Research Paper

Food Grains Production in Nagaland: An Evaluative Study

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ABSTRACT

The present study attempts to analyze the trends in the area, production and productivity of major food grain crops in the state of Nagaland for a period of ten years i.e., from 2011-12 to 2020-21. Statistical tools such as average, percentage and line charts have been used to study. To measure the variability in the area, production and productivity of major food grains, Coefficient of variation (CV) has been computed. Compound Annual Growth Rate (CAGR), has also been used to estimate the growth in the area, production and productivity of food grains in the state. The finding shows that the production and productivity of food grains have experienced an upward trend, registering a percentage increase of 24.50 percent and 13.26 percent, respectively. Cultivation of food grains occupies more than 75 percent of the total cropped area throughout the period. Under food grain area, cultivation of cereal occupied more than 66 percent of the total cropped area. Rice being the stable crop of the people occupied more than 47 percent of the total cropped area. The percentage area of jhum paddy and maize to total cropped area witnessed a decreasing trend during the period. The share of agriculture and allied sector in Gross State Value Added (GSVA) has also been decreasing during the period.

HIGHLIGHTS

◉ Production and productivity of food grains in Nagaland have been increasing consistently increasing over the years.

◉ The area under the cultivation of food grains predominate the total cropped area in the state.

Keywords: Trends, Production, Productivity, Coefficient of variation (CV), CAGR, GSVA

Nagaland is the 16th state of the Indian Union with a total geographical area of 16579 sq. km and a population of 1978502 (2011 census) of which 1407536 (71%) of the population are living in rural areas. The state is bounded by the state of Assam in the west, Myanmar and Arunachal Pradesh in the east and Manipur in the south. The state is an agrarian economy with more than 73 % of the population engaging in agriculture and allied sector for their livelihood. Agriculture and allied sector in the state is also one of the major contributors to the Gross State Domestic Product (GSDP) and is the largest employer of the workforce with 45.47 % of the working population engaged in agriculture activities (Census 2011). Agriculture in the state is mostly organic with rare use of chemical fertilizer and pesticides. The total cultivable area of the state

is 721924 hectares (ha) which is 43.55 % of the total geographical area. The gross cropped area is 457945 ha and a net irrigated area of 122260 ha (26.70 %) with a cropping intensity of 138 %. The climate is generally cool (4ºC) in winter and pleasantly warm (35ºC) during summer with an average annual rainfall varying from 200-250 cms. Agriculture in the state being rain-fed, 90 % of the crops are grown during *kharif* season. On an average, the state produces 679.84 metric tonnes (mt) of food grains (Table 1) of which average production of cereal is 636.28 mt and 43.56 mt comes under pulses. The average productivity of food grain is 2091 kg/ha

(Table 2) which is at par with the national average of 2490 kg/ha. The area under the cultivation of food grains continues to predominate with more than 75 % of the total cropped area under food grain cultivation. Rice being the staple food of the people of the Nagas, cultivation of rice occupies more than 47 % of the total cropped area with an average production of 481.01 mt and an average yield rate of 2373 kg/ha. The production of food grains in the state was 570.44 mt in 2011-12 which increased to 755.59 mt in the year 2020-21, registering a percentage increase of 24.50 %. However, as the present rate of food production in the state is not sufficient to meet the growing demand of the population, the state has to import from other states. The state has been found deficient in almost all the agricultural commodities like rice, fish, meat, milk, egg, etc. among various commodities, region is highly deficient in egg production (86%) followed by fish (75%) and milk production (55 %) in spite of the fact that there is tremendous potential for fishery as well as backyard poultry rearing in the region (Bhatt, 2006). The state like the rest of the northeast region has a certain distinct factors viz. undulating topography, hilly terrain, high rainfall, heavy landslides, demography, community and individual based land tenure system, etc., which hampers for application of modern agricultural farming system. Another reason for the underdevelopment of agriculture and allied sector in the state is the fact that more than 70 % of the total cultivable area is under shifting (Jhum) cultivation using age-old methods of cultivation which results in not only low productivity but is also scientifically detrimental to the soil environment. "In the present context no society has remained purely traditional. Elements of modern technology have made their inroads to agriculture even in remote areas in some way or other. The market forces have become all pervading and the farmers in different areas are adjusting to it in different degrees and different forms" (Phukan, 1990). There is an urgent need to improve the status of agriculture and allied sector in the state to meet the growing demand of the population and also to contribute towards socio-economic development particularly in the rural area of the state. Agriculture today will not have any significant impact without proper post-harvest management, processing, value-addition and effective marketing

