This series of working papers is intended to provide information and to generate fruitful discussion on key issues in the sustainable and equitable use of plant resources.

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Applied Ethnobotany: case-studies from the Himalayan region

Y. Aumeeruddy-Thomas & Pei Shengji
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The People and Plants Initiative has, since 1992, developed a series of field projects aimed at finding appropriate conceptual frameworks, approaches and practices for the management of plant resources, building both on indigenous local systems and on scientific knowledge. Applied ethnobotany using community-based approaches has been used to address major conservation and related development issues at each site. Case-studies giving precise descriptions of processes, methods and approaches have been published in the People and Plants working paper series, including work undertaken in Indonesia (Aumeeruddy, 1994), at Bwindi National Park, Uganda (Cunningham, 1996; Wild and Mutebi, 1996), in Loita, Kenya (Maundu et al., 2001), and around Mt. Kinabalu, Sabah, Malaysia (Martin et al., 2002). This working paper is a compilation of case-studies undertaken under the People and Plants UNESCO-ICI-MOD Hindu Kush-Himalaya project, the major aim of which was to promote applied ethnobotany in the Himalayan region and to encourage the sustainable management of plant resources.

It is important to emphasize that ethnobotany has an especially important role to play in the development of mountainous areas such as the Himalayas. People in rural Himalayan societies are highly dependent on natural resource use, due to isolation, and relatively poor access to arable lands. Over time, they have developed knowledge about the utilization of diverse biological resources. They also possess substantial information regarding soils, climates, vegetation types, stages of ecological succession, land use, etc., and in many cases have developed mechanisms or techniques for maintaining biological diversity (Pei, 1994, 1998; Lama et al., 2002). Although they live in remote areas, Himalayan mountain dwellers also have much ‘external knowledge’ of the ways and habits of neighbouring societies with which they have interacted for trade or for political and cultural reasons over centuries (Fisher, 1987).

The economic system of the Himalayan region is characterized by self-sufficient and self-reliant subsistence, and agroforestry based upon extremely diversified land use, bio-resources and human culture. This region is also characterized by secular trade exchanges between highlands and lower valleys.

Regenerative biological resources have been managed since ancient times by local people in the mountain regions, for agriculture, horticulture, animal husbandry, forestry products, herbal medicine, hunting, rituals, cultural needs, and almost all of their subsistence needs. For them, the mountain habitat provides a means of survival, not just an area from which resources can be exploited for short-term benefits. Over the past two decades, however, environmental and cultural changes, and economic development in the mountain region have accelerated, with a serious impact on its natural resources.

Practices of plant collection by local communities may be unsustainable and lead to over exploitation. For instance, a large number of households in rural and remote areas of Nepal depend on the collection of non-timber forest products (NTFPs), especially medicinal and aromatic plants (MAPs) for sustaining livelihoods through collection of these products for trade (Edwards, 1996; Olsen and Helles, 1997). Evidence of overexploitation by commercial collectors has been demonstrated in Dolpo (Aumeeruddy et al., 2002) which contradicts the assumption made by Olsen (1999) that collection by commercial collectors is sustainable and that they regulate their practices, access to resources and regeneration of plant populations. There is thus a need for balancing local knowledge with scientific knowledge to ensure long-term planning and conservation of plant resources.

Traditional knowledge systems are hundreds or even thousands of years old, and are still evolving. They involve not only the knowledge of plants for medicine and food, but also include strategies of protection for the utilization of plant resources as well as management systems.
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In this respect, ethnobotany will play an important role in the future in documenting and describing traditional knowledge about medicinal and edible plants, and their uses in different ecological zones and human Himalayan societies as well as at the global level (Pei, 1996).

This paper aims to show how applied ethnobotany may lead to a better understanding of resource management in this region. The authors of this working paper have attempted to draw lessons based on their own understanding of resource use management in the Himalayas.

**Ethnobotany**

*What is it?*

Ethnobotany is a multi-disciplinary science encompassing botany, anthropology, economics, and linguistics, which studies the ways in which a society relates to its environment. These relationships can be social, economic, symbolic, religious, commercial, and artistic.

Ethnobotany was originally based largely on qualitative methods such as inventories of plants and their uses, with a major focus on the economic importance of plants. This approach is largely associated with colonial periods in western countries where explorers and scientists had a major interest in finding new plant resources (Davis, 1991; Schultes and von Reis, 1995).

Ethnobotany moved on to the understanding of knowledge systems through the use of anthropological methods and the work of Conklin (1954, 1957) who coined the word ‘ethnosciences’, and the work of the famous anthropologist Levi Strauss (1962) which highlighted the structural relationships between each society and its environment, followed by the work of many other anthropologists such as Berlin et al. (1974) and Ford (1978). Further avenues were explored by other researchers who began to develop quantitative methods for estimating amounts of products used, the distribution of useful species, or the relative importance of different values of products to people (Prance et al., 1987; Phillips and Gentry, 1993 a and b; Caballero, 1992; Höft et al., 1999). Besides developing quantitative methods, ethnobotany has moved towards a wider approach, including other aspects of the natural world. Ethnobotanists quite often identify themselves more and more as ethnoecologists or ethnobotanists because these disciplines offer more opportunities to analyse human interactions with the overall environment as well as people’s relation to external factors such as the impact of trade systems on local economies and ways of life (Lama et al., 2002).

Traditional management systems and their relationships to larger economic systems have been the subject of numerous studies using ethnobiological methods (Johnson, 1980; Brush, 1980; Alcorn, 1984; Altieri et al., 1987; Bâlée and Gely 1989; Aumeeruddy, 1994; Pei and Sajise, 1995). All these studies give much attention to conservation practices underlying local practices, local institutional background, conflicts of worldviews and value systems.

Since 1992, the People and Plants initiative has coined the phrase ‘applied ethnobotany’ which actually relates to studies and methods which enable work with the knowledge holders in a participatory way, to analyse knowledge and set up improved management systems which build on local sets of practices and social dynamics (Martin, 1995; Hamilton, 1997; Cunningham, 2001). Applied ethnobotany also strives to bridge the gap between traditional knowledge and scientific knowledge and to understand the relationships between local practices and knowledge systems and policies, rules and economic trends at the national and international level. Work in applied ethnobotany in the Himalayas relates to the study of agroecosystems and shifting cultivation, medicinal and non-timber forest product (NTFP) management (Jain, 1996; Shinwari et al., 1996; Shrestha et al., 1998, Pei et al., 1997) and the cultural dimension of resource use (Pei, 1994). The most recent work in applied ethnobotany in the Himalayan region is a comprehensive case-study undertaken by WWF Nepal at Shey Phoksundo National Park. This explores the relationship between traditional health-care systems and plant conservation, and demonstrates how local knowledge may be used to develop new creative management systems (Lama et al., 2002).

*Why is it important?*

The contribution of applied ethnobotany is not limited to pure science, but has an important role to play in understanding the dynamic relationships between biological diversity and social and cultural systems and their development.

