



A COMPARATIVE STUDY OF TREND IN AREA, PRODUCTION AND PRODUCTIVITY OF RICE IN ASSAM AND NAGALAND

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Abstract

The present study discusses the trend in area, production and productivity of rice cultivation in Assam and Nagaland, two states which lies in the Northeastern region of India. Study investigates the sustainability of rice production in Assam and Nagaland. Food deficit, specially rice deficit is a persistent issue and a challenge in Nagaland and the state rely on Assam along with other states for food grains and other vegetables. Ensuring food security and access to sufficient quantity of food to meet the nutritional requirements of the people is a very challenging issue. Nagaland is self sufficient in all other food grains besides rice where there is deficit of 33%. The study was based on secondary data collected from 1997-98 to 2015-16 and tried to investigate the major issues and challenges of rice cultivation. The study indicates that the area under rice has declined in Assam by -0.01 percent, while it has increased in Nagaland by 1.73 percent but production and productivity has seen an increasing trend in both the states by a rate of about 2.22, 2.83, 2.22 and 1.09 percent respectively. There is a fluctuating trend in area, yield and production in this region and stresses by natural calamities like heavy floods or droughts, heavy infestation of weeds and insects/pests, non-availability of high yielding seeds, discouraging price conditions limiting the rice growers weaning away from rice cultivation in North East Region.

Keywords: Rice, Area, Production, Food security, Self-sufficiency, Productivity Trends and Determinants

1. INTRODUCTION

Agriculture is the backbone of the India's economic system. It is not merely a source of livelihood but a way of life and the basic foundation of economic development. Agricultural growth has a direct impact on poverty eradication, health, nutrition of rural masses, national food security etc. Although agriculture is the dominant sector of the economy, it is characterized by low productivity and low supply elasticity. The low productivity per worker means, major proportion of the output is absorbed for self-consumption and little surplus is left for use in industry and other sectors. Despite concerted industrialization in the last few decades, Indian agriculture still forms the backbone of Indian economy and occupies a place of pride and is the most important sector of Indian Economy and the sector accounts for 18 per cent of India's gross domestic product (GDP) and provides employment to 50% of the countries workforce. In spite of all this it

has a lot of scope for improvement in this sector and for the development of Indian economy. Agricultural strategy for Raising Productivity must be technical change, that is both seed and complementary farm inputs and resources based rather than only seed or only resource-based (Bhupat M. Desai et al, 1999).

Rice is one of the most important staple food crop of India and is considered as a life for our country as this crop plays a vital role in our national food security and is a means of livelihood for millions of rural households. India holds one-third of the world's rice cultivation in area and the share of rice is about 35.36 per cent of the gross cropped area and 43 per cent of the total food grain production. The average yield of rice in India is 5686 Kg per hectare and it constitutes nearly 25 percent of country's agricultural export. India has the largest area under rice covering an area of 41.92 million hectares with annual production of 89.09 MT. It is the second largest producer of rice after China. West Bengal, Uttar Pradesh and Andhra Pradesh are the leading rice producing states in India and Assam is the leading producer of rice in North Eastern Region. Rice is a major food crop of the North Eastern Hills region occupying more than two third of the total cropped area, Borthakur (1997) and north eastern region accounts for 10.48% of country's total area and 6.46% of the total rice production, Bujarbaruah (2004). Cost escalation is the most important factor, which makes rice cultivation a relatively less remunerative enterprise and it suggested that mechanization should be followed wherever possible and which will reduce the cost of human labour and cost of production (Mohandas and Thomas, 1997). Increasing land holding and farm size has substantial benefits for efficiency improvement in cultivation of rice and regional factors were also found to be important in influencing technical efficiency (Linh H. Vu, 1994). A shift from jhum to scientific and ecologically less harmful forms of cultivation like settled cultivation sound to be more profitable but it is doubtful whether settled cultivation can sustain jhum cultivators looking at the context of the uneconomic size of holdings and agricultural stagnation characteristic of eastern India (K. N. Ninan, 1992).