of the products. The stakeholder in the state has to adopt, innovate and suggest effective policies in line with the prevailing situation as the growth and development of the rural economy depends on the progress of this sector. Thus, the research establishes the truth and suggests measures that are to deal with the problems. It is with this background that the present piece of research study is conceptualized and taken up. The study aimed to concentrate on the following objectives;

1. To analyze the trends in area, production and productivity of food grains in the state of Nagaland (from 2011-12 to 2020-21).

2. To measure the variability in production and productivity of food grains.

3. To study the role of agriculture in the economy of the state.

Data and Methodology

The method of the study is empirical and analysis is done in qualitative and quantitative approach. The main objective of the study is to discuss the food grain production in the state of Nagaland for a period of ten years (i.e., from 2011-12 to 2020-21). For the purpose of the study only secondary data have been used to analyze the picture of state's agriculture.

Estimation of Growth Rate

Compound Annual Growth Rates (CAGR) were computed for estimating the trends in area, production and productivity of food grains based on the exponential function for the period. The compound growth rates were computed as follows:

$$Y = ab^t$$

Taking the log $LnY = Ln\ a + bt$

Where, Y = area, production and productivity of food grains

t = Time (years) a = constant, b = regression coefficient which provide the estimate of growth rate

Compound Annual Growth Rate percentage = (b–1) × 100

Coefficient of Variation (CV)

Coefficient of variation has been used to study the

variability in area, production and productivity of major food grains crops.

(Standard Deviation / Mean) * 100

Co-efficient of variation = $\sigma/X * 100$, where

σ = Standard deviation, X = Arithmetic Mean

Statistical tools and tabular analysis such as percentage, average and charts has also been used to generate meaningful interpretation from the data. Data used for the study were collected from various published source- Statistical Handbooks of Nagaland, Directorate of Economics and Statistics, Government of Nagaland, Annual Administrative Reports, Department of Agriculture, Government of Nagaland, Nagaland Economic Survey, Department of Economics and Statistics, Agriculture Statistic at a Glance, Ministry of Agriculture and Farmers Welfare, Govt. of India, journals and reports.

ANALYSIS AND DISCUSSION

To quantify the growth and performance of food grain production in Nagaland, trend analysis, growth rate of area, production and productivity, and cropping pattern are considered to find out the existing status of food grain production in the state. The average area under food grains production in the state during the period was 1014.68 thousand

hectares (ha) (Table 1). The CAGR in the area under food grains was 1.59 %. During the period, except jhum paddy and maize which has shown lesser volatility, all other food grains- WTR paddy, other cereals and pulses witnessed considerable volatility in the annual growth rate in the area under food grains during the period. It is also observed that the area under jhum paddy showed a negative growth rate (-0.52%) while that of Wet Terrace Rice (WTR) paddy witnessed the highest growth rate (4.06) among other food grains. This indicates that there is a shift from jhum system of cultivation to settled/ terrace cultivation during the period.

The production of food grains has shown a consistent increase during the study period. The total production of food grains (Table 2) in the year 2011-12 was 570.44 thousand metric tonnes (mt) which was increased to 755.59 thousand mt in 2020-21, registering a percentage increase of 24.50 %. The average production of food grains production during the period was 679.84 thousand mt. Production of rice (jhum and Wet Terrace Rice (WTR)) also witnessed an upward trend from 382.38 thousand mt in 2011-12 to 550.95 thousand mt in 2020-21 with an average production of 481.01 thousand mt during the period. Similarly, total cereal and pulses has also shown an increasing trend from 533.27 thousand mt and 37.17 thousand mt in 2011-12 to 708.45 thousand mt and 47.14 thousand mt respectively during the period. The

