

Chapter 10

Agricultural Development, Growth and Poverty in India's Mountain Region

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10.1 Introduction

India can be classified into five primary or major natural regions on the basis of topographical factors. These are: i) the Himalayas and Associated Hills; ii) the Northern Plains; iii) the Peninsular Plateaus and Hills; iv) the East Coast Plains, and v) the West Coast Plains (Alagh 1990). Out of these five regions, the hill areas of the country constitute 21% of the total geographical area and 9% of the total population of the country. The hill areas offer a basic life support system and natural resources. Besides those living in this region, a large part of the population in the plains is dependent on hill resources, especially those of the Himalayan region, and on their management. Most of the perennial rivers of the country originate and have their watersheds in the Himalayas. These rivers are a lifeline of agriculture in the plains, and any adverse change in the Himalayan ecology directly affects flows in these rivers. For instance, deforestation in the Himalayas results in reduction in water discharge from the watersheds and increase in soil erosion, leading to siltation of rivers which raises river beds, causes frequent floods in the plains, and reduces the lifespans of multipurpose reservoirs. The indirect effects are innumerable.

The hill and mountainous areas of the Himalayan region are ecologically fragile and generally underdeveloped. Development of these regions cannot be ignored because underdevelopment and poverty are serious causes of ecological degradation in the hills. Furthermore, ecological problems experienced in the hills and mountains have

serious repercussions for large areas in the adjoining plains and for the global environment.

The salient distinguishing features of hill regions are: difficult terrain, sparse population, mostly inaccessible, far-flung small villages, tiny landholdings of stony soil or sloping fields, an agropastoral economy, emigration of able-bodied men, crop production as the prime responsibility of women, and scanty irrigation with little use of modern and improved inputs, keeping the productivity low. Consequently, the area is technologically backward and poor. The region generally lacks infrastructural facilities for irrigation, power, roads, and markets and not least an industrial climate and institutional finance systems (Swarup 1992).

As a result of increased recognition of the importance of the hill region and because of the specific circumstances of the hills, a separate chapter on Hill Area Development was included in India's 7th Five Year Plan with an emphasis on eco-restoration, eco-development, and eco-preservation. The Eighth Five Year Plan posited that the basic objective of the hill area development plan was socioeconomic development of the hills and the people living there in harmony with ecological development.

The present paper examines the growth experience of different hill states and regions of India and examines the extent of undernourishment and poverty. For most of the 11 hill states/regions the requisite information on economic growth and poverty is either not available or it is available but after a considerable time lag. In this paper we have furnished information on output, growth, and productivity of the agricultural sector and the total economy of all the hill states until the recent period. A special feature of the analysis in this paper is that it has prepared estimates of the undernourished population, which designate poverty, for each of the states, whereas, so far, the estimate pertaining to the state of Assam has been considered to hold true for the rest of the north-eastern states.

The paper is organised into the introduction and five other sections. The second section briefly describes the areas in the Indian Himalayan region, especially its Western and Eastern zones, in terms of agro-climatic characteristics and the significance of agriculture in the economies of various Himalayan States and areas. Section 3 analyses the progress and changes in the agricultural sector along with public investment in agriculture. Growth in the state economy and per capita income are examined in the fourth section. Section 5 discusses nutrition intake and poverty trends. Information and issues related to sustainable resource use are discussed in Section 6. The conclusions are drawn at the end of Section 6.

10.2 The Mountain Region of India and Its Socioeconomic Features

Geographical coverage

Most of the mountain area of India are located in 11 distinct states or regions comprising the states of Jammu and Kashmir, Himachal Pradesh, the hill region of

Uttar Pradesh known as Uttaranchal¹, and the north-eastern states of Sikkim, Assam, Arunachal Pradesh, Nagaland, Manipur, Meghalaya, Mizoram, and Tripura (for details on socioeconomic characteristics of different states/areas of the region, see an earlier paper in this volume by B.K. Joshi). Based on agro-climatic planning, accepted as the principal method of agricultural planning in the country by the Planning Commission and Government of India, the mountain region of India is divided into two distinct zones, namely, the Western Himalayan Region and Eastern Himalayan Region. Broad characteristics of the two regions are described in Table 10.1. Beside the factors listed in Table 10.1, one important difference between the two regions is that, in the Western Himalayan region, settled agriculture is practised, whereas in the Eastern Himalayan region about one-third of the area is under settled agriculture and two-thirds under shifting (jhum) cultivation (Shah 1992).

Table 10.1: Broad distinguishing features of the western and eastern Himalayan zones

Characteristics	Western Himalayas	Eastern Himalayas
Geog. area in '000 sq.km	245	274
Net sown area %	18.2	18.7
Forest %	45.3	42.8
Irrigated area %	23.0	16.73
Climate	Semi arid, humid, cold arid	Humid
Rainfall mm	165-2000	1840-3528
Fertiliser/ha	23.0	9.4
Soil type	Hill soil, mountain meadow, skeltal, Terai, brown hill	Brown hill, red sandy laterite, acidic, alluvial, red loamy, Terai soil
Major crops	Wheat, maize, rice, pulses	Rice, maize, jute, r/mustard
Population under poverty line %	20.4	30.1

Note : The information pertains to 1988.