Ethnobotanists are in a position to collaborate with a network of people from different cultural and social contexts, including academics, NGO workers, and government agencies, and can transcribe the knowledge of those who are actually the local knowledge-holders. The role of ethnobotanists is therefore to bring a larger perspective, whilst remaining open about how the knowledge recorded will be used in the future. It is important that results are shared with the communities at every stage of the research process. Participation as described by Pimbert and Pretty (1995) lies at many different levels, and ethnobotanists should therefore decide jointly with the knowledge-holders what levels of participation are actually most appropriate in order to reach agreed objectives and prior consent as how the recorded knowledge will be used.
Ethnobotany as an interdisciplinary science is in a position to contribute much to plant conservation. This includes a precise understanding of local social dynamics, institutions, and different values attributed to resources. These values may be symbolic, religious or political for a given society, whilst the same plant resources may represent only an economic value for other societies or for other social groups within the same society (Aumeeruddy, 1994). Maximum effort should be made to document and integrate indigenous knowledge about land use, vegetation and forest management, non-timber forest products, medicinal plants, agroforestry, home-gardens, swidden agriculture, and biodiversity.

Ethnobotanical approaches enable the establishment of close dialogue and communication with local people, and may ultimately facilitate the elaboration of management plans which ensure participation by local people and avoid having an adverse impact on their life and their environment (Martin, 1995; Pei and Sajise 1995; Cunningham, 2001).

The Hindu Kush-Himalaya Ethnobotany Project

The Hindu Kush-Himalaya Ethnobotany Project started in July 1995 as a joint operation of the UNESCO People and Plants programme and ICI-MOD (the International Centre for Integrated Mountain Development) with funds-in-trust from DANIDA (the Danish Agency for Development Assistance), for a duration of three years.

The Hindu Kush-Himalaya Ethnobotany Project had three major functions: providing training, supporting small case-studies, and networking.

The project emphasized the application of ethnobotany in community development and conservation. Over three years (1995-1998), the following interrelated activities were carried out:

(a) organization of field training workshops on ethnobotany and the sustainable use of plant resources at a national and sub-regional level, and the publication of proceedings as resource material;
(b) provision of small grants to young ethnobotanists and research institutions to facilitate their involvement in community development programmes;
(c) provision of small grants to graduate students for field research in ethnobotany and the sustainable use of plant resources;
(d) provision of travel grants to young researchers from all over the region in order to facilitate greater professional interaction and exchange.

A thematic approach was adopted for addressing important issues at the interface of conservation and community development. This encompassed work in the following broad areas:

(a) cultural context of natural resource management;
(b) over-exploitation of high-value non-timber forest products, including medicinal plants;
(c) traditional agroforestry systems;
(d) people/protected area interface.

The major thrust of the project has been on human resource development. The training in ethnobotanical methods of young researchers and workers involved in conservation and community development programmes at the field level was the most important objective of the project’s first phase.

Six, week-long training workshops on applied ethnobotany were attended by nearly two hundred participants. In addition, more than twenty-five investigators have been involved in the small grants and case-studies, and the resulting projects have contributed to a greater understanding and recognition of various aspects of the ethnobotanical knowledge of the people (see references of workshop proceedings in Annex).

Furthermore, over the three-year duration of the project, an informal regional network of ethnobotanists, conservationists, researchers, development workers and protected area managers has grown to more than 300 co-operating participants who are involved in exchange of information through publications, workshops and other channels.

Case-studies

Descriptions of all the case-studies which were carried out were compiled by the authors and were based on the original reports (for which full references are given in the Annex). The discussion of the lessons learned from these case-studies is important in order to improve future work in the subject area and to examine how ethnobotany can actually contribute to the analysis of community-based management systems, particularly medicinal plant resources.

The impact of socio-cultural, economic and environmental changes on the traditional use and management of medicinal plants is discussed, as are the possibilities for further projects which could benefit community development and conservation in the region. However, because time and available funds are limited for these case-studies, this project is more of a learning process than standardized research. For more details regarding the ethnobotanical methods used in these case-studies and suggestions for applications in the Hindu Kush-Himalayas, refer to a companion discussion paper by Ajay Rastogi (1998).
Resource management in the Himalayas: case-studies compiled and lessons learned

Yildiz Aumeeruddy-Thomas

The ethnobotany of fruit plants and its role in conservation and community development in Droph Valley, Chitral (Hindu Kush-Himalaya Region) of Pakistan, by Dr F. Hussain

Highlights of the study

At the southern fringe of Central Asia, at the northernmost tip of Pakistan, lies the District of Chitral. It lies between longitude 71°30' and 74°55' east and between latitudes 35°15' to 36°55' north. It is bounded by Afghanistan to the north and west, by Ghizir District to the east, and by Swat and Dir Districts to the south.

The major aim of this study was to analyse local knowledge and practices about fruit trees with a view to understanding the scope of orchard development in this area.

A total of 728 respondents belonging to 36 villages were interviewed. The majority of them were in the age groups 21-40 and 41-60. Most of them were either illiterate or had only primary education. No women were included in the groups because of the veil system or shyness.

The following six wild fruit plants were known to the local community:

1. Diospyros lotus
2. Eleagnus angustifolia
3. Vitis vinifera
4. Prunus dulcis
5. Monotheca buxifolia
6. Ficus palmata

There were 19 cultivated species in the area, and most appeared in at least two varieties. For grapes, the number of local varieties was between 10 and 20. The knowledge of the respondents was analysed by the method of free-listing. It was found that the age groups between 21 and 40 and 41 and 60 were the most knowledgeable. The majority of them knew 4-8 fruits, while 3% of the respondents could list 11-12 fruits. Knowledge was related to educational status, and the illiteracy rate was 35%.

Ranking methods were used to analyse the fruits most preferred by the populations. The criteria used included good flavour, medical value and contribution to health in general, suitability to climatic conditions, yield, price, storage life, as well as possible use of wood for furniture and construction. Grapes and apples were considered the best fruits, followed by pomegranate, walnut, ‘tonge’ (pear), apricot, mulberry, and ‘nashpati’ (pear).

Agronomic practices such as propagation, the pruning and picking of fruits, use of agrochemicals for protection against insects, diseases and pests, the role of grazing animals, and the use of commercial fertilizers and organic manure were analysed. Post-harvesting methods, such as storage and drying, were also explored. A low percentage of respondents used agrochemicals, commercial fertilizers and organic manure for fruit plants. No preservatives were used during the storage and drying of fruits. The agronomic part of the work was mainly done by men, while the storage and drying of fruits were carried out by women.

The majority of the locals sold the fruits in fresh and dried condition either themselves, near their houses or on the roadside, or in the nearby grocery shops. A few sold to shopkeepers in the main bazaars and fruit markets. The fruits were sold ungraded.
Many local preparations such as desserts, herbal medicine, food, syrups, wines, and top- pings were made from fruits. Walnut and mulbery wood was used in furniture-making, while those of other species were used as beams, firewood, thatching materials, and for making sheds or shelters. The leaves of most fruit plants were used as fodder, while dead leaves were composted into organic manure.

There was a keen interest shown in the introduction of new tree species and good varieties of fruits as well as training in post-harvest technologies i.e. the preservation, drying and packing of fruits. More information was also needed regarding the fruit market and industry, but the majority of respondents were in favour of developing crop-cultivation areas in comparison to fruit cultivation (probably because of the quick returns for crops). The area needs improvement in the communication system, the construction of roads and irrigation canals, and in educational and health facilities.

Societal changes over the last 30-40 years show that the younger generations are beginning to place more trust for their livelihood in modern developments rather than in the traditional resources, hence beginning a process of knowledge erosion in the area.

