Chapter 3
"Biodiversity Conservation is Favoured in the Forest and Farm Management Practised in Shifting Cultivation"

Biodiversity in the Eastern Himalayas

The eastern Himalayas are a part of one of 34 'biodiversity hotspots' in the world (CI 2005). This fact is appreciated more and more at the global level as a result of the increasing concerns about biodiversity conservation. However, although it has helped to draw attention to the eastern Himalayas, it has also strengthened the surge against shifting cultivation, as until very recently no one fully appreciated the contribution that shifting cultivators have and are making to the local biodiversity. As a result of the practices of slashing, burning, and fallowing, shifting cultivators are highly visible, and shifting cultivation is often blamed as being the main cause of biodiversity loss. But is shifting cultivation really as bad as it is claimed to be? There are many players and processes influencing conservation, and shifting cultivators are an easy scapegoat. In the following, several examples are presented of the different ways in which shifting cultivation can benefit conservation efforts.

How Does Shifting Cultivation Benefit Biodiversity Conservation?

Livelihood dependency

The range of products (and species) that shifting cultivators depend on for their livelihoods is much higher than for most other farmers, because they use their plots and other common resources to supply virtually all their needs. Most shifting cultivators are relatively poor and have little access to markets to purchase what they cannot produce. Their interest in diversity is not limited to species alone, but also to the wide array of landscape elements from which these products are obtained.

The different livelihood uses for the diverse range of products include food (variety is required to ensure both food security and quality of diet), medicine, fuelwood, fodder, agricultural implements, utensils, construction materials, cultural and religious uses, ornamental purposes, and, increasingly, commercial purposes. Tiwari (2003) has listed and classified according to use over 380 non-timber forest products in the shifting cultivation areas of the War Khasi region of Meghalaya (Table 1).

Table 1: Uses of non-timber forest products in Meghalaya

Type of Product	Number
Medicinal and aromatic plants	> 200
Edibles	> 80
Crafts	> 10
Construction and household materials	> 40
Dye and oil yielding	> 40
Others	> 10

Source: Tiwari (2003)

Some people think that the relative poverty of many shifting cultivators leads to too great a pressure on different species, but in fact if proper policies are in place, this dependency can turn farmers into the best conservers (Box 6). Any loss of species will have a marked impact on the farmers' livelihood and food security; thus they are willing to invest in conservation.

Box 6: Conservation of Germ Plasm of Preferred Food Crops and Livestock in Tuensang, Nagaland, India

In Tuensang, Nagaland, farmers make an effort to maintain good breeds of crops and livestock in their fields and to conserve germ plasm. The aim is to produce a wide variety of foods that are nutritious and tasty and available year round. A number of different varieties of each crop are cultivated depending on soil conditions and altitudes. This maximises crop productivity because risk is spread and species selection is adjusted to land capability. Farmers take the necessary measures to ensure that the crop seeds are never lost. They are exchanged from farmer to farmer and village to village. Shifting cultivators not only conserve crops, they also conserve many other plant and animal species.

Cultural values and requirements

There are many ways in which culture can influence the conservation of species and landscape elements. Particular species and ecosystems may have a religious or cultural value, or even be an object of worship, and be protected for this reason. The value can be intangible and difficult to comprehend for outsiders, but often cultural significance is actually linked to tangible benefits. Most of the species and areas that are worshipped or protected for religious reasons by shifting cultivators have important tangible benefits for livelihoods and/or ecological services. Culturally preferred species are often keystone species, which means that, like the keystone in an arch, they keep several other species in place. Loss of these species would cause the loss of several others in the same ecosystem (P.S. Ramakrishnan, personal communication in 2004). Examples include the chiuri tree (*Diploknema butyracea Roxb, syn. Bassia butyracea, syn. Madhuca butyracea, syn. Aesandra butyracea)*, which is a multi-purpose tree species with a strong cultural significance for the Chepang in Nepal; the *Macaranga* tree, which is valued by the Konyak in Nagaland, India; and sacred forests in general, which are common in many shifting cultivation communities.

The erosion of cultural values can lead to deterioration of sacred groves. In Meghalaya, India, for example, village communities traditionally set aside sacred groves and protected them, thereby conserving a significant amount of local biodiversity. In recent times, however, the erosion of traditional values and accompanying deterioration of sacred groves has become a matter of concern (Shankar Raman 2000).