Source: Basu and Guha 1996 and Algah1990

Importance of agriculture in the economies of the hill states/areas

Work participation rate computed as per cent of main plus marginal workers in the total population is highest in Mizoram where about half of the population is engaged in some work activity or other (Table 10.2). The lowest worker to population ratio is observed in Tripura where only 31% of the population is engaged in work/activity.

In order to see the changes in structure of the economy of different hill states, the share of the agricultural sector in total state domestic product at current prices was compared at two points of time taking triennium averages for the years 1980/81 to 1982/83 and 1994/95 to 1996/97. The results are presented in Table 10.2. In a

¹ The region has since the writing of this paper been separated from the state of Uttar Pradesh to make a new state, called Uttaranchal.

developing state, share of agriculture in the total NSDP is expected to decline over time. This phenomenon is observed in all the hill states except for Sikkim and Mizoram where the share of agriculture during the last 15 years showed an increase. The agricultural sector accounted for more than half of the state income of Sikkim. On the other hand, in Nagaland, the contribution of the agricultural sector to the state economy was below 20%.

Table 10.2: Structure of workforce and economy of India's hill states/regions

(per cent)

State/Region	Non-agri. Workers in Main Workers	Share of Agri. in NSDP	
		TE 19	TE 1997
Jammu & Kashmir	na	37.6	34.6
Himachal Pradesh	33.4	36.3	27.8
Uttar Pradesh Hills	70.0	57.2	55.0
Sikkim	34.1	52.6	54.5
Assam	37.0	41.3	35.8
Arunachal Pradesh	34.5	36.3	29.5
Meghalaya	32.3	37.0	22.9
Mizoram	35.2	20.8	30.1
Nagaland	25.8	25.8	18.0
Manipur	31.6	43.8	30.1
Tripura	38.4	44.9	26.2
India	35.2	36.8	26.6

Source: CSO 1984, 1998

NA = Not available

TE = Triennium

NSDP = Not Sate Domestic Product

10.3 Status and Growth of the Agricultural Sector

As discussed earlier, the agricultural sector provides employment to more than two-thirds of the workforce and it contributes a substantial share to the state income. Therefore, agricultural growth and diversification are vital for the employment and income of the people. Major determinants of the income of rural people are per capita agricultural land and land productivity. Per capita land availability in different hill regions varied between 800 square metres to 2,300 square metres (vide Table 10.3). Per capita land availability was below 1,000 square metres in Manipur, Mizoram, and Jammu and Kashmir, whereas it was 2,300 square metres in Sikkim. In Himachal Pradesh and the UP Hills, per capita availability of agricultural land was 0.11 of an hectare.

The average size of holdings shows considerable variation across the hill states. Average size of holdings is below one hectare in Jammu and Kashmir, the UP Hills, and Tripura. At the other extreme is Nagaland where the average size of holding is

Table 10.3: Structure of agriculture and use of inputs in India's Hill States/Region

State/ region	Net sown area '000 ha	Per person net sown area (ha)	Net sown area under irrigation (%)		Fertiliser use/ ha of area (kg)		Average Size of holding (ha)	Per cent of marginal/ small farms
			1980-81	1995-96	1980-81	1995-96		
Jammu & Kashmir	736	0.10	42.5	52.4	29	69	0.83	90.2
Himachal Pradesh	572	0.11	16.1	17.7	28	52	1.20	83.6
UP Hills	665	0.11	28.6	18.5	6	17	0.96	88.1
Sikkim	95	0.23	11.6	16.8	5	11	2.11	69.8
Assam	2706	0.12	21.7	21.1	3	18	1.31	82.6
Arunachal Pradesh	150	0.17	21.4	24.0	1	0	3.62	36.8
Meghalaya	201	0.11	24.9	22.4	13	15	1.80	62.3
Mizoram	65	0.09	12.3	10.8	2	15	1.38	85.2
Nagaland	189	0.16	38.3	30.4	0.5	5	6.82	23.9
Manipur	140	0.08	46.4	46.4	22	86	1.23	83.1
Tripura	277	0.10	11.6	13.3	8	30	0.97	89.9
India	142095	0.17	27.7	37.6	40	87	1570	78.0

Source: Ministry of Agriculture 1999

more than six hectares. In Arunachal Pradesh and Sikkim holding sizes are around 3.6 and 2.1 hectares respectively. Except for Nagaland and Arunachal Pradesh, landholdings below two hectares constitute 62 to 90% of the total landholdings. The greatest concentration of smaller-sized holdings was in Jammu and Kashmir, closely followed by Tripura and the hill region of UP

Input use in agriculture

Irrigation and fertiliser are considered to be the major determinants of agricultural growth and productivity. The progress in the use of these two inputs is presented in Table 10.4. Net sown area under irrigation varied between 11.6 to 46.4% in different hill states during 1980-81. During 1980-81, Manipur was at the top, with 46% net sown area under irrigation, it remained at that level even in 1995-96. In the case of Jammu & Kashmir, irrigation coverage increased from 42.5% during 1980-81 to 52.4% during 1995-96. Coverage of irrigation was below 12% in Sikkim and Tripura during 1980-81, and it has increased somewhat during the last 15 years. One disquieting trend in the case of irrigation has been that some states witnessed a sharp decline in irrigated area. Irrigation coverage in Nagaland declined from 38% in 1981 to 30% in 1995-96. Similarly, the hill region of UP witnessed a decline of 10% in irrigation coverage in the same period. Irrigation facilities were slow to improve in the states of Assam, Himachal Pradesh, and Manipur.

