	Rajasthan, Utter Pradesh	-
<b>Yield</b>			
Positive and significant growth in yield	West Bengal	Haryana, Madhya Pradesh, West Bengal, Rajasthan	Haryana, Madhya Pradesh, West Bengal, Rajasthan, Utter Pradesh
Positive but non-significant growth in yield	Rajasthan, Madhya Pradesh	-	-
Negative and non-significant growth in yield	Haryana	-	-

sufficiency in oilseed's crop. Rajasthan, Haryana Madhya Pradesh and West Bengal were the states that have seen greater growth in production as compared to other major rapeseed-mustard growing states in 1992-93 to 2017-18. In order to bring upspring in rapeseed-mustard production it has to extended in those states which have more potential to grow this crop. Improvement in production technologies have to be made available to the farmers in order to increase the productivity and also campaigns, training programmes have to

be organized at villages levels in order to create awareness among the farmers regarding use of improved production technologies and related to rapeseed and mustard crops.

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**Table 3. Per cent contribution of area, yield and their interaction towards production of rapeseed-mustard in different states of India.**

Period	Effect	Rajasthan	Haryana	Madhya Pradesh	Uttar Pradesh	West Bengal	India
<b>Period I</b>	Area effect	47.53	40.65	17.28	319.52	51.74	31.25
	Yield effect	33.35	47.93	77.29	-323.29	34.68	58.19
	Interaction effect	19.10	11.41	5.42	103.77	13.56	10.55
<b>Period II</b>	Area effect	200.22	-56.56	-49.95	-335.77	51.81	-483.21
	Yield effect	-166.19	202.20	162.25	507.14	33.02	709.96
	Interaction effect	65.96	-45.63	-12.30	-71.36	15.16	126.75
<b>Overall Period</b>	Area effect	-5.77	-2.81	16.77	-718.72	38.02	-4.62
	Yield effect	112.03	106.19	70.88	1453.81	39.62	108.40
	Interaction effect	-6.25	-3.37	12.33	-635.08	22.35	-3.78

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