

# An Evaluative Study on the Performance of Agriculture in Nagaland: A Comparative Study with the State of Meghalaya

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**Abstract:-** The study focused on analyzing the progress of major food grain production in the state of Nagaland. For this purpose, a comparative study was conducted with the state of Meghalaya regarding the production of major food grains. The study revealed that the average production of major food grains in Nagaland (688.92 thousand MT) was higher than the state of Meghalaya (356.57 thousand MT) during the study period. Similarly, the Compound Annual Growth Rate (CAGR) in the production of food grains was found to be higher in the state of Nagaland (1.12 per cent). Analysis of Coefficient Variation (CV) in the production of major food grains in Nagaland was found to be highly inconsistent, with a CV of 17.34 per cent compared to Meghalaya, with a CV of 4.10 per cent. The average percentage of Gross Irrigational Area (GIA) to Total Cropped Area (TCA) was also found to be higher in the state of Meghalaya (34 per cent) than in Nagaland at 22 per cent over the period. Inter-district variations in the production of major food grains were also examined to have a comprehensive understanding of the performance of agriculture in the state. The study shows that production of major food grains (rice, maize, wheat and pulses) was observed to be highly inconsistent in Dimapur district which is more than the state's variations.

**Keywords:** Food grains, Production, Average, Compound Annual Growth Rate, Co-efficient of Variation, inter-district variations.

## 1. Introduction

Agriculture and allied sectors still play a significant role in the economic growth and development of the North-Eastern Region (NER) of India. The NER of India, with an area of 2.6 million sq. km and a population of 38.5 million comprises the state of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The region is endowed with enormous untapped natural resources, water resources and diverse agro-climate. The economy of the region is largely agrarian, with over 70 per cent of the population engaged in agriculture for livelihood (Saikat et al., 2021). The region is hilly (about 70 per cent), and the topography of the region varies within each state. The states of Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, and Sikkim are mostly covered by mountains and hills, and one-fifth of Assam, nine-tenth of Manipur and around half of Tripura. The total cropped area of the region in 2021-22 is 6080 thousand hectares (databank.nedfi.com). The percentage of cultivated area to the total geographical area ranges from 5.15 per cent to 45.25 per cent, as compared to 54.79 per cent at the all-India levels. Rice is the principal crop of the region followed by maize and wheat. Other crops grown in the region include pulses, oilseeds, sugarcane, horticultural crops, medicinal plants and a large variety of fruits and vegetables. During 2021-22, the production of food grain was 7369.62 thousand tonnes, contributing 2.35 per cent of the country's total food grains production.

In the context of Agriculture in the state of Nagaland, the sector is the mainstay of the economy, with more than 70 per cent of the total population depending on agriculture. The state's topography is largely hilly, with more

than 90 per cent of the terrain being hilly. The state is endowed with a rich forest soil and rich bio-diversity of flora and fauna with favourable agro-climatic conditions varying from sub-tropical to temperate. The traditional form of shifting cultivation (jhum) is widely practiced across the state occupying more than 90 per cent of the area. Rice is the staple food of the Nagas and is the major crop of the state. Other major crops such as maize, wheat, pulses, fruits and vegetables, horticultural and forestry products are grown in the state. The application of farm technologies in terms of improved seeds, fertilizers and modern implements in the state has been minimal due to the hilly terrain and low purchasing power of the farmers. The practice of agriculture in the state is primarily organic, with a rare use of chemical fertilizers and pesticides. Conventional methods of preserving soil quality and productivity, controlling insect invasion, maintaining seed and viability and preservation are still considered (Solo & Kikhi, 2021). The total cultivable area of the state is 1006.20 thousand ha (AAR 2022-23), with a gross cropped area of 245.71 thousand ha and a gross irrigated area of 50.69 thousand ha. The cropping intensity of the state is 137 per cent. The cultivation of food grains in the state of Nagaland occupies a major share in terms of area and production. The percentage area of food grains in the state occupies 75.61 per cent of the total cropped area, while the production comprises 60 per cent of the total agricultural production. The total production of food grains was anticipated to be 706.02 thousand tonnes with a yield rate of 2287 kg/ha. As of 2020-21, the percentage share of agriculture and allied sectors in total Gross State Value Added (GSVA) was 29.37 per cent (ASG, 2022).

