

Chapter 19

Shifting Cultivation: Issues and Strategies in the NEH Region

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Considering the high cost, labour and energy input involved in terrace cultivation, and in the absence of other viable alternatives to shifting cultivation, the majority of the population of the North-Eastern hill states continues to depend on shifting cultivation for their subsistence livelihood. Due to limited arable land and increasing population growth, farming on the ecological fragile and marginal mountain lands, including those situated on more than 30% slope, will continue. If shifting cultivation in its present form is allowed to continue, land degradation and the impoverished living conditions of resource-poor upland farmers are bound to worsen with time. Considering the adverse impacts of shifting cultivation, such as loss of precious top soil, nutrients and forest biodiversity, destabilisation of slopes and low productivity, sustainable farming alternatives need to be developed and implemented immediately.

INTRODUCTION

Shifting cultivation is a part of the life of the hilly tribal areas of the country. Shifting cultivation in its traditional form was an ecologically and economically viable system of agriculture, as long as population density was low and the *Jhum* cycle was long enough to maintain soil fertility. However, because of shortened cycles and the systems slow response to the changing requirements of high population pressure, *Jhum* cultivation has led to catastrophic degradation of biodiversity and the environment. Substantial increase in human and livestock population, lack of land ownership rights, shortening of *Jhum* cycle, bun method of cultivation on hill slopes and hill tops, mining, industrial demand for timber

and pulpwood, clearance of forests for agriculture and urban development, along with firewood extraction have all caused land degradation in areas where shifting cultivation is a part of tradition. Due to the depletion of natural resources, the very existence of the tribal populace is being threatened. The state as well as central governments have undertaken various *Jhum* control schemes, such as land development comprising terracing, construction of water harvesting structures, forestry and horticultural development including plantation crops, agricultural inputs supply, demonstration of modern techniques and development of piggery and poultry, etc. In spite of these ambitious programmes, the country is still witnessing large areas practicing *Jhum* cultivation that is dangerous to the sustainability and viability of hill agriculture. The present paper deals with the status of shifting cultivation, its implications on resource degradation along with the prospects of some potential farming systems for sustainable land use. The authors have focussed on the North Eastern Hills (NEH) of India, where shifting cultivation is widespread and traditional.

ISSUES INVOLVED AND THEIR PRESENT STATUS

The land use system in shifting cultivation involves slashing the vegetation, burning the dried slash (Fig. 19.1), raising a mixture of crops on temporarily nutrient enriched soil for a year or two, fallowing the plot for the re-growth of natural vegetation, and eventual return to the same plot for another cropping phase after a few years (Ramakrishnan, 1992). It is used to be an appropriate and sustainable land use practice in diverse socio-economic set-ups, where the dependent human population was within the carrying capacity of a 10-15 year *Jhum* cycle. However, today, scientists view shifting cultivation as environmentally destructive and a faulty land use practice having very low input/output ratio. Shifting cultivation became unsustainable primarily, due to the increase in population that led to an increase in the demand for food. In order to meet the growing food demand, the *Jhum* cycle (the intervening period between two successive slashes) got shortened, which resulted in an overall decrease of crop yield (Anonymous, 1997). This necessitated in bringing more virgin forest areas under shifting cultivation. Thus, the vicious cycle continued



(a)



(b)



(c)



(d)

Fig. 19.1. Stages of slash and burn shifting cultivation (jhum). (a) Clearing of forest by felling trees. (b) Burning of leaves and other biomass in the field. (c) Heat generated due to high intensity fire causes damage to flora and fauna. (d) Farmers construct small temporary huts in jhum area for watch and ward of their crop.

and more forest areas were converted to wastelands, as a result of repeated *Jhum* having very short (often 2-3 years) cycles.

MAJOR TYPES OF SHIFTING CULTIVATION

1. Jhum Cultivation

Even today, shifting cultivation is the mainstay of the subsistence of tribal people (Table 19.1). Nagaland has the highest area under *Jhum* cultivation, followed by Manipur, Meghalaya and Arunachal Pradesh. *Jhum* is practiced in a highly complex system with wide variations in cropping pattern. The periodic work *Jhum* carried out in fields has been mentioned in Table 19.2. The cycle of agricultural operations in *Jhum* field includes (i) selection of the forest area before December by the entire village on the basis of the rotation of fields, (ii) cleaning the forest tract by cutting down the jungle during December –January and leaving chipped leaves and twigs to dry till February, (iii) burning the dried debris into ashes around February to mid March, before the onset of the monsoons, (iv) planting seeds of various crops in an intimate mixture with the help of a dibbling stick or sharp knives, (v) weeding, watching and protecting of crops, and (vi) harvesting, threshing and storing.