Lessons learned

This case-study successfully reveals an area of Pakistan which has a high potential for fruit cultivation and a rich local knowledge about fruit tree management, both in terms of pre-harvest (cultivation, propagation, pruning, etc.) and post-harvest techniques. However the whole system seems to be declining. One reason for this is that higher-yielding varieties of fruit plants are replacing older varieties, although it is probable that the existing varieties are better adapted to local conditions. They could possibly be used as stock for grafting new varieties, and the grafted plants could then be provided to the people in Chitral. Another factor contributing to the decline is the problem of poor communications (roads), market facilities, and lack of support from agricultural extension services. This is therefore mostly an issue of national policy and priorities.

This type of study may help in terms of the better recognition of local potential. A lack of recognition of local potential at the national level would eventually lead to the genetic erosion of the local fruit tree varieties of Chitral and to the related knowledge systems, and hence to a loss of material for improving fruit trees in Pakistan in general. In order to ensure that the whole system evolves in the future, both recording of local knowledge and its continuing support are essential.

Ethnobotanists may be instrumental in this context through developing guidelines for the setting-up of community-based nurseries and gardens, with proper identification of the tree varieties and linking to central agricultural institutions such as the NARC (National Agricultural Research Council) for developing these tree varieties ex situ.
Ethnobotanical study on traditional shifting cultivation practices based on the alder tree (*Alnus nepalensis*), by the Naga tribes of Nagaland India, by S. Changija, A. Yaden and A. Aier

**Highlights of the study**

This ethnobotanical study on the use of alder by the Naga tribes of Nagaland was carried out with the objective of making a detailed survey of local practices related to the improvement of soil conservation and fertility in shifting cultivation systems (‘jhum’).

Nagaland is one of the frontier states of India. It is flanked by Myanmar in the east, Assam State in the west and north, and Manipur State in the south. The climate is monsoonal, with an average rainfall of 2,500 mm per year and 85% relative humidity. The relief is mountainous, with relatively steep slopes, deep gorges, and narrow valleys. Land status in the state is as follows: 7% of the geographical area is under government control and the rest is under the control of tribal communities.

The state is inhabited by the Nagas, a mongoloid group, of which 16 different sub-groups are officially recognized, having diverse linguistic backgrounds. The society is organized into clans, which are exogamous units.

The most common form of agriculture in the area is ‘slash-and-burn’ agriculture called ‘jhum’. It is estimated that 7,200 sq km of the state area is under cultivation, i.e. 43.3% of the total area, with an annual increase of about 750 sq km. The second type of agricultural system is wet rice cultivation, which is restricted to a relatively small area which has potential for cultivation - 1,790 sq km for the whole state.

Indigenous agroforestry systems are also practiced by the Nagas in the form of bamboo and palm groves mixed with various fruit and timber tree species. The main purpose of the agriculture is to sustain livelihood systems; however, social prestige is claimed on the accumulation of sufficient surplus to afford large feasts. Three types of land ownership system are found: village land administered by the village council, clan land, and individual land.

The methods used for investigation were: mapping the alder-growing area in the whole state; identification of all species associated with the alder-based farming system; and the collection of ethnobotanical, socio-economic and anthropological data through field observations and semi-structured and structured interviews. Analyses of soil samples from alder-based farms were carried out as well as biomass analysis of alder coppice production.

Alder grows in the high altitudes of the northern temperate belt. *Alnus nepalensis* fixes nitrogen by forming symbiotic associations with the nitrogen-fixing bacterium *Frankia*. It is drought- and frost-resistant, and is found on slop-
Alder-based farming is typically managed in four- to ten-year cycles in Nagaland. Alder trees are either protected or planted, and a wide variation in individual tree age has been created within alder stands.

Alder displays other characteristics noted by local farmers: the wood is easy to split and can be burnt the next day after cutting, the stumps are relatively fire-resistant, and cultivation areas underneath alder trees always give better yields than those where there is no alder.

The process of alder-based ‘jhum’ cultivation is outlined below. The alder in a ‘jhum’ plot is pollarded just before slash-and-burn, and intercropping with a number of food crops is conducted for two consecutive years. The ‘jhum’ plot is then left to recover for at least two years. The most appropriate height for pollarding is about two meters; this is out of the reach of animals, is above the fire level and does not hamper the growth of the crops. A sharp hatchet is needed to cut the trunk the first time the tree is pollarded, so as not to split the stool head. It is then plastered with mud, and a stone stab placed on top to prevent the head from sustaining frost damage, and to orient the shoots in a more horizontal direction. According to practitioners, it is not advisable to keep the coppice shoots longer than six years because the weight of old coppice shoots affects the stump during periods of high winds. After the first pollarding, it is also advisable during the next winter season to carry out selective thinning of the coppice shoots in order to keep only about six shoots growing. Alder trees may be associated with a large number of crops. A total of 60 crop species have been recorded growing in alder-based ‘jhum’ cultivation. Many wild vegetables and fruit-bearing plants are also conserved on the field, including useful tree and palm species such as Livistona jenkinsiana, bamboos, species of Caryota, perennial vegetables, and medicinal and ornamental plants. The fast growth of alder controls the succession of other species, and the need for weeding is kept to a minimum.

The net income over two years is 18,711Rps, which is a comparatively higher rate than that of non alder-based ‘jhum’ fields in Nagaland state.

Lessons learned

This study is important as it very clearly shows how the use of Alnus nepalensis can actually improve the shifting cultivation system in this region. Since this species is widespread throughout the Himalayas, this could represent a good model for other areas. From a purely agricultural perspective it does indeed seem more efficient than a non alder-based system. However, this study does not show the benefits of non-‘jhum’ systems in terms of, for example, non-timber products and hunting, and the expansion of alder-based cultivation systems could in the long run affect the useful biodiversity of the area. Indeed, as has been pointed out in this study, the quick growth of alder controls the succession of other species. Ideally, complex agroforestry systems including all useful species should be developed side-by-side, as this would prevent the erosion of useful products in the area.

Ethnobotanists could help in this context in assessing jointly with local communities the useful biodiversity and interrelationship with habitat and other non-useful species, discuss with the communities the relevance of these products to their livelihood, and jointly plan a model of land use which includes alder-based ‘jhum’ systems, permanent agroforestry systems and intensified irrigated agricultural lands as well as community-protected forests.
The use of indigenous knowledge in mountain natural resource management: a case-study of the Wancho community, Tirap District, Arunachal Pradesh, India, by A. Godbole

Highlights of the study

This case-study aims at documenting the indigenous knowledge and related resource management system of the Wancho tribes living in the south-eastern corner of Arunachal Pradesh, as well as identifying the factors affecting biodiversity and indigenous knowledge systems in that area.

Arunachal Pradesh is India’s most eastern province, and is characterized by its remoteness and its very high biological and cultural diversity (about 30-35 major ethnic groups). This work on the Wancho tribal community is an effort to understand the complex mechanisms involved in natural resource management and to find out how these systems could be used effectively in today’s context. A multi-method approach has been adopted, including participant observation, informal survey along transect walks and in the villages, biodiversity inventory, resource mapping, and the quantification of ethnobotanical knowledge through the method of pair-wise ranking.

Shifting cultivation, locally called ‘zang’ and more widely known in this region as ‘jhum’, is the major subsistence activity of the Wanchos as well as of most other tribal groups of northeast India. The major problems identified in the area are: a high rate of deforestation presumably due to population growth, and a reduction in the cycle of shifting cultivation (eight to ten years instead of ten to twelve years); depletion of first class timber species from Wancho territories due to commercial timber exploitation; the fact that the practice of ‘honeyem’ (a traditional practice which involves maintaining fuelwood species of good quality in the fallows) is declining; and the spread of Christianity and tribal development practices which is affecting the culture and resource use system.

