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## Is Growth in Agriculture Propelled by its Allied Sectors in North-East India?

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### Abstract

Activities like livestock farming, fisheries, forestry and sericulture of sectors allied to agriculture have traditionally been integral part of culture, habit and livelihood of the people in the North-East Region (NER) of India. This paper has examined whether growth in agriculture is propelled by the growth of its allied sectors by collecting state-wise data for the period 2004-05 to 2010-11 on the value of output, livestock and landholdings from published sources. The study has found that activities of allied sector have been an important part of the predominantly agrarian economy of NER. While facilities to introduce genetic improvement and its wide spread adoption have been found crucial for livestock and poultry development, the fresh water prawn, either as monoculture or polyculture, with compatible species of carp, could transform the inland fishery scenario in the states of Assam and Tripura. The forest resources have been found to offer livelihood by way of firewood, raw materials like bamboo and cane for self-employment and minor forest produce like honey for cash income for a large section of forest-dependent population. The sericulture practised by the indigenous population, can be transformed into a major sector for investment, employment and income generation in the region. The study has concluded that the development of the allied sectors that conform to the local preference and habits in the NER, would serve as prelude to investments in the settled agriculture.

**Key words:** Livestock, fisheries, forestry, sericulture, growth in agriculture, North-East India

**JEL Classification:** Q13, Q22, Q23

### Introduction

The growth of allied sectors of agriculture occurs with shift in demand for food products from basic cereals to high-value food products like milk, egg, fish, meat, meat products, processed food, etc. due to rise in income, population and urbanization. While this transformation of agriculture is viewed and advocated as the growth strategy of diversification and commercialization of agriculture in usual parlance, the activities of its allied sectors, viz. livestock, fisheries, forestry and sericulture had traditionally been an

integral part of the predominantly agrarian economy of North-East Region (NER)<sup>1</sup> of India. Almost 90 per cent of the rural households in NER keep livestock of one species or other as ethnic habit associated with food preference and livelihood security. Due to mountainous terrain and large forest cover, only little land is available for settled agriculture in the region and certain indigenous inhabitants practice jhum cultivation. The share of allied sectors in the value of output from agricultural sector in the region was 34.2 per cent in 2010-11, around half of it arising from the livestock sector. Livestock farming is more prevalent

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The views expressed in the paper are of the author and may not be of the organisation he belongs to.

<sup>1</sup> The NER includes eight states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. It constitutes 7.9 per cent of India's geographical area and 3.8 per cent of population.

among small and marginal farmers and agricultural labourers as it can be practised irrespective of the size of landholding and is necessary also for sustainable agriculture in a scenario of declining sizes of landholdings. These activities supplement income of the farmers and also provide employment, draught power, fuel and manure to them.

The NER is the natural abode of diverse silkworms due to its environment which is friendly to the growth of silkworms. Four varieties of silk, viz. mulberry, eri, muga and oak tasar are produced in the NER of which eri, muga and oak tasar belong to the 'vanya silk' category due to their non-domesticated rearing. The NER contributes 19.3 per cent to the total production of raw silk in India and in this the contribution of Assam alone is 11.6 per cent. The region has enormous potential for fisheries in terms of rivers and canals, reservoirs, floodplains, lakes, ponds and large areas under the rice fish culture system. The NER is considered as one of the hot spots of freshwater fish diversity in the world. This region is ideal for inland and freshwater pisciculture also. The total freshwater resources of the region are estimated at 20,875 km of rivers and canals, 33,000 ha of reservoirs, 3,71,000 ha of tanks and ponds and 1,59,000 ha of floodplains and lakes. The region is also characterized by rich and abundant natural resources like thick and bio-diverse forests. The poor households in the region depend on the collection of forest produce for their livelihood.

Under the above scenario, this paper has attempted to find whether activities of various sub-sectors associated with agriculture contribute to agricultural development in this region.