Fertiliser use per hectare of net sown area is highest in Manipur followed by Jammu and Kashmir. These two states were also first in terms of irrigation coverage. In

Table 10.4: Capital outlay per hectare of net sown area at 1980- 81 prices, 1974-75 to 1996-97

(rupees per year)

State	1974-75 to 1978-79 5 th Plan	1980-81 to 1984-85 6 th Plan	1985-86 to 1989-90 7 th Plan	1990-91 & 1991-92	1992-93 to 1996-97 8 th Plan	Average Annual Expenditure
Jammu & Kashmir	1563	1072	1060	1405	1176	1242
Himachal Pradesh	420	335	277	267	249	323
Assam	163	190	197	205	122	172
Sikkim	542	524	521	646	504	537
Arunachal Pradesh	728	1107	1107	1457	1514	1148
Manipur	1420	1272	1121	1627	1170	1295
Meghalaya	417	408	418	643	706	500
Mizoram	1690	1399	1573	1705	1744	1606
Nagaland	876	913	733	581	239	702
Tripura	743	1138	1295	1372	796	1043
All India	311	258	197	187	182	237

Source: Ministry of Agriculture 1999

Himachal Pradesh also per hectare fertiliser use is quite high compared to other hill states. The lowest fertiliser use is observed in the case of Arunachal Pradesh where less than one kg of fertiliser is applied per hectare of net sown area. Similarly, per hectare fertiliser use in Nagaland is around five kg. Though fertiliser use witnessed high growth in all the states, except Arunachal Pradesh, per hectare use of fertiliser is below 20 kg in seven out of 11 hill states/regions.

Public investment in agriculture

Public investment in agriculture plays a vital role in the development of infrastructure. A series from 1974-75 has been compiled by summing up capital expenditure on all important heads for each state. It covers capital outlay from public funds on medium and major irrigation schemes, special and north-eastern development funds, soil and land development, agricultural markets and storage, rural roads, rural electrification, and so on. (see Chand 1999 for details). For the sake of brevity, the information at state level is presented by grouping years according to the period of the Five Year Plans. Capital expenditure on public account per hectare of net sown area at 1980-81 prices in different hill states is presented in Table 10.4.

Public capital invested in agriculture was lowest in Assam among all the hill states. Except for Assam, public money for infrastructural development in all the hill states was higher than the national average. The average of the resources allocated for public investment in agriculture per hectare of net sown area during the last 25 years reveals an interesting pattern. Public investment in agriculture in Jammu and Kashmir was more than four times the national average. Compared to the country average of IRs² 237 per ha of net sown area, the amount spent for infrastructural development

² There are 46.05 Indian rupees to the US dollar.

was IRs 323 in HP, IRs 500 in Meghalaya, IRs 537 in Sikkim, IRs 702 in Nagaland, and more than IRs 1,000 in Tripura, Manipur, Arunachal Pradesh, and Mizoram.

The allocation of public investment in agriculture shows that resources allocated to the north-eastern states and Jammu and Kashmir were very high compared to Assam and Himachal Pradesh and compared to the average of all other states.

Flow of institutional credit

The flow of institutional credit per hectare of cultivated area from the commercial and cooperative banks together has been much lower than the national average in all the hill States (Table 10.5). Himachal Pradesh has the highest per hectare credit, but it is still only about 70% of the all-India average. Tripura and Jammu and Kashmir come next to Himachal Pradesh, although they are far behind in respect of per hectare flow of institutional credit. The lowest figures are those for Manipur, Assam, and Meghalaya with totals (working capital and term loans) of IRs 50, 70, and 143 per hectare respectively compared to a figure of IRs 1,644 for the country as a whole. A special feature of credit in most of the hill states is a relatively larger proportion of term loans than is observed for the country as a whole, suggesting that loans for capital investments have greater weight in these areas than in the plains, although in both cases short-term loans of one-year maturity meant to meet working capital requirements constitute most of the institutional credit made available to farmers.