2. REVIEW OF LITERATURE

N. Krishnaji (1975) stated that regional disparities in per capita production have widened during the sixties and the changes in the land-man ratio have not favoured a reduction in inequalities in per-capita production. Such a compensatory change in the land-man ratio can neutralize the wide inter-regional variations in productivity per hectare, in the very long run. Praduman Kumar and Mark W. Rosegrant (1994) analyzed that the productivity can be enhanced further by improving the management of infrastructure as well as by extending it to the less developed areas and by introducing new technologies.

Phanindra Goyari (2005) suggests that Assam can be made the foodgrain basket for the whole NER of India if all potentialities of agricultural development in the state can be explored and it suggest the need for controlling the flood menace in Assam because it is very critical for ecological security, livelihood security and food security of the state and its neighbouring states and the country as a whole.

RukuosietuoKuotsuoet.al. (2014) suggests the idea for scientific systems of organic cultivation which should be taught to the farmers that can give a better option to generate income in a land where fertilizers have never been used before. Longshibeni N Kithan

(2014) studied the benefits of indigenous farming systems practiced by Naga farmers such as the indigenous practice of Zabo and Alder farming which is soil and water conserving oriented and is sustainable in the long run. Altaf Hussain (2015), the study reveals that the level of productivity of farms is positively influenced by factors like labour, fertilizer, pesticides, irrigation, tractor and many other related factors.

3. STATEMENT OF THE PROBLEM

Rice is a stable food crop for both the states of Assam and Nagaland and rice cultivation is also a source of employment opportunity to uplift the level of economic and social condition of the people. Cultivation of rice generally depends on many factors like fertility of soil, irrigation facility, better seeds and climatic conditions. Production of rice varies from state to state depending on the climatic condition and for a state like Assam it is blessed with a much favourable climatic condition and also most of the area in Assam is plain area unlike Nagaland which is mostly hilly except Dimapur district. Lack of irrigation facility, is one of the main obstacle that prevents rice cultivation along with the shortage of land area and farmers are also affected by many problems such as high wage rate, poor fertilizer quality, loss due to pests and diseases, lack of technology etc. Assam is the leading producer of rice in Northeast region and also among the leading rice producers in India, while Nagaland rely on Assam for most of the food grains, specially rice and a change in production of rice in Assam will have a significant impact in Nagaland. For this reason it is very important to study the trend in acreage, production and productivity of rice in Assam and Nagaland.

4. METHODOLOGY

The study is based on secondary data collected from the year 2001-02 to 2015-16 from the databank of North Eastern Development Finance Corporation Ltd (*NEDFi*). The data used for analysis is on area, production and productivity and a method of trend projection based on time series analysis was employed to understand the trend in area, production and productivity of rice cultivation in Assam and Nagaland. The reason behind the method was to estimate future trend through the past data. In addition to the usual statistical measures such as percentages, compound growth rates, the simple and multiple regression analysis are applied.

The multiple regression model may be specified as

$$Y_t = \sum_{i=0}^k \beta_i X_{it} + \mu_t$$

Where,

Y_t is the dependent variable, the X 's are the independent variables, and μ_t is the error term. β_1 is the constant term.

5. RESULTS AND DISCUSSIONS:

Area, Production and Productivity of Rice

Rice cultivation generally depends on climatic condition, fertility of land, high yielding varieties of seeds and irrigational potentials and for this reason production of rice varies between state to state and even region to region. As per table 1 the trend in area under rice of Assam and Nagaland from the year 1997-98 to 2015-16, shows that the area under

