Chapter 4
"Shifting Cultivation is a Storehouse of Species of Commercial Value and Innovative Organic Farming Practices"

Commercial Mountain Products and Organic Farming

There is an increasing demand for subsistence farmers to integrate into the market economy. At the same time, there is an increasing demand for farming to be 'organic' (i.e. carried out without application of agrochemicals and using 'natural' techniques) and for organic farm products, which offers a possibility for subsistence farmers to enter the market economy while retaining their indigenous practices. If farmers can obtain premium prices for organic products, this can contribute to the rural economy. The challenge is to develop commercial products and organic farming practices that are suitable for the Himalayan environment. Shifting cultivators rarely adopt intensive 'green revolution' technologies such as agrochemicals and heavy machinery, mainly because such technologies are generally inappropriate for the shifting cultivation farming system, and partly because such technologies are poorly accessible. Thus in many places shifting cultivation, as other areas of subsistence farming, can be considered organic by default.

Farmers have already developed adaptations to enhance production based on their own principles and the limitations of their land. The case studies revealed that shifting cultivation is a showcase of organic farming practices that are adapted to the Himalayan environment. Shifting cultivators have developed some promising technologies and practices, which could be applied when adopting organic farming in other areas. Shifting cultivators also maintain a wide diversity of species on their land adapted to the Himalayan conditions, including some that are difficult to grow in sedentary farming systems or have been abandoned by agriculturalists focusing on a few high volume crops. Some of these are now proving to have high commercial value.

Commercial Crops and Organic Farming Techniques

Some examples of local niche products and innovative organic farming practices are provided below.

Commercial crops

Several important food and other crops of major commercial importance have originated from shifting cultivation systems (Figure 20). The benefit of these is that they are endemic and niche products with which farmers can compete on the world

Figure 20: Shifting cultivation is a storehouse of local niche products with commercial value – (a) Chiraito has become a major niche product in Nepal, (b) pulses in Manipur, (c) baharpatta, (d) rongas *(Vexa orelea)*, a food dye, in Bangladesh

market. Shifting cultivation crops with existing or potential commercial value include medicinal plants, several legumes, and bamboo. As market access is increasing, farmers are adjusting their crop selection more and more to incorporate commercial species.

In Chandigre (Meghalaya, India), squash (*Sechium edule*) is an important cash crop – it is available for seven months of the year and can be harvested continuously. In Tuensang (Nagaland, India) crops like rajma (kidney bean), French bean, and soy bean not only serve to improve soil fertility, but have become important commercial crops. The bay leaf tree (*Cinnamomum tamala*) is a medium-sized native tree of the subtropical humid forests of North East India. In the War area, it has emerged as a husbanded and semi-domesticated wild tree. The leaves are used as condiments and yield essential oil. Trees growing in the wild are protected and helped to regenerate; in some areas, it is cultivated. The tree is grown together with betel, jackfruit, wild pepper, and timber trees.

Toko (*Livistona jenkinsiana*) is a multipurpose palm tree of medium size, which is grown in special toko gardens (some more than 100 years old) in the villages of Mon (Nagaland, India). Its leaves are important for roofing and its fruits are consumed during the lean period. Wild leafy vegetables that grow underneath are also consumed. In remote areas, toko leaf has a market value, but prices are going down in areas where tin sheet is used for roofing. Perhaps a new use might be found once tourism develops.

In Nalbu (Taplejung, Nepal), the medicinal plant chiraito (*Swertia chirayita*) has become a product of major economic importance in the last decade. The number of farmers involved in its production increases day by day, and production levels are currently at five tonnes per year. It has been domesticated locally by farmers who say that it grows best in shifting cultivation fields, particularly after burning. Nowadays, fallows and community forests are planted with chiraito.

The chiuri tree (*Diploknema butyracea*) has been domesticated by the Chepang of Nepal, but its economic importance spreads to a much more extensive area. It is used for fruit, ghee, fertiliser, pesticide, and fodder purposes.

Large cardamom (*Amomum subulatum*), ginger (*Zingiber officinale*), and bahar patta (*Eryngium foetidum*) are three introduced species that have been adopted successfully in shifting cultivation farming systems.

Soil and water conservation

In organic farming, it is necessary to pay careful attention to techniques for soil, weed, and pest management, as mistakes cannot simply be compensated with chemicals. Shifting cultivators have developed such techniques from centuries of experience. Farmers in Tuensang (Nagaland, India) show extensive knowledge of soil fertility management; the cropping of leguminous crops and tree species compensates for the nutrient losses in crop fields. Crop combinations used during various years of cultivation match the soil capability with the fertility requirements of the various crops.

Intercropping of maize with a variety of legumes (cowpea, black gram, common beans, soybean, and horse gram) is a long-standing practice for the Chepang in Dhading, Nepal (Figure 21). Marketing of the beans is a recent development, but the agricultural practice is not. Rather than pulling the beans at harvest time, the stalks are cut and the stumps and roots are left in the ground to decompose and add nutrients.

