

UNSUSTAINABILITY OF AGRICULTURE IN THE EASTERN HIMALAYAS

Before going on to micro-studies, an overview of the Eastern Himalayas based on the AERC, Jorhat material (1989) is presented in this Chapter. This region covers Sikkim; Manipur; Meghalaya; Nagaland; Arunachal Pradesh; Tripura and Mizoram; the districts of Darjeeling, Coochbehar, and Jalpaiguri in West Bengal; and the hill districts of Assam.

The agricultural practices followed in the Eastern Himalayas are broadly of two types, viz., settled farming practised in the plains, valleys, foothills, and on terraced slopes and shifting cultivation practised in the hills of the North-East; the latter accounting for 35.3 per cent of the region's total cultivated area. Cropping patterns in the region, with the exception of Sikkim where the dominant crop is maize, are rice-based. More than 80 per cent of the gross cropped area in the region is under food crops which shows that crop farming in the region is basically subsistence-oriented. The region cannot meet its foodgrain requirement. The transport and communication system in the region is one of the weakest in the country.

The main problem of agricultural production in the hilly areas of the region is that the available land resources are subject to heavy soil erosion and soil degradation, resulting from rampant deforestation. In the hills of the North-East, deforestation is largely attributable to the slash and burn technique of production associated with *jhum*, as well as to indiscriminate sale of timber to private contractors. In Sikkim, soil erosion is also caused by untterraced farming on the slopes and by canal irrigation systems without protective cover to the channels. According to AERC, Jorhat's report (1989), "*soil conservation and control of shifting cultivation in the hills thus comes first in order of priority in the developmental sequence*" (p 5).

As mentioned in Chapter 1, according to the agro-climatic regional planning classification, the Eastern Himalayan zone was classified into five sub-zones. The problems and constraints of sub-zone I (Sikkim and the Darjeeling Hills) are limited land resources available for agricultural uses; soil erosion and soil degradation caused by denudation of forests as well as faulty land use and land management; strongly acidic reactions of the soils; extremely cold climate at higher altitudes, limiting the effective crop production period; and, above all, a poor communication system and poor marketing infrastructure (AERC, Jorhat 1989, p 20). The problems in sub-zones II and III (Arunachal Pradesh, Meghalaya, Nagaland, Assam Hills, Manipur, Tripura, and Mizoram) mainly relate to soil erosion. The problem of *jhum* cultivation in these sub-zones is likely to assume serious proportions by the end of the century as the estimated *jhumia* population, which was 4.8 lakh families in 1979-80, is expected to increase to 7.66 lakh families. The intensity of the problem of soil erosion and soil degradation associated with *jhum* in these sub-zones can be judged from the soil erosion calendar given in Table 6.1.

In sub-regions IV and V (lower and upper Brahmaputra valleys), the problems mainly relate to the constraints involved in rice cultivation.

Lastly, the population growth rates are quite high in many areas of the Eastern Himalayan region. Between 1981 and 1991, the population growth rate was more than three per cent in this region.

Table 6.1: Soil Erosion Calendar

Months	Agricultural Operations	Soil Erosion (T/ha)	
		Min.	Max.
January to March	Cutting, burning, and clearing of jungles	0.0	3.7
April	Clearing and sowing seeds	0.0	22.4
May	Sowing and weeding	0.2	61.9
June	Weeding	0.2	45.4
July	Weeding and harvesting	1.8	21.9
August	Harvesting and occasional weeding	1.0	29.6
September	Harvesting continues	0.1	13.8
October and November	-do-	0.0	0.0
December	Harvesting ends	0.0	0.0
Total Annual		3.3	201.4

Source: ICAR Research Complex quoted in AERC, Jorhat 1989

6.1 Shifting Cultivation in the Eastern Himalayas

Shifting or *jhum* cultivation is an agricultural system which involves slashing the forest, burning the dried biomass, mixed cropping for one or two years, and then leaving the land fallow for conversion to secondary forest until the soil fertility is restored. The traditional *jhum* cycle took some 20 to 30 years. The reduction of the cycle to about four to five years or even less, owing to the population pressure on land and other factors, is held responsible for the land degradation in areas affected by shifting cultivation. Because of this, shifting cultivation has been considered by many as ecologically undesirable and chiefly responsible for increasing the area under the wastelands' category. However, there is a contrary view that supports shifting cultivation because it is the only practical method, given the constraints existing in the Eastern Himalayas. About 81 per cent of the population in Mizoram, 58 per cent in Arunachal Pradesh, 35 per cent in Meghalaya, 28 per cent in Manipur, and six per cent in Tripura depend on shifting cultivation.

