

# An Economic Analysis of Growth and Instability of Mustard Crop in Meerut district of Uttar Pradesh

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## ABSTRACT

Mustard is one of the important oilseed crops grown in Rabi season in India. In India, mustard crop is grown the most in Rajasthan in terms of area. This study is completely based on secondary data of area, production and productivity of mustard crop in Meerut district, India. In this study, data of 30 years has been recorded which is related to the area production productivity of mustard crop. The study period was divided in to three sub period, Period I (1991-92 to 1999-2000) Period II (2000-01 to 2009-2010) and Period III (2010-11 to 2020). In this study statistical tools were used for analysis coefficient of variation, compound annual growth rate and instability. Cuddy Della Valle index was used for calculating compound annual growth rate and instability. In the case of mustard crop in Meerut district, more area instability can be seen in the first period and more production and productivity instability can be seen in the second period. In India, instability of area, production and productivity of mustard crop was more in second period.

**Keywords:** Area, Production, Productivity, Compound annual Growth Rate, Instability index

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## INTRODUCTION

Mustard is an important crop among the oilseed crops grown in Rabi season in India. Rapeseed & mustard is the key source of income mainly for the marginal and small farmers in rain-fed areas. Thus, this crop is cultivated mainly in the rain-fed and resource vulnerable regions of the country, their effect to livelihood safety of the small and marginal farmers in these regions are also very important (Shekhawat *et al.*, 2012) Mustard oil is used as condiment in the preparation of pickles and for flavoring curries and vegetables. The oil is utilized for human consumption throughout northern India in cooking and frying purposes. The oil cake is used as a cattle feed and manure. Green stems and leaves are a good source of green fodder for cattle. The leaves of young plants are used as green vegetables as they supply enough sulphur and minerals in the diet. The oil content of the rapeseed and mustard ranges from 30 to 48 percent. The crop is grown both in subtropical and tropical countries. Among the rabi oilseeds, rapeseed and mustard can play an important role in the north eastern hill region to boost oilseed production. Despite the high quality of oil and meal and also its wide adaptability for varied agro-climatic conditions, the area, production and yield of rapeseed-mustard in India have been fluctuating due to various biotic and abiotic stresses coupled with India's domestic price support programme. (Kumar *et al.*, 2016;

Kumar *et al.*, 2018). Nevertheless, the crop has potential to ensure the nutritional security and contribute to livelihood security.

Indian mustard (*Brassica juncea*) is predominantly cultivated in the states of Rajasthan, Madhya Pradesh, Uttar Pradesh and Haryana, which contribute 71.9% area and 80.1% production (2020-21). In India, mustard is second in production after soybean, which contributes approximately 27% to the total oilseed production. India ranks fourth in mustard production in the world after Canada, Germany and China, which contributes 10.1% of the world's total mustard production The largest mustard producing state in India is Rajasthan which contributes 44.57% of India's total mustard production. The highest productivity is in Haryana (2028 kg/ha), Gujarat (1976 kg/ha), Madhya Pradesh (1745/kg. ha) and Rajasthan (1675 kg/ha) with overall national yield of 1524 kg/ha In India, Uttar Pradesh is at fourth rank in mustard production after Rajasthan, Madhya Pradesh and Haryana, which contributes 9.87% of the total production. (Directorate of Economics & Statistics, DAC&FW). In Uttar Pradesh, Gonda, Bahraich, Mirzapur, Saharanpur, Sonbhadra, Kanpur, Sitapur, Etah, Meerut, Faizabad, Etawah, Sultanpur, Mathura, Aligarh and Bulandshahr are the main districts where mustard is grown. Therefore, A study was conducted to assess the trend of

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mustard area, production and productivity in Meerut district of Uttar Pradesh. Secondary data was compiled for the period 1990-91 to 2019-20 from various published sources and websites. For analysis, the overall period was divided into three sub-periods Period I (1991-92 to 1999-2000) Period II (2000-01 to 2009-2010) and Period III (2010-11 to 2020).

**MATERIALS AND METHODS**

This study is completely dependent on secondary data. In this study, secondary data of area, production and productivity in mustard cultivation from 1990-1991 to 2019-2020 was collected at India level and Meerut level. The following years were divided into three time periods, the first time period (1991-92 to 1999-2000) second time period (2000-2001 to 2009-2010) and third time period (2010-2011 to 2019-2020). This secondary data is related to area production and productivity of mustard which has been taken from various published sources. In this study, an attempt has been made to achieve the targeted objectives by collecting data and using various tools and techniques according to time periods.