In Chandigre (Meghalaya, India), vegetables such as pumpkin, and sometimes sweet potatoes, are used effectively as ground cover to suppress weeds. Farmers cut and dry thatch grass (*Imperata sp.*) and lay it on top of the ground as a mulch to suppress weeds, particularly in beds of ginger and turmeric. The latter are erect emergents, and thus grow undisturbed, thereby reducing the labour requirement. In other home gardens, farmers consciously choose taller crops with erect forms, like maize, roselle (*Hibiscus sabdariffa*), taro, or chillies, which are less susceptible to weeds (Box 11).

Minimum tillage, although it sounds uneventful, is an important soil conserving practice on sloping land. Dibbling is a technique whereby farmers make a small hole with a dibbling stick, called ‘dao’ in North East India, and then throw in the seeds (Figure 22). In Sankhuwasabha, Nepal, this is even practised on unterraced land of more than 45-degrees slope. This is quite challenging for farmers since they have difficulties in planting; they hold the dibbling stick in one hand and maize seed

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Figure 21: Growing a variety of legumes together with maize on steep slopes in Dhading, Nepal

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Figure 22: Dibbling is an example of minimum tillage that prevents soil loss

Box 11: Rice and Taro in Mon, Nagaland, India

Rice and taro are two of the most important crops in Mon. Intercropping seems unlikely because taro is a wide-leaved crop that could overshadow the rice. However, Konyak farmers take advantage of certain crop features for productive interaction. Rice is erect while taro is broad leaved, and rice has fibrous superficial roots, while taro has deep rooting tubers. Both are sown at the same time, but the rice germinates much ahead of taro covering the entire field. This process suppresses the growth of taro, which does not emerge in time to compete for sunlight. The taro emerges later and only reaches full coverage after the rice has been harvested.

Mixed cropping of rice and taro has also been reported among the Khasis and Garos of Meghalaya, India. In Ukhrul (Manipur, India), in fields that are five years-old or more, maize is the dominant crop, grown in combination with tall varieties of rice, beans, taro, and pumpkin.

in their mouth and dibble seeds directly from their mouth. In some areas, farmers also tie a string at their back and sow the seeds.

Most shifting cultivators apply a wide variety of soil and water conservation measures in combination (Box 12). Structural measures include furrowing in Bhutan and contour bunding in Nepal and North East India (Figure 23). In Nepal, two technologies have been introduced successfully that were based on principles of intercropping and other traditional measures. Contour hedgerows (sloping agricultural land technology) have the potential to control soil erosion and improve crop productivity, and strip cropping has the potential to improve soils and provide direct cash income.

Box 12: Traditional Soil and Water Conserving Practices in Taplejung, Nepal

Farmers have the following good practices: water channelling, stone walling, terracing, controlled burning, leaving trees in the crop fields, use of farmyard manure or composted leaf litter, removal of weeds, fallow management, mulching, rotational cropping, and growing of legumes. In addition, farmers monitor the soil fertility status of their farm through indicators such as lower crop production levels, occurrence of certain weeds, and soil dryness.

Settled farming as practised by newcomers who do not know how to practise shifting cultivation can be detrimental both to the environment and to people's livelihoods. This is shown in a case from Bara Dalu village in Khagrachari, Bangladesh. Inappropriate land use for commercial vegetables and tuber crops has had a damaging effect on the environment in the hills. The root crops planted by the migrants from the plains require 'double scoop', in other words deeper digging, as well as weeding and the use of chemical fertilisers. These farmers do not know about appropriate compensatory soil erosion prevention measures for this type of land. Growing crops in this way has a devastating effect on soil and water conservation, resulting in lower water yield, soil erosion, and sedimentation at mini watershed level. In contrast, Marma shifting cultivators allow some naturally growing herbaceous plants to grow, because they help in controlling soil erosion, retaining soil moisture, and

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Figure 23: Contour bunding in North East India

improving soil fertility. When the field is free from weeds and at the end of the heavy monsoon, farmers plant sweet potato (*Ipomoea batata*) as a relay crop, which covers the soil after the herbaceous weeds dry up at the beginning of the drought period.

Controlled burning

The use of fire is an integral part of shifting cultivation, and helps in the organic management (Figure 24). The environmental movement tends to focus on fires as an indication that shifting cultivation is bad, but fires are not necessarily harmful, especially when they are controlled. Burning of slashed vegetation is only carried out once in the jhum cycle of many years, although some communities also burn crop residues before planting in the second year. The main reason that farmers use fire is that it enables them to manage soil fertility and control weeds and pests in a labour efficient manner. Use of fire is one of the major reasons that use of agrochemicals can be avoided. As explained above, most of the nutrients in rainforests are stored in the vegetation. These nutrients are returned to the soil through slashing and burning. If the slashed material was simply left to decompose, the nutrients would not become available for a long time, and cropping would not be possible. Although the slashed matter could be chopped finely to hasten decomposition, this would be too labour intensive.