The following land-use systems are found in the Wancho tribal areas: ‘jhum’ cultivated and fallow areas, wet rice-cultivated terraces, home-gardens (‘sawat’), opium plots, and community forests (‘lings’).

The study conducted in one village, Zadua, shows that the Wanchos are maintaining a ten-year ‘jhum’ cycle, which is a sufficient time to allow biodiversity to recover in the successional vegetation phases, and which also allows recovery of soil fertility. In rice terraces, only one crop is produced in a year, and terraces are used as fishponds during the three to four months after rice harvesting. Opium cultivation is an important economic activity, though the product is mostly used at the household level.

In Zadua, the decision regarding the selection of resource areas for ‘jhum’ is taken by the community with consent of the ‘wangham’ (village customary chief) and his council. Certain rituals are performed as part of the selection procedure. The criteria for selection are based on the maturity of fallow, an understanding of the previous ‘jhum’ cycles, and the distance of the resource area from the village. The practice called ‘honeyem’ consists of keeping the seedlings of two species, ‘puak’ (Macaranga denticulata) and ‘puakmi’ (Mallotus tetracoccus), to grow in the rice fields during the second year of ‘jhum’ cultivation. The advantages of this practice according to local perceptions are the following: it increases soil fertility, checks soil erosion, and produces good fuelwood and timber within four to five years.

‘Jhum’ fallows are sometimes transformed into palm groves called ‘loham’, especially with Livistona jenkinsiana, a most useful species (the leaves are used for thatching). Similarly, well-developed bamboo groves are maintained around the village, mainly on individual lands.

Five community forests are located within the Zadua village territory and represent a major source of timber, fuelwood, game, and non-timber forest products. These forests are strictly under the control of the village council, except for small patches which may be owned individually. Logging and large-scale extraction are not allowed in the community forests though timber extraction seems to have occurred more recently. The role of these community forests is also to avoid disputes between different communities; they are also burial grounds. Some twelve species of mammal are found in these forests, as well as numerous bird species.

The role of women in resource management has been explored. Though they are not represented in the village council and have no formal decision-making power, they are much more involved in resource management than the men. Women are solely responsible for all the activities, except cutting for ‘jhum’ cultivation and transporting harvests to the village. Women also do most of the terrace cultivation. On the other hand, it is mostly men who are involved in opium cultivation.
Through the method of free-listing, it was found that 42 species used for fuelwood are known by the women. Preferences for specific fuelwood species were analysed by the method of pair-wise ranking. This is a fastidious and time-consuming method, based on criteria selected, by women, in a preliminary phase. The criteria are availability, heat-producing capacity, burning time, and light-producing capacity. The highest ranking was given to three species: ‘gnut’ (*Dendrocalamus* species), ‘puak’ (*Macaranga denticulata*), and ‘puakmi’ (*Mallotus tetracoccus*).

Major changes affecting biodiversity and its related knowledge systems are outlined below. There are changes in land-use systems in that some areas for ‘jhum’ are being transformed into plantations for tea, a cash crop. A traditional type of club known as a ‘morung’ has long been important as a place where young boys, and adult and elderly men would gather for the transfer of knowledge and art and to take part as a group in community work. Today, the role of these ‘clubs’ is fading, and they are sometimes used for gambling or smoking. Tribal welfare schemes also have an impact today as they can introduce practices which are not necessarily appropriate to local conditions, such as the introduction of chicken hybrids which are highly susceptible to diseases. Due to the need for more cash income, timber is now extracted at a larger scale than before, thus endangering the very existence of the community forests and important products available during periods of scarcity.

The main recommendations from this study are: to introduce more cash-oriented crops into the ‘jhum’ system; and to support and develop the ‘morung’ as a means of raising awareness among the Wanchos of the importance of their own knowledge system. This would also help to facilitate dialogue with project-implementing agencies. Other species can be introduced based on the ‘honeyem’ system. Community forests degraded due to the logging of timber should be replanted with local species such as *Dobabanga grandiflora* and fast-growing timber species such as *Gmelina arborea*. The practice of ‘loham’ and the plantation of bamboo groves are proving to be very complementary to ‘jhum’ and should not be abandoned.

Lessons learned

This study shows the importance of indigenous knowledge systems in the management of ‘jhum’. It is also useful in demonstrating the complementary aspects of other land use systems such as ‘loham’, bamboo groves, and community forests.

Through addressing the role of women in agriculture, it shows that they are the primary workers in agriculture, and therefore represent a particular target group to work with in the future. As pointed out by the study, ‘morung’ are important places for the transfer of knowledge, but are only for men. Understanding how these practices are affected in the modern context enables us to think of possible avenues for the future.

Future work by ethnobotanists could concentrate on modes of knowledge-transfer among women, and on the creation of a forum whereby women can express their opinions on their precise needs as a group, without too much interference from men. Specific study methods for understanding women’s knowledge still need to be devised, and these need to be less time-consuming as women are generally too busy with everyday tasks. Two major ways of working with women are with ‘participant observation’ or in special group workshops which are appropriately scheduled according to their timetable during the year and use a number of methods and exercises which define in advance the possible concrete outputs.
Preliminary studies in the ethnobotany of Chittagong Hill Tracts, Bangladesh, and its linkage with biodiversity, by M. K. Alam and S. K. Khisa

Highlights of the study

The Chittagong Hill Tracts (CHT) region is located in the south-east corner of Bangladesh and lies between 21°25’ and 23°45’ north latitude and between 91°40’ and 92°50’ east longitude. The area is characterized by its hilly relief and high ethnic diversity. Ten major ethnic groups are recognized to be living in the area. The traditional utilization of biologically diverse resources in the hill region is related to the diverse use pattern. This study aims to understand the indigenous knowledge system and how it relates to biodiversity resource management.

The methods used to explore the indigenous knowledge are: semi-structured interviews in the field with small groups of people including men and women; indoor or village level free-listing exercises to list all species known in each use category (timber, fruit trees, ‘jhum’ species etc.); village market surveys; surveys of species growing on the homestead; and collections of herbarium voucher specimens.

The results of the investigation show that some 185 species from 60 families were found to be used for different purposes. These species range from Pteridophytes to Gymnosperms, and Angiosperms including both Dicotyledons and Monocotyledons. Specific use categories are: fruits, leaf and shoot vegetables, fuelwood, house posts, furniture, and health-care.

A study of the folk taxonomy reveals that hill people use different nomenclature or terms to indicate different categories of plants according to growth habit, habitat, and part used. Thus, suffixes are added to plant names to indicate their utility or where they grow or what part of the plant is used.

For example, the Chakma tribe uses the suffix ‘lodi’, and the Marma tribe the suffix ‘noi’/’nui’ to indicate that a plant is a climber. The following words in Chakma may be associated to the name of a plant in order to determine its characteristics: ‘mura’ (hill), ‘jhar’or ‘tarum’ (forest), ‘jhum’ (shifting cultivation), ‘brikha’ (tree), ‘jhop’ (shrub), ‘chotogach’ (herb), ‘shag’ (leaf vegetable), ‘lodi’ (climber), ‘dhela’ (branch), ‘phul’ (flower), ‘gola’ (fruit), ‘shigor’ (root), ‘dhan’ (paddy), ‘baar’ (bamboo), ‘darboa’ (fuelwood), ‘daru’ (medicine), ‘mida’ (sweet), ‘tida’ (bitter), ‘khoro’ (sour), ‘mod’ (country liquor).