Table 1: Trend in Area of Food grains in Nagaland (in '000 ha)

Year	Jhum paddy	WTR paddy	Total Rice	Maize	Other cereals	Total cereals	Pulses	Food grains
2011-12	95.55	86.03	181.58	68.52	196.23	264.75	34.94	927.60
2012-13	94.92	88.41	183.33	68.67	198.38	267.05	36.20	936.96
2013-14	94.70	94.78	189.48	68.78	204.52	273.30	36.75	962.31
2014-15	94.38	100.86	195.24	68.82	210.38	279.20	37.00	985.88
2015-16	92.98	108.02	201.00	68.91	216.43	285.34	37.49	1010.17
2016-17	91.49	115.17	206.66	68.96	222.33	291.29	38.65	1034.55
2017-18	91.25	120.75	212.00	69.00	227.8	296.80	39.73	1057.33
2018-19	91.04	123.41	214.45	69.07	230.31	299.38	40.30	1067.96
2019-20	90.83	126.12	216.95	69.13	232.84	301.97	40.31	1078.15
2020-21	90.74	128.07	218.81	69.19	234.70	303.89	40.44	1085.84
Average	92.79	109.16	201.95	68.91	217.39	286.30	38.18	1014.68
CV	2.08	14.52	6.91	0.30	6.62	5.10	5.17	5.82
CAGR (2011-12 to 2020-21)	-0.52	4.06	1.88	0.10	1.81	1.39	1.47	1.59

Source: Computed based on data collected from Statistical Handbooks of Nagaland.

Table 2: Trend in Production of Food grains in Nagaland (in '000 tonnes)

Year	Jhum paddy	WTR paddy	Total Rice	Maize	Other cereals	Total cereals	Pulses	Food grains
2011-12	171.94	210.44	382.38	134.30	16.59	533.27	37.17	570.44
2012-13	180.82	224.36	405.18	134.65	18.68	558.51	40.45	598.96
2013-14	181.82	247.82	429.64	135.44	18.60	583.68	41.60	625.28
2014-15	182.64	271.55	454.19	135.94	18.74	608.87	42.40	651.27
2015-16	182.98	295.23	478.21	136.36	19.22	633.79	43.11	676.90
2016-17	182.69	322.37	505.06	136.54	19.63	661.23	44.51	705.74
2017-18	181.57	342.87	524.44	136.78	19.83	681.05	**46.06**	727.11
2018-19	181.08	353.96	535.04	136.90	19.92	691.86	46.40	738.26
2019-20	180.75	364.22	544.97	137.16	19.96	702.09	46.78	748.87
2020-21	180.57	370.38	550.95	137.53	19.97	708.45	47.14	755.59
Average	**180.69**	**300.32**	**481.01**	**136.16**	**19.11**	**636.28**	**43.56**	**679.84**
CV	**1.77**	**19.74**	**12.63**	**0.79**	**5.47**	9.86	7.43	9.70
CAGR (2011-12 to 2020-21)	0.49	5.82	3.72	0.24	1.87	2.88	2.40	2.85