## Data and Methodology

The data for the study were collected from the state-wise estimates of value of output from agriculture and allied activities for the period 2004-05 to 2010-11 (with new 2004-05 base) published by the Central Statistical Organisation, Ministry of Statistics and Programme Implementation (MoSPI), Government of India, New Delhi, in 2013 and the key indicators of land and livestock holdings in India, NSS 70<sup>th</sup> Round (January-December 2013) published by MoSPI, GoI, in December 2014. The state-wise data on livestock population, production, etc. were collected from the Basic Animal Husbandry and Fisheries Statistics 2014

published by the Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, New Delhi. Data on raw silk production in NER states were collected from the *Annual Report, 2013-14* of the Central Silk Board, Ministry of Textiles, Government of India, Bangalore. Statistical tools like percentage shares, compound annual growth rates, etc. have been used for analysis.

## Sub-sectoral Shares and Growth

The share of crop sector in the value of output from agriculture and allied activities was 65.8 per cent in the NER and 63.4 per cent at all-India level in 2010-11. In NER, the share of crop sector ranged from a low of 32.9 per cent in Arunachal Pradesh to a high of 78.7 per cent in Sikkim. The share of crop sector had increased substantially in Meghalaya, Mizoram and Nagaland, which had a relatively high share of livestock in 2004-05, though the share of livestock had reduced marginally in Meghalaya and Nagaland. These states also had very high shares of forestry in the value of output in 2004-05 which declined in 2010-11. It could be a pointer that allied sector activities constituted the 'core sector' for the states in NER in the early phase of agricultural development. The state-wise shares of sub-sectors in the value of output from agriculture and allied activities in the North-East India as also at all-India level are presented in Table 1.

The share of livestock sector ranged from 12.1 per cent in Assam to 23.3 per cent in Nagaland with NER average of 14.8 per cent as against 24.2 per cent at all-India level. The share of forestry was 12.7 per cent for NER compared 8.4 per cent at the country level. It has been found that 5 states out of 8 in the NER had very high shares of forestry in the value of output from agriculture and allied activities, ranging from 15.7 per cent in Tripura to 46.0 per cent in Arunachal Pradesh. The fishery sector had also depicted a higher contribution in the NER at 6.7 per cent as against 4.1 per cent at all-India level, with lead states being Tripura (10.1%) and Assam (8.2%).

To assess inter-sectoral performance, the growth of value of output from different sub-sectors was analyzed and the results are presented in Table 2. The value of output from agriculture and allied activities grew at a compound annual growth rate of 4.6 per cent for the NER as compared to 3.6 per cent for all-India

**Table 1. State-wise shares in value of output from agriculture and allied sectors in North-East India, 2010-11**

State	Shares of sub-sectors (%)			
	Crops	Livestock	Forestry	Fishery
Arunachal Pradesh	32.9 (34.9)	19.7 (13.6)	46.0 (50.4)	1.5 (1.5)
Assam	73.4 (74.5)	12.1 (10.8)	6.3 (9.3)	8.2 (5.4)
Manipur	54.6 (54.7)	17.4 (22.1)	23.3 (14.7)	4.7 (8.5)
Meghalaya	55.2 (47.4)	22.5 (24.0)	20.9 (26.5)	1.5 (2.2)
Mizoram	66.3 (37.7)	22.1 (21.0)	7.3 (37)	4.2 (4.3)
Nagaland	51.3 (39.9)	23.3 (29.3)	23.5 (29.2)	2.0 (1.6)
Sikkim	78.7 (71.2)	14.2 (17.3)	6.9 (11.2)	0.3 (0.2)
Tripura	58.3 (68.6)	15.9 (12.8)	15.7 (12.6)	10.1 (6.0)
North-East Region	65.8 (65.4)	14.8 (14.2)	12.7 (15.5)	6.7 (4.8)
All India	63.4 (61.7)	24.2 (24.2)	8.4 (9.8)	4.1 (4.3)

*Note:* Figures within the brackets are shares of sub-sectors in 2004-05

*Source:* Calculations based on data from GoI (2013)

between 2004-05 and 2010-11. All the NER states, except Arunachal Pradesh, had higher growth rates than all-India average ranging from 3.7 per cent in Tripura and Assam to 7.8 per cent in Manipur. The sub-sectoral growth rates for crop, forestry and fisheries have been found higher for the NER than for all-India. The growth in value of output from livestock was 4 per cent per annum for the NER as against 4.9 per cent at all-India level. The livestock population in the region is large, but most of it belong to the indigenous non-descript breeds with low productivity and this could be the reason for a lower growth. Moreover, the proportion of crossbred cattle, productivity of livestock and output from livestock sector have increased in several other states of the country over time which has resulted in a higher growth rate at all-India level, whereas the infrastructure for the growth of livestock sector in the NER was inadequate.