Similarly, the state of Meghalaya is a hilly strip with a geographical area of 2243 thousand hectares with a total population of 29.67 lakhs. Agriculture is the predominant occupation of the state, with 58.45 per cent of the total working population engaged in this sector. Rice is also the major crop of the state. The total cropped area of the state in 2021-22 was 324.47 thousand ha with a net sown area of 268.56 thousand ha, and a cropping intensity of 121 per cent. During 2022-23, the total area under food grain cultivation in the state was 139.09 thousand ha, of which area under the cultivation of rice was 107.77 thousand ha (i.e. 77.48 per cent). The total production of food grains was 339.18 thousand tonnes, of which rice production amounts to 279.27 thousand tonnes, accounting for 82.24 per cent of the total food grains production in the state. Other crops grown in the state include oilseeds, fibre crops and horticultural crops such as fruits, vegetables, plantation crops, medicinal plants, indigenous plants, etc. As of 2020-21, the percentage share of agriculture and allied sectors in total Gross State Value Added (GSVA) was 20.68 per cent (ASG, 2022).

The country still heavily relies on the progress of agriculture and allied sectors as more than half of the population still depends for their livelihood. Analysis of agricultural production, productivity, practice trends, etc., are conducted by different scientists using different dimensions for the attainment of food security as well as economic growth of the entire society. Biswas (2019), Chand et al (2011), Ram and Jyoti (2019), and Sekhon (2018), Sharma and Raina (2021), Singh et al. (2018) attempted studies on inter-district and inter-state variations in the production and productivity of agricultural crops and concluded that heavy dependence on rainfall, natural hazards such as floods and droughts, hilly terrain and lack of irrigational facilities in region were the major reasons for the variations in the production and productivity of agriculture. The variations in the climatic conditions, institutional and infrastructural developments, varied natural endowments, and density of population, the pattern of agricultural growth and reaction to different stimuli have varied across- some states following the same patterns as at the national level while others depicted a pattern totally of their own (Chand et al, 2011). So far, no study in the literature has provided estimates of agricultural production for recent years at the district level in the state of Nagaland. Thus, the study aims to analyze the progress of major food grain production in Nagaland (A comparative study with the state of Meghalaya). The study also attempts to analyze inter-district variation in the production of major food grains in Nagaland.

## 2. Materials and Methods

The present study is focused on the progress of the agriculture sector in the state of Nagaland, for which a comparative study of the agricultural progress of the state of Meghalaya has been conducted. An attempt was also made to study the inter-district variations in the production of rice, wheat, maize, and pulses to get a comprehensive picture of the progress of major food grain production in the state. For this purpose, secondary data for a period of ten years, i.e. from 2013-14 to 2022-23, has been collected from various sources, viz.

Annual Administrative Reports (AAR), Directorate of Agriculture, Government of Nagaland, Nagaland Statistical Handbooks, Directorate of Economics and Statistics, Government of Nagaland, Nagaland Economic Survey, Agriculture Statistics at a Glance, Government of India, Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics, NeHAgrStat, Statistical Handbook Meghalaya, NedFi Databank, A Database of Agricultural and Allied Sector in North Eastern Hill Region of India, and various other published reports, journals and books.

To examine the land use patterns and to analyze the progress of major food grains production, the Compound Annual Growth Rate (CAGR) has been used in the form:

$$Y = e^{a+bt}$$

Where,  $Y = \text{Area/Production/Yield}$

By taking logarithms of both sides of the equation, it takes the following form:

$$\log y = a + bt$$

Where,

$Y = \text{Area/Production/Yield}$

$a = \text{Constant}$

$b = \text{Growth rate}$

$t = \text{Time}$

Descriptive statistic was also employed to extract the average production of major food grains. The mean/average value is calculated by using the following equation:

$$\bar{X} = \frac{1}{N} \sum_{i=1}^n X_i$$

Where,

$\bar{X} = \text{Average value}$

$\sum X_i = \text{Sum of all observation}$

$N = \text{Total number of observations}$

To analyze the variation in the production of major food grains, Co-efficient of Variation (CV) has been used using the formula:

$$CV = \sigma / x \times 100$$

Where,

$CV = \text{Coefficient of Variation}$

$\sigma = \text{Standard deviation,}$

$x = \text{Arithmetic Mean}$

### 3. Results and Discussions

A comparative study on the land use pattern in the states of Nagaland and Meghalaya has been highlighted in Table 1. During the period, the CAGR in the land unavailable for cultivation increased by 3.37 per cent in the state of Meghalaya than compared to Nagaland with a CAGR of 2.73 per cent. Both the state has witnessed a decline in the total cropped and net sown areas. Comparatively, the percentage decline in the total cropped area and the net sown area was observed to be more in the state of Nagaland, with a negative CAGR of -4.78 per cent and -4.47 per cent, than in Meghalaya. As of 2021-22, of the total cropped area of 315618 ha in Nagaland, the

gross irrigational area stood at 50688 ha, i.e. 16 per cent of the total cropped area, while in Meghalaya, 35 per cent of the total cropped area is under irrigation. The following table (1) highlights the land use pattern in the states of Nagaland and Meghalaya for the last ten years.