Table 19.1: Area involved (lac ha) and number of families engaged in shifting cultivation

State	Area involved	No. of Families
Arunachal Pradesh	2.61	54,000
Manipur	3.60	70,000
Meghalaya	2.65	52,290
Mizoram	0.45	50,000
Nagaland	6.33	1,16,046
Tripura	1.08	43,000

(Source: Anonymous, 2000)

Table 19.2: Periodic work in *Jhum* fields

Month	Produce harvested
January/February	Harvesting of chillies, brinjals, pumpkins, turmeric, ginger, other edible roots, shoots, leaves and ferns from old <i>Jhum</i> plot
March	Harvesting of bamboo shoots, from the new <i>Jhum</i> plot, which come up after burning. Harvesting of chillies, brinjals, pumpkins, turmeric, ginger, other edible roots, shoots and leaves from old <i>Jhum</i> plots.
April	Harvesting of chillies, brinjals, pumpkins, turmeric, ginger, other edible roots, shoots and leaves from old <i>Jhum</i> plots.
May	Harvesting of watermelons, cucumbers and maize from new <i>Jhum</i> fields and continuing harvesting from old fields.
June	Harvesting of sorrel leaves and continuation of harvesting cucumbers and water melons. No further harvesting is done from old <i>Jhum</i> fields.
July	Harvesting of maize, beans, millets, pumpkins (harvest begins and continues for 10 months). Also early rice is harvested.
August	Main harvest of rice in some areas. Continue to harvest vegetables, pumpkins, etc.
September	Main harvest of rice in some areas. Continue to harvest vegetables, pumpkins, etc.
October/December	Harvest vegetables, pumpkins, beans, soybeans and turmeric.

The most remarkable feature of shifting cultivation is that all essential crops like rice, maize, tapioca, colocasia, cucurbits, sweet potato, ginger, finger millet, cotton, tobacco and many others are grown in the same field in a mixed land use system, resembling the latest cafeteria system of cultivation. The large number of crop species are effectively managed over both space and time due to sequential harvesting throughout the year. The cultivators erect watchhouses, either on a raised platform or on tree branches, in their respective fields, for watching and protecting the crops. The field is used for a year for mixed cropping and subsequently, it is either abandoned or cultivated with one or two selected crops; occasionally some residual crops are collected from the abandoned fields. Owing to leaching, erosion and loss of fertility after one or two years (some time three years), the cultivated area is abandoned, a new piece of land is then selected to repeat the process, leaving the old one fallow for a period of 3-5 years. The average size of a *Jhum* plot varies from 1.0 to 2.0 ha, and the average family consists of 2 adults and 3 to 4 children. Collection of timber, cane and bamboo for house-building and making household tools and implements are important sources of income. Although practices under shifting cultivation vary widely in different parts of the North East, and the variability in practices are largely tribe-specific, shifting cultivation in any form, invariably involves clearing the vegetation, and then, slashing and burning the plant parts, including debris. The *Jhum* cycle plays a critical role in the natural regeneration and consequently, the *Jhum* economy. About 3-4 decades ago, shifting agriculture was quite sustainable as the forest was allowed to regenerate successfully. Due to shortening of the *Jhum* cycle, productivity has decreased drastically. The *Jhum* cycle has reached the critical limit in parts of Arunachal Pradesh, Assam and Mizoram, where it is as low as 2 to 3 years, even though the maximum range is from 4 to 10 years (Verma *et al.*, 2001).

2. Bun Cultivation

This system of *Jhuming* involves cutting shrubs and grasses, putting dried vegetation in the form of raised beds along the slope and covering the same with soil collected from the surroundings, burning the covered vegetation and planting it in the soil afterwards (Fig. 19.2). Although good yields of crops have been obtained through this system, yet it leads to large amounts of soil erosion. The *bun* size varies according to the hilly terrain and land availability. *Bun* is always prepared along the slope. A large variety of crops are cultivated, and as much as 14 crops are grown sequentially, in this system.

