

# Study on Growth and Instability of Sesame in North-Eastern Hill Region of India

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## ABSTRACT

Alongside making considerable progress in the production of food grains and oilseeds especially during the last three decades, the Indian agriculture has simultaneously been indicative of growing instability in the production front for several reasons. It was in this backdrop, an attempt was made through the present study to examine the growth and instability of sesame over five of the six sesame growing states of North-Eastern Hill Region of the country by way of analyzing the time series data of 20 years. The growth rate of area and production found to be highest in Nagaland state but in terms of productivity it was highest in Manipur state. The instability which was highest observed in case of area and productivity for Manipur was observed lowest in Nagaland state. Hence, the study highly recommends the use and adoption of site specific scientific package of practices of the crop to avoid the prevailed instability.

**Keywords:** Growth, Instability, Sesame, North-Eastern Hill region of India.

Among food crops, oilseeds play a significant role in our daily diet. Sesame (*Sesamum indicum* L.) - also known as *simsim*, *gingelly*, *benniseed*, *ajonjoli*, *sesamo* and *til* - is one of the most important oilseed crops used by mankind. It has both nutritional and medicinal values. The world harvested about 3.84 million metric tonnes of sesame seeds in 2010. India was the world's largest exporter of sesame seeds with Japan being the largest importer (FAO, 2012). For quite a long time agricultural growth and instability has remained to be the subject of intense discussion and debate. While it is imperative to increase the agricultural production or growth for obvious reasons, the concomitant increase in instability in agricultural production simultaneously demands due attention and strategic mitigation measures especially to keep that growth steady. This is more so because apart from adversely affecting food management and macroeconomic stability, instability raises the risk involved in the farm production and affects farmers' income and decisions to adopt high paying technologies as well

as investments in farming. Apart from affecting the price stability and the consumers, it also increases vulnerability of low income household to the market. Alongside making considerable progress in the production of food grains and oilseeds especially during the last three decades, the Indian agriculture has simultaneously been indicative of growing instability in the production front for several reasons. Pal (1989) examined the trend in oilseed production (groundnut, rapeseed, mustard and sesame) in India and associated instability for the period between 1950-51 and 1983-84 to reveal that in the post-Green Revolution period not only was the yield remained stagnant in most of the states, but the average yield of sesame also decreased in cases of Rajasthan, Andhra Pradesh, Madhya Pradesh, Tamil Nadu and Uttar Pradesh. From another study examining the production and productivity of oilseeds in India during 1970-90, Rao *et al.* (1993) observed that though production increased in the 1980s, it nevertheless was also associated with increased instability in yields. As the fall out of analysis specifically on the growth

and instability in area, production and productivity of sesame in the arid zone of Rajasthan, Gajja *et al.* (2008) revealed that though both area and production was increased, it was coupled with high instability also. In concern to North-eastern states, Dhakre and Sharma (2010) studied the trends of area, production and productivity of Rape-Mustard in Nagaland to reveal that the maximum decrease in production under rape-mustard production was (-) 45.31 per cent in the year 1988-89 and maximum increase in production under Rape-Mustard was 90.79 per cent in the year 1986-87. Among area, production and productivity of Rape-Mustard the instability was highest for the production. Among oilseed crops, sesame is one of the most important ones not only in India but in North-East India also. The North-Eastern Region of India, comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Among those states excepting Assam all the remaining states together constitutes the North-Eastern Hill Region. Though Sesame flourishes comfortably under the climate of the region and is one of the major oilseed crops there save and except Sikkim, this crop virtually remained unattended by the contemporary researchers in terms of its production scenario and associated instability in a holistic manner. And there lied the importance of the present study to analyze and understand the growth and instability pattern of that crop through time series analysis.

### Data Base and Methodology

The basic objective of the research study was to assess the performance of growth and judge the instability in growth performance of sesame in all the six sesame growing states of North-Eastern Hill Region of India; namely Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura; wherein the crop under reference is having a significant share in the domestic cropping pattern. While selecting this crop, the regularity in area and production was also taken into consideration.