rice has decreased in Assam by -0.01 percent and it has increased in Nagaland by 1.73 percent over this two decades. We see from the table that area under rice in both the states has been fluctuating over this period. For the state of Assam, the area increased 24.9 lakh hectares in 1997-99 to 26.46 lakh hectares in 2001 and declined to 25.37 lakh hectare in 2001-02 and it declined and fluctuated continuously from 2003-04 onwards till 2009-10. The area under rice experienced an increase in 2010-11 by 25.7 lakh hectare from 24.96 lakh hectare in 2009-10 but again it started falling and in 2015-16 Assam had only 24.85 lakh hectares under rice cultivation. In case of Nagaland, the fluctuation has been less as compared to Assam and the area under rice increased from 1.45 lakh hectares in 1997-98 to 1.57 lakh hectares in 2001-02 but it declined to 1.56 lakh hectares in 2005-06 after 2001-02 onwards. Again area increased to 1.73 lakh hectares in 2008-09 from 1.56 lakh hectares but again it decreased to 1.68 lakh hectares in 2009-10 and after that it has experienced an increase till 2015-16. Similarly, the production of rice of the two states indicate that the production of rice in Assam has increased from 33.83 lakh tones in 1997-98 to 38.54 Lakh tons in 2001-2002 but it decreased from 39.99 lakh tones in 2000-01 to 33.19 in 2007-08. But after that it has been experiencing an increase and has increased to 51.25 lakh tons in 2015-16. For the state of Nagaland, production under rice has seen an increase from 1.87 lakh tones in 1997-98 to 3.45 lakh tons in 2008-09 even though there were some fluctuations in between. Production decreased to 2.40 lakh tones in 2009-10 but after that it has been experiencing an increase and as per the table production in 2015-16 is 3.18 lakh tons, increasing at 2.21% and 2.83% respectively as per annual compound growth rate over the period of time. In spite of the very negligible increase and decrease in area under rice, the average increase in production of both the states is much higher and is mainly attributed to the adoption of modern technique of production like use of fertilizers, HYV seeds, irrigation etc, specially for the state of Assam. However, the production is very less in Assam and Nagaland as compared to the rest of the country and the reasons for this is mainly due to the slowdown in rice yield and production, diminishing returns to modern varieties when irrigation and fertilizer uses are already high, and the fact that cereal prices have fallen relative to input costs. There is also concern that pest and disease resistance to modern pesticides decelerates yield growth, and that breeders have largely exploited the yield potential of major Green Revolution crops.

Even though Assam experienced a fall in area under rice but it experienced an increase in productivity by a bigger margin than Nagaland during the same period. The productivity of rice in Assam increased by 2.22 percent while it was only 1.09 percent for the state of Nagaland during the study period from 1997-98 to 2015-16. Despite the fluctuation in area under rice in Assam experienced an increase in productivity more than the state of Nagaland. In 1997-98 the productivity of rice was 1359 Kg/Hectare and the total area under rice was 24.90 lakh hectares and in 2015-16 productivity increased by 2062 Kg/Hectare even though area declined to 24.85 lakh hectares from 25.37 lakh hectares. The main reason for increase in productivity over these years inspite of the fall in area under rice is Assam is due to the endowed of favourable climate and fertile soil of the Brahmaputra valley, which had enabled agriculture production and productivity

specially rice cultivation. The cultivation of summer rice also resulted in rice growing faster than that of autumn and winter rice, especially in flood-affected areas. Its growth rates in area, production and productivity have been faster in the recent decades. Even though the effect of Green Revolution in Northeast in general and Assam in particular is very less but increase in productivity can also be attributed to adoption of HYV seeds, modern machines, fertilizers, pesticides etc. Productivity of rice in Nagaland on the other hand is more or less increasing without much fluctuation like Assam but the average productivity per hectare is very less when compared to the state of Assam. Productivity per hectare in 2001-02 was 1516 Kg/Hectare and when compared to the productivity in 2015-16 it increased to only 1586 Kg/Hectare which is just by 0.3 percent as per the compound growth rate. Even though there has been a continuous increase in productivity but the margin of increase or growth is by a very small margin. The main reason for less productivity in Nagaland is most of the area is under jhum and wet terrace cultivation and it becomes difficult to use modern means of production due to the small land area and also hilly slopes where it becomes difficult to use tractors, power tillers, fertilizers and HYV seeds etc. Not only this but using modern means of technology will be more effective and efficient when it is used in large land area. Again farmers in Dimapur district where most of the WRC in Nagaland is practiced are unable to get high yield since they are unable to use and apply modern technologies, tractors, fertilizers and irrigation etc due to the financial constraints they have and is unable to get credit facilities from the institutions. Another reason for decrease in productivity is the attitude of the people specially the younger population towards agriculture and is more into other sectors to earn a livelihood. This is the reason why most of the cultivators are cultivating for their own sustenance.