### Livestock Sub-sector

The survey of agricultural households by NSSO<sup>2</sup> provides the number of households in possession of various livestock species (GoI, 2014a). In 2012-13, the number of households owning cattle in four NER states was way above the national average. While 433 per 1000 households reported owning cattle at the national level, the number was 756 in Sikkim, 665 in Assam, 563 in Arunachal Pradesh and 529 in Tripura. The average number of households owning cattle for NER

**Table 2. Growth rate of sub-sectors of agriculture in North-East Region and India during 2004-05 to 2010-2011**

State	Compound annual growth rate (%)				
	Crops	Livestock	Forestry	Fishery	Total
Arunachal Pradesh	1.1	9.8	0.4	0.5	2.1
Assam	3.3	4.7	4.7	5.4	3.7
Manipur	8.6	3.6	6.7	2.2	7.8
Meghalaya	0.4	1.4	10.9	-4.8	5.9
Mizoram	16.2	2.3	-0.3	-0.4	7.6
Nagaland	9.7	1.3	3.1	4.6	5.6
Sikkim	4.3	-0.2	8.3	3.5	6.5
Tripura	3.1	5.7	-0.6	12.5	3.7
North-East Region	3.9	4.0	6.1	5.6	4.6
All India	3.2	4.9	2.2	4.5	3.6

*Source:* Calculations based on data from GoI (2013)

<sup>2</sup>NSSO 70<sup>th</sup> round survey was conducted only in the rural areas.

**Table 3. Number of households reporting owning of livestock, 2012**

State	No. of livestock-owning households per 1000 households				
	Cattle	Goats	Pigs	Chicken	Ducks
Arunachal Pradesh	563	396	711	825	205
Assam	665	469	156	692	304
Manipur	131	63	249	647	267
Meghalaya	290	120	489	760	11
Mizoram	42	53	473	640	0
Nagaland	49	105	571	651	146
Sikkim	765	343	186	611	0
Tripura	529	309	291	667	225
North-East Region	379	232	391	687	145
All India	423	197	18	185	22

Source: GoI (2014a)

was 379 due to the preponderance of households owning pigs in other four states, viz. Manipur, Meghalaya, Mizoram and Nagaland.

The number of households owning goats was also very high in Assam (429), Arunachal Pradesh (396), Sikkim (343) and Tripura (309) compared to the national average of 197 households. The prevalence of pig-rearing in the NER households appears almost like a rule as in every 1000 households, 711 in Arunachal Pradesh, 571 in Nagaland, 489 in Meghalaya and 473 in Mizoram reported owning of pigs in 2012-13 making the NER average of 391 households against the national average of mere 18 households. The rearing of poultry birds say chicken and ducks, was also widely

practised by the NER households. While the number of households rearing chicken was uniformly high in all the NER states, ranging from 611 in Sikkim to 825 in Arunachal Pradesh, the rearing of ducks was more prevalent in Assam, Manipur, Tripura and Arunachal Pradesh. The details are presented in Table 3.

The concentration of livestock and poultry was also high in the NER states compared to the national average. The average number of livestock and poultry birds owned by households, given in Table 4, indicates that there were 1040 cattle, 804 goats, 1024 pigs, 8189 chicken and 815 ducks per 1000 households in the NER.