Table 10.5: Flow of institutional credit to the hill region

States	Cooperatives		Commercial Banks		All Agencies		Per Ha Credit (IRs)	
	Working Capital	Term Loan	Working Capital	Term Loan	Working Capital	Term Loan	Working Capital	Term Loan
Jammu & Kashmir	102.7	27.7	32.6	28.4	135.3	56.1	183	76
Himachal Pradesh	221.7	134.9	113.4	118.8	335.1	253.7	585	443
Sikkim			08.1	05.8	08.1	05.8	85	61
Assam	05.5		26.3	157.5	31.8	157.5	12	58
Arunachal Pradesh	16.2		00.6	05.0	16.8	05.0	112	33
Meghalaya	15.6		03.4	09.9	19.0	09.9	94	49
Mizoram	08.2		00.5	01.1	08.7	01.1	134	17
Nagaland	20.0		01.0	00.5	21.0	00.5	103	2
Manipur			00.5	06.5	00.5	06.5	4	46
Tripura	30.1	08.8	71.1	12.6	101.2	21.4	384	81
India	120.19	233.8	562.5	335.0	176.44	568.9	1243	401

Source: Ministry of Agriculture 1999

Diversification of agriculture

Since the productivity of traditional food grains (cereals) is quite low, diversification of agriculture through high-value crops like fruit, vegetables, and condiments and

spices is an important instrument for growth and for improving the productivity of hill agriculture (Chand 1996a, 1996b, 1996c, 1997, and 1999). Broad contours of agricultural diversification that took place from 1980-81 to 1992-93 in different hill states can be seen from Table 10.6. Cereals continued to have the predominant share covering 55 to 90% of the cropping area in different states. Cereals are cultivated on about 90% of the cropped area in Manipur and Himachal Pradesh, whereas they account for 56 to 62% of the gross cropped area in Meghalaya, Sikkim, and Tripura. In the UP hills, the share of cereals in the total cropped area increased from 70% in 1980-81 to 81% in 1992-93.

There was an increase in area cultivated with fruit crops in all the states; the biggest increase is observed in the case of Mizoram where fruit cultivation increased from three per cent to 10% in a short duration of 11 years. Fruit cultivation is continuing to be the most popular in Tripura where the area under fruit constitutes 12% of the total cropped area. Meghalaya, Arunachal Pradesh, and Sikkim showed an impressive shift in favour of area under fruit. Area under fruit remained below three per cent in the UP hills, Manipur, Assam, and Nagaland.

As was the case with fruit, the area under vegetables also grew spectacularly in Mizoram. The State now has 12% of its area under vegetable cultivation, the highest among all the hill states of India. Meghalaya continues to have 11% of its area under vegetable production. Among the other states, vegetables are sown on more than six per cent of the cropped area in Sikkim, Tripura, Arunachal Pradesh, and Manipur.

Table 10.6: Changes in the share of major crop groups in total area in various hill states

State/region	(% in total crop area)							
	Food Grains (Cereals)		Fruit		Vegetables		Condiments & Spices	
	1980-81	1992-93	1980-81	1992-93	1980-81	1992-93	1980-81	1992-93
Jammu & Kashmir	85.9	82.7	3.6	4.8	1.6	1.3	0.2	0.17
Himachal Pradesh	90.6	89.4	2.6	4.6	2.5	2.4	0.3	0.3
Uttar Pradesh Hills	69.9	80.9	0.57	0.91	1.16	1.83	0.28	1.18
Sikkim	54.2	62.4	-	6.3	1.3	6.7	12.1	20.8
Assam	71.8	71.3	1.4	2.6	3.4	5.0	2.3	2.8
Arunachal Pradesh	88.4	74.0	2.0	7.7	4.8	7.2	0.8	0.95
Meghalaya	55.8	55.8	1.4	9.0	11.0	11.2	6.7	7.76
Mizoram	71.2	70.6	3.0	10.0	3.2	12.1	9.5	3.9
Nagaland	87.9	79.8	1.6	2.3	3.7	1.9	1.9	1.3
Manipur	92.0	90.3	1.1	2.0	1.0	6.4	1.8	0.62
Tripura	79.8	61.4	12.0	12.1	6.0	6.9	1.1	1.1
India	73.9	67.2	1.1	1.5	1.7	2.2	1.2	1.4

Source: Ministry of Agriculture 1999

Although Himachal Pradesh is acclaimed to have achieved significant transformation through horticulture, the area under vegetables in this state is a meagre 2.4%. Other regions with less than two per cent of their area under vegetable crops are J&K, Nagaland, and the U.P hills.

Condiments and spices are grown on about 20% of the total cropped area in Sikkim, and on about 8% of the area in Meghalaya. In other states, the area under condiments and spices varies between 0.17% (J&K) and 4% (Mizoram).

Agricultural productivity and growth

There are wide variations in agricultural productivity and growth of output in the agricultural sector throughout all the hill states. Agricultural output increased annually at the rate of two to 2.5% during the last 15 years in the states of Jammu and Kashmir, Himachal Pradesh, Assam, Manipur, and Tripura (Table 10.7). The lowest growth rate (1.29 % per annum) was recorded in Meghalaya, whereas the highest growth rate (10.5%) was in the state of Mizoram. Sikkim and Arunachal Pradesh had a growth rate of about six per cent in agricultural output.