Table1: Area and productivity of rice in Assam and Nagaland

(Area in Lakh Hectare, Productivity in Kg/Hectare)

Sl. No	Year	Area of rice in Assam	Area of rice in Nagaland	Productivity of rice in Assam	Productivity of rice in Nagaland
1	1997-98	24.9	1.45	1359	1290
2	1998-99	24.2	1.45	1345	1446
3	1999-00	26.46	1.49	1459	892
4	2000-01	26.46	1.50	1511	1533
5	2001-02	25.37	1.57	1519	1516
6	2002-03	25.41	1.51	1471	1490
7	2003-04	25.29	1.55	1534	1600
8	2004-05	23.77	1.53	1460	1698
9	2005-06	24.2	1.56	1468	1682
10	2006-07	21.89	1.65	1332	1600
11	2007-08	23.24	1.72	1428	1685
12	2008-09	24.84	1.73	1614	1994
13	2009-10	24.96	1.68	1737	1425
14	2010-11	25.7	1.81	1843	2100
15	2011-12	25.37	1.82	1780	2106
16	2012-13	24.88	1.83	2061	2210
17	2013-14	24.49	1.89	2012	2267
18	2014-15	24.95	1.95	2093	2326
15	2015-16	24.85	2.01	2062	1586
16	CGR	-0.01%	1.73%	2.22%	1.09%

Source: The North Eastern Development Finance Corporation Ltd (NEDFi) Databank

Table 2: Production of rice in Assam and Nagaland
(Production in Lakh Tones)

Sl. No	Year	Assam		Nagaland	
		Production (Lakh Tones)	Year wise variation	Production (Lakh Tones)	Year wise variation
1	1997-98	33.83	0.00	1.87	0.00
2	1998-99	32.55	-0.037	2.11	0.128
3	1999-00	38.61	0.186	1.32	-0.374
4	2000-01	39.99	0.035	2.3	0.742
5	2001-02	38.54	-0.036	2.37	0.030
6	2002-03	37.38	-0.030	2.57	0.084
7	2003-04	38.8	0.037	2.48	-0.035
8	2004-05	34.71	-0.105	2.6	0.048
9	2005-06	35.52	0.023	2.63	0.011
10	2006-07	29.16	-0.179	2.64	0.003
11	2007-08	33.19	0.138	2.9	0.098
12	2008-09	40.08	0.207	3.45	0.189
13	2009-10	43.35	0.081	2.4	-0.304
14	2010-11	47.37	0.092	3.81	0.587
15	2011-12	45.16	-0.046	3.82	0.002
16	2012-13	51.28	0.135	4.05	0.060
17	2013-14	49.27	-0.039	4.29	0.059
18	2014-15	52.22	0.059	4.54	0.058
19	2015-16	51.25	-0.018	3.18	-0.299
20	CGR	2.21%	-0.999	2.83%	-0.991