Coefficient of variation (CV), is the simplest method for calculating instability of crop in which overestimates the degree of instability in time series data as given by long-term trends.

$$\text{Coefficient of Variation (CV)} = \frac{\text{Standard Deviation} \times 100}{\text{Mean}}$$

Cuddy-Della Valle Index (CDVI) The Cuddy-Della Valle Index reverse annually trend and clearly shows the direction of change (Cuddy and Della, 1978). As a result, this is a super method to measure the instability of area, production and productivity. Smaller values of this index represent lower price volatility, and vice versa. Cuddy-Della Valle index as follows: Cuddy – Della Valle Instability Index (%) =  $CV\sqrt{(1-R^2)}$

Where, CV = coefficient of Variation (%)

$R^2$  = adjusted coefficient of determination

Compound annually growth rates for the area, production, and yield of groundnut was calculated by fitting time-series data to the following mathematical function.

$$Y = ab^t$$

Where, Y = Index number of area, production, productivity considered as the dependent variable.

t = Year considered as independent variable.

a = Intercept

b = Regression coefficient

This Equation can be described in logarithmic form are as follows:

$$\text{Log } y = \text{log } a + t \text{ log } b$$

$$\text{Log } y = A + B t$$

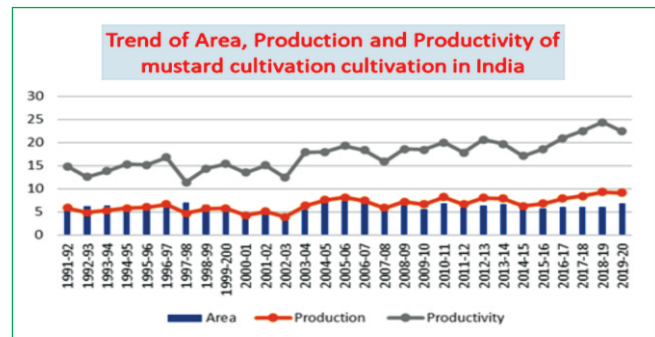
Where, A = log a; B = log b

The compound growth rate “r” was computed as.  $r = (\text{Antilog of } b - 1) \times 10$ .

**RESULTS AND DISCUSSION**

As per the prescribed years, it has been seen that the area production and productivity of mustard in the country has gradually increased. Changes in result have been found due to

changes in data. “Gradual changes in the variable data over a long period and cause apparent increase or decrease in it that may not be detected in a year-to-year analysis.” (Goodwin, 1994) “Trend analysis uses time variable as a surrogate for capturing the effect of changes in other variables that either cannot be measured or in groups of Variables that change so gradually that collecting the information is not worth the effort.” (Tomek & Kenneth, 2003). This study not only shows the data of area production and productivity of the last few years, but according to this study, we can also predict the pattern of mustard crop in the coming years and what will be the situation of production in future. The area, production and productivity of mustard in India from 1992-1993 to 2019-20 has been displayed through a graph, which shows that there has been variation in area and production in the past years.



In India, the area of mustard in the year 1991-92 was 6.55 million hectares, production 5.86 million tons and productivity 8.95 quintals per hectare, whereas in the year 2019-20, the area 6.86 million hectares, production 9.12 million tons and productivity were recorded 1331 quintals per hectare. In comparison to the year 1991-92, in India, mustard area was increased by 4.77 percent, production 55.63 percent and productivity 48.71 percent in 2019-20. Various policies and programs made by the Government of India for self-reliance in mustard oil production like National Oilseeds Development Project, Technology Mission on Oilseeds, Oil Palm Development under Technology Mission on Oilseeds etc. are the results of which the area, production and Productivity of mustard in the country has increased in the last years.

**Performance of rapeseed-mustard crop**

It can be clearly seen from Table 1 that the period wise compound annual growth rate of total area production and productivity of mustard in India has been shown, under which the compound annual growth rate of area production and productivity in I period is 0.21, 0.56 and 0.34 per cent was recorded which was indicative of positive performance in this period.

The compound annual growth rate in total area production and productivity of mustard in period II was 3.34, 5.70 and 2.38 per cent respectively. In the II period (2000-01 to 2009-10), there was a very good performance in mustard crop in India.

In III period, it can be seen that there has been a decrease in the area of mustard crop in India, the rate of decrease was recorded at -0.22 per cent. Despite the decline in area in Period

III (2010-11 to 2019-20) in India, the performance of production and productivity was positive, which was seen at the growth rate of 2.05 and 2.49 per cent respectively. It is evident from the table 2 estimates the period wise compound annual growth rate of mustard crop in Meerut district of Western Uttar Pradesh, India. According to the table, it is seen that in Period 1 (1991-92 to 1999-2000) the extreme decline trend of area and production of mustard crop was recorded in Meerut district, which was -10.50 and -8.74 per cent in terms of area and production. Despite the tendency of area and production to decrease in the I period the trend of productivity was positive, which was seen with an increase of 1.27.