**Table 4. Average number of livestock owned per 1000 households, 2012**

State	Average number of livestock owned per 1000 households				
	Cattle	Goats	Pigs	Chicken	Ducks
Arunachal Pradesh	2519	1794	2507	11762	999
Assam	1828	1334	480	7224	1693
Manipur	321	231	980	7759	2102
Meghalaya	908	300	962	6753	26
Mizoram	167	206	787	9132	0
Nagaland	112	271	1673	10481	901
Sikkim	1416	1231	302	4530	0
Tripura	1053	1065	502	7868	801
NER Average	1040	804	1024	8189	815
All India	879	706	55	2302	102

Source: GoI (2014a)

**Table 5. Share of various product groups in value of output from livestock sector**

(in per cent)

State	Milk	Eggs	Silk & honey	Meat	Others*
Arunachal Pradesh	10.6	1.7	0.7	72.6	14.4
Assam	59.3	4.5	4.4	28.1	3.7
Manipur	33.3	12.4	3.8	54.6	-4.0
Meghalaya	23.1	3.4	3.1	58.5	12.0
Mizoram	12.8	5.4	1.8	66.9	13.1
Nagaland	17.9	2.3	2.5	72.9	4.4
Sikkim	67.7	5.5	2.8	26.0	-2.1
Tripura	41.0	8.0	0.5	37.8	12.7
North-East Region	42.6	4.9	3.3	43.4	5.8
All India	65.8	3.8	1.0	19.4	10.0

\*Note: Others include the value of output from wool, hair, dung and annual net increase in the livestock population

Source: Calculations based on data from GoI (2013)

**Table 6. A comparison of growth rates of product groups in livestock sub-sector between North-East Region and all-India, 2004-05 to 2010-11**

State	Compound annual growth rate (%)				
	Milk	Eggs	Silk & honey	Meat	Total
Arunachal Pradesh	-12.3	34.5	16.3	23.4	9.8
Assam	0.8	-3.4	11.7	3.3	4.7
Manipur	0.6	6.8	6.4	2.7	3.6
Meghalaya	1.5	0.9	9.7	0.3	1.4
Mizoram	-5.5	4.2	19.9	3.2	2.3
Nagaland	1.0	0.2	15.3	0.7	1.3
Sikkim	-1.6	-1.5	26.6	-0.7	-0.2
Tripura	3.7	6.8	-5.6	8.0	5.7
North-East Region	0.5	1.2	11.4	3.8	4.0
All India	4.4	5.6	3.5	5.6	4.9

Source: Calculations based on data from GoI (2013)

### Product Groups in Livestock Sub-sector

The share of various product groups within the livestock sub-sector is presented in Table 5. Contrary to the all-India scenario of milk group leading the product group share, it was the meat group that had a higher share in the value of output from livestock sector in the NER. The share of meat group was particularly high in the states of Nagaland (72.9%), Arunachal Pradesh (72.6%), Mizoram (66.9%), Meghalaya (58.5%) and Manipur (54.6%). The milk group had a higher share in Sikkim (67.7%) and Assam (59.3%) than the NER average of 42.6 per cent. The product

groups like eggs, silk and honey also had a higher share in the NER compared to the national average. The product group ‘others’, which include the value of output from wool, hair, dung and annual net increase in the livestock population, had a lower share in the NER.

A comparison of the growth of value of output from various product groups within the livestock sub-sector in the NER states and all-India for the past five years, presented in Table 6, has revealed that all product groups, except silk and honey group, had a lower growth in the NER in spite of the higher density of livestock and poultry birds within the region.

### Livestock Population

Livestock population had increased in the NER between Livestock Censuses 2007 and 2012, whereas it had declined at all-India level (Table 7).

**Table 7. Livestock population in North-East Region**

State	Livestock population (in lakhs)		Percentage change 2007-2012
	2007	2012	
Arunachal Pradesh	14.1	14.1	0.0
Assam	172.3	190.8	10.8
Manipur	7.9	7.0	-11.8
Meghalaya	18.2	19.6	7.4
Mizoram	3.3	3.1	-4.9
Nagaland	14.2	9.1	-35.8
Sikkim	2.7	8.0	196.9
Tripura	18.7	19.4	3.6
North-East Region	251.4	271.1	7.9
All India	5297.0	5120.6	-3.3

Source: GoI (2014b)

The region has a high density of local non-descript variety of cattle which are very low in milk production. The proportion of cross-bred cattle (jersey × local) is very low in the NER (6.8%) as compared to all-India level (20.8%). This proportion was extremely low in Assam, the state which houses 78 per cent of the cattle in the NER (Table 8). Added to this, the buffaloes in