Table 10.7: Agricultural growth and productivity in India's hill states at 1980-81 prices

State/Region	NSDP Agr. IRs '000 at Constant Prices		Productivity (NSDP/NSA) IRs		Growth Rates NSDP Agri. TE 83 to TE 97 (% per annum)	NSDP Agriculture (at Current Prices TE 1995-96 IRs)	
	TE 1983	TE 1997	TE 1983	TE 1997		Per Hectare	Per Rural Person
Jammu & Kashmir	40489	55767	5631	7577	2.31	22827	1914
Himachal Pradesh	27021	38104	4724	6662	2.49	21976	2213
Uttar Pradesh Hills							
Sikkim	2808	6176	3383	6501	5.79	21607	2396
Assam	103584	142081	3862	5251	2.28	21723	2352
Arunachal Pradesh	3958	9148	3472	6099	6.17	18694	2768
Meghalaya	6864	8208	3557	4084	1.29	16295	1599
Mizoram	1321	5313	2032	8174	10.45	32105	2557
Nagaland	3257	5192	2061	2545	3.39	17794	4472
Manipur	9115	12076	6511	8626	2.03	33820	2267
Tripura	12152	16609	4803	6315	2.26	18144	1493
India	4265084	6545056	3036	4611	3.11	16007	2452

Source: CSO 1984, 1998

NSDP = Net State Domestic Product
NSA = Net Shown Area
TE = Triennium

Despite relatively slow growth, agricultural productivity in Jammu and Kashmir and Himachal Pradesh was higher than in the north-eastern states, except for Manipur and Mizoram. Among all the states, the highest rate of agricultural productivity during the early 1980s, as well as the mid 1990s was in Manipur. Agricultural productivity was lowest in Mizoram during the early 1980s, but spectacular growth enabled the state to raise agricultural productivity to the second position from the top. During the recent triennium, the lowest productivity at 1980-81 prices was observed in the case of Nagaland and at current prices in Meghalaya.

10.4 Growth in the Overall Economy and Per Capita Income

Net state domestic products (NSDP) of different states during the trienniums ending in 1982-83 and in 1996-97, and growth rates along with per capita income are presented in Table 10.8. The lowest growth in NSDP since 1980-81 is recorded in the state of Jammu and Kashmir and the highest growth is observed in the state of Arunachal Pradesh: State income showed a growth rate exceeding six per cent in the case of Nagaland, Tripura, Mizoram, and Arunachal Pradesh. Growth rates varied between four to five per cent in the states of Manipur, Meghalaya, and Himachal Pradesh. In Sikkim and Assam, state incomes increased at the rate of 5% and 3.3% respectively.

The high growth rate in NSDP meant that Arunachal Pradesh realised the highest per capita income among all the hill states, and this is also about 25% higher than the average per capita income for the whole country. Per capita income in all other hill states was lower than the average for India. One reason for the low per capita income

Table 10.8: Growth in net state domestic product (NSDP) and per capita income at 1980-91 prices

State/Region	NSDP Total (IRs '000)			Growth Rates(%)	Per Capita Income (IRs)
	TE 1983	TE 1997	TE 83-TE97	TE 1983	TE 1997
Jammu & Kashmir	107767	161200	2.92	1777	1926
Himachal Pradesh	74400	137200	4.47	1718	2518
Uttar Pradesh Hills	5333	11325	5.53	1644	2467
Sikkim	251067	397333	3.33	1374	1606
Assam	10900	31033	7.76	1692	3209
Arunachal Pradesh	18567	35867	4.82	1367	1773
Meghalaya	6359	17638	7.56	1244	2117
Mizoram	12600	28800	6.08	1582	2170
Nagaland	20833	40150	4.80	1443	1993
Manipur	27067	63467	6.28	1298	2155
Tripura					
India	11592033	24583167	5.52	1672	2670

Source: CSO 1984, 1998

of the north-eastern states is the high rate of growth in population in these states compared to the rest of India.

10.5 Nutrition and Poverty

Information on daily intake of calories, protein, and fat per consumer unit and per cent of population that does not consume the minimum amount of calories required has been computed from household data from the 50th round of the Quinquennial Survey of the National Sample Survey Organisation (NSSO) on consumer expenditure pertaining to the year 1993-94. The information is presented in Table 10.9. Among all the hill states and the UP hill region, Jammu and Kashmir is at the top in terms of intake of calories, protein, and fat. Per capita (consumer unit) intake of calories in the state is 3,154 Kcal, while the intakes of protein and fat are 95 and 58 gm respectively. Himachal Pradesh followed Jammu and Kashmir closely with a per capita daily intake of 2,916 Kcal energy, 88 gm of protein, and 56 gm of fat. Both per capita calorie and protein intakes are lowest in Sikkim, while fat consumption is lowest in Manipur. In all the eastern states, per capita calorie and protein intakes are lower than the average for the country.