SHIFTING CULTIVATION IN THE NORTH-EAST – A CRITICAL ANALYSIS

1. Some positive aspects

Shifting cultivation helps conserve the rich cultural diversity, as *Jhum* is

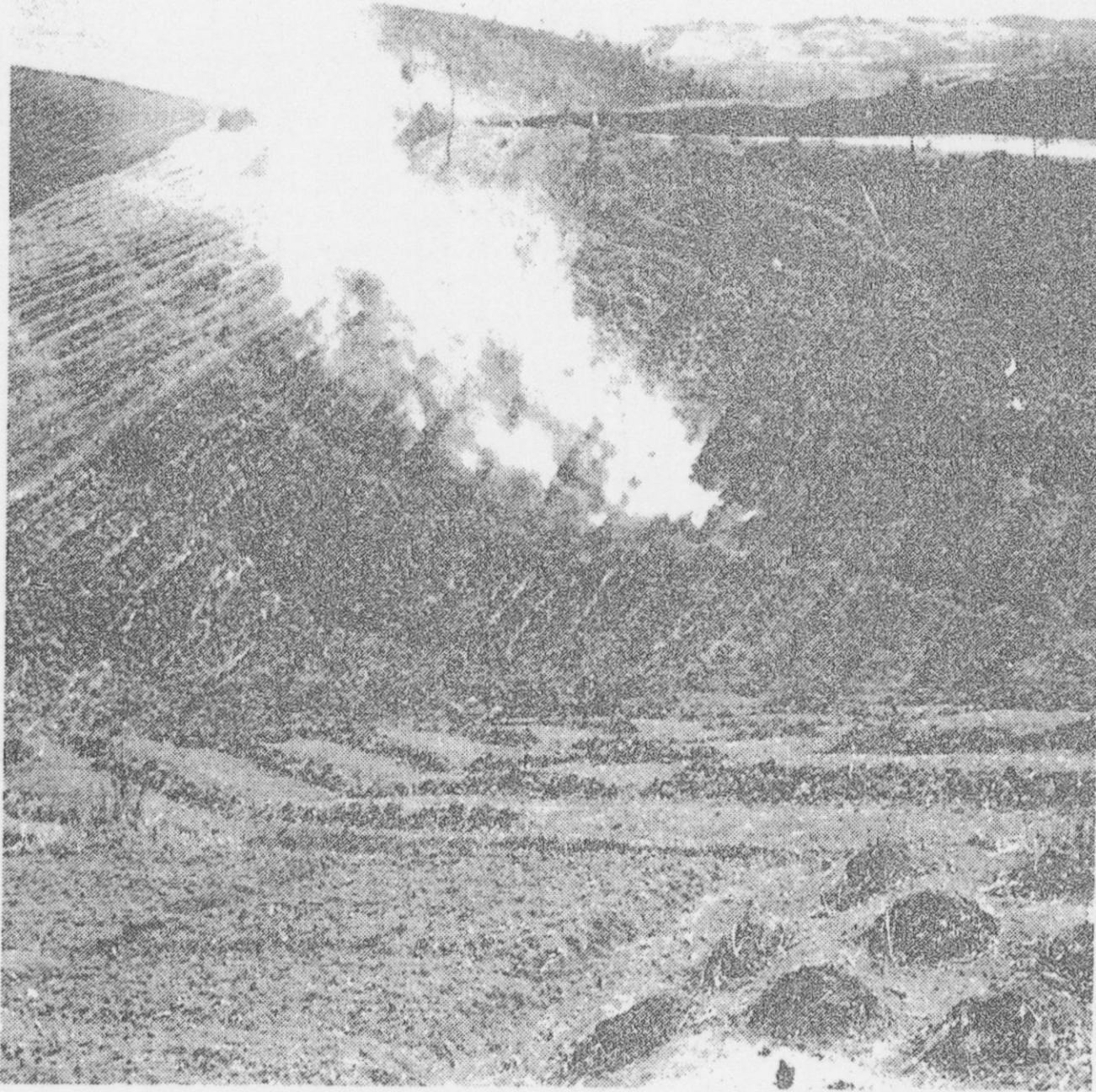


Fig. 19.2 : Traditional cultivation systems of NEH Region.
Bun a system of cultivation in jhum lands.