**Table- 1: Land Use Statistics of Nagaland and Meghalaya**

In Thousand Hectares

State/ classification	Nagaland			Meghalaya		
	Land not available for Cultivation	Total Cropped Area	Net Sown Area	Land not available for Cultivation	Total Cropped Area	Net Sown Area
2013-14	95358	499311	380468	239041	342885	285659
2022-22	121540	321213	252050	322197	324693	268559
<b>CAGR (2013-14 to 2021-22)</b>	<b>2.73</b>	<b>-4.78</b>	<b>-4.47</b>	<b>3.37</b>	<b>-0.60</b>	<b>-0.68</b>

Source: Nagaland Statistical Handbook & Statistical Handbook Meghalaya, Various Issues

With regard to the production of major food grains, the average production of food grains in Nagaland was observed to be higher (668.92 thousand tonnes) than in the state of Meghalaya, with an average production of 356.57 thousand tonnes. The CAGR in the production of food grains was also observed to be higher in Nagaland (1.12 per cent) than in Meghalaya with a CAGR of 0.24 per cent. Similarly, among the major food grains, the average production of rice was also found to be higher in Nagaland (481.81 thousand tonnes) than in Meghalaya, with an average production of 290.31 thousand tonnes. The CAGR in rice production was 2.59 per cent in Nagaland, while the state of Meghalaya witnessed a negative growth rate of -0.05 per cent during the period. Maximum production of rice in Nagaland was observed in 2022-23 (554.67 thousand tonnes), with a minimum production (240.92 thousand tonnes) in 2021-22. On the other hand, in Meghalaya, maximum production was observed in 2017-18 (304.55 thousand tonnes) and minimum production (232 thousand tonnes) in the 2021-22. However, it was observed that the CAGR in the production of maize, coarse cereals and pulses in Nagaland witnessed negative growth rate of -4.12 per cent, -1.17 per cent and -0.75 per cent, respectively, during the same period. While, in Meghalaya, production of maize and pulses witnessed a positive growth rate with a CAGR of 1.07 per cent and 4.91 per cent; however, the state also witnessed a negative growth rate in the production of coarse cereals with a CAGR of -0.09 per cent during the same period. The Tables (2.1 & 2.2) below show the trend in the production of major food grains in the states of Nagaland and Meghalaya over the last ten years.

**Table (2.1): Production of Major Food grains in Nagaland**

(Thousand Tonnes)

Year	Rice	Maize	Coarse cereals	Pulses	Food grains
2013-14	429.60	135.44	18.64	41.60	625.28
2014-15	454.20	135.94	18.73	42.40	651.27
2015-16	478.21	136.36	19.22	43.11	676.90
2016-17	505.06	136.54	19.63	44.51	705.74
2017-18	524.44	136.78	19.83	46.06	727.11
2018-19	535.04	136.90	19.92	46.40	738.26
2019-20	544.97	137.16	19.96	46.78	748.87

Year	Rice	Maize	Coarse cereals	Pulses	Food grains
2020-21	550.95	137.53	19.97	47.14	755.59
2021-22	240.92	62.01	11.39	47.14	361.46
2022-23	554.67	88.93	16.57	38.59	698.76
<b>CAGR (%)</b>	<b>2.59</b>	<b>-4.12</b>	<b>-1.17</b>	<b>-0.75</b>	<b>1.12</b>
<b>Average</b>	<b>481.81</b>	<b>124.36</b>	<b>18.39</b>	<b>44.37</b>	<b>668.92</b>
<b>Maximum</b>	<b>554.67</b>	<b>137.53</b>	<b>19.97</b>	<b>47.14</b>	<b>755.59</b>
<b>Minimum</b>	<b>240.92</b>	<b>62.01</b>	<b>11.39</b>	<b>38.59</b>	<b>361.46</b>

Source: Nagaland Statistical Handbook, Various Issues

**Table (2.2): Production of Major Food grains in Meghalaya**

(Thousand Tonnes)

Year	Rice	Maize	Coarse cereals	Pulses	Food grains
2013-14	280.55	39.66	3.33	7.73	331.27
2014-15	297.94	40.76	6.63	7.97	353.50
2015-16	301.02	41.24	3.69	11.72	357.67
2016-17	304.52	41.54	3.69	11.83	361.58
2017-18	304.55	41.62	3.67	11.92	361.76
2018-19	302.97	41.67	3.63	11.98	360.25
2019-20	303.48	41.76	3.62	12.03	360.89
2020-21	295.85	41.83	3.62	12.04	353.34
2021-22	232.93	46.87	94.29	12.12	386.21
2022-23	279.27	44.13	3.30	12.48	339.18
<b>CAGR (%)</b>	<b>-0.05</b>	<b>1.07</b>	<b>-0.09</b>	<b>4.91</b>	<b>0.24</b>
<b>Average</b>	<b>290.31</b>	<b>42.11</b>	<b>12.95</b>	<b>11.18</b>	<b>356.57</b>
<b>Maximum</b>	<b>304.55</b>	<b>46.87</b>	<b>94.29</b>	<b>12.48</b>	<b>386.21</b>
<b>Minimum</b>	<b>232.93</b>	<b>39.66</b>	<b>3.30</b>	<b>7.73</b>	<b>331.27</b>