Due to the perceived harmful effects of *jhum* cultivation on the ecology and economy of the Eastern Himalayas, a *Jhum* Control Scheme has been implemented by the Central Government and some States. Under this scheme, *jhum* cultivators are encouraged to take up settled cultivation by abandoning *jhum* cultivation.

6.2 Economics of Shifting Vs. Settled Cultivation

In a review of micro-level data, Ninan (1992) compared the returns from shifting and settled cultivation. Table 6.2 provides the gross returns from crop production under *jhum* and settled (terrace) cultivation. It shows that, in the case of paddy, settled cultivation yields better returns than *jhum*. However, when crop farming as a whole (all crops) is considered, *jhum* areas yield greater returns than terraced areas.

Table 6.2: Annual Gross Returns from Crop Production under *Jhum* and Terrace Cultivation

Annual Gross Returns (In Rs)	<i>Jhum</i>		Terrace	
	Paddy	All Crops	Paddy	All Crops
Per household	262.29	980.93	319.81	491.98
Per capita	33.28	124.47	46.38	71.38

Source: Borah and Goswami 1973 quoted in Ninan (1992, p. A-5)

After reviewing the micro-studies, Ninan (1992) provided the following conclusions.

- a) When the *jhum* cycles were long enough, shifting cultivation was sustainable, but, with the growing population pressure on land and the shortening of *jhum* cycles, shifting cultivation cannot be sustained without adverse ecological effects.
- b) Although a shift from *jhum* to settled cultivation reduces the harmful effects of *jhum* cultivation, the low returns under settled cultivation may not sustain the living standard of *jhum* cultivators.
- c) "The strategy for hill area development, which has hitherto focussed on the narrow issue of *jhum* versus settled cultivation, should shift its emphasis to the larger and more relevant issue of diversification of economic activities in hill regions, which holds the key to the future and economic prosperity of hill and tribal regions" (p A-6).

The difference between the gross returns from wet rice cultivation and *jhum* cultivation is Rs 30 per hectare only. Unless there is a difference of 50 to 100 per cent in the net returns or crop yields, it may be difficult to shift from *jhum* to settled cultivation (Shah 1992). Pathy's study (1986) showed that, unnecessarily, shifting cultivation has been made the scapegoat for deleterious effects on forests and the environment at large. This study also revealed that the *Jhum* Control Scheme brought untold miseries to innocent people.

6.3 Some Indicators of the Unsustainability of Resources in the Eastern Himalayas

Floods in Teesta

CSE (1991) provided some information on floods in the Teesta River which flows through Sikkim and the Darjeeling Hills. This river seems to be the wildest in the Himalayas, with a valley extremely prone to cloudbursts, landslides, and flash floods. Two-hundred thousand landslides took place during the 1968 flood. Since the 1970s, the Teesta Valley seems to be becoming more floodprone. Based on streamflow data, however, CSE revealed that there is no demonstrable tendency towards high water discharges. Due to construction of highways and extensive land use changes, the Teesta Valley could be becoming more landslide- and floodprone.

Soil Erosion

The hilly terrain of the North-Eastern Himalayas is highly exposed to soil erosion because of intensive human activities that include agriculture, deforestation, road construction,

establishment of new townships, etc. Singh and Singh (1981) examined soil erosion caused by the above-mentioned activities. They indicated that an *"unimaginable change has taken place in the ecological system and it may not be an exaggeration in concluding that the resource degradation rate in the region is in the increasing order"* (p 4). The soil loss in a calendar year has already been mentioned above. On the basis of the area under shifting cultivation in the N.E.H. region, and the quantitative values of soil erosion, this study made an estimate of the total soil erosion. The estimation thus made indicated that nearly 19 million tonnes of soil are eroded annually as a result of shifting cultivation in the region. Nutrient losses are estimated to be six million tonnes of organic carbon, 9.7 tonnes of available P_2O_5 , and 5,690 tonnes of available K_{20} . Cultivation of tuber crops in Meghalaya has led to 40 to 50 tonnes per ha of soil loss annually. In a study of 38 per cent slope, Singh (1979) revealed that for every tonne of potatoes produced, the soil lost because of the system was two tonnes. Cultivation of pineapples, which are widely grown as a commercial crop in the region, initially resulted in heavy soil losses. During the first year of its establishment, a study (Ghosh 1976) showed that this cultivation resulted in soil loss at the rate of 24 to 62.6 T/ha/year. All these examples show that most of the agricultural activities in this region contribute considerably towards (land and water) degradation. There are certain local, resource-based techniques that could be used to solve the problem but they remain confined to limited areas only.

