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Research Article

AVAILABILITY AND REQUIREMENTS OF MAJOR FOOD ITEMS IN NEH REGIONS: AN EMPIRICAL ANALYSIS

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Abstract- The present study aims to find out food and nutritional security in North- East region of India by simple tabular method during 2001 to 2011 period. The study found that NE region according to demand deficient in production of food grain, oilseeds, milk, fish and egg but this region was surplus in case of fruits, vegetables and meat production. In NE region food grain production has increased by (28%) during 2001 to 2011 and it was highest in case of Nagaland (60%) followed by Arunachal Pradesh, Manipur and Assam while Arunachal Pradesh, Manipur and Nagaland found surplus in food grain production. While in rice production the increased was highest in case of Nagaland followed by Manipur, Tripura and Arunachal Pradesh but Arunachal Pradesh and Nagaland having surplus in rice production. All the states of NER were found deficient in pulse production and deficiency ranged from 21 to 92 percent in Sikkim and Meghalaya. The oil seed production in NER was increased by 15 percent during 2001 to 2011, where Manipur 26 percent was next to Nagaland 27 percent. Except Nagaland the highest increase of fruits production was documented in order in Mizoram, Manipur and Arunachal Pradesh. The vegetable production in NER was increased by 37 percent during 2001 to 2011, recorded highest in Manipur 164% followed by Mizoram 159 percent. In terms of total fish production this region was around 302.99 thousand tonnes which was less than total fish requirement for this region. The milk and eggs production was also deficient in this region which were around 61 percent and 85 percent respectively, whereas this region having surplus in meat production around 46 percent during 2001 to 2011 and at state level highest growth was in Tripura 1071 percent followed by Nagaland 237 percent. The study has suggested that the pulse production can be increased horizontally by utilizing a part of 1.67 Million ha area under Jhum cultivation and mixed cropping with other crops area and production of pulses could be increased vertically and there is need for increasing the cropping intensity through diversification of crops with action oriented mega national programme for the rain fed and hilly eco-systems of the regions with concerted efforts from all line departments.

Keywords- Food and nutritional security, Total fish production, Milk and eggs production

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Introduction

The ensure food and nutritional security and through this improving the standard of life have the most important goal of country. The two important method for achieving food and nutritional security are accelerated technology generation and its adoption and increase the production [1]. The North-East India has eight states with a total geographical area of 262180 km^2 which is about 8 % of the country's total area [2]. The region has a population of about 45.5 million (2011) with an average annual rainfall of 2000 mm accounting to about 10 percent (42.5mhm) of the country's total precipitation. The region is characterized by fragility, marginality, inaccessibility, cultural heterogeneity, ethnicity and rich in biodiversity [3].

Materials and Methods

The secondary data on the production of fruits, vegetable, food grains, oilseed crops, fish production, meat production, milk production and egg production of North-East hill region were compiled from ministry of agriculture, Govt. of India and Indian horticulture database, state Government and annual report of icar research from period 2001 to 2011[4-6]. The method used in the analysis was simple tabular Method.

Results and Discussion

The state wise total production of food grains in North-East region is presented in [Table-1]. [Table-1] reveals that the region requires a total of 8.8 Mt of food grains for its population of 45.5 million in 2011. During the last ten years the food grains production of this region has increased by 28 percent (from 6043.5 thousand tonnes in 2001 to 7770.8 thousand tonnes in 2011) and the maximum food grain production was increased in case of Nagaland (60%) followed by Arunachal Pradesh (53%), Manipur (47%) and Assam (28%) except in Mizoram (32%) where food grain production was decreased. In the supply demand analysis Arunachal Pradesh (37.70%), Manipur (24%) and Nagaland (63%) were surplus in food grain production while Assam Meghalaya, Mizoram, Sikkim and Tripura were making deficient of this region about 12 percent. The rice is the staple food crop for this region the total rice production was 7750.8 thousand tonnes in 2011 for 45.5 million population. In the north east region the rice production was considerable increased in all the states except Meghalaya (9%) and Mizoram (60) where rice production was decreased during the last ten year. The increase was highest in the case of Nagaland (60%), followed by Manipur (30%), Tripura (9%), Arunachal Pradesh.

(7%), Sikkim (4%) and Assam [Table-2]. [Table-3] reveals that in the case of pulse production all the states have considerable increase in pulse production and the

increase was highest in case of Manipur (681%) followed by Sikkim (56%), Tripura (28%), Arunachal Pradesh (27%), Assam (25%), and Nagaland (22%) and all the states of this region found deficient in pulse production except in Nagaland the deficiency percent was minimum in Sikkim (21%) and maximum in Meghalaya (92%). [Table-4] reveals that in the NE region total oil seed production has increased 15 percent (from 259 thousand tonnes in 2001 to 297 thousand tonnes in 2011) during the last ten years whereas the increase was highest in Nagaland (27%) followed by Manipur (26%), Meghalaya (16%), and Sikkim (13%).