The study was based on secondary time series data of 20 years *i.e.*, from 1991-92 to 2010-11 as collected from the Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India (<http://eands.dacnet.nic.in/>).

In view of assessing the performance of growth and

instability during study period, data were divided into two halves *viz.*, Period-I (1991-92 to 2000-01), Period-II (2001-02 to 2010-11). And the entire period under study (*i.e.*, *overall period*) was termed as Period-III (1991-92 to 2010-11). The compound annual growth rate of area, production and productivity of each crop for the two periods was calculated separately by using the Log Linear model.

$$\text{Log } Y = a + bt$$

Where,

Y = dependent variable (e.g. Area, production and productivity)

t = time; a = intercept; b = slope coefficient

$$\text{CAGR} = \{\text{Exp}(b) - 1\} \times 100$$

The simple coefficient of variation (CV) overestimates the level of instability in time series data characterized by long-term trends, whereas the Cuddy-Della Valle Index corrects the coefficient of variation by:  $I = CV \times (1 - R^2)^{0.5}$

Where,

I = Instability index (per cent); CV = Coefficient of variation (per cent)

$R^2$  = Coefficient of determination

Further, by taking into account the growth rates and instability index of yield, the sesame growing states of North-Eastern Hill Region was classified into four categories *viz.* (a) Positive growth rate and low instability index, (b) Positive growth rate and high instability index, (c) Negative growth rate and low instability (<15 per cent), and (d) Negative growth rate and high instability (>15 per cent) in conformity with the type of classification made by Dharke and Sharma (2009).

### Results and discussion

The account of compound annual growth rate of area, production and productivity of sesame has been presented through Table-1. It was revealed from the table that though Nagaland state recorded the highest growth rate in case of area during both the overall period and in the first sub-period (5.9 per cent and 11.0 per cent respectively), it was the state of Manipur that showed highest growth rate during the second sub-period (9.3 per cent). However, in terms of overall period the later one has been observed to

**Table 1. Compound annual growth rate of area, production and productivity of sesame in North-Eastern Region of India**

State	Compound Annual Growth Rate								
	Area			Production			Productivity		
	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III
Arunachal Pradesh	3.9	-1.1	0.2	2.1	-1.8	0.8	-1.7	-0.7	0.5
Manipur	4.0	9.3	-4.5	4.0	12.5	0.7	-0.3	3.0	5.4
Meghalaya	#	1.1	1.5	#	1.5	1.7	#	0.4	0.1
Mizoram	-0.4	-12.8	-6.5	-3.5	-12.8	-10.3	-3.1	0.0	-4.0
Nagaland	11.0	0.4	5.9	10.0	-5.2	4.9	-0.9	-5.5	-0.9
Tripura	-6.8	0.1	-4.3	-6.0	3.0	-2.2	0.9	2.9	2.2

# remained constant over the period

be maintained a negative growth rate of area (-4.5 per cent). In case of Mizoram, the concerned state recorded the lowest growth rate (-6.5 per cent) during the overall period. Further, Tripura (-6.8 per cent) and Mizoram (-12.8 per cent) showed the lowest growth rate during the first and the second sub-period respectively. All the other states ranged in between Mizoram and Nagaland during the overall period.

A further perusal of Table-1 is indicative of the fact that in keeping parity with the trend in area, in case of production also though the Nagaland state recorded highest growth rate during both the overall period and the first sub-period (4.9 per cent and 10 per cent respectively), it was, however, the state of Manipur that showed highest growth rate during the second sub-period (12.5 per cent). On the other hand, while Tripura showed lowest growth rate (-6.0 per cent) in the first sub-period, the state of Mizoram showed lowest growth rate during the overall period as well as the second sub-period (-10.3 and -12.8 per cent respectively). All the other states ranged in between Mizoram and Nagaland during the overall period.

In case of productivity, while the highest growth rate (5.4 per cent) was observed in Manipur during the overall period, it was contrarily observed to be the lowest (-4.0 per cent) in Mizoram state during the same period. In the first sub-period, Tripura (0.9 per cent) showed highest growth while Mizoram showed lowest (-3.1 per cent) growth rate. In the second sub-period Manipur showed highest (3.0 per cent) growth rate while Nagaland showed lowest growth rate (-5.5 per cent). All the other states ranged in between Manipur and Meghalaya during the overall period.