**Table 8. Cross-bred cattle population in North-East Region, 2012**

State	Total cattle (lakhs)	Crossbred cattle (lakhs)	Percentage of crossbred cattle
Arunachal Pradesh	4.6	0.2	5.0
Assam	103.1	4.0	3.8
Manipur	2.6	0.4	16.8
Meghalaya	9.0	0.4	3.9
Mizoram	0.3	0.1	32.7
Nagaland	2.3	1.3	54.9
Sikkim	1.4	1.3	90.1
Tripura	9.5	1.3	14.0
North-East Region	132.9	9.0	6.8
All India	1909.0	397.3	20.8

Source: GoI (2014b)

the region are mostly swamp type which is poor in milk production. Among goats, Assam Hill goats and black/white Bengal goats are the common breeds which are popular due to their adaptability to harsh environment, high reproductive efficiency and good meat quality.

### Meat Production

The state-wise meat production in NER during 2008-09 to 2012-13, reported in Table 9, reveals that in 2012-13, the meat production in NER was 2.35 lakh tonnes which was 4 per cent of national production. Nagaland was the leading state in NER in meat production with a share of 30 per cent. The annual

**Table 9. State-wise meat production in North-East Region**

State	2008-09	2009-10	2010-11	2011-12	2012-13	(lakh tonnes) CAGR (%)
Arunachal Pradesh	0.20	0.21	0.21	0.19	0.18	-3.6
Assam	0.31	0.32	0.34	0.34	0.37	4.4
Manipur	0.23	0.24	0.24	0.24	0.25	1.6
Meghalaya	0.37	0.37	0.38	0.38	0.39	1.0
Mizoram	0.13	0.10	0.09	0.13	0.12	1.7
Nagaland	0.63	0.66	0.65	0.78	0.71	4.0
Sikkim	0.01	0.03	0.03	0.03	0.03	27.4
Tripura	0.19	0.21	0.23	0.25	0.32	12.5
North-East Region	2.07	2.14	2.18	2.35	2.35	3.5
All India	42.80	45.66	48.69	55.14	59.48	8.8

Source: GoI (2014b)

**Table 10. State-wise egg production in North-East Region, 2008-09 to 2013-13**

State	2008-09	2009-10	2010-11	2011-12	2012-13	(million No.)
						CAGR (%)
Arunachal Pradesh	36.1	38.0	40.7	41.9	43.9	5.0
Assam	465.9	467.1	470.7	470.5	471.0	0.3
Manipur	110.5	111.9	113.7	114.9	116.2	1.3
Meghalaya	99.5	99.9	101.1	102.1	102.8	0.9
Mizoram	41.1	37.1	38.7	34.9	35.2	-3.6
Nagaland	83.2	83.4	80.2	70.4	61.8	-7.4
Sikkim	13.7	13.6	14.0	14.6	14.6	2.1
Tripura	138.8	144.2	157.0	165.0	156.5	3.8
North-East Region	988.7	995.3	1016.1	1014.3	1002.0	0.5
All India	55562.4	60267.0	63024.4	66449.9	69730.7	5.7

Source: GoI (2014b)

growth in meat production has been found low (3.5%) in NER compared all-India (8.8%).

Pigs are reared for meat (pork) predominantly by the tribals in this region. The state of Assam produces the highest quantity of pork in the country, but still the production is not sufficient to meet the demand. The pigs commonly reared in the region are indigenous local breeds which are small in size and do not attain much body weight. There is a significant potential for upgrading these breeds to attain better growth and body weight.

### Egg Production

The state-wise egg production in the NER for the period 2008-09 to 2012-13 is presented in Table 10. In 2012-13, the egg production in the NER was 1002 million which was 14.4 per cent of national production and was high compared to the share of poultry birds (6%) in the region. In egg production, Assam was the leading state (47%), followed by Tripura (15.6%), Manipur (11.6%) and Meghalaya (10.2%). However, the growth in egg production between 2008-09 to 2012-13 was meagre for NER, 0.5 per cent per annum as compared to 5.7 per cent per annum at country level.