Source: The North Eastern Development Finance Corporation Ltd (NEDFi) Databank

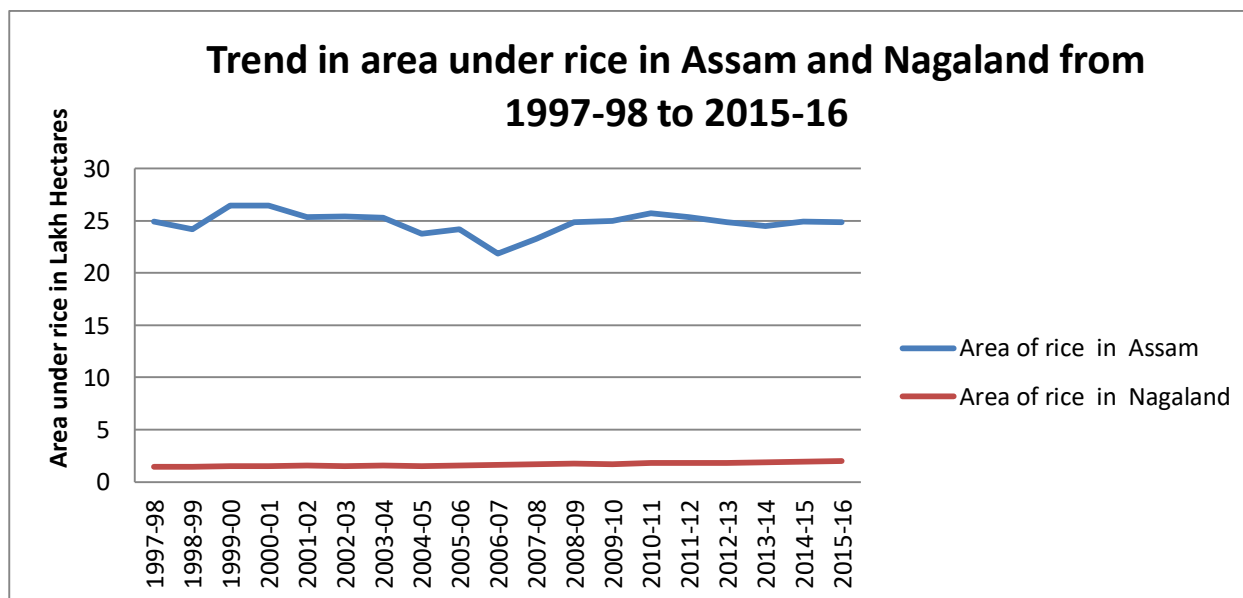


Figure 1: Trend in area under rice in Assam and Nagaland from 1997-98 to 2015-16

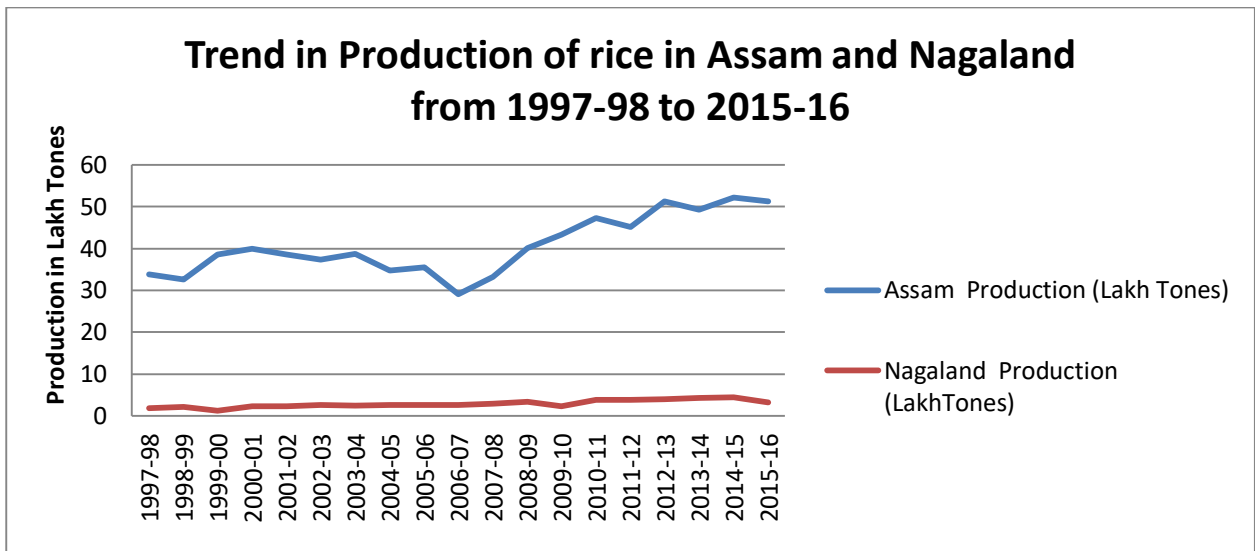