interwoven into the culture and tradition of more than 200 tribes which inhabit the North-East region. Shifting cultivation, being a labour intensive but low input based farming system, it provides an assured source of food security to the poor farmers of the hill region. Shifting cultivation, in its traditional form, might also have contributed towards the conservation of agrobiodiversity, particularly the germplasm of native crop varieties. The practice of shifting cultivation in the North-East also represents an effective form of land use, by way of optimum utilisation of space, where as many as 60 different types of crops are cultivated at a time, in the same plot. In the process, a small piece of shifting cultivation plot fulfills almost all the needs of the farmer and minimises his dependency on external inputs. Besides burning, various cultural practices of shifting cultivation help in controlling weeds, soil-borne pathogens and other diseases of crops. Given the difficult terrain of the North-East, application of modern technology has several limitations. *Jhum*, therefore, serves as a low external input agricultural technology.

2. The negative aspects

One of the most important negative environmental impacts of shifting cultivation is the damage that it causes to the soil system. Besides causing air pollution due to burning, shifting cultivation is also responsible for loss of soil nutrients and useful soil fauna and microbes. Burning of slash lowers soil acidity, organic

matter and total nitrogen, but enhances phosphorus and cations. Slashing, burning and subsequent cropping result in a significant reduction in the available carbon, nitrogen and magnesium, compared to the pre-cropped stage. Most shifting cultivation practices are a part of subsistence level farming system, having very low output/input ratio compared to other farming systems/methods. The clearing of forest areas for shifting cultivation, at regular and frequent intervals, results in the loss of primary forests and the formation of secondary forests. This causes substantial loss to tree diversity and the associated vegetation which are adapted to the primary forests. Due to the shortening of the Jhum cycle, quite often, the secondary forests also do not get adequate time to regenerate. The repeated use of land with short Jhum cycles, finally converts the Jhum fallows into degraded wastelands. Therefore, shifting cultivation is considered to be the single most important factor causing deforestation and forest degradation in the North-East. Incidentally, the largest wasteland area in the North-East comes under the category of shifting cultivation (Tripathi and Barik, 2003).

3. Status of Shifting Cultivation

There are varying estimates of areas affected by shifting cultivation, by different agencies. The area affected by shifting cultivation, in the North-Eastern region, was reported to be 3.81 million ha, by a task force on shifting cultivation (1983). Other such estimates are 2.80 million ha, by the North-Eastern Council (1975) and 7.40 million ha, by the FAO (1975). However, as per the State of Forest report (1999), the cumulative area affected by shifting cultivation, during the above period, was found to be 1.60 million ha. The extent of area under shifting cultivation is maximum (0.39 m ha) in Nagaland, followed by Mizoram (0.38 m ha) and Manipur (0.36 m ha). These states together, account for about 65% of the total area under shifting cultivation (Anonymous, 1999 - Table 19.3). According to these estimates, the area under shifting cultivation is between 2.80 million ha and 7.40 million ha.

Table 19.3: Area affected by shifting cultivation

<i>State</i>	<i>Geographical area (sq. km.)</i>	<i>Cumulative area of shifting cultivation (1987-1997) (million ha)</i>
Arunachal Pradesh	83,743	0.23
Manipur	22,327	0.36
Meghalaya	22,429	0.18
Mizoram	21,081	0.38
Nagaland	16,579	0.39
Tripura	10,486	0.06
Total		1.60

(Source: Anonymous, 1999)

Shifting cultivation has been the main source of livelihood for most of the tribes in North-East NEH Region, Shillong, and Eastern hills; and a substantial

portion of the total hill population exclusively depends on it for survival. On an average, 3,869 sq km area is put under shifting cultivation every year and an estimated 443,336 households earn their livelihood from shifting cultivation.