In case of area, during the overall period and in both the sub-periods the highest instability (52.11 per cent, 29.37 per cent and 74.45 per cent respectively) was observed in Manipur state (Table- 2). On the contrary, whereas Meghalaya showed lowest growth rate at the rate of 5.43 per cent and 5.22 per cent during both overall period and in the second sub-period respectively, the state of Tripura showed the lowest instability (5.27 per cent) among the other states during the first sub-period only. All the other states ranged in between Manipur and Meghalaya during the overall period.

**Table 2. Instability index of area, production and productivity of sesame in north-eastern hill region of India**

State	Instability Index								
	Area			Production			Productivity		
	P-I	P-II	P-III	P-I	P-II	P-III	P-I	P-II	P-III
Arunachal Pradesh	6.97	12.19	12.51	12.38	20.45	18.09	8.88	8.75	10.50
Manipur	29.37	74.45	52.11	27.64	22.61	33.40	2.77	132.77	140.45
Meghalaya	#	5.22	5.43	#	6.85	6.42	#	4.69	3.31
Mizoram	7.66	17.07	18.72	16.50	34.37	28.68	15.26	32.99	26.19
Nagaland	28.41	38.34	44.21	28.99	45.33	52.56	23.23	14.03	21.90
Tripura	5.27	13.19	15.44	7.11	15.77	18.23	3.61	7.05	6.4

# remained constant over the period

In case of production during the overall period and in both the sub-periods the highest instability (52.56 per cent, 28.99 per cent and 45.33 per cent respectively) was observed in Nagaland state. On the contrary, whereas during both the overall period as well as the second sub-period Meghalaya showed lowest instability (6.42 and 6.85 per cent respectively), the state of Tripura, nevertheless, showed the lowest instability (7.11per cent) among all other states during the first sub-period. All the other states ranged in between Meghalaya and Nagaland during the overall period.

In case of productivity, while the Manipur state reflected highest instability during both the overall period as well as the second sub-period (140.45 and 132.77 per cent respectively), the Nagaland state on the contrary showed highest instability (23.23 per cent) only during the first sub-period. Further, whereas the state of Meghalaya that showed lowest instability in both the overall period and the second sub-period (3.31per cent and 4.69 per cent respectively), it was the state of Manipur which showed lowest instability in the first sub-period (2.77 per cent). All the other states ranged in between Manipur and Meghalaya during the overall period.

**Table 3. Combined performance of growth and instability of yield of sesame in North-Eastern Hill Region of India during the overall period**

Growth and instability	States
Positive growth and low instability	Meghalaya, Tripura and Arunachal Pradesh
Positive growth and high instability	Manipur
Negative growth and low instability	Nil
Negative growth and high instability	Mizoram, Nagaland

Table-3 provides grouping of states by combining both growth and instability of yield in sesame. Meghalaya, Tripura and Arunachal Pradesh showed positive growth and low instability which is quite desirable. Among the remaining states,

while Manipur showed positive growth with high instability; Nagaland and Mizoram, however, showed negative growth with high instability. Results revealed that in terms of yield three out of six selected states (Manipur, Nagaland and Mizoram) of the region have been suffering from either negative growth or high instability or a combination of both.

## Conclusion

Among the states of North Eastern Hill Region, Nagaland state registered highest growth rate in terms of both area and production of the crop; while in case of productivity the state of Manipur found to be highest. On the contrary, in case of area and productivity, highest instability was observed for Manipur, the Nagaland state was indicative of the highest instability contextual to production of sesame. However, combination of both growth and instability of productivity of sesame revealed that the performance of Meghalaya, Tripura and Arunachal Pradesh remained satisfactory. Therefore, to reduce the instability, site specific interventions in terms of scientific package of practices of the crop should be adopted by the farmers and initiated by the extension specialists of the state.

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