Table-1 *State-wise Production and requirements of Total Food grains*

State with human Population in 2014	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	217.4	333.67	53.48206	242.30	37.70
Assam (31169272)	4023	5179	28.73478	5462.42	-5.19
Manipur (2721756)	400.5	592.7	47.99001	476.98	24.26
Meghalaya (2964007)	224.7	236.4	5.206943	519.44	-54.4895
Mizoram (1091014)	126.3	85.3	-32.4624	191.20	-55.387
Nagaland (1980602)	355.4	568.32	59.90996	347.10	63.73
Sikkim (607688)	98.7	103.41	4.772036	106.49	-2.89
Tripura (3671032)	597.5	652	9.121339	822	-20.68
NE Region (45587982)	6043.5	7750.8	28.25019	8838.60	-12.30

Source: Ministry of Agriculture, Govt. of India

Table-2 *State wise production and Requirement of Rice*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	132.7	233.9	7.589696	217.0699	7.753309
Assam (31169272)	3998.5	4152.4	3.216505	4893.58	-15.146
Manipur (2721756)	381.7	521.74	30.27216	427.3157	22.09871
Meghalaya (2964007)	179	204.5	-8.98976	465.3491	-56.0545
Mizoram (1091014)	103.7	50.2	-60.2534	171.29	-70.693
Nagaland (1980602)	355.4	568.32	59.90996	347.10	63.73
Sikkim (607688)	98.7	103.41	4.772036	106.49	-2.89
Tripura (3671032)	597.5	652	9.121339	822	-20.68
NE Region (45587982)	6043.5	7750.8	28.25019	8838.60	-12.30

The National Horticultural Mission has played an important role in increasing production of fruits and vegetables in NE region. Introduction of superior and hybrid verities of different fruits and vegetable crops in the hill agriculture, all the states in this region have increased their fruits production from 2658.3 thousand tonnes in 2001 to 3767.39 thousand tonnes in 2011. The increase was highest in Mizoram (192%) followed by Manipur (156%), Arunachal Pradesh (138%), Sikkim (67%) and Meghalaya (58%) whereas in Nagaland the fruit production was decreased. In case of supply demand analysis Arunachal Pradesh, Manipur, Mizoram, Nagaland and Tripura had surplus in production remaining states were deficient in production [Table-5]. In the case of vegetables, the production has increased by 37 percent (from 4094 thousand tonnes 2001 to 5613 thousand tones in 2011. All the states have increased their production during last ten years except in Arunachal Pradesh Where production was decreased around 16 percent the increase was highest in Manipur (164%) followed by Mizoram (159%), Meghalaya (56%), Assam (36%) [Table-6].

Table-3 *State-wise Production and requirement of Pulses*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	7.1	9.05	27.46479	25.23265	-64.1338
Assam (31169272)	65.7	82.4	25.41857	568.84	-85.5144
Manipur (2721756)	3.1	24.20	680.6452	49.67	-51.2784
Meghalaya (2964007)	3.5	4.2	20	54.09	-92.2352
Mizoram (1091014)	3.9	4.32	10.76923	19.91	-78.3024
Nagaland (1980602)	29.7	36.46	22.76094	36.15	0.86
Sikkim (607688)	5.6	8.75	56.25	11.09031	-21.1023
Tripura (3671032)	5.5	7.06	28.36364	66.99633	-89.4621
NE Region (45587982)	124.1	176.44	42.17566	831.9807	-78.7928

Table-4 *State-wise Production and requirement of oilseed Crops*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	28	29.25	4.464286	50.4653	-42.0394
Assam (31169272)	156	152.20	-2.4359	1137.678	-86.6219
Manipur (2721756)	2	26.69	2569	99.344	-73.1338
Meghalaya (2964007)	6	6.955	15.91667	108.1863	-93.5713
Mizoram (1091014)	5	3.16	-36.8	39.822	-92.0647
Nagaland (1980602)	53	67.53	27.41509	72.29	-6.58
Sikkim (607688)	7	7.91	13	22.18061	-64.3382
Tripura (3671032)	4	3.21	-19.75	133.9927	-97.6043
NE Region (45587982)	259	296.905	14.63514	1663.961	-82.1567