4. Land use and soil erosion

High rainfall and steep hill topography is always associated with problems of severe soil erosion, particularly when the land use systems have biotic interference. Quantitative facts on soil erosion hazards from soil erosion studies in the region, indicate that except for forestlands none of the other land uses are safe as they lead to land degradation (Table 19.4). The study also indicated that erosion and runoff increase with up to 45% slope, thereafter, it decreases linearly with further increase in the slope. The soil erosion from hill slopes (60-70%) under first, second year and abandoned *Jhum* was estimated to be 147,170 and 30 t/ha/yr (Singh and Singh, 1981). It is estimated that 181million tons of soil is lost every year from this region, due to this defective system of farming (Satapathy, 2003).

Table 19.4: Soil erosion hazards associated with various land use practices in NEH Region

<i>Land use system/practices</i>	<i>Experimental plot size</i>	<i>Soil loss (t/ha/yr)</i>	<i>Average annual rainfall (mm)</i>
Shifting cultivation	Small	30.2-170.2	1600
Shifting cultivation	Field	5.1-83.3	1600
Tuber crops on raised bed (bun)	Medium	40.0-50.0	1800
Pineapple cultivation along the slope (first 2 years)	Small	24.0-62.6	1600
Homestead areas	Field	6.8	1600
Mixed crop of maize and rice	Small	19.7-21.0	1600
Rice crop on slope	Small	32.9-45.0	1600
Bare fallow	Small	83.8	1600
Cropping systems	Medium	51.0-83.8	1600
Grass cover (planted)	Medium	10.83	1600
Natural bamboo forest	Field	0.04-0.52	1600

Note: Area of small, medium and field size plots were in ranges of 2-5, 16.40 and 69,000 m², respectively.

5. Some traditional environment friendly farming systems

Some potential indigenous farming systems of the region are the *Zabo System*, *Rice Cultivation of Apatani Plateau* (Fig. 19.3), *Agriculture with Alder Trees*, and *Terraced Rice Cultivation (Panikheti)* – Fig. 19.4), (Prasad and Sharma, 1994).

Zabo, which integrates forests, agriculture, livestock and fisheries with an efficient soil and water conservation base, is practiced in the Phek district of Nagaland. Organic base of farming is the characteristic feature of the *Zabo* system.

The *Apatani Plateau* in Subansiri district of Arunachal Pradesh is known as the rice bowl of the Apatani tribe, who cultivate wet rice with indigenous



Fig. 19.3 : Traditional cultivation systems of NEH Region. Wetland rice cultivation system practiced in Subansiri district of Arunachal Pradesh. Water collected from upper plots is channelized through lower plots and a specific water level is always maintained. The system represents a unique example of water conservation.



19.4: Traditional cultivation system of NEH Region. Panikheti, a system of wetland rice cultivation practiced in Nagaland and Sikkim. In this system also water is collected from top and channelized to the lower plots. Organic farming with long duration traditional rice varieties is practiced in both systems.

knowledge of land and water management. Another potential system is the farming of Alder (*Alnus nepalensis*), in and around agriculture fields, for the restoration of soil fertility and sustainable crop yield. It is even cultivated in *Jhum* fields. The practice is most popular among Angami, Chakhesang, Chang, Yungchinger and Konyak tribes of Nagaland. Khonoma village of Nagaland is proud of its plantation and Alder-based agriculture. Apart from this, Angami and Chakhesang tribes of Nagaland have developed a system of terrace rice cultivation (*Panikheti*). In this system, some forest area is retained at the hilltop to divert the runoff water to rice fields, through channels and sub-channels, while making terraces. Other major indigenous farming systems includes bamboo

drip irrigation, which is found in the Jaintia and Khasi Hills of Meghalaya. The system is highly efficient for water management. Water is carried with the help of different forms of bamboo pipes and further distributed into different bamboo sub-channels for use at the required site.

EFFORTS MADE TO CONTROL SHIFTING CULTIVATION IN THE NORTH-EAST REGION

Several *Jhum* and *Jhumia* rehabilitation schemes have been implemented in the North-Eastern region since independence, by the state and central governments, to control shifting cultivation in the region. The examples of such schemes are Watershed Development Projects in Shifting Cultivation Areas (implemented by the Ministry of Agriculture, Government of India), Soil conservation schemes of the Government of India, Tripura *Jhumia* Rehabilitation Scheme of the Government of Tripura and New Land-use Policy Scheme of the Government of Mizoram. However, most of these schemes have not been able to achieve the desired level of success.