Source: Computed based on data collected from Statistical Handbooks of Nagaland.
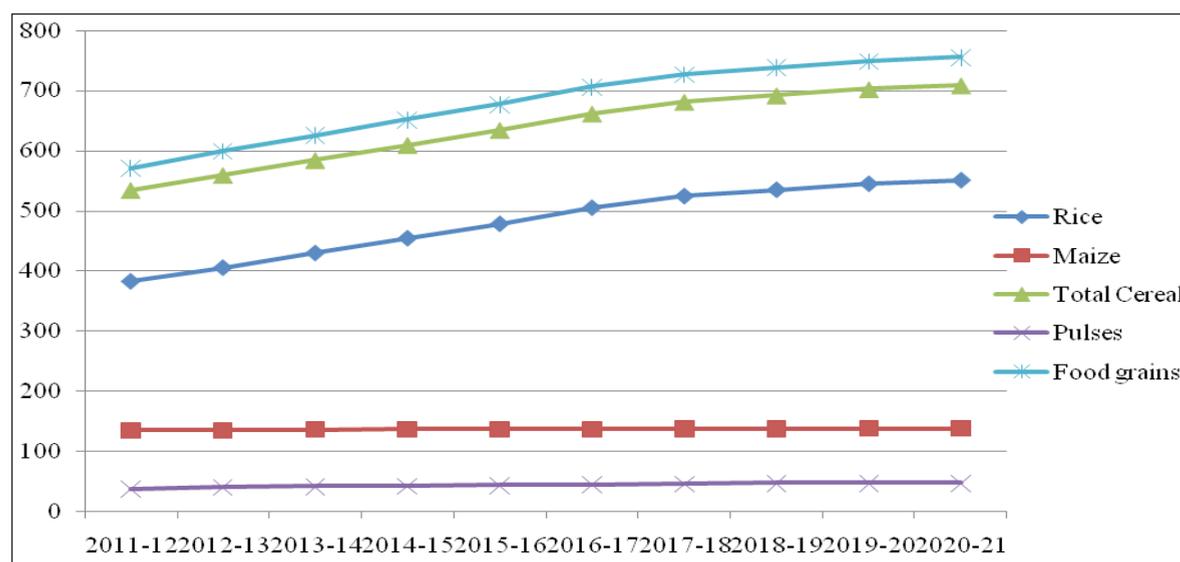

Fig. 1: Trend in production of major food grains (in '000 tonnes)

percentage increase in the production of total cereal and pulses over the period was 24.73 % and 21.15 % respectively. The increasing trend in the production of food grains signifies economic development of the state even though the percentage achievement of the sector is not very encouraging as compared to the national average rate of growth. It is observed that the coefficient variation value in the production of rice (12.63 %) was highest among other food grains during the period indicating highly inconsistent. This was mainly due to the inconsistency in the production of WTR paddy (19.74 %) during the period. Among other food grains, production of maize (0.79 %) was found to be the most consistent

followed by followed by Jhum paddy (1.77 %) and other cereal (5.47 %) during the same period. The CAGR in the production of food grains ranges between 0.24 % to 5.82 % during the period. Rice being the staple food and generally mono-cropped, witnessed the highest growth rate (3.72 %) during the period.

The productivity of food grains (table 3) has also consistently increased during the period. The yield of food grains in 2011-12 was 1903 kg per hectare which increased to 2194 kg per hectare in 2020-21 registering a percentage increase of 13.26 %. The average productivity rate during the period was 2090.90 kg per hectare. The productivity of rice

(jhum and WTR paddy) increased from 2105 kg per hectare in 2011-12 to 2518 kg per ha in 2020-21 with an average of 2373 kg per ha. Similarly, the productivity of total cereals and pulses increased consistently from 2014 kg per ha and 1063 kg per ha in 2011-12 to 2331 kg per ha and 1166 kg per ha respectively in 2020-21. The percentage increase in productivity of total cereal and pulses was 13.60 % and 8.83 % respectively during the period. From the analysis, it is found that the productivity of maize was highly consistent (0.49 %) followed by pulses at 2.71 % during the period. The coefficient variation of rice (5.99 %) productivity was observed to be the highest among other food grains indicating an inconsistency in productivity rate. The annual growth rate in the productivity of food grains varied in the range from 0.14% to 1.81 % during the period. It is observed that the productivity of food grains in the state has increased during the period but the growth in the productivity levels has not been steady.

Rice cultivation remains the dominant form of land use pattern in the state. Table (3) shows the cropping pattern of major food grains to total cropped area in Nagaland for the past ten years i.e. from 2011-12 to 2020-21. Cultivation of food grains occupies more than 75 % of the total cropped area throughout the period. Under food grain area, cultivation of cereal

Table 3: Trend in Productivity of Food grains in Nagaland (kg per hectare)