Table-5 *State-wise Production and requirement of Fruits*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	124.9	297.32	138.0464	65.55	353.5774
Assam (31169272)	1335.1	1774.3	32.89641	3397.451	-47.7756
Manipur (2721756)	134	341.91	155.1567	296.6714	15.24872
Meghalaya (2964007)	186.9	294.81	57.73676	323.0768	-8.74925
Mizoram (1091014)	63.4	185.49	192.571	118.9205	55.97815
Nagaland (1980602)	302	209.54	-30.6159	57.83	262.3379
Sikkim (607688)	12	20.08	67.33333	26.61	-24.5396
Tripura (3671032)	500	643.94	28.788	160.79	300.4851
NE Region (45587982)	2658.3	3767.39	41.72178	1331.169	183.0137

Table-6 *State wise Production and requirement of Vegetables*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	83.9	70.87	-15.5304	150.7046	-52.9742
Assam (31169272)	2935.2	4010	36.61761	3397.451	18.02
Manipur (2721756)	66.1	174.3	163.6914	296.6714	-41.2481
Meghalaya (2964007)	265.9	415.8	56.37458	323.0768	28.70005
Mizoram (1091014)	44.1	114.4	159.4104	118.9205	-3.80128
Nagaland (1980602)	286	330.4	15.52448	215.89	53.0409
Sikkim (607688)	60	75.20	25.33333	66.23799	13.53002
Tripura (3671032)	353.2	422.54	19.63194	400.1425	5.597381
NE Region (45587982)	4094.4	5613.51	37.10214	4969.09	12.96

Source: Indian Horticulture Database and State govt.

It was found that the total fish requirement in NE region was 592.64 thousand tonnes and total production was 302.99 thousand tonnes in 2011 so this region was deficient about 49 percent in fish production. The all the states of NE region have considerable increase in fish production and the increase was highest in Arunachal Pradesh 538 percent followed by Sikkim 100 percent, Tripura 67 percent, Mizoram 55 percent, Nagaland 26 percent and Manipur 25 percent [Table-7]. The total milk requirement in north east region was 3327.92 thousand tonnes for its population 45.5 million during 2011. The NE region was deficient around 61 percent in milk production while state level except Mizoram all the states have increased in milk production and it was highest in Tripura 18 percent followed by Nagaland 16 percent and Assam 13 percent. In supply demand analysis except Sikkim (where milk production was surplus around 4 percent) all states lagging behind in milk production and make this region around 61 percent deficient [Table-8].

Table-7 *State-wise Fish Production and requirement in NER*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	2.6	16.6	538.4615	17.973943	-7.64408
Assam (31169272)	161.45	199.41	23.51192	405.200536	-50.7873
Manipur (2721756)	16.45	20.5	24.62006	35.382828	-42.0623
Meghalaya (2964007)	4.97	5.5	10.66398	38.532091	-85.7262
Mizoram (1091014)	3.15	4.89	55.2381	14.183182	-65.5225
Nagaland (1980602)	5.2	6.58	26.53846	25.747826	-74.4444
Sikkim (607688)	0.14	0.28	100	7.899944	-96.4557
Tripura (3671032)	29.45	49.23	67.16469	47.723416	3.156907
NE Region (45587982)	223.41	302.99	35.62061	592.643766	-48.8749

Source: Ministry of Agriculture, Govt. of India

Table-8 *State-wise Production and requirement of Milk in NER*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	49	50.50	3.061224	100.9306	-49.9656
Assam (31169272)	751	850	13.18242	2275.357	-62.6432
Manipur (2721756)	77	78	1.298701	198.6882	-60.7425
Meghalaya (2964007)	75	79	5.333333	216.3725	-63.4889
Mizoram (1091014)	16	15	-6.25	79.64402	-81.1662
Nagaland (1980602)	67	77.84	16.1791	144.5839	-46.1627
Sikkim (607688)	49	46	-6.12245	44.36122	3.694173
Tripura (3671032)	89	105.23	18.23596	267.9853	-60.7329
NE Region (45587982)	1173	1301.57	10.96078	3327.923	-60.8894

Source: Ministry of Agriculture, Govt. of India

[Table-9] reveals that between 2001 and 2011 the total production of eggs has increased by 24 percent (from 8305 thousand tons to 10294 thousand tons). The total eggs requirements of this region was 68381.97 thousand tons for its population 45.5 million in 2011. The all the state of northeast region have considerable increased in eggs production except Arunachal Pradesh and Assam where eggs production were decreased around 52 percent and 4 percent

respectively. The increased was highest in case of Sikkim 195 percent followed by Tripura 158 percent, Manipur 75 percent, Mizoram 69 percent and Nagaland 48 percent during the last 10 years from 2001 to 2011. In the case of supply demand all the state of this region has deficient in eggs production. The deficiency percentage range was 68 percent in Manipur to 98 percent in Arunachal Pradesh [Table-9]. It was observed that the total meat production has increased by 97 percent (from 118.98 thousand tons to 235.3 thousand tons) in the northeast region during 2001 to 2011. The total meat requirement of this region was 15.208 thousand tons and total production was 97.76 thousand tonnes. At the state level all the state of this region have considerable increased in meat production. The meat production was increased highest in Tripura 1071 percent followed by Nagaland 237 percent, Mizoram 120 percent and Assam 116 percent. Meghalaya 33 percent, Arunachal Pradesh 19 percent [Table-10].