In the same way, a whole set of different terms have been analysed as used in the Mara and Tripura tribes. Local taxa may differ from scientific taxa. The Tripura tribe for instance differentiates four taxa of plantain bananas according to a set of characteristics including habitat, height, clump size and number of off-sets, pseudostem sheath, position of fruiting bunch, leaf texture, flowering period, taste of inflorescence and pith. These taxa are locally called: ‘tampothali’, ‘jati-thali’, ‘liarang-thali’, ‘jati-laiaphenthali’. The texture of leaf lamina and the extent to which they split easily are also important characteristics as the leaves are used for making plates and for wrapping. Scientific studies in the past, however, differentiated only two taxa of wild plantain: *Musa sapientum* var. *sylvestris*, and *M. ornata*.

Local perceptions were analysed in order to distinguish the criteria governing the choice of each category of wild plant used by the local tribes. These criteria are the following:

(a) fruit: sweet and acidic taste (they generally eat most fruits eaten by monkeys, squirrels and birds);
(b) edible fruits, leaves and shoots: tenderness, not acrid, low fibre content, no bad smell, containing essential oils (it is generally thought that leaves eaten by cattle and buffalos are edible);
(c) fuelwood species: ease of felling (splits easily, dries quickly, burns uniformly with little smoke and no sparks from the charcoal);
(d) fuelwood species: not prone to attack by termites during storage and not containing ants;
(e) house posts: should have a straight bole, be easy to fell and should not be prone to insect attack;
(f) furniture-making: should be light to moderately heavy, with a straight grain, be easy to work, and have natural colours;
(g) medicine: plants should have a bitter taste, mucilaginous properties and/or soft-textured leaves.
A variety of trees grow in the homestead area. These include fruit trees, timber trees, and different species grown for obtaining housing materials, such as bamboos. A number of plants producing spices, tubers and beans are also found.

An important tree-felling practice related to biodiversity-management was recorded. Trees are always cut for ‘jhum’ above 1-1.5 m. The reasons for this are that stumps at this height develop better coppice shoots which remain out of reach of animal browsing, boles developed from coppice shoots are straight, and stumps along with newly-developed shoots can be used as supports for yams and other creeping vegetables. This practice helps in the quick development of secondary forest from coppices when the ‘jhum’ field is abandoned after cultivation.

Previous studies by Khisa also showed that some species are not felled when encountered in the ‘jhum’ fields. This also contributes to quick regeneration, and controls soil erosion. There are other reasons for keeping trees in the ‘jhum’ fields’, including religious belief (particularly associated with Ficus species), for keeping a stock of seeds which will facilitate regeneration, to improve the growth of paddy and other annual crops (Albizia and Derris particularly), and for providing resting places, in the case of large specimens.

‘Jhum’ cultivation is important in terms of biodiversity-management from the point of view of wild crop domestication; some twelve species of Dioscorea are grown in the Chittagong Hills. In the ‘jhum’ agroecosystem, maintenance of biodiversity is also due to the fact that people collect a large number of products in different habitats and at different seasons. Small amounts of each product can be collected without putting too much pressure on the resource.

Lessons learned

This study shows that local biodiversity perceptions can be understood through the analysis of local nomenclature and vernacular classifications. Too often it is assumed, in studies of local knowledge systems, that a simple list of species known to the population will adequately describe local knowledge. However, only through the analysis of local nomenclature can a precise vision of the local perception and use of biodiversity be attained. Moreover, as is shown in this study, the recording of criteria on which local preferences are based can reveal local rationale based, in turn, on practical aspects, which may also be related to religious or cultural beliefs.

Finally, this study shows that precise descriptions of local practices (such as the felling system of trees in this area) which may at first sight not be understood are appropriate to local conditions.

The important point about this type of study in Bangladesh is that it is innovative and sheds new light on the usefulness of tribal practices. Conducting this type of study in the future may help to change national policies.

Meanwhile, sharing the results of the research with the communities may also help them to acquire a sense of pride regarding their knowledge, which might in the past have been considered primitive and inappropriate.
The ecology and indigenous management techniques of tribal homegardens - a case-study of the Marma tribe in Rangamati Hill District, Bangladesh, by Dr M. Millat-e-Mustapha

Highlights of the study

The Rangamati Hill district of Chittagong Hill Tracts is one of the major hilly regions of Bangladesh. The district covers an area of 6,116.13 sq km, has a total population of 0.401 million, and is inhabited by twelve ethnic communities of different cultures and lifestyles. The tribal population represents about 56% of the total population. This case-study is based on the assumption that tribal community knowledge of the species and their uses represents an important resource in itself and is now recognized as significant for scientific research, biodiversity conservation, and the development of alternative economic options.

Agriculture represents the main production system among the tribal communities. Agricultural areas are used variously for ‘jhum’ cultivation, flat croplands, and homegardens. This case-study looks at how local indigenous knowledge is applied in the management of homegardens. The Marma tribe, which is the second biggest tribe in the district, has been chosen to conduct this study. The Hapchori community in the sub-district of Kaptai was chosen randomly for the study site.

A preliminary socio-economic survey, based on a structured questionnaire, was carried out in order to determine socio-economic parameters of the study village and to select respondents for detailed survey. Based on total annual income, farmers were categorized into three groups: rich (income more than Tk 50,000); medium (income Tk 36,000-50,000); and poor (income less than Tk 36,000). Ten homegardens were sampled randomly from each of the farm categories in which vegetation surveys were conducted, by listing species present. A tree-use matrix was then used with each farmer and his family. This was followed by a semi-structured interview, with questions related to:

(a) origin and type of planting materials (cuttings, seedlings, seeds, etc.) found in the homegarden;
(b) criteria for the selection of mother trees;
(c) other management practices such as weeding, lopping, pruning, thinning, coppicing, pollarding, manuring, and watering.

Daily activity and seasonal calendars were also used to assess overall activities and gender-specific ones.

The results of this study show that ‘jhum’ is the major agricultural activity in the area in association with the collection of non-timber forest products. However, due to shortage of land, the ‘jhum’ fields are used on a continuous five to six year cycle. The size of the homegardens is independent of the respondents’ annual income, which is mostly based on the size of the ‘jhum’ land to which they have access. This may vary from 9 ha for the richest to 1 ha for the poorest. In all cases, homegarden size is about 0.02 ha. The size of flat croplands varies from 0.25 ha for the richest to 0.04 ha for the poorest members of the community. All the respondents of the poor farm category and 30% of the medium farm category reported that they were deficient in rice for some period during the year. Income from the sale of timber/fuelwood was a major activity during this period.

A total of 19 perennial species was recorded from the set of 30 homegardens surveyed. Among these, 13 (69%) were food and fruit-producing species, five (26%) were timber species, and one (5%) was an ornamental. A pair-ranking exercise with ten common species including Aegle marmelos, Areca catechu, Bambusa vulgaris, Carica papaya, Citrus grandis, Cocos nucifera, Gmelina arborea, Hibiscus rosa-sinensis, Moringa oleifera and Tamarindus indica, showed that Gmelina arborea was the most preferred species, followed by Cocos nucifera, Areca catechu, Carica papaya, and Bambusa vulgaris.