Based on the norm of the minimum calorie requirement³, about 10% of the rural population in Jammu and Kashmir, 21% in the UP hills, and 24% in Himachal Pradesh are undernourished. The proportion of rural people who do not consume sufficient calories is significantly higher in the Eastern Himalayan zone than in the Western region. More than half of the rural population in Sikkim, Arunachal Pradesh, Meghalaya, and Tripura is undernourished according to the NSSO survey for 1993-94. The proportion of undernourished rural population was 47% in Assam and 41% in Mizoram. In Manipur and Nagaland about 29% of rural people did not consume sufficient calories.

There is a very close association between nutritional intake and income; and the poverty line represents the minimum level of income corresponding to one that enables a household to buy food items that supply the minimum calorie requirements. In other words, the population that has not been able to consume sufficient calories can be considered to be the population living below the poverty line. Based on this, the proportion of undernourished population, presented in Table 10.9, can be treated as the population living in poverty.

Although the issue of poverty has been studied extensively in India, state-level estimates of poverty are not provided separately for each of the north-eastern states. Generally, estimates of the population below poverty level for the state of Assam have been used for all the northern hill states. These estimates are presented in Table 10.10. In fact our estimates of undernourished population are the first attempt to provide such information for each of the north-eastern states.

³ The undernourished population has been estimated by computing the number of people consuming less than 2,300 calories per day.

Table 10.9: Nutritional intake and incidence of undernourishment in India's hill states, 1993-94

State/Region	Nutritional Intake/Consumer Unit/Day			Undernourished Population %
	Calorie Kcal	Protein GM.	Fat GM	
Jammu & Kashmir	3154	94.9	57.8	10.0
Himachal Pradesh	2916	88.5	55.9	24.0
Uttar Pradesh Hills	na	na	na	21.0
Sikkim	2281	59.9	38.6	57.0
Assam	2406	60.1	25.5	47.0
Arunachal Pradesh	2620	75.7	20.2	52.0
Meghalaya	2430	62.5	28.7	51.0
Mizoram	2576	72.4	27.4	41.0
Nagaland	2667	74.7	19.0	28.0
Manipur	2664	68.0	15.3	30.0
Tripura	2350	62.5	26.5	50.0
India	2683	75.0	31.4	35.0

Source: NSSO (1996)

NA = Not available

Table 10.10: Changes in rural poverty during 1973-93

State/Region	1973	1983	1993	% Change 1973-83	% Change in 1983-93
	% of population below poverty line				
Jammu & Kashmir	45.5	26.0	30.3	-19.5	4.3
Himachal Pradesh	27.4	17.0	30.3	-10.4	13.3
Uttar Pradesh Hills					
Sikkim	52.7	42.6	45.0	-10.1	2.4
Assam	52.7	42.6	45.0	-10.1	2.4
Arunachal Pradesh	52.7	42.6	45.0	-10.1	2.4
Meghalaya	52.7	42.6	45.0	-10.1	2.4
Mizoram	52.7	42.6	45.0	-10.1	2.4
Nagaland	52.7	42.6	45.0	-10.1	2.4
Manipur	52.7	42.6	45.0	-10.1	2.4
Tripura	52.7	42.6	45.0	-10.1	2.4
India	56.4	45.6	37.3	-10.8	-8.3

Source: Planning Commission 1992

10.6 Issues of Sustainability

There is not much information available in official records about the sustainability of natural resources in the hill states. We have made use of pieces of information on this aspect available here and there to draw some inferences about the sustainability issues. It is widely believed that excessive pressure of human beings and livestock and the extent of dependence on natural resources affect sustainability of the economy. These and similar issues are discussed in the following sections.

Livestock population and density

The livestock population in total and by the large and small ruminants and growth rate in their population are presented in Table 10.11. The numbers of both cattle and sheep and goats showed numbers in all areas declining between 1982 to 1992, except in the state of Manipur. The highest increase is in the order of around nine per cent in Nagaland, followed by Arunachal Pradesh. Livestock population increase was lowest (0.2 % per annum) in Himachal Pradesh. In contrast, in Jammu and Kashmir, the population of cattle increased at the rate of 2.7% and that of sheep and goats by 5% per annum.

Table 10.11: Total population and growth in livestock in India's hill states/region

States	Cattle '000		Growth Rate	Sheep and Goats '000		Growth Rate	Total Livestock '000		Growth Rate
	1982	1992	%/year	1982	1992	%/year	1982	1992	%/year
Jammu & Kashmir	2888	3784	2.74	2913	4712	4.93	5801	8496	3.89
Himachal Pradesh	2790	2865	0.27	2151	2194	0.2	4941	5059	0.24
U.P Hills		2772*			1268*			4206*	
Assam	7308	11077	4.25	1775	3603	7.34	9083	14680	4.92
Manipur	885	833	-0.6	56	52	-0.74	941	885	-0.61
Meghalaya	579	668	1.44	212	217	0.23	791	885	1.13
Mizoram	53	66	2.22	29	21	-3.18	82	87	0.59
Sikkim	177	200	1.23	106	129	1.98	283	329	1.52
Tripura	696	969	3.36	348	434	2.23	1044	1403	3
Arunachal Pradesh	180	329	6.22	96	157	5.04	276	486	5.82
Nagaland	160	364	8.57	62	152	9.38	222	516	8.8
India	262236	288755	0.97	144020	166062	1.43	406256	454817	1.14