Table-9 *State-wise Production and requirement of Eggs*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	86	40.50	-52.907	2073.9165	-98.0472
Assam (31169272)	5067	4854	-4.20367	46753.908	-89.618
Manipur (2721756)	717	1253	74.75593	4082.634	-69.309
Meghalaya (2964007)	902	1045	15.85366	4446.0105	-76.4958
Mizoram (1091014)	289	487	68.51211	1636.521	-70.2418
Nagaland (1980602)	540	800	48.14815	2970.903	-73.0722
Sikkim (607688)	97	286	194.8454	911.532	-68.6243
Tripura (3671032)	607	1569	158.4843	5506.548	-71.5066
NE Region (45587982)	8305	10294	23.94943	68381.973	-84.9463

Table-10 *State-wise Production and requirement of meats in NER*

State with human Population in 2011	Production		Increase 2001 to 2011 (%)	Requirement as per 2011 population ('000 tonnes)	Deficit/ Surplus (%)
	2001 ('000 tonnes)	2011 ('000 tonnes)			
Arunachal Pradesh (1382611)	18.6	22.20	19.35484	15.20872	45.96889
Assam (31169272)	18.9	41	116.9312	342.862	-88.0418
Manipur (2721756)	21.5	25	16.27907	29.93932	-16.4978
Meghalaya (2964007)	30.79	41	33.16012	32.60408	25.75113
Mizoram (1091014)	7.71	17	120.4929	12.00115	41.65309
Nagaland (1980602)	19.48	65.67	237.115	21.78662	201.4235
Sikkim (607688)	-	-	#VALUE!	40.38135	-41.9782
Tripura (3671032)	2	23.43	1071.5	501.4678	-53.0777
NE Region (45587982)	118.98	235.3	97.76433	15.20872	45.96889

Policy Implications

The study has suggested that the pulse production can be increased horizontally by utilizing a part of 1.67 Million ha area under Jhum cultivation and mixed cropping with other crops area and production of pulses could be increased vertically. As the soil of this region is acidic in nature, integrated nutrient management (INM) is necessary for increasing production of crops in this region and there is need for increasing the cropping intensity through diversification of crops. There is need for action oriented mega national programme for the rain fed and hilly eco-systems of the regions with concerted efforts from all line departments.

Conclusions

The study was found that NE region was deficient in production of food grain, oilseeds, milk, fish and egg but this region was surplus in case of fruits, vegetables and meat production. In NE region food grain production has increased by 28 percent and it was highest in case of Nagaland 60 percent followed by Arunachal Pradesh, Manipur and Assam while Arunachal Pradesh, Manipur and Nagaland found surplus in food grain production. While in rice production the increased was highest in case of Nagaland followed by Manipur, Tripura and Arunachal Pradesh but Arunachal Pradesh and Nagaland having surplus in rice production. All the states of NER were found deficient in pulse production and deficiency ranged from 21 to 92 percent in Sikkim and Meghalaya. The oil seed production in NER was increased by 15 percent during 2001 to 2011, where Manipur 26 percent was next to Nagaland 27 percent. Except Nagaland the highest increase of fruits production was documented in order in Mizoram, Manipur and Arunachal Pradesh. The vegetable production in NER was increased by 37 percent during 2001 to 2011, recorded highest in Manipur 164 percent followed by Mizoram 159 percent. In terms of total fish production this region was around 302.99 thousand tonnes which was less than total fish requirement for this region. The milk and eggs production was also deficient in this region which were around 61 percent and 85 percent respectively, whereas this region having surplus in meat production around 46 percent during 2001 to 2011 and at state level highest growth was in Tripura 1071 percent followed by Nagaland 237 percent.

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Authors contributions

Narendr Kumar Meena is the main author for this research paper. Dr. Ram singh is my major guide, Dr. N. U. Singh is my co-guide, Rajesh Kumar and G.N. Gurjar are my coauthor.

Abbreviations

%	= Percent
ha	= Hectare
INM	= integrated nutrient Management
kg/ha	= Kilogram per hectare
MT	= Million tone
qtl	= Quintal
qty	= Quantity
UK	= United Kingdom
USA	= United States of America

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participants or animals performed by any of the authors.

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