Commercialization of poultry is still at the nascent stage in the NER. The demand for poultry feed and day-old chicks is met from the neighbouring states of West Bengal and Bihar. It is estimated that there is an inflow of 80 lakh eggs per week to the state of Assam alone from Andhra Pradesh. Efforts are being made to

promote backyard poultry farming and broiler production in the region.

The poultry production in the region is also affected by the high cost of poultry feed. Since the region is deficient in oilseeds production, oilcakes are transported from other states which increase the cost of feed. A major constraint in the development of poultry in the NER is the reduction in the number of poultry birds in the region (Table 11).

**Table 11. Number of poultry birds in North-East Region, 2007-2012**

State	Number of poultry birds		Percentage change (2007-2012)	(lakhs)
	2007	2012		
Arunachal Pradesh	13.5	22.4	66.43	
Assam	290.6	272.2	-6.35	
Manipur	24.0	25.0	4	
Meghalaya	30.9	34.0	9.93	
Mizoram	12.4	12.7	2.6	
Nagaland	31.6	21.8	-30.97	
Sikkim	1.6	4.5	187.06	
Tripura	37.0	42.7	15.45	
North-East Region	441.6	435.3	-1.41	
All India	6488.3	7292.1	12.39	

Source: GoI (2014b)

**Table 12. State-wise milk production in North-East Region, 2008-09 to 2013-13**

State	2008-09	2009-10	2010-11	2011-12	2012-13	(000 tonnes)
						CAGR (%)
Arunachal Pradesh	24.4	26.3	28.4	21.9	22.7	-3.2
Assam	753.2	756.4	790.4	796.0	799.7	1.7
Manipur	78.5	77.6	78.0	78.6	80.0	0.5
Meghalaya	77.5	78.1	79.1	79.7	80.5	1.0
Mizoram	16.9	10.6	11.4	13.9	13.6	-1.6
Nagaland	53.4	77.7	76.0	78.0	78.7	8.1
Sikkim	42.0	44.0	43.2	45.0	42.2	0.3
Tripura	95.6	100.1	104.5	111.0	118.0	5.4
North-East Region	1141.4	1170.8	1211.1	1224.1	1235.5	2.1
All India	112183.4	116425.3	121847.7	127904.0	132430.6	4.4

Source: GoI (2014b)

### Milk Production

The milk production in NER for the period 2008-09 to 2012-13 is depicted in Table 12. In 2012-13, the milk production was 12.35 lakh tonnes which was only 1 per cent of the national production and depicted a very low share compared to the share of cattle population in the region (5.3%). The growth in milk production between 2008-09 to 2012-13 was also low at 2.1 per cent per annum compared to 4.4 per cent at all-India level.

The low growth of milk production in the NER was due to the low productivity of animals in this region. The low milk productivity of cattle has to be understood in the context of genetic profile. One of the pre-requisites for increasing milk production in the region is breed improvement through wide scale adoption of artificial insemination, the facilities for which are extremely poor in the region. There is acute shortage of green fodder also in the region, though efforts to expand fodder cultivation and popularize stall feeding have been reported in Meghalaya. The shortage of animal feed is to be addressed by encouraging establishment of feed mills in the private sector.

### Silk Production

Sericulture is practised in 81 out of 84 districts of 8 states in the NER (3 districts where sericulture is not practised are in Arunachal Pradesh). Four varieties of silk, viz. mulberry, eri, muga and oak tasar are produced in the region, which contribute 19.3 per cent to the

total production of raw silk in India. Assam is the third largest state in raw silk production after Karnataka and Andhra Pradesh due to its strength in eri silk production. To boost Muga Industry in Assam, the State Sericulture Department is developing Batakuchi of Kamrup district as a model Muga village. The raw silk in production in NER states and the country is presented in Table 13.

Low investment, labour-intensive nature, especially for women, silkworm-friendly environment and high returns make silkworm rearing an attractive venture to the rural masses. Sualkuchi block of Kamrup district, known as "Manchester of Assam" with 25,000 handlooms, provides gainful employment to more than 12,000 weavers and indirect employment to another 10,000 people. It is reported that traders bring yarn, both domestic and imported, to use the expertise of traditional weavers. Thus, the sector has huge potential for growth and offers scope for productive investments.