Agricultural practices for agrobiodiversity and genepool conservation

Agrobiodiversity (the biological resources that support the agricultural production systems of every farming culture, the crops and livestock, and the agro-ecological processes of which they are part) is a vital subset of biodiversity. Shifting cultivators maintain high levels of agrobiodiversity in their farming practices. All the farmers in this study used complex practices of intercropping and sequential cropping in their agricultural fields and home gardens. Home gardens have developed in all eastern Himalayan countries; they harbour a great variety of species selected on the basis of intricate ecological processes (Figure 13). The farmers also had well-developed seed conservation practices which contributed to in situ conservation of agro-biodiversity and the overall gene pool. Some specific examples are described below.

Farmers apply intercropping and sequential cropping to produce a wide variety of crops within the limits of the resources available. They place a high variety of crop species (including shrubs and trees) on a single plot, with the specific selection based on the biophysical features and the farmer's requirements (Figures 14 and 15). Sequential cropping allows new species to take up the space vacated by species that have been harvested, while perennial species remain in the field. Different crops are selected in different years and planting seasons (Box 7). The selection depends on the availability and plant-specific requirements of nutrients, the suitability of combination with other species, and other plant characteristics. Crops like rice are more prevalent in the first and second year, while maize and millet are more prominent in subsequent years. In the later years, farmers plant higher-stature and more nutrient-efficient crops that are better able to compete with weeds.

E. Sharma

Figure 13: A home garden in Bangladesh with trees, shrubs, and other plants, and livestock

E. Kerkhoff

Figure 14: Multipurpose tree species are intercropped during the cropping phase

E. Kerkhoff

Figure 15: Crops of different shapes and sizes are fitted closely together

Box 7: High Levels of Agro-biodiversity Based on Intercropping and Sequential Cropping

Crop diversity in Ukhrul (Manipur, India) is as rich as in any shifting cultivation practices in the uplands of North East India. Crops include cereals, legumes, tubers, rhizomes, bulbs, spices, vegetables, oilseeds, and others. A total of 33 crops were recorded from these systems; 28 crops were grown in the first year, 26 in the second, 23 in the third, 18 in the fourth, and only 4 in the fifth year. The farmers explained that the decline in diversity by the fourth year is due to weeds, not a reduction in soil fertility.

In Mon district (Nagaland, India) rice is intercropped with taro (*Colocasia* spp.) to suppress weeds. Since rice and taro are the most important crops, many varieties are conserved. For example, nine varieties of rice and thirteen varieties of taro were found growing in Ngangching village at the time of study. Trees and many other crops are cultivated. Each crop has its specific location within the plot, including the boundary, burnt heaps, burnt bamboo groves, main field, near hut, and near poles and tree stumps.

The benefits of this practice are that a single plot can be used intensively for many different crops. This has a number of additional advantages, including that it is a valuable pest management tool; that the soil is covered at all times, which helps erosion control and weed suppression; and that certain species provide ecological benefits to others like nutrition or shading. The conservation value of these species should not be underestimated.

Tree seedlings of varied species are planted between other crops during the first year to grow up during the cropping phase. One of their roles is to enhance rapid forest regeneration in the first fallow phase. Crop combination and selection is adjusted according to the tree cover, and more shrub and tree species are incorporated in the later years.

In Ukhrul (Manipur, India), farmers' innovations like fireless shifting cultivation and extension of the cropping phase to more than two years were only made possible by the use of crop diversity maintenance, complicated crop combinations, and sequential harvesting.

In terms of genetic diversity, there are many land races, rather than hybrids, as well as many wild (endemic) varieties of important food crops. According to Darlong (2004): "*... the historical value of shifting cultivation is often seen in the context of the in situ conservation of so many varieties of edible food crops through the practice of shifting cultivation. ... It is often argued that had there been no shifting cultivation, perhaps many of these germ plasms would have been lost in the wild or would not have been possible to conserve as they are today*." Genetic diversity is maintained among communities through intricate seed exchange and conservation measures.

Farmers have extensive knowledge related to seed selection, preservation and exchange, which is the origin of so many crop species. Farmers actively preserve

local germ plasm, in the form of living material as well as seed (Figure 16). They maintain good breeds of major food crops, supporting crops, and animals. To increase variety, villagers exchange seeds through extensive networks. Box 8 describes an example of traditional seed storage.