The plants were raised either from seeds, seedlings, or vegetative propagules. Seeds were sown purposely for some species and collected from other species which regenerated naturally, for example leak. Most of the fruit and food-producing and timber species were propagated from seeds and seedlings. Only Moringa oleifera, Bambusa vulgaris and Hibiscus rosa-sinensis were propagated vegetatively. As far as the supply of planting material is concerned, farmers depend on three different sources: hill, homegarden, and market. Almost three quarters of the planting material is obtained free from homegardens, hills, or as gifts from friends. No specific mother tree was sought by the farmer when seeking planting material. Weeding was carried out in the homegarden in order to clear the ground and thus decrease encounters with snakes and poisonous insects.
Most plants grown in homegardens were found to have multiple uses. The women are largely responsible for maintaining the homegardens. Even though some of the homegarden plants have medicinal properties it was found that people preferred the medicinal plants originating from ‘jhum’ areas. Major conclusions of this study are that homegardens require very little labour input and are very cost effective as most of the planting material comes from the homegardens themselves. Fertility level is also maintained through the accumulation of leaf litter. Homegardens are therefore seen as having the potential for expansion and for increasing economic benefits. This is particularly so because of the decreasing soil fertility of the ‘jhum’ areas which is leading to a decline in their production.

**Lessons learned**

As in many other studies conducted in homegardens throughout the world, this work shows that they are very appropriate for the cultivation of a large number of species directly useful to the household. A common feature shared by homegardens in general is the high level of fertility due to permanent tree cover and manure from livestock and kitchen waste. As women are the main caretakers of the house and the children, they are also mainly responsible for the homegardens, as is shown in this study.

The expansion suggested in this study is constrained by the land available around the homestead, and the small size of homegardens is precisely due to limited available land. The transformation of ‘jhum’ lands on the other hand into permanent agroforestry systems could be envisaged. Elements of these agroforestry systems can already be detected in the ‘jhum’ areas, where trees regenerating naturally are sometimes kept, and other tree species are occasionally cultivated.

Changes from shifting cultivation systems to permanent agroforestry systems have occurred in other parts of the world, many examples of which are found in Indonesia (Aumeeruddy and Sansonnens 1994). Experience in Indonesia, however, shows that the establishment of agroforestry systems is generally accompanied by intensification in the use of flat, irrigated land areas in order to supplement the food crops which may no longer be cultivated in the shifting cultivation areas.
A community-based case-study on the indigenous system of 'sal' (Shorea robusta) forest management, by S. Rajbandhary, N. Dongol and B. K. Karna

Highlights of the study

Shorea robusta ('sal') forests used to extend throughout the Terai and Siwalik regions of Nepal as well as in the fringes of the hills. Degradation of these forests over the last two decades has been mainly due to timber extraction for commercial purposes, resettlement of large populations from the mid-hills, and a lack of control of these forests by the agencies concerned.

'Sal' is known to be one of the most important tree species of Nepal as it provides good and highly-priced timber as well as a number of other useful products, including fuelwood, fodder for livestock, good compost, oleoresin and oil from the bark and seeds, and leaves which are highly valued for making plates. It also has strong religious significance as it has been argued that Lord Buddha was born and attained salvation under a 'sal' tree. An important characteristic of 'sal' is that it is highly resilient and coppices readily; it also resists burning and is adapted to relatively poor soil conditions.

Community forestry is a system established in Nepal in which it is recognized that the communities should participate in and bear the responsibility for the management and utilization of their nearby forest resources. The history of the community forestry system and its present status have been extensively documented by a large number of scholars and foresters in Nepal. This particular case-study aims at analysing the historical background, indigenous forest management practices and the relation between the indigenous and community forestry practices in five community forests (Chuchekhola, Betkholsi, Chitrepani, Neureni/Chisepani, and Pragatishil/Pradampokhari) out of the 45 community forests of Makawanpur District. The study area is located in the district of Makawanpur, which has a population of 315,588, consisting mainly of migrants of different ethnic origins. Population growth is 2.63% per year. The main occupations in the area are agriculture and livestock rearing. In the area 'sal' grows mostly in pure stands.

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The information was obtained through formal and informal interviews with key informants and at household level, and through field observations. The questionnaire for the household level contained sections on socio-economic and demographic information; past and present forestry practices; people’s participation in forestry management; the utilization of ‘sal’ parts; the role of indigenous knowledge in forest management; and the relationship between indigenous and community forest management. The data obtained were analysed either through percentage or using standard deviation or chi-square methods.

This study shows that until around 1957 the forests in the study site area used to be protected by the Talukdars or Mukhiya acting as village heads. Mukhiya (Talukdar) were appointed by the king to collect taxes and revenue and were responsible for law and order in the area including enforcing control over the forests, in particular the extraction of timber. Once transportation facilities were established, people from the temperate and high alpine region started migrating into the area, resulting in high levels of forest destruction. This took place between 1962 and 1985. At the beginning of the 1980s, some forests were handed over to the Panchayats (district level institution), but this system did not work, and the forests continued to be exploited. The nationalization of all forests between 1957 and 1987 also led to a situation of open access to the forest resources as everybody tried to maximize their own personal benefits, and the Forest Department did not have sufficient man-power to control this.

By 1987 the forests had been so destroyed that initiatives emerged from the local level as people realized that their resources were disappearing. This consisted mainly in the establishment of forest management committees, which restricted access to the forest at the community level. Though the forest started regenerating, women had to face the problem of having to go long distances to collect firewood.

Again in 1989-90, political instability in the country led to a new wave of destruction of the forest. While the initial forest protection committees were dissolved at Nureni and Chisepani (two villages from the study site), in Chitrepani the study revealed women-initiated protection practices of the forest around 1986. These resulted in the quick regeneration of ‘sal’ coppices to the extent that growth of other species such as Eugenia operculata, Terminalia chebula and T. bellirica was greatly affected.
Community forestry management covers the protection, utilization and distribution of forest products as well as the institutional or organizational arrangements by which they are carried out. While indigenous management consisted mainly in complete protection from grazing, illicit cutting of fuelwood and fodder collections, the new management system introduced the practices of thinning, singling, weeding, and specific access regimes. The access rules, the penalty structure and forest protection provision were adapted to those in practice before, but were now presented in a written form. Under the new rules, anyone cutting ‘sal’ trees could be fined Rps.100, whereas those cutting *Terminalia tomentosa* would be fined only Rps.5. The hunting of birds and other animals resulted in a fine of Rps.100. Village forest guards were appointed, just as was the case with the previous community level system.

Management practices such as thinning, pruning, weeding, and selective logging were conducted according to specific management prescriptions in specific forest compartments and following a particular schedule. For example, fuelwood and fodder are collected only on Tuesday from October to May in Chitrepani. Species other than ‘sal’ can be cut for fuelwood, whereas only branches of ‘sal’ or coppices through the thinning process can be collected for fuelwood. Many of these activities are conducted as a group. The main functions of the forest protection committee are to appoint forest watchers, arrange meetings, implement rules and regulations, and make decisions. From this study it appears that people’s participation in the protection of the forest can be traced at least ten to twelve years back before the establishment of community forestry.

Information from the study area shows that ‘sal’ is used in a variety of ways, as follows. Plates for rituals and ceremonies are made from leaves. This work is carried out mainly by women, from the collection, to the stitching of the leaves. The oleoresin from the bark is used as incense and as a disinfectant fumigant. The resin is used against diarrhoea and dysentery - the gum soothes burnt skin, and the oil cures skin disease. Juice from the bark is administered in cases of stomachache. Paints and dyes are made from an extract from the bark. The leaves are used for animal bedding, and afterwards for making compost.