Source: Ministry of Agriculture 1982, 1987 & 1992

* Refers to the year 1988

The number of livestock per thousand persons and livestock intensity per hundred hectares of net sown area (NSA) and per hundred hectares of forest area in different states are shown in Table 10.12. The ratio of population of cattle and buffaloes to human population is highest in Himachal Pradesh and lowest in Mizoram. There were 55 cattle per hundred persons in Himachal Pradesh and only about ten in Mizoram. The number of sheep and goats per hundred persons was highest in Jammu and Kashmir. There were 61 sheep and goats per hundred persons in Jammu and Kashmir, followed by Himachal Pradesh with 42 sheep and goats. The number of sheep and goats was below 3 per 100 persons in Manipur and Mizoram. In the other states, the number of sheep and goats per 100 persons varied between 12 to 32.

The number of total livestock was higher than human population by about 13% in Jammu and Kashmir, while in Himachal Pradesh, Arunachal Pradesh, and Sikkim,

Table 10.12: Density of livestock in India's hill states/region 1992

States	Livestock/ '00 Persons			Livestock/ '00 ha NSA			Livestock/ '00 ha Forest Area		
	Cattle	Sheep & Goat	Total	Cattle	Sheep & Goat	Total	Cattle	Sheep & Goat	Total
Jammu & Kashmir	49	61	113	518	645	1191	138	172	317
Himachal Pradesh	55	42	99	499	382	890	277	212	493
U.P Hills*	47	21	71	417	191	632	81	37	123
Assam	49	16	72	409	133	594	558	182	810
Manipur	45	3	70	595	37	921	138	9	214
Meghalaya	38	12	67	331	107	585	71	23	126
Mizoram	10	3	30	102	32	312	5	2	16
Sikkim	49	32	95	211	136	405	78	50	150
Tripura	35	16	58	368	165	605	160	72	263
Arunachal Pradesh	38	18	97	221	105	565	6	3	16
Nagaland	30	13	89	192	80	565	42	18	124
India	34	20	56	202	116	330	425	244	693

Source: Ministry of Agriculture 1982, 1987 & 1992

* Refers to 1988

livestock population was slightly lower than human population. There were about 3 animals per 10 persons in Mizoram, which is the lowest among all the hill states.

Jammu and Kashmir also topped in the number of livestock per hectare of net sown area. There were about 12 animals per hectare of net sown area in this state. The second highest pressure of livestock on net sown area was in Manipur, and the lowest livestock pressure was observed in Mizoram where one hectare of net sown area supports about three livestock units.

When area under forests is used as a denominator, then livestock density turns out to be highest in Assam where one hectare of forest area supports about eight animals. The lowest livestock pressure on forest land is found in the states of Arunachal Pradesh and Mizoram where there is one livestock unit per six hectares of forest area.

Demand for fuelwood

Demand for firewood is one of the factors that effects tree cover in the forests. Because of the harsh climate and scarcity of alternative sources of energy, use of firewood in hill states is quite high. It can be seen from Table 10.13 that per capita use of firewood in the western Himalayan zone is estimated to be 710 kg and that in the eastern Himalayan zone is 621 kg. This is in contrast to other agro-ecological zones where per capita use of firewood varies between 130 to 582 kg.

Forest cover and land degradation

Changes in forest cover, distribution of area under forest cover according to crown density, and area under problem lands like those suffering from land erosion and

Table 10.13: Average per capita use of non-commercial fuels in various agro-climatic zones

Agro-climatic Zone	Firewood kg	Crop Residue kg	Cow Dung kg
Western Himalayan Zone	710	52	79
Eastern Himayalan Zone	621		
Other Zones	130-582	11-321	47-182

Source: Planning Commission 1992

degradation are presented in Table 10.14. During the short period of the last six years for which information is available, the area with forest cover has increased at a rate varying from 1.9 to 6.2% in the states of Jammu and Kashmir, Sikkim, and Himachal Pradesh, while there was no significant change in Tripura. In the remaining six states, area under forest cover declined.

Table 10.14: Area under forest and degraded lands in Indian hill states

State/Region	Changes in Forest Cover (100 sq. km.)			Forest Area Based on Crown Density (%)		Degraded Land As % of Total Rep. Area
	1987-89	1993-95	% change	>40 %	10-40%	
Jammu & Kashmir	200.6	204.4	1.89	54.8	45.2	19.82
Himachal Pradesh	117.8	125.2	6.28	75.6	24.4	56.38
Uttar Pradesh Hills				NA	NA	NA
Sikkim	30.3	31.3	3.30	79.2	20.8	42.68
Assam	247.5	238.2	-3.76	64.0	36.0	38.19
Arunachal Pradesh	687.6	686	-0.23	79.3	20.7	48.26
Meghalaya	158.7	156.6	-1.32	20.8	79.2	49.22
Mizoram	188.5	187.7	-0.42	22.7	77.3	29.02
Nagaland	143.2	142.2	-0.70	24.7	75.3	67.40
Manipur	176.8	174.2	-1.47	30.0	70.0	33.20
Tripura	55.3	55.4	0.18	33.0	67.0	26.60
India	6391.8	6333.9	-0.91	60.2	39.1	57.37