Farmers in Bangladesh have developed a special indigenous method of preserving seeds. "The selection of seed begins during the previous harvest. At those places in the field where the harvest is unusually good, the fully matured and evenly proportioned paddy ears are harvested separately according to variety; they are then dried, threshed, winnowed, and finally put into a basket lined with special leaves...". (Brauns and Loffler, undated). Other criteria for seed selection are early maturity, high-yielding and disease-free crops, and preferred varieties.

Box 8: Seed Storage in Toimatai, Bangladesh

In Toimatai seed collection and storage generally fall in the women's sphere. Vegetable seeds are stored in dry bamboo pots (culms, internodes) and/or in dry gourd shells with the mouth closed and airtight; rice seed is stored in bamboo baskets. The women hang maize heads by the stalk, and beans over the kitchen fireplace. These seeds remain aerated at all times, while smoke protects them from insect infestation. Cereal seeds are often checked and periodically slightly re-dried in the sun. Stocks of ginger and turmeric are kept spread on the earth floor in a corner of the house.

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Figure 16: Farmers actively preserve local germ plasm

Rotation and fallows are a source of ecological diversity, as well as providing a wide range of products for farmers

Rotation is a fundamental characteristic of shifting cultivation and in itself is a good practice for combining conservation with agriculture. Since shifting cultivation creates a diverse landscape (compared with only primary forest or only agricultural fields), more habitats are created and therefore species and ecological richness are higher. Shifting cultivation promotes a series of landscape successions, which if left undisturbed would 'climax' to conditions very close to the primary forests. The result, on a landscape level, is a mosaic of secondary forests with a primarily native species composition. This is conducive to the needs of both wildlife and people. Though primary forests are important, farmers cultivate, collect, and hunt in all fallow stages.

Bamboo and cane are typical products of major livelihood importance that are obtained during earlier successional stages in the fallows, and that tend to disappear in primary forest vegetation. Thus the landscape variety is beneficial to livelihoods as well as biodiversity. Box 9 shows how this varied landscape favours the management of mithun cattle; rotational grazing is a well-known practice for managing livestock in forests.

Some very valuable species have become predominant because of shifting cultivation. Alder (*Alnus nepalensis*) is a pioneer species and occurs in recent clearings. Similarly, farmers' observations suggest that chiraito (*Swertia chirayita*), which is listed as a critically endangered species, prefers recently burned open places for germination (Maiti and Chauhan 2000). Chiraito is an economically important medicinal plant in Nepal, and the government promotes its cultivation by encouraging even non-shifting cultivators to burn the soil before sowing.

Box 9: Mithun Are Favoured by Rotation and Have Become a High Value Product in Khonoma

"The semi-domesticated mithun (*Bos frontalis*) roams Khonoma's forests. A mature beast is worth 10-12,000 rupees on today's market, which stems partly from a new ritualistic use – slaughtering great numbers of mithun during wedding ceremonies – that has developed in Nagaland's increasingly status-conscious society. Mithun free-graze the jhum-fields after the crops are harvested. Raising mithun in Khonoma's forests has become increasingly popular as a way to earn extra cash with little labour input. Mithun run free in the forest and are looked after communally by herdsmen. Many are owned by Khonoma descendants who have become government officials in Kohima, but continue to maintain property rights. In this way they benefit from community resources without investing any of their own labour" (Cairns 2004).

What Are the Opportunities and Constraints for Biodiversity Conservation in the Current Situation?

It is clear that biodiversity conservation is favoured in the type of forest and farm management practiced in shifting cultivation. The question is how this potential can be strengthened in the future, to strengthen the sustainability of shifting cultivation as well as for the benefit of both farmers and society at large.

The practices described above were taken from cases in all the countries included in this project. Crop diversity maximisation is a fundamental principle of shifting cultivation as are the rotating of plots, the forest fallows, and the typical customary institutions and knowledge. Some special considerations that should be taken into account for conserving biodiversity in shifting cultivation areas are summarised in the following.

Recognising the value of farmers' practices and innovations for agrobiodiversity conservation

The biodiversity nurtured in both the agricultural and fallow phases is useful to both farmers and the world at large. The germ plasm conserved in shifting cultivation provides the 'building blocks' for improved varieties of most modern day cereals. Shifting cultivators are the custodians of the germ plasm that conventional plant breeding depends on for the future.