Year	Jhum paddy	WTRC paddy	Total Rice	Maize	Other cereals	Total cereals	Pulses	Foodgrains
2011-12	1799	2446	2105	1960	1132	2014	1063	1903
2012-13	1905	2537	2210	1961	1241	2091	1117	1975
2013-14	1920	2615	2267	1969	1237	2135	1131	2017
2014-15	1935	2692	2326	1975	1238	2180	1145	2060
2015-16	1968	2733	2379	1979	1246	2221	1149	2097
2016-17	1997	2799	2444	1980	1253	2270	1152	2139
2017-18	1990	2840	2474	1982	1256	2295	1159	2161
2018-19	1989	2868	2495	1982	1256	2311	1159	2175
2019-20	1990	2888	2512	1984	1256	2327	1160	2188
2020-21	1990	2892	2518	1988	1257	2331	1166	2194
Average	**1948**	**2731**	**2373**	**1976**	**1237**	**2218**	**1140**	**2090.90**
CV	3.19	5.72	5.99	0.49	3.06	4.94	2.71	4.77
CAGR (2011-12 to 2020-21)	1.01	1.69	1.81	0.14	1.05	1.47	1.00	1.43

Source: Computed based on data collected from Statistical Handbooks of Nagaland.
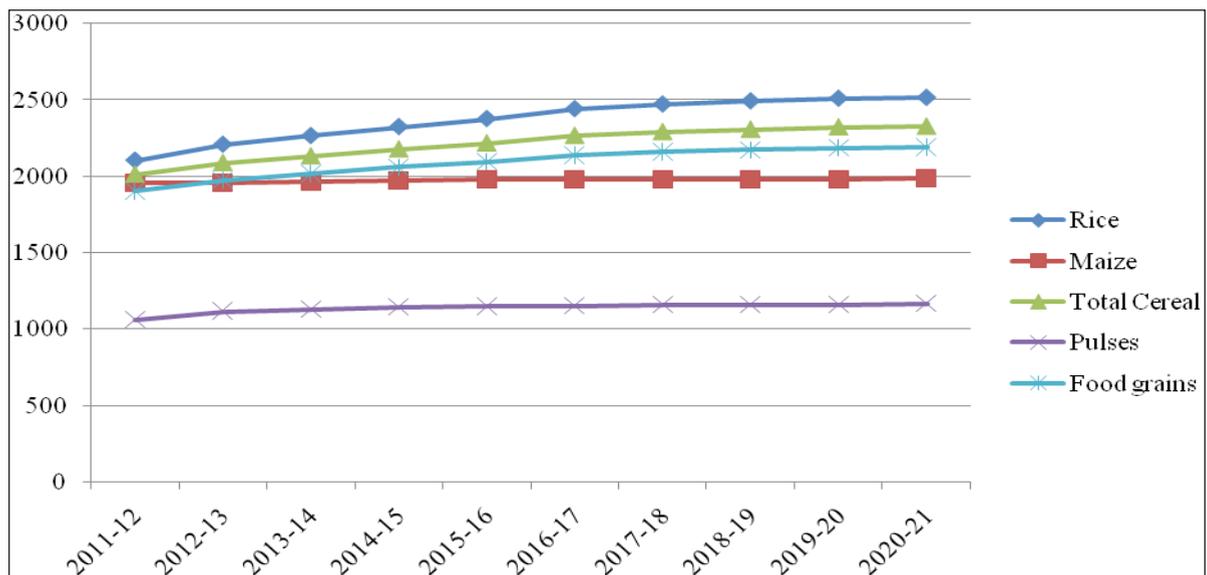

Fig. 2: Trend in productivity of major food grains (kg/ha)

Table 4: Cropping Pattern of major food grains

Crops	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Jhum paddy	24.06	23.44	23.09	22.45	21.72	20.98	20.58	20.18	19.96	19.84
WTR paddy	21.66	21.83	23.11	24.00	25.23	26.41	27.23	27.36	27.72	28.00
Total Rice	**45.72**	**45.27**	**46.20**	**46.45**	**46.95**	**47.39**	**47.81**	**47.54**	**47.68**	**47.84**
Maize	17.25	16.96	16.77	16.37	16.10	15.81	15.56	15.31	15.19	15.13
Other cereals	3.69	3.72	3.67	3.60	3.89	3.59	3.57	3.52	3.64	3.48
Total cereals	66.65	65.94	66.65	66.41	66.65	66.79	66.94	66.37	66.37	66.45
Pulses	8.80	8.94	8.96	8.80	8.76	9.11	8.96	8.87	8.86	8.84
Food grains	**75.45**	**74.88**	**75.61**	**75.21**	**75.42**	**75.91**	**75.89**	**75.24**	**75.22**	**75.29**