Suppression of weeds is also of vital importance, as weeds (rather than soil fertility) are the main factor limiting the length of the cropping phase. Burning suppresses weed growth, but even so weeding takes up most of the time in the farming calendar. If weeds and pests had to be removed by hand at the start of the cycle, it would take much more time than the few hours it takes to burn them, and later chemicals would have to be used.

Insect pests, particularly soil-borne (i.e. eggs or 'hibernating' forms) are also eliminated during burning. By the time natural re-colonisation takes place, the crops in the jhum fields will have germinated well, and are less vulnerable to damage. Many farmers smear the crop seeds with a mixture of soil and ash before sowing to 'mask' them from birds. In this way seed loss is significantly reduced.

Although burning is used to capture the nutrients from the slash, many nutrients are lost with the smoke. One way farmers try to reduce nutrient losses is through controlling the intensity of burning and keeping the fires small and low. In Bhutan and parts of India (Arunachal Pradesh and Meghalaya), the slashed material is covered with soil before burning (Figure 25).

Another hazard that comes with burning is the risk of forest fires. Shifting cultivation communities have developed local fire prevention mechanisms which adequately reduce the major risk of fires spreading into forests and other nearby areas.

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Figure 24: Controlled burning

P. Gyamtscho

Figure 25: Covering slash with soil prevents nutrients from going up in smoke

Common technologies include choosing the appropriate timing (season as well as hour of the day) and fire lines, which are dug either around areas that need protection or around the fields to be burned. In Bangladesh, a buffer forest is maintained around villages to protect them against fire. In Nepal (Nawalparasi district) counter firing is practiced in which two fires are set up against each other, to prevent both from spreading and to reduce the labour required for control measures.

While the use of fire is a contentious issue in shifting cultivation areas, in other parts it is considered a common and useful silvicultural practice, including by the Indian forest service and in the teak plantations in Myanmar. Forest officials and newly immigrated farmers can cause forest fires when they burn their fields or trees, because they do not have experience and cannot mobilise whole communities for help. This they could learn from shifting cultivators. In Bhutan, controlled burning is even used in annually cropped rainfed land (Figure 26).

What Are the Opportunities and Constraints for Organic and Commercial Farming in the Current Situation?

Shifting cultivation farming systems are a storehouse of crop species of commercial value and of innovative organic farming practices. Shifting cultivators demonstrate an intimate knowledge of the qualities of and cultivation techniques for a high number of crop species.

In view of this, the persistent misconception that shifting cultivation is 'backward' or 'irrational' and in need of modernisation should be changed. Permaculture is a modern form of organic farming and agroforestry based on the criteria of keeping the soil covered at all times, imitating nature by intercropping a wide variety of species, and optimising space by maintaining multiple vertical layers. All of these criteria are matched by shifting cultivation practices. Efforts to maintain agrobiodiversity are even shown in recent farmer innovations like home gardens and orchards. Fruit orchards, although introduced from outside, are intercropped by farmers with a variety of other species.

Promotion of commercial crops from shifting cultivation

In most shifting cultivation areas, there is insufficient market and infrastructural development to support commercial farming. Some initiatives already exist for cash crop farming, including orchards and other major cash crops, but these have disadvantages as the land needed is taken from areas previously used for shifting cultivation, thereby upsetting existing tenurial arrangements, and there is little retention of economic benefits locally. As efforts are needed anyway for market development, it might be beneficial to look into the opportunities offered by niche products, rather than focusing on crops such as pineapple, rubber, tea, and coffee for which competition on the world market is very strong.

Shifting cultivation is a storehouse of innovative commercial crop species that could be exploited for commercial purposes at a much larger scale (Figure 27). Shifting

E. Kerkhoff

Figure 26: Burned annually cropped rainfed land in Monghar, Bhutan

G. Chakma

Figure 27: Upland rice is increasingly intercropped with sesame and cotton in Bangladesh

cultivators have found markets for crops that were previously grown for subsistence purposes, and increasingly adopt commercial crops to sustain their livelihoods (Figure 28). Those described above represent just a few of the native species that have developed from the shifting cultivation systems themselves, rather than being introduced. The advantage is that they are most prevalent in the eastern Himalayas, and nowhere else in the world. This makes them niche products with which farmers can compete on the world market. These crops have been manipulated and improved by the farmers through their systems of seed selection and management, and are thus a part of the farmers' intellectual property.