**Table 1:** Compound annual growth Rate of India.

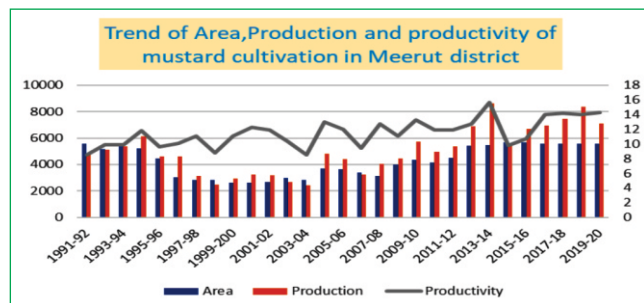
Particulars	Area	Production	Productivity
Period I	0.21	0.56	0.34
Period II	3.34	5.70	2.28
Period III	-0.22	2.25	2.49

During the second period (2000-01 to 2009-10), a change in the crop cycle was observed in Meerut district, the effect of which was seen on the mustard crop, due to which the area of mustard crop increased at the rate of 5.05 percent. An increase of 6.48 percent and 0.91 percent increase in productivity was also seen.

**Table 2:** Compound annual growth rate of Meerut district of western Uttar Pradesh.

Particulars	Area	Production	Productivity
Period I	10.50	8.74	1.27
Period II	5.05	6.48	0.91
Period III	2.68	3.85	1.82

During the third period (2010-11 to 2019-20), the area and production of mustard crop in Meerut district increased at a lower rate than during the second period, which was recorded at 2.68 and 3.85 percent. It was also observed during this period that productivity was increased at a faster rate by 1.82 percent as compared to the second period.



As Table 3 shows the instability of area production and productivity of mustard crop in Meerut district on the basis of different time periods. Based on the data in this table, it was noticed that in the I period, Instability of area was recorded

10.65 per cent. Due to area instability of 10.65 per cent, instability of 17.41 per cent in production and 9.47 per cent in productivity was seen.

**Table 3:** Instability rate of mustard crop in Meerut District of Uttar Pradesh.

Particulars	Area	Production	Productivity
Period I	10.65	17.41	9.97
Period II	8.92	19.36	13.44
Period III	6.81	14.35	12.98

In the II period, the highest instability was seen in production which was 19.36 per cent. This instability of production can be seen due to the instability of the area because in the second period the area instability was recorded at 8.92 per cent. The impact of instability in production and area was also seen on productivity which was 13.44 per cent.

In the III period, the area instability was 6.81 per cent, which was less as compared to the I and II periods, but the instability in the case of production was 14.35 per cent and in the case of productivity, it was 12.98 per cent. Based on the data recorded in the III period, it can be seen that area instability was less but production and productivity instability were high.

In the case of mustard crop in Meerut district, more area instability can be seen in the first period and more production and productivity instability can be seen in the second period.

**Table 4:** Instability rate of mustard crop in India.

Particulars	Area	Production	Productivity
Period I	4.98	10.66	11.99
Period II	15.22	18.15	7.52
Period III	6.86	10.85	7.35

Table 4 shows the instability of mustard crop in India on the basis of different periods. At India level, area instability of mustard crop in the I period was 4.89 per cent, production instability was 10.66 per cent and productivity instability was 11.99. In the II period, area instability at India level was 15.22 per cent, production instability was 18.15 per cent and productivity instability was 7.55 per cent. In the third period, area instability of mustard crop in India was 6.86 per cent, production instability was 10.85 per cent and productivity instability was 7.35 per cent was recorded. Table 4 shows that area, production and productivity instability of mustard crop in India, more in the second period compare with first and third period.

**CONCLUSION**

Mustard crop is known as the main oilseed crop of India. In Meerut district of Uttar Pradesh, mustard crop is sown only after the harvesting of sugarcane and green fodder crops. Mustard crop is especially adopted in areas with crop rotation and less water availability because mustard crop requires less water. Based on the data of last few years in Meerut district, it has been seen that the area under mustard crop has increased.

To make India self-reliant in the oilseed sector, it is necessary to increase the mustard area in Uttar Pradesh, mainly in Western Uttar Pradesh. In areas with low production and productivity of mustard, the Government of India should take

policy and technical steps so that the decline in area and production of mustard crop can be stopped and production can be increased.

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