It was concluded from this case-study that all the study area had a past history of indigenous management which had been improved more recently through the implementation of community forestry. The recommendations are that people should plant multipurpose trees in and around the forest and on private lands. Systems such as the use of improved stoves should be established to minimise the amount of fuelwood collected. Women should be included more in the decision-making processes.

### Lessons learned

Community forestry in Nepal and joint forest management in India have been extensively documented. This case-study is interesting because it successfully shows the importance of previously existing indigenous knowledge, and the importance of people’s participation.

Reading between the lines, however, it is clear that indigenous knowledge in these cases was not sufficient for managing the forests properly. Although it succeeded in protecting the nearby forest, the pressure was only transferred to neighbouring forests which were not under control. New problems for the women were also created, and political instability led to a collapse of local initiatives.

“Why did this happen?” is probably the major question which still lacks an answer. One hypothesis is that social cohesion was not very high in these new communities. There was a high percentage of migrants, and people acted mostly on an individual basis. As is stated in the study, the situation of free access in times of political disruption or nationalization had a very negative impact as there was no control except through local initiatives which were not sufficiently mature.

Possible avenues for the future may consist in trying to address some of the issues raised. This study shows that both the resiliency of ‘sal’ as a species, together with management practices which consisted in cutting all other species, have actually contributed to the impoverishment of these forests in terms of biodiversity conservation, converting these community forests into almost pure ‘sal’ stands. However, knowing the importance of trees such as *Terminalia bellirica* and *Terminalia chebula* in the Ayurvedic, Chinese and Tibetan medical systems, it could well be in the interest of the communities also to protect these trees. These are new avenues for investigation in the future.

Another question which arises is: “Would community forestry have succeeded if the major species did not have such a level of resilience”? In other words, can community forestry succeed in regenerating complex forests comprising species more vulnerable or less resilient than ‘sal’? A discussion of this subject is given, by Cunningham, in the People and Plants working paper on Joint Forest Management in India (Aumeeruddy-Thomas et al., 1999).
By-products of agriculture, grass from the fields and manure produced by the livestock. Agricultural yields are very dependent on the type of crops, with rice (in low, irrigated areas), maize and millet (in the upper hill areas) being important. The area has an average size of 0.76 ha, varying from 2-40 ropanis (1 ropani = 0.05 ha). Major crops are rice, wheat, mustard and potatoes (on the hillsides), and maize and millet (in the upper hill areas). Agricultural yields are very dependent on the amount of manure produced by the livestock. By-products of agriculture, grass from the fields and pastures, and forest foliage are the main sources of fodder.

Due to the depletion of the forests, people in Kalikasthan started introducing forest fodder trees in the agricultural lands a few decades ago. Twenty-one fodder tree species have been found to be growing on the farms, of which the majority are from the family Moraceae, including six Ficus species: *Ficus auriculata*, *F. hispida*, *F. nerifolia*, *F. racemosa*, *F. semicordata*, and *Artocarpus lakoocha*. Three species are from the Araliaceae: *Brassaiopsis hainla*, *Schefflera venulosa*, and *Trevesta palmata*, and two are legumes from the family Fabaceae: *Bauhinia purpurea* and *Milletia extensa*.

Most of the fodder trees are multipurpose species yielding a variety of products including fruits, edible leaves and flowers, and fibres for making ropes. A number of other species present on the homestead area are mostly used for animal bedding and ultimately as compost. Among these there are large trees (e.g. *Castanopsis indica*), shrubs (e.g. *Eupatorium adenophorum*), herbaceous ferns (e.g. *Nepheleps cordata*), hemiepiphytes (e.g. *Rhus wallchii*), and small trees (e.g. *Schima wallchii*).

The agroforestry system follows a pattern of planting rows of trees along the edge of terraced fields. Spacing between the trees is arranged so that the trees do not hamper each other. In addition, by lopping off tree branches for fodder the canopy is maintained according to the farmer’s requirement and does not overshadow crops growing on the terraces. In general, lopping is heaviest at the bottom and becomes gradually lighter towards the top. Trees are selected by each farmer according to the following characteristics: capacity for retaining leaves for a long duration, suitability for use as feed during the flush stage, a positive impact on milk production, and improvements in quality, nutrition and taste of milk. *Artocarpus lakoocha* for instance keeps its leaves during the dry season and is therefore considered a good species.

Trees are categorized according to three types: very good (A), good (B) and normal (C). An additional set of criteria was found to be used for selecting trees: fast growth and quick regeneration, all-year-round availability, ability to be lopped more than once a year, high moisture content, suitability to be mixed with all grades of fodder, and suitability for animal bedding.
Trees are mainly regenerated from seedlings growing spontaneously, and from vegetative cuttings (mainly for *Ficus sarmentosa* and *Schefflera venulosa*). Any branches bearing fruits in the highest part of the canopy may be saved on specific trees in order to collect new seeds for establishing tree nurseries. The tree rows are maintained over time by planting seedlings in places where the farmer thinks the tree should be replaced in the future. This shows the intimate knowledge that farmers have of tree growth and turnover rate.

There are some side effects of agroforestry on agriculture. One is that the tree rows have some border effects through delaying ripening stages of the crops. There is also an increase in disease attacks and a decrease in overall productivity (crops grow too high and thin due to shade). But these problems are balanced by the increase of profit made from livestock, and also the feeling of self-sufficiency. Besides compost, manure can also be produced with this type of system, and this helps to maintain the overall fertility of the agricultural lands. Fuelwood needs are also met by collecting dried fodder branches, by-products of crops, and dried animal dung. The farmers estimate that one fodder tree is sufficient to feed one cow or buffalo for one month. Any surplus of milk, curd and ghee (clarified butter) is sold in the local market.

Following this multiple-criteria system, a diversity of species is planted according to each farmer’s requirements. Other reasons for keeping trees on the homestead are because forests are some distance from the homestead and because of the fear of forest guards.

The major recommendations of this study are to guide farmers in the management of tree nurseries for sale and to encourage them to replace border crops with ginger and turmeric which are more shade-tolerant. This agroforestry system in Kalikhastan should be used as a model for other parts of Nepal in the form of a farmer-to-farmer exchange.

**Lessons learned**

This useful study shows the potential for tree domestication in Nepal. The richness of this study lies in the precise record of the tree species and their particular uses. It also shows a management system which relies on farmers’ knowledge of tree growth patterns. Such agroforestry systems, which are typically based on the growing of alternative rows of food crops and trees, have been described extensively in other parts of the world and have been catalogued by ICRAF (World Agroforestry Centre) according to the specific ICRAF guidelines for the description of agroforestry systems.

This particular case-study would benefit from these guidelines as some major aspects, such as the economic benefits of this system, have not yet been fully assessed. These data would also be useful for demonstrating the economic sustainability of such a system, and its constraints, before it can actually be used as a model for the country. A list of the fodder tree species, their ecological requirements, general growth patterns, and the types of vegetation from which they originate, could be included to enhance the study.
General points and lessons learned

Based on the analysis of each case study and detailed lessons learned, as drawn above, the general issues identified are:

(a) Genetic erosion of local agrobiodiversity and related knowledge, as shown in the study in Chitral, Northern Pakistan. This issue is directly linked to the following: lack of communications, market facilities and agricultural extension services which recognize local potentials, and very little interaction between central research institutions and local resources and needs.

(b) Shifting cultivation systems once sustainable from an ecological and economic point of view are no longer sustainable due to high population pressure. Among the major findings of the different case-studies which deal with ‘jhum’ cultivation systems is the alder-based improved ‘jhum’ cultivation system as well as local initiatives for tree-planting in ‘jhum’ which indicates the potential for shifting cultivation to be transformed into permanent agroforestry plots.