Figure 2: Trend in production of rice in Assam and Nagaland from 1997-98 to 2015-16

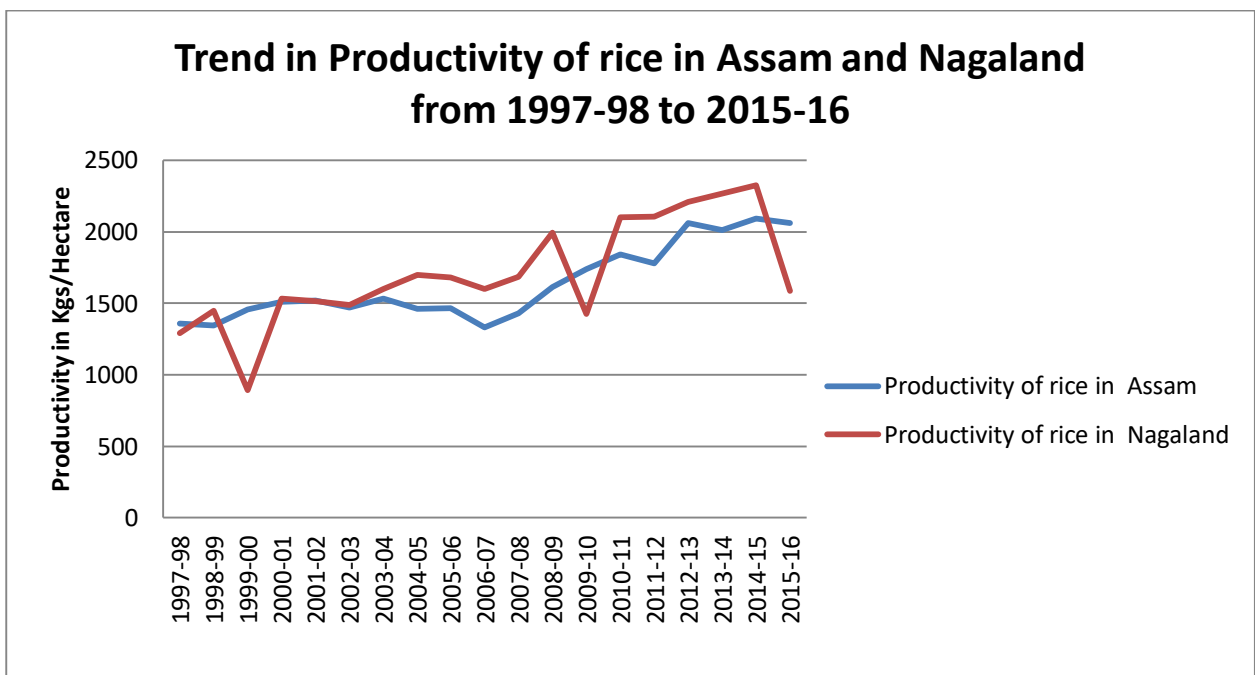


Figure 3: Trend in production of rice in Assam and Nagaland from 1997-98 to 2015-16

Table 3: Regression Analysis of the Rice Production of the States of Assam and Nagaland