Despite adjustments made to a new market and legal environment, farmers often try to maintain their principles of crop diversity and the use of locally developed varieties. This is not because they cannot part with their customs, but because it makes economic and environmental sense. Intercropping and sequential cropping make sense for reducing the risks of market dependency, efficient land use, soil conservation, and weed control. In some places, farmers grow a mixture of crops under introduced systems, such as orchards and plantations, for example in Empu para in Bandarban, Bangladesh (Figure 17). This has increased both productivity and ecological sustainability.

Many people fear that agrobiodiversity will be lost when farming adjusts to market forces, since subsistence farming is associated with risk spreading. In the case of shifting cultivation, the choice of crops is changing towards more commercial varieties, but since this change is occurring gradually, opportunities are created to avoid the loss of less important species. Many of the non-timber forest products used traditionally for subsistence have become commercial, and their importance for farmers' livelihoods is increasing.

Successes in enterprise development based on non-timber forest products are by no means universal, and obstacles are common, even in non-shifting cultivation areas. Farmers and collectors are often unable to obtain a fair share of a product's total value. Where no appropriate regulatory mechanisms are in place, many of these products have experienced 'boom-and-bust' cycles. A typical example is wild ginseng in Nagaland. At first it commanded a high price, then collection became 'free-for-all'

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Figure 17: Undercropping of orange orchards with traditional crops in Empu para, Bangladesh

and it was collected from the forests at a high rate, to the point of depletion. This happens when village institutions are powerless to stop community members (particularly the young) from plundering communal forests after they taste easy money. There are, however, also cases where, with proper local-level regulations and strong local-level bodies, farm income from non-timber forest products has increased, and so have local-level investments in their conservation.

The potential for strengthening the role of shifting cultivators in conservation of biodiversity does not just relate to non-timber forest products; it stretches from individual species to the ecological processes and landscape elements that sustain them. In Bhutan, shifting cultivation fallows are applied as a buffer to protect farmers, crops, and livestock against threats by wildlife. Farmers say that their permanent fields are better protected when wildlife makes use of the fallows and shifting cultivation plots. These plots are less productive anyway, because they are on more marginal land.

Conservation of a natural or a human landscape?

The objective of nature conservation is often thought to be to preserve ecosystems and landscapes in a state as close to the natural state as is possible (Sharma and Chettri 2005). However, the question “What is natural?” is highly relevant. Many apparently ‘natural’ landscapes have actually evolved or been maintained as a result of human activity over millennia. If the interventions ‘match’ rather than ‘remodel’ the landscape, e.g., promoting useful tree species, they tend to remain unrecognised. Shifting cultivation areas are cultural landscapes with their own

value. Shifting cultivation has transformed a great part of the 'natural' landscapes of the eastern Himalayas into cultural landscapes with their own unique biodiversity. It is now impossible to distinguish between 'natural' or 'pristine' forests and human influenced or 'secondary' vegetation. Equally, although shifting cultivation has been practised for a long time in the region, the biodiversity resources are very rich. This indicates that the people themselves are probably at least partly responsible for the wealth of biodiversity that is now present. Forest farmers are often found to have an enriching influence on natural vegetation.

Cultivated or protected areas for the conservation of threatened wildlife?

There are some threatened species that can benefit from shifting cultivation, even though they do not directly benefit the farmers. Hoolock gibbons, for example, prefer undisturbed primary forests in protected areas, but have also been found in the home gardens of Chandigre, where food availability is higher.

Shifting cultivation also benefits wild elephants, which prefer large spaces with grassy vegetation as well as forest patches. Due to their migratory habits, elephants often pose a threat to sedentary farmers, whereas the rotation practised in shifting cultivation enables people and elephants to use the same resources at different times. If elephant conservation were to be taken up in shifting cultivation areas, the cycles could be made long enough to allow for the different habitats they require. In Sri Lanka, the traditional plot pattern was changed from dispersed smaller plots to larger congregated areas for this reason (Dr. Eric Wikramanayake from WWF-US, personal communication). In the Garo Hills of Meghalaya, farmers have several elephant management practices in place, including tree huts for crop protection during the night (Figure 18), intact forest patches that serve as corridors (Figure 19), use of fire, and even an elephant repellent tree species at strategic locations.