### Fishery Sub-sector

The estimates of fish production in the NER are given state-wise for the period 2008-09 to 2012-13 in Table 14. In 2012-13, the fish production in the NER was 3.6 lakh tonnes forming 6.3 per cent of the inland fish production in the country (57.2 lakh tonnes). The share of inland fish production in the region was more or less commensurate with their shares in the total water bodies at 7.65 per cent. The share of inland fish production in NER was highest from Assam (71%),

**Table 13. Raw silk production in North-East Region states, 2013-14**

State	Mulberry	Muga	Eri	Oak Tasar	Total	(tonnes)
Arunachal Pradesh	1.9	1.4	11.3	-	14.6	
Assam	27.0	126.0	2612.7	-	2765.7	
Manipur	128.9	0.8	352.8	4.0	486.5	
Meghalaya	14.0	16.0	613.8	-	643.8	
Mizoram	34.0	1.0	8.0	0.7	43.7	
Nagaland	6.6	1.9	597.4	-	605.9	
Sikkim*	2.0	-	1.5	-	3.5	
Tripura	40.0	-	-	-	40.0	
North-East Region	254.4 (1.3)	147.1 (99.4)	4197.5 (99.1)	4.7 (94.0)	4603.7 (19.3)	
All India	19476.0	148.0	4236.0	5.0**	23865.0	

Source: GoI (2014c)

Notes: \*Data pertains to 2012-13

\*\* 2619 tonnes including Tropical Tasar.

Figures within the brackets are percentages to all-India production

**Table 14. Estimates of fish production during 2008-09 to 2012-13**

State	2008-09	2009-10	2010-11	2011-12	2012-13	(`000 tonnes) CAGR (%)
Arunachal Pradesh	2.9	2.7	3.2	3.3	3.7	7.5
Assam	206.2	218.8	227.2	228.6	254.3	4.7
Manipur	18.8	19.2	20.2	22.2	24.5	7.0
Meghalaya	4.0	4.3	4.6	4.8	5.4	7.5
Mizoram	2.9	3.3	2.9	2.9	5.4	12.3
Nagaland	6.2	6.4	6.6	6.8	7.1	3.7
Sikkim	0.2	0.2	0.2	0.3	0.5	29.9
Tripura	36.0	42.3	49.2	53.3	57.5	12.4
North-East Region	277.0	297.1	314.1	322.3	358.4	6.1
All India - Marine	2978.2	3103.8	3249.5	3371.8	3320.8	3.1
All India - Inland	4637.9	4894.1	4981.3	5294.7	5719.6	5.1
All India - Total	7616.1	7997.9	8230.7	8666.5	9040.4	4.3

Source: GoI (2014b)

followed by Tripura (16%) and Manipur (7%). The growth in fish production has been found high in the NER at 6.1 per cent per annum, compared to 5.1 per cent at all-India level.

Scientific fish farming is carried out in only 5 per cent area of the water resources available in the region. Establishment of eco-hatcheries in potential areas for fish seed production and popularising seed rearing

farms are required to ensure supply of good quality improved fingerlings. Reclamation of derelict water bodies and development of beels (a type of lake) for scientific fish culture would offer additional water surface area for inland fish culture. The region has potential for replacing the bottom dweller fish species with fresh water prawn, breeding and rearing of endangered ornamental fish species like Chana barca, fresh water pearl culture, etc.

**Table 15. Inland fishery resources in North-East Region and India**

State	Rivers and canals (km)	Reservoirs (lakh ha)	Tanks & ponds (lakh ha)	Floodplains, lakes and derelict water bodies (lakh ha)	Brackish water (lakh ha)	Total water bodies (lakh ha)	Water bodies (%)
Arunachal Pradesh	2000	-	2.76	0.42	-	3.18	4.32
Assam	4820	0.02	0.23	1.1	-	1.35	1.83
Manipur	3360	0.01	0.05	0.04	-	0.1	0.14
Meghalaya	5600	0.08	0.02	Neg	-	0.1	0.14
Mizoram	1395	-	0.02	-	-	0.02	0.03
Nagaland	1600	0.17	0.5	Neg	-	0.67	0.91
Sikkim	900	-	-	0.03	-	0.03	0.04
Tripura	1200	0.05	0.13	-	-	0.18	0.24
North-East Region	20875	0.33	3.71	1.59	0	5.63	7.65
All India	195210	29.07	24.14	7.98	12.4	73.59	100.00