Serial No.	States	Constant	Coefficient				
			Area	Yield	R ²	F-Change	N
1	Assam	-35.51	1.435 (48.59)*	0.024 (206.81)*	0.999	26.90	19
2	Nagaland	-2.63	1.550 (8.34)*	0.001 (19.72)*	0.989	57.17	

Source: The North Eastern Development Finance Corporation Ltd (NEDFi) Databank

Note: Figures in the parenthesis indicates 't' values

*, ** and *** indicates 1 percent, 5 percent and 10 percent significance

Regression results from table 3 shows production on Area and yield. The data of Assam and Nagaland shows that the explanatory variable has expected signs. Both area and yield in Assam and Nagaland are found to be positively associated with dependent variable and statistically significant at 1 percent. The R^2 values of .999, and .998 clearly indicates that area and yield has affected significantly over the period of time and it implies that about 99.9 and 99.8 per cent of variation in production is explained by explanatory variables.

6. CONSTRAINTS

There are many problems associated with rice production like climatic condition, soil type, lack of irrigation, fertilizers, machines etc, and these problems vary from state to state, region to region. Comparing the two states, it is found that Assam is better off than Nagaland even though both the states faces many constraints and is in a position to expand the area, and increase production and productivity better than Nagaland. Shortage of land, irrigation problem, and shortage of inputs are some of the problems that rice farmers in Nagaland faces along with higher cost on production. Most of the rice farming practices in Nagaland are mostly jhum and wet terrace cultivation and is more labour intensive and use of machines, fertilizers or HYV seeds is very less and the cost of production is higher and productivity is lesser when compared to Assam. On the other hand, despite many constraints the rice farmers in Assam faces blessed with a much favourable climatic condition and also most of the area in Assam is plain area unlike Nagaland which is mostly hilly. But in spite of all this the state has to bear the problem of flood due to high rainfall or drought. Like the rest of the states, farmers in Assam also faces the problem of lack of use of fertilizers, modern machines, HYV seeds etc, since they are not in a financially stable position to use all this inputs efficiently and effectively. It also faces the problem of infestation of weeds and insects like blast and brown spot and if no timely care or prevention is done than it decreases productivity as it results loss of grains. Low marketability, discouraging price conditions, and lack of awareness about scientific methods etc, also limits the rice growers weaning away from rice cultivation in North East Region.

7. CONCLUSION

Rice is a staple food crop of the state of Assam and Nagaland and is a source of income and employment for the people of these states. The study reveals that, the area under rice in Assam is showing a decreasing trend by -0.01 percent, while it has increased by 1.73 percent in Nagaland. On the other hand production and productivity has seen an increasing trend at lower rate about 2.21 percent, 2.83 percent, 2.22 per cent and 1.09 per cent in both the states respectively. In spite of the increase in area under rice in Nagaland, it is still dependent on other states including Assam for their requirements and about 33 percent of rice crop is imported to Nagaland. Higher cost of production and low productivity are some of the reason for Nagaland importing rice from other states including Assam. While the decreasing trend of area in Assam is due to human settlement, industrialization etc, and the increase in production and productivity is due to advancement of science and technology and research. Result shows that productivity in

Assam is more than Nagaland even though the rate of production is showing more or less the same in both the states. Since rice is a very important crop not only in terms of food but also in terms of income and employment, Government should intervene and take up the issues and formulate various policies appropriate for their concerned states. It will help to tackle the problem of food security (rice) in both the states specially Nagaland where almost 33 percent of the rice requirements are being imported. Assam can be made the foodgrain basket for the whole NER of India if all potentialities of agricultural development in the state can be explored but it is found that the growth of rice and other crops have been threatened due to flood problems in the form of soil erosion, sand casting, water logging, damage to standing crops, etc. The study suggests the need for controlling the flood menace in Assam because it is very critical for ecological security, livelihood security and food security of the state and its neighbouring states and the country as a whole.

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