Agriculture

Crop yields in the Eastern Himalayas are very low compared to the Western Himalayas. In a sample survey of 50 farmers in Majuli sub-division (which is a major oilseed and pulse growing area) of Jorhat district, Saikia (1988) compared field data concerning the cost of cultivation schemes for the 1971-72, 1980-81, and 1984-85 periods. Profitability estimates of crop cultivation indicated a very dismal performance.

In the case of major cereal crops, i.e., paddy, the value of returns per hectare minus the direct operational costs showed gross profits of Rs 677.96, Rs 346.78, and Rs 961.60 for the years 1971-72, 1980-81, and 1984-85 respectively. For mustard it was estimated at Rs 509.29, Rs 764.00, and Rs 1105.50 and, for pulses, Rs 634.79, Rs 722.26, and Rs 369.20 for the years 1971-72, 1980-81, and 1984-85 respectively. The study indicated that, if other notional costs, such as the rental value of owned land, depreciation of implements, interest on fixed capital, etc, are taken into account, negative returns will be obtained. Therefore, crop cultivation under the existing technology is not sustainable.

As an alternative to shifting and terrace cultivation, plantation crops were tried in some areas. In a study on the area around Nayabungalow in the Khasi Hills of Meghalaya, Kumar and Ramakrishnan (1989) examined the ecological implications of some cash crop systems. In this study, energy and economic analyses of cash crops (coffee, tea, ginger, and pineapple mixed cropping systems) were contrasted with shifting agriculture under a 10-year cycle in North-Eastern India. The results showed that nutrient losses through water was high under cash crops, with the maximum losses being under ginger; compared to shifting cultivation the losses were substantial. A major disadvantage of plantation/cash crop systems, such as tea and ginger, is the heavier labour input that often necessitates employment of outside labour. Under existing conditions, the study advocates a mixed land-use pattern including the redevelopment of shifting agriculture along with small units of plantation/cash crops for families organised on a cooperative basis.

Micro-studies on livestock in the Eastern Himalayas are not readily available. Detailed information on livestock in the different zones of the region are provided in this section (GOI 1989c). Among the various types of animals, cattle account for 61.74 per cent of the total livestock population. Cattle and buffaloes are predominant in the valleys and plains. Over the five-year period between the censuses, the cattle population increased by 6.6 per cent and the buffalo population recorded a steep increase to 173 per cent, while in the case of sheep and goats a change of 27.7 per cent and 24.13 per cent occurred respectively. Among the sub-zones, the zone covering Manipur, Tripura, and Mizoram, recorded a decline in the cattle population by about 43.7 per cent. The number of buffaloes increased significantly in the Brahmaputra Valley while the sheep population increased nearly five-fold in Sikkim and the Darjeeling Hills. On the whole, the pressure of the livestock population on land resources is relatively less in the Eastern Himalayas than in the Western Himalayas.

Degradation of Forest Resources

Who is responsible for the degradation of forest resources in the Eastern Himalayas? It is generally believed that *jhum* cultivation is one of the important causes of the diminishing forest resources in the North-Eastern states. Some micro-studies, however, reveal that the major cause of degradation is the cutting down of forests for commercial purposes.

Roychaudhury (1992) analysed the reasons for forest degradation in Arunachal Pradesh. Ninety per cent of Arunachal Pradesh's revenue is generated by its forests. "*Yet these very forests are under heavy pressure, thanks to the lucrative and often illegal timber trade thriving under political patronage*" (p 8). It was discovered that timber worth Rs 200 crore was sent to Delhi for the Asiad in 1982. Due to deforestation, energy and grazing problems have increased in the State. In and around *Nishi* villages in lower Subansiri, the local *Nishi* herders have to travel longer distances to graze their undernourished cattle. The study suggests that "*while shortening of the jhum cycle years in places like the lower Subangiri has created vast deforested tracts, putting the entire blame for this on the jhumia is unfair. After all, there is extensive deforestation in certain tribal tracts like Tawang as well, where shifting cultivation is not practised*" (p 9). From the villagers' point of view, the *jhum* cropping pattern is ecologically sound. In addition, it provides them with nutritional sustenance in a very harsh environment. This study also mentions that, in the Aptani Valley, forest land is becoming increasingly privatised. The educated urban elite are also trying to privatise large areas of land by registering it in their names with the help of the local village heads.