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

Table 5: Population, Cultivators and Agricultural Laborers (2011 census)

Population	Rural population	Cultivators	Agricultural laborers	Marginal workers
1978502	1407536 (71.14 %)	420379 (43.16 %)	22571 (2.32 %)	232943 (23.91 %)

Source: Statistical Handbook of Nagaland.

occupied more than 66 % of the total cropped area. Rice being the stable crop of the people occupied more than 47 % of the total cropped area. The percentage area of maize to total cropped area witnessed a decreasing trend from 17.25 % in 2011-12 to 15.13 % in 2020-21. It is interesting to note that the percentage area of jhum paddy to total cropped area has been gradually declining over the years. The area under cultivation of jhum paddy to total cropped area has continuously declined from 24.06 % in 2011-12 to 19.84 % in 2020-21. While the percentage area under WTR paddy to total cropped area has increased from 21.66 % in 2011-12 to 28.00% in 2020-21. This indicates a steady shift from jhum system of cultivation to WTR paddy cultivation during the period.

Agriculture and Allied sector is one of the key contributors to the Gross State Value Added (GSVA) and continues to engage 45.47 % of the working population in the state. The share of agriculture and allied sector in GSVA at constant (2011-12) price was 23.73 % in 2019-20 which is higher than the state of Assam (16.22 %), Mizoram (20.62 %), Sikkim (8.07 %), Meghalaya (16.44 %) and all India share of 14.83 % during the same period. Although this sector remains as one of the largest contributors to the state economy, the share of the sector in the GSVA has witnessed a steady decline over the years. The share of Agriculture and Allied sector in GSVA was 30.94 % in 2011-12 has steadily declined to 23.73 % in 2019-20 (Provisional) but is anticipated

to increase to 25.67 % (Advance Estimate) in 2020-21. The decline in the share indicates the shifting of economy from agriculture toward other sectors. The total population of the state is 1978502 (2011 census) of which 71.14 % of the population are in rural areas (table 5). The state is predominantly an agrarian economy where 69.39 % of the total working force is engaged in agriculture and allied sector (as per 2011 census). Out of the total workforce engaged in agriculture and allied sector, 43.16 % are cultivators, 2.32 % as agriculture laborers and 23.91 % are marginal workers.

CONCLUSION

The study showed that the area under the cultivation of food grains predominate the total cropped area in the state. The area under the cultivation of cereal occupies more than 66 % with cultivation of paddy occupying almost 48 % of the total cropped area. During the same period, the land under the cultivation of other cereals and pulses did not witness any significant expansion. It is also found that the production and productivity of food grains in the state have been increasing consistently over the years, but the motive of farming in the state is mostly for consumption and not market-oriented farming. Thus, there is a need to change the motive of cultivation from subsistence farming to large scale commercial farming. Shifting (Jhum) cultivation is also commonly practiced in the state with more than 70 percent of the total cultivated

area under shifting cultivation. However, due to the hilly topography of the state, traditional shifting methods cannot be eliminated. Thus to maintain ecological balance, settled farming and indigenous farming systems such as *Zabo* system and *Alder* based farming which are eco-friendly and sustainable are to be encouraged and expand to other parts of the state. There are also various problems that hinder the farming community in the smooth conduct of agricultural activities in the state. Basic infrastructures such as banking and credit services and farm mechanization are inadequate particularly in the rural areas of the state. Lack of proper transportation facilities, absence of organized marketing and market support, lack of cold storage and agro-processing units discourages farmers for commercial scale production. It is also observed that the efforts and initiatives of the Government and other NGOs to improve the status of agriculture and to raise the socio-economic condition of the rural people have not seen much significant result.

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