The concern of the Government of India for controlling shifting cultivation is reflected in its agricultural and forestry policies from time to time. For instance, both the Forest Policies notified during the post-independent period, viz., National Forest Policy, 1952 (NFP 1952) and National Forest Policy, 1988 (NFP 1988) have emphasised the need to control shifting cultivation and rehabilitate the affected areas. The NFP, 1952 discuss "tree lands in agricultural areas and their importance in rural economy" (section 17) and the "concern for damage caused to forests by shifting cultivation" (section 23), and the NFP 1988, states the "concern for adverse effects of shifting cultivation on environment and land productivity" (section 4.7) and "to contain the areas already affected and rehabilitation through energy plantation and social forestry".

In order to deal with the problems of shifting cultivation, the Government of India has also constituted two task forces, one in the Ministry of Agriculture in the year 1983, and the other in the Ministry of Environment and Forests in 2001. Besides estimating the area under shifting cultivation in the country, the task forces have recommended a sustainable approach to manage shifting cultivation by adopting a holistic and integrated approach.

1. Successful experiments having potential to manage shifting cultivation effectively

Since independence several research and extension organisations in the North-East have been trying to develop alternatives to shifting cultivation. Such efforts have resulted in developing ecologically and economically viable land use models, having the potential to work as alternatives to shifting cultivation. These successful experiments need to be adapted widely, depending upon the local socio-economic and biophysical conditions. Some of these successful experiments tried in the North-East have been listed in Table 19.5. The list also

includes those successful practices which have been tried and standardised by the people themselves and have been successfully practiced for some time now, as alternatives to traditional *Jhum*.

Table 19.5: Some successful experiments to supplement shifting cultivation

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- ICAR 3-tier model (experiment by ICAR)
 - NEPED (Nagaland Environment Protection and Economic Development) (experiment by Government of Nagaland)
 - SALT (Sloping Agriculture Land Technology) (experiment by GBPIHED)
 - SWEET (Sloping Watershed and Environmental Engineering Technology) (experiment by SFRI)
 - Intensive watershed based livestock production system (experiment by ICAR)
 - *Modified shifting cultivation practices undertaken by Jhumias with the introduction of cashcrops like large cardamom, medicinal plants, broom grass, beetle leaf and beetle nut, cinamomum, fruit orchards and orchid cultivation (documented by RCNAEB and SFRI)*
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(Source: Tripathi and Barik, 2003)

FUTURE STRATEGIES FOR MANAGING SHIFTING CULTIVATION

There can be two approaches to successfully manage shifting cultivation in North-East India. Considering the socio-cultural importance of *Jhum* in the life of the people of the North-East, the best strategy would be to modify and improve the existing practices of *Jhum* cultivation. Alternatively, new alternative programmes can replace the existing forms of *Jhum*. While modifying the existing *Jhum*, the following aspects must be taken into account:

- soil and water conservation
- maintenance of soil fertility
- crop diversity
- food security
- high-yielding varieties of crops
- low volume and high value cash crops
- market links
- yield optimisation
- conformity with ecological principles

(Source: Tripathi and Barik, 2003)

In hill agroecosystems, agroforestry plays an important role in sustainability, resource conservation and food security. It combines elements of agriculture, whether crops or animals with elements of forestry in production system in its land piece, either simultaneously or sequentially. This land use system is particularly suitable for resource-poor marginal lands and even, for wastelands (Bhatt *et al.*, 2001). Foresters in the past have seen agroforestry, mainly in terms of improving the supply of forest products; agriculturists have seen it as a logical extension of traditional intercropping practices, as an aid to soil conservation measures and as plantation agriculture, such as tea plantations. Soil conservation specialists see agroforestry as a major tool in the maintenance of soil productivity,

and ecologists seek the increase in diversity that moving away from monocultures can bring. In rural development, the improvement of land use systems and thus, of rural income and well-being are the primary objectives. In a broader sense, the major function of agroforestry is associated with sustainability for the farmer, stability of resources, production and income, and minimisation of risk. The objective of sustainability is probably the most important function of such kind of land use systems (Bhatt and Verma, 2001).

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