Source: GoI (2014b)

The river system and other water bodies in the region are critically short of stocking of fish. Much has to be done to make the region self-sufficient in this sector as there is strong preference and huge demand for locally produced fish in the region. Initiatives for taking up fishery on commercial lines, appropriate policy intervention from respective state governments for proper management of water bodies and rivers, revamping of fishery extension services, organized marketing facilities, etc. are the need of the hour.

#### Forestry Sub-sector

Forests play a pivotal role in the socio-economic development of the NER. The forest resources in the region include industrial wood, fuel wood and non-timber forest produces (NTFP) like honey. The dependence of the poor especially tribals in the region is mainly on fuelwood, bamboo for weaving household articles, and minor forest forest produces like honey (Table 16).

**Table 16. Share of product groups in value of output of forestry in North-East Region, 2010-11**

State	Industrial wood	Fuelwood	Non-timber forest products (NTFP)
Arunachal Pradesh	86.6	10.6	2.8
Assam	16.9	69.7	13.4
Manipur	87.6	8.5	3.9
Meghalaya	73.8	15.5	10.7
Mizoram	54.3	33.0	12.7
Nagaland	44.5	46.9	8.6
Sikkim	60.0	25.4	14.6
Tripura	71.6	24.4	4.0
North-East Region	56.0	35.9	8.1
All India	44.0	43.0	13.0

Source: Calculations based on data from GoI (2013)

**Table 17. Growth of product groups in forestry, 2004-05 to 2010-11**

State	Compound annual growth rate (%)			
	Industrial wood	Fuelwood	NTFP	Total
Arunachal Pradesh	-0.3	6.1	-0.1	0.4
Assam	0.3	7.6	5.1	4.7
Manipur	-0.3	-0.7	0.3	6.7
Meghalaya	1.1	3.7	1.0	10.9
Mizoram	-0.3	-0.1	-8.7	-0.3
Nagaland	0.0	8.4	13.7	3.1
Sikkim	-0.3	-3.4	-10.1	8.3
Tripura	-0.2	2.3	-0.1	-0.6
North East Region	0.1	6.7	3.4	6.1
All India	-0.2	6.0	-0.4	2.2

Source: Calculations based on data from GoI (2013)

The livelihood support to a sizable tribal and other forest-dependent population is being managed through Joint Forest Management Committees (JFMC). The value of output from the forest produce like industrial wood and NTFP is on the decline at all-India level, but depicts growth in the NER, highlighting the importance of forests to livelihood of the region (Table 17).

### Conclusions and Policy Implications

The paper rests on the premise that allied sector activities like livestock farming, fishery, forestry and sericulture are the integral part of culture, habit and livelihood of the people in the NER and technological innovations in these areas are easy to integrate. The NER has tremendous potential for organized development of livestock, fishery, forestry and sericulture that touched the lives of almost entire rural population in the region. While facilities to introduce genetic improvement and its wide spread adoption are crucial for development of livestock and poultry, the fresh water prawn, either as monoculture or polyculture, with compatible species of carp, could transform the inland fishery scenario in the states of Assam and Tripura. The livestock and poultry sub-sectors in NER need intensive extension services, enhancement of productivity, better marketing arrangements and facilities for organic certification. The forest resources offer livelihood by way of firewood, raw materials like bamboo and cane for self-

employment and minor forest produce like honey for cash income for a large section of forest-dependent population. Sericulture being an important activity practised by the indigenous population, can be transformed into a major sector for investment, employment and income generation both in the farm and non-farm sectors. The development of allied sectors that conform to the local preference and habits in the NER would serve as prelude to investments in settled agriculture. The study has concluded that growth in agriculture is really being propelled by its allied sectors in the North-East region of India.

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