(c) Women play a major role in resource management, but have little decision making power nor representation as a group. This is shown in the study on Wancho communities in Arunachal Pradesh, India, as well as in Community Forestry of ‘sal’ in Nepal. Their interests need to be affirmed, especially in the context of changes in land use patterns and management practices which are taking place due to societal changes. Women need to be integrated in all processes of planning and change since they are the primary workers, both in agriculture and in natural resource use management.

(d) Community forestry has been a success story both in Nepal and India. It is a model for other South Asian countries. However, community forestry still needs to challenge the problem of biodiversity conservation as most community forests in the region show relatively low levels of diversity.

(e) Agriculture is part of an agroecosystem including a number of components such as swidden fields, community forests, etc. This is important for planning future changes as all parts of this puzzle contribute to local livelihood systems.

(f) Domestication of useful crop and tree species is a dynamic process in the Himalayan region, as is shown in the study on agroforestry in Kalikhasthan, Nepal. This is also part of the agrobiodiversity of the region and needs to be supported as living systems and not solely through written records or through ex situ conservation. IPGRI (International Plant Genetic Resources Institute) has a number of programmes in the region which aim at in situ conservation. At the national level, the active support of government agencies is needed.

Highlights of the study

This study discusses the status of indigenous medicinal plants and their role in the traditional health-care practice system of Bungmati Village.

This village lies on the southwest edge of the Kathmandu Valley, and is well known in Nepal as the dwelling place of Lord Machhindranath. The population of Bungmati is about 6,000, of which 80% are Newars, and the rest are Chhetris, Tamangs, Brahmins, and others. As regards religion, some 70% are Buddhist, and 30% are Hindu.

Agriculture provides the main economy for the majority of the inhabitants of Bungmati. Rice, maize and wheat are the dominant crops grown in ‘khet’ (irrigated land) while maize, millet, pulses, mustard, and beans are cultivated in ‘ban’ (unirrigated land). Woodcarving, the weaving of traditional mats and baskets from locally available plant resources, the trading of a few commercial plants, and the rearing of livestock are supplementary economic activities. The literacy rate is about 30%.

The investigation has generated much information regarding the availability, usage and importance of indigenous plants in the study area. More than 144 plant species have been investigated, out of which 50 species were reported as being used for medicinal purposes. Important medicinal plants found in this area are Artemisia vulgaris, Justicia adhatoda, Achyranthes aspera, Bergenia ciliata, Acorus calamus, and Celtis australis.

Altogether 26 species of plants are used for ceremonial purposes in different religious and cultural activities. Amongst the most commonly used species are Buddleia asiatica, Ficus religiosa, and Cynodon dactylon.

Bungmati villagers use 33 species as food plants. Likewise 36 plant species are used for fodder, the most easily available species being Grewia optiva, Arundinaria sp., Cyperus rotundus and Imperata cylindrica.

Altogether twelve plant species are used as fuelwood, the preferred species being the commonly found Grewia optiva, Melia azedarach, and Spondias auxillaris. Seven species of tree are used for timber, the most common being Melia azedarach, Alnus nepalensis, Schima wallichii, and Grewia optiva.

Among the identified plants, several species such as ‘chutro’ (Berberis asiatica), ‘sugandhawal’ (Valeriana jatamansi), ‘ketuki’ (Agave americana), ‘titepati’ (Artemisia indica), and ‘nigalo’ (Arundinaria sp.) are abundant and have commercial value. However, because of a lack of market information, the only plants known to be used commercially are ‘nigalo’ and ‘sugandhawal’.

Almost 40% of the local people use herbs for self-treatment, 8% go to the herbal healer (‘baidhya’), and 28% to the faith healer. Some 24%, mostly the younger generation, use modern medicine. Until ten years ago, most of the population of Bungmati put great faith in traditional herbal medicines and used indigenous plants extensively for treating different diseases. They would use herbal medication in the treatment of such diseases and ailments as malarial fever, jaundice, asthma, elephantiasis, eye diseases, colic etc. Nowadays, however, due to the introduction of allopathic medicines, people are turning to modern medicine. This trend is very common amongst the younger generations of all ethnic groups. However, people still retain a strong belief in traditional faith healing.
Self-treatment with herbs, and consultation with a herbal or a faith healer are the major methods of traditional treatment. The extent of dependence on faith healing is related to literacy level and to the degree of contact with the outside world. Those who are literate and in contact with the outside world choose modern medicine first, traditional medicine next, and faith healing last. Conversely, those who have less contact with the outside world, choose faith healing first, traditional medicine next, and modern medicine only when the first two have failed. There is a similar correlation between choice of healer and level of income. On average, it was found that people with low income are more inclined towards the traditional health-care system. They are generally more comfortable with it as their ancestors have practiced this method for generations, and expense is not an issue. In the Newar community of Bungmati, it is clear that people with good incomes and resources prefer allopathic medicines to the traditional health-care system. If any disease persists for a long time or recurs after allopathic treatment, then people turn to faith healers rather than to herbal healers. However, people with low incomes choose herbal self-treatment first, a faith healer or a herbal healer next, and an allopathic doctor only if not cured by the other methods. There are ten herbal healers in Bungmati.

Around 60% of people are familiar with medicinal plants and their value, whilst the remaining 40% do not have the relevant knowledge. This may be due to a decrease in natural resources as well as the introduction of modern medicine. The survey has also revealed that older people are most familiar with plants and their uses and, as knowledge is no longer being transferred from one generation to another, young people are becoming increasingly ignorant about the subject.

The knowledge of and beliefs regarding indigenous medicinal plants vary amongst different community groups. Knowledge about plant resources is greater in the Tamang and Chhetri communities than in the Newar community. The women of Newar and Chhetri communities were found to be more knowledgeable about the use of indigenous medicinal and cultural plants than their male counterparts. In the Tamang community, on the other hand, the reverse is true.

The people of Bungmati were heavily dependent on medicinal plants until 1961. Due to the introduction of allopathic medicines, the traditional use of medicinal plants has been neglected by the new generation because they believe there is no benefit.

Another reason for the decline in traditional knowledge about plants is the continuous decrease in the number of valuable medicinal plants. These are becoming less available, mainly because of habitat loss and land use change. The protection and conservation of valuable plants are being neglected.
Moreover, the bulk of traditional medicinal knowledge is limited to a few persons of the older generation, who seldom reveal their secrets. Due to a lack of dissemination and transfer of knowledge, the secrets of traditional herbal medicine are becoming lost with the demise of herbal practitioners. Even healers who do wish to share their knowledge have been unsuccessful in doing so because of the lack of interest shown by the younger generation. The unwillingness of young people to take over herbal practice stems from the fact that the low incomes involved are not sufficient to sustain them. The decrease in the popularity of this practice is also due to the difficulty involved in the growing of the required herbal medicines in the area.

Furthermore, patients have started adopting allopathic treatment as an alternative to traditional herbal medicine. Only ten years ago, many people outside of Bungmati Village used to visit Surya Muni Baidya, a renowned herbal healer of Bungmati, to consult about various diseases. Nowadays very few patients visit him.

Although Bungmati is not far from the affluent and developed capital city, most of the villagers are very poor and therefore cannot afford allopathic medicines. They had previously depended on natural forest resources, but now depletion of the forest is causing severe lifestyle problems.

According to herbal