CSE (1985b) has given some information on shifting cultivation. It is true that the shortening of the *jhum* cycle is definitely a cause of soil erosion. The increase in population density is one of the main factors in reducing the period of the *jhum* cycle, but the number of people dependent on *jhum* cultivation does not appear to have increased dramatically during the 1960s and 1970s. According to CSE (1985b), the major factor for diminishing forest cover could be wood felling for commercial purposes. The study quotes the following example given by Seth (in CSE 1985b). "*The erection of the Nagaland paper mills in the midst of the extensive bamboo forests, which have sprung up as a result of past*

and recent *jhum*, has made bamboo a much more valuable industrial crop than any fertiliser that could be obtained by burning it. Further, bamboo clumps have to be preserved and not destroyed in the interest of sustained production of raw material to feed the paper mills. One sector of the economy has therefore become industry-oriented and the evaluation criteria (for forest resources) are correspondingly altered" (p 170). To support the powerful social sections, government agencies have made many vain efforts to control *jhum* and resettle shifting cultivators. These programmes have not succeeded. For example, in Manipur State, swidden cultivators are given grants for terrace construction. But as this is a very expensive proposition, most of the states have hardly undertaken such programmes (Pathy 1986). Even where terraces have been constructed with government aid, the families settled there have abandoned them after a short period, as the low capital availability, high labour input, changed social structure, and low yields proved to be very discouraging (CSE 1985b).

P.S. Ramakrishnan, a Professor at the Jawaharlal Nehru University in New Delhi, has carried out almost two decades of consistent research on the North-eastern tribal practice of shifting agriculture and exploded the myth that the system is primitive, random, and destructive. According to him, "*people try to ignore the fact that the rapidity of land degradation is caused by a variety of other reasons, such as the high rate of timber extraction for industrial purposes. They overlook the fact that extraction of industrial timber, which is done on hundreds of hectares, causes more harm than shifting agriculture, which operates at a much smaller scale. Because we are responsible for this degradation, it bothers our conscience, and we conveniently put the entire blame on shifting cultivation*".⁷

Ramakrishnan (1985) reviewed the conversion of rain forests into secondary forests in North-eastern India. Large-scale timber extraction has been carried out in the North-eastern region during the last few decades. Substantial timber and plywood requirements for the country as a whole are being met by the humid tropical forests of the Eastern Himalayas. The annual availability of timber from two North-eastern states, Manipur and Tripura, is given in Table 6.3. Most of the forested area in the North-east consists of degraded bamboo forests of various types. Bamboo, along with other pulp wood trees, is being exported out of the region for both industrial and non-industrial units. The establishment of three giant paper mills in the region has also created a greater demand for bamboo resources in the region.

Much of the firewood consumed in the North-eastern region comes from secondary forests. The rural population in this region is chiefly dependent upon fuelwood for cooking. The firewood consumption pattern in Syth Liew, a small village in the Khasi Hills, is given in Table 6.4. This village consists of 20 members, and 3,060kg of firewood are imported each year, accounting for about 58 per cent of the total consumption of 5,033kg of fuelwood per year. This study also indicated that, in order to meet their fuelwood requirements, the villagers are forced to go about 10-15km beyond the village boundaries. The other causes of deforestation mentioned in Ramakrishnan's study (1985) are tea plantation and shifting cultivation.

⁷ "In Defence of Shifting Cultivation" - P.S. Ramakrishna shared his views with Ananta Roychaudhury. See *Down to Earth*, Vol.2, No.12, 50-51 pp.

Table 6.3: Annual Availability of Forest Products from Manipur and Tripura(Units in m³ x 10³ bamboo in t x 10⁵)

Product	Manipur	Tripura
Saw Timber	10.0	7.1
Plywood	110.0	19.8
Pine Wood	23.9	-
Hard Wood for Industry	147.0	-
Pine Wood for Industry	9.1	-
Pulp Wood	-	66.0
Poles	-	1.8
Match Wood	-	1.6
Bamboo	1287	5.5

Source: Ramakrishna 1985

Table 6.4: Annual Fuel Consumption for Cooking in the Syth Liew Village Ecosystem

Category	Quantity Used (kg)	Energy Equivalent (MJ)
Firewood	5033	86276
Rice Husk	328	6032
Total	-	92308
Imported Firewood	3060	52455

Source: Ramakrishna 1985