Source: CSO 1998

In the Western Himalayas, about 45% of the forest cover in Jammu and Kashmir and 24% in Himachal Pradesh has a crown density of between 10 to 40%. The rest of the forest area has a crown density above 40%. In the Eastern Himalayas, the density of forest cover was better in Sikkim, Assam, and Arunachal Pradesh. In the rest of the states more than two-thirds of the forest area has a 10-40% crown density.

The extent of land mass prone to soil erosion and degradation constitutes about 20% of the geographic area in Jammu and Kashmir and 56% in Himachal Pradesh. In the north-eastern region, the proportion of problem lands in the geographic area is highest in Nagaland (67 %) and lowest (27%) in Tripura.

10.7 Conclusions

The paper shows that per capita income in all the hill states of India is lower than the average of the country as a whole and that the incidence of poverty is quite high in the north-eastern states. Although the productivity of agriculture per unit area is higher than the national average, agricultural income is low because of the scarcity of per capita net sown area. Similarly, considering the potential, the agricultural output in hill states is low, and there seems to be several factors underlying this. One, fertiliser use is poor and irrigation systems quite scarce. Two, hill states have poor infrastructure, particularly in terms of accessibility to roads and markets, and accessibility is vital for harnessing the production potential and for translating production into income.

Although the north-eastern states have been allocated quite a lot of resources for agricultural infrastructure, this has not resulted in commensurate growth in output. It seems there are serious institutional constraints hindering the progress of agriculture in the north-eastern region. These relate to marketing, farming systems, access to institutional credit, and need-based infrastructural development with the involvement of local people.

There are indications of unsustainable use of natural resources. These are reflected in (i) decline in area under irrigation due to degradation of water resources, (ii) heavy livestock pressure, (iii) poor and declining forest cover, (iv) a high proportion of problem lands in total land mass. The pressure on natural resources can be reduced only by raising the socioeconomic status of people by raising incomes through agricultural growth and development. There is also an urgent need to introduce measures to curtail the rapid population growth in the hill states. It must, however, be recognised that there is tremendous heterogeneity across and within each hill state/region and, as a result, it is difficult to generalise the factors contributing to growth and alleviation of poverty, and, therefore, it is necessary to identify the constraints and options and devise a strategy for agricultural development and diversification at the micro-level.

References

- Alagh, Y.K. (1990) 'Agro-Climatic Planning and Regional Development'. In *Indian Journal of Agricultural Economics*, Vol. 45 (3): July to September
- Basu, D.N.; Guha, G.S. (1996) *Agro Climatic Regional Planning in India*. New Delhi: Concept Publishing Company
- Chand, R. (1996a) 'Ecological and Economic Impact of Horticultural Development in the Himalayas: Evidence from Himachal Pradesh'. In *Economic and Political Weekly*, Vol.31 (26): A-93 - A-99, June 29

- Chand, R. (1996b) 'Agricultural Diversification and Farm and Non-farm Employment in Himachal Pradesh'. In *Indian Journal of Labour Economics*, Vol.39 (4): 841-852, October – December
- Chand, R. (1996c) 'Diversification through High Value Crops in Western Himalayan Region: Evidence from Himachal Pradesh'. In *Indian Journal of Agricultural Economics* Vol.51 (4): 652-663, Oct -Dec.
- Chand, R. (1997) *Agricultural Diversification and Development of Mountain Region* New Delhi: M.D. Publication
- Chand, R. (1999) 'Emerging Trends and Regional Variations in Agricultural Investments and Their Implications for Growth and Equity.' Draft Project Report, National Centre for Agricultural Economics and Policy Research, New Delhi
- CSO (1984) *Statistical Abstract of India*. New Delhi: Central Statistical Organisation
- CSO (1998) *Statistical Abstract of India*. New Delhi, Central Statistical Organisation
- Ministry of Agriculture (1982, 1987 & 1992) *Livestock Census*. New Delhi: Government of India
- Ministry of Agriculture (1999) *Indian Agricultural Statistics*. New Delhi: Government of India, Ministry of Agriculture
- NSSO (1996) *Nutritional Intake in India*. Fifth Quinquennial Survey of Consumer Expenditure (July 1993-June 1994) New Delhi: National Sample Survey Organisation, Government of India
- Planning Commission (1992) *Eight Five-year Plan (1992-1997)*. New Delhi: Planning Commission, Government of India
- Shah, S.L. (1992) 'Tribal Economy in India with Special Reference to the Himalayan Region – Important Development Issues'. In *Indian Journal of Agricultural Economic*, Vol.47 (3): July to September
- Swarup, R. (1992) *Agricultural Economy of Hill Region*. Nainital: Gyanodya Prakashan