Source: Statistical Handbook Meghalaya, Various Issues

The inconsistencies in the production of food grains over the years have also remained a major concern for food security and also pose a major challenge in the supply of raw materials, particularly for the agro-based industries. Various studies have shown that a lower value of variation indicates more consistency in the production and productivity rate mainly due to the use and application of quality inputs, irrigational facilities, agricultural infrastructures and modern farm implements. Thus, an attempt is also made to analyze the variation in the production major food grains in both the states to understand the status of agricultural production over the years. The variation in the production of major food grains in Nagaland was observed to be highly inconsistent, with a CV of 17.38 per cent (table 3). Among the major food grains, the variation in the production of maize was found to be highly inconsistent, with a CV of 21.34 per cent. High fluctuations were also observed in the production of rice (19.67 per cent) and coarse cereals (14.51 per cent) during the period. Comparatively, the state of Meghalaya showed a lesser variation in the production of major food grains, with a CV of 4.10 per cent

during the same period. However, a considerable variation was observed in the production of coarse cereals (220.08 per cent), followed by pulses with a CV of 15.81 per cent.

**Table (3): Co-efficient of Variation in Production of Major Food grains**

(2013-14 to 2022-23)

Crops /State	Nagaland	Meghalaya
Rice	19.67	7.66
Maize	21.34	4.77
Coarse Cereals	14.51	220.08
Pulses	6.49	15.81
<b>Food grains</b>	<b>17.34</b>	<b>4.10</b>

Source: Author Computation

#### Inter-district Variations in the Production of Major Food grain in Nagaland

To have a comprehensive understanding of the performance of the state's agriculture, an attempt was also made to examine the inter-district variations in the production of major food grains. It is observed (table 4) that production of rice was highly inconsistent in all the districts, with Dimapur district witnessing the highest variation with a CV of 36 per cent, followed by Kiphire, with a CV of 33 per cent. While low variation was observed in Mon district (12 per cent), followed by Mokokchung and Zunheboto districts, with a CV of 14 per cent. With regard to the production of maize, the highest variation was observed in Dimapur and Kohima districts (39 per cent), followed by Longleng district with a CV of 36 per cent. Similarly, the production of wheat was highly inconsistent in Dimapur district (54 per cent), followed by Kohima with a CV of 49 per cent. It is to be noted that, among the major food grains, wheat production was observed to be highly inconsistent in all the districts of the state during the period. During the same period, the production of pulses was comparatively highly consistent in all the districts of the state. Kiphire district witnessed the lowest variation rate in the production of pulses with a CV of 5 per cent, followed by Mon with a CV of 7 per cent.

**Table (4): Inter-district variation in the Production of major food grains in Nagaland**

(2013-14 to 2022-23)

Districts	Rice	Maize	Wheat	Pulses
Dimapur	36	39	54	26
Kohima	22	39	49	16
Mokokchung	14	30	40	17
Mon	12	10	43	7
Tuensang	18	27	44	20
Wokha	28	32	44	12
Peren	27	22	35	8
Zunheboto	14	21	27	11
Phek	24	34	44	8
Kiphire	33	21	-	5
Longleng	25	36	33	13
<b>Nagaland</b>	<b>20</b>	<b>21</b>	<b>26</b>	<b>6</b>

Source: Computed based on data collected from Statistical handbooks of Nagaland

#### 4. Conclusion

To conclude, the main reason for the high variations in the production and productivity of major food grains is due to too much dependency on rainfall, regional disparities such as climatic conditions, soil, irrigational facilities and limited use of quality seeds and farm mechanization. District-level data for the whole country have revealed that poverty, fertilizer use, irrigation and rainfall cause significant variations in the production and productivity across districts. As the spread of improved technologies has been found to be associated with a decline in variability in production, there is a need to pay special attention to the production and distribution of seeds of improved varieties to bring stability to agricultural production (Chand et al., 2011). Therefore, the state needs to adopt and implement specific strategies at the district level for sustainable agricultural development. The estimates of inter-district variation presented in the paper have provided a snapshot view of the production and productivity regimes of major food grains across the whole state, which can be used effectively to delineate other agricultural crops for effective and specific interventions.

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