Acknowledgement of shifting cultivation produce as organic

Shifting cultivation is mainly organic in the sense that little or no chemical pesticides or fertilisers are used. The per hectare consumption of chemical fertilisers (N, P, K and N+P+K) for cropped area during the year 1999/2000, was only 2.8 for Nagaland, and 2.0 for Arunanchal Pradesh, as compared to 95.6 for India as a whole (DoF undated); and in Nagaland, for example, no plant protection chemicals are used, the Department of Agriculture only produces chemicals for research use. Still, it will be a long time before farmers will be able to get a premium price for their products, or indeed a reasonable price at all. Besides the existing market requirements, each and every process in the farming and processing needs to be certified and externally verified, in order to get the premium price for certified organic produce. Organic farming is for the benefit of the world at large, however, and therefore certification and premium pricing could be pursued as a long-term objective.

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Figure 28: Local markets for traditional shifting cultivation products

One of the short-term benefits of shifting cultivation being organic is that other (permanent) farmers may discover technologies and crop species available in the system that they can use to help make their own farms organic. Good organic farming practices could be identified and studied in shifting cultivation areas and be used to improve other farming systems that are having trouble in maintaining organic standards, while at the same time managing pests, weeds, and soil fertility. In Kachin state, Myanmar, knowledge about biological methods of insect control is slowly vanishing, while newly introduced options are not yet taking effect. Similar cases can be found all over the eastern Himalayas, and such knowledge should be studied and captured for future use.

As explained above, controlled burning is one of the main practices enabling farmers to avoid the use of chemicals. However, it is a controversial issue, as most existing certification agencies do not accept any land that is periodically burned as organic because there is no control over the chemical composition of the soil. On the other hand, state policies to subsidise chemical fertilisers, pesticides, and other inputs are a strong disincentive against the adoption of more organic farming methods. Even permanent cultivators would probably become more interested in integrating nitrogen-fixing trees or pulses into their land-use systems if they had to pay the true cost of external inputs.

Fire management

Existing controlled burning and fire control practices should be fortified by policy measures. A good example was found in Bhutan, where a 'resoop' is recruited from each community to work as a salaried forest caretaker. This person is informed of any burning and mobilises the community at the site. Together with the men and women involved, they ensure that no fire outbreaks occur. A case from Mizoram is presented in Chapter 5, describing the institutional difficulties involved in changing from a community-based to a government-based fire control system.

Fireless shifting cultivation has been tried out in several countries. Simply doing away with the burning as part of the cycle is not possible; fireless shifting cultivation requires several major changes in the system as a whole. The case from Nepal reported that it was mostly practised for bush fallows, rather than forest fallows with big trees. In a case from India, there was a major shift in the season and timing of the cropping phase, which caused constraints in the organisation of labour as the peak season was at the same time as the season of the rice terraces. Adaptations in crop selection were also needed, with only legumes being grown in the first year. While farmers may be encouraged to practise fireless shifting cultivation due to outside circumstances, it is not as easy as it seems.

Without closing our eyes to the current problems in shifting cultivation, the innovations by shifting cultivators that are in line with current government programmes should be appreciated. In other words, shifting cultivators have been doing many of the things that governments want them to do, but in a way that fits with local circumstances. Overall, traditional agroforestry practices are one of the

main tenets of the shifting cultivation system. Shifting cultivators are contributing their portion to adjust to markets and develop commercial farming, and they have tried out innovations like orchards, cash crops, and rice terraces wherever appropriate and have developed innovations to maintain the length of the fallows and practise fireless shifting cultivation.

Policy Points

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

- **The value of farmers' innovations to improve shifting cultivation should be recognised.**

  Changes should be made gradually, in the form of do-able technologies that fit within the main principles of shifting cultivation, rather than complete conversion (Box 13).

- **Niche products should be prioritised for marketing research and development.**

  An enabling environment should be created, including roads and other infrastructure, access to credit, stabilised prices at the farm gate, appropriate land tenure arrangements, and research and development into post harvest technology and product development.

- **Organic farming can be promoted in many ways.**

  Existing good practices can be identified for adoption in other farming and forestry systems. New settlers can be taught about appropriate practices from shifting cultivation, rather than making shifting cultivators convert to practices from the plains. And lastly, shifting cultivation products could be promoted as organic and premium prices pursued.

- **The value of controlled burning as an agricultural and silvicultural practice should be appreciated.**

  Regulations on the use of fire should be reconsidered and farmers and forest officials should learn from each other about the most appropriate burning techniques. The effect of burning on agricultural products should be more widely understood so that shifting cultivation products can be certified as organic.

Box 13: What is an Innovation?

We need viable solutions to address the increasing marginalisation of shifting cultivation, and the vulnerability of its practitioners. Viable solutions should reflect a high degree of pragmatism and flexibility, particularly the ability to adjust to the ever-changing markets. At the same time they should safeguard the strengths of traditional practices. Such solutions will have a high degree of acceptance and replicability (Jamir et al. 2004).