Without doubt, there is a need to conserve primary undisturbed forests, and for these there is the protected area system. However, the park system has limitations for animal species that are migratory or that need a large area to fulfil their needs, as it does for forms of biodiversity supported by human practices. The formation of protected areas in areas formerly used for shifting cultivation has also increased the pressure on the remaining land, causing the shortening of cycles. Provided that shifting cultivators share in the benefits and maintain control over their resources, shifting cultivation can play a vital role in biodiversity conservation.

Policy Points

Some points that could or should be taken into consideration when developing policy are summarised in the following.

- **Shifting cultivation is much less destructive to biodiversity than settled agriculture.**

  The effect that shifting cultivation has on conservation should be compared with that of settled agriculture, which has caused the permanent destruction of large areas of natural vegetation. Because only limited biodiversity remains in

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Figure 18: Tree hut for crop protection during the night

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Figure 19: Elephant corridor in the shifting cultivation landscape

agricultural areas, settled cultivators are not expected to conserve wildlife or natural biodiversity. Shifting cultivators, on the other hand, are made to feel like intruders, although they actually combine agriculture with maintenance of a quasi-'natural' system. Outside settlers who practise slash-and-burn as a clearance procedure for permanent farming contribute to the bad name of shifting cultivators, but are vastly more harmful.

The advantages and disadvantages of several alternatives that are currently being promoted in the eastern Himalayas should also be assessed in this light. Commercial tree plantations have taken much of the land previously used for shifting cultivation, thereby increasing the pressure on the remainder. However, they are mono crops, and although they increase tree cover, they have a negative effect on forest conservation and overall biodiversity. For example, Darjeeling's *Cryptomeria japonica* plantations are currently seen as one of the greatest obstacles to biodiversity conservation.

- **Shifting cultivators' role in conservation, especially of agrobiodiversity and wildlife, should be acknowledged and supported, and their control over conservation efforts increased.**

  Considering shifting cultivators' role in landscape management and biodiversity conservation, and the impact of conservation activities on their land and livelihoods, they should be provided with some level of control over conservation activities that are introduced from outside. The communities in question must have the right to participate when development policies are framed, and when the parameters and definitions are being created. Farmers could be rewarded for environmental services, rather than depriving them of their resources (Box 10).

  The current practices and knowledge that are beneficial to the conservation of biodiversity and agrobiodiversity should be conserved and strengthened.

  Wildlife management practices can be strengthened and rewarded (Box 10). Fallow cycles can be adjusted to the needs of certain species that are part of the conservation objective. Traditional knowledge can be documented and put to good use for income purposes.

- **Objective research is vital to assess the effect of shifting cultivation on biodiversity and to increase its positive potential.**

  Too much research is done with the preconceived assumption that shifting cultivation is bad for the environment and outdated. Such research focuses on assessing the damage caused by shifting cultivation, but fails to recognise potential benefits. It is biased towards the general government stance that shifting cultivation will soon be a thing of the past.

  On the other hand, there are researchers who romanticise 'tribals' and their culture. They are sometimes blinded by the notion of the 'noble savage' who is

part of 'pristine' nature. Apart from the fact that this attitude is discriminatory, they fail to recognise the modern relevance of shifting cultivation, and the modern needs of its practitioners. Many scientists and influential people still demonstrate such attitudes; although well intentioned, it can be very detrimental both to objective research and to the shifting cultivators themselves.

Objective research is required on the role of shifting cultivation in biodiversity conservation. Biased research will identify all the species that may be lost due to certain practices, but does not consider those species that benefit. Both shifting cultivators and conservation efforts could benefit from objective research into the intricate relationship between shifting cultivation and a particular conservation goal. In any such research, shifting cultivation should not be seen in isolation, but within the broader picture of processes and stakeholders influencing conservation in a particular place. Scientists and policy makers should realise and research what will be lost if shifting cultivation becomes degraded or is abandoned.

Box 10: Environmental Services

Improved forest fallows play an important role in conserving biodiversity and deliver many of the same environmental services as primary forests, including soil erosion control and water source protection. There is thus a growing stream of thought that mechanisms should be devised to compensate forest-dwelling communities for the services that they provide in managing and maintaining tropical forests. While most funds for conservation come to communities in the form of development projects, rewards could take the form of payments for as long as the service is being provided. This provides a much stronger incentive to farmers to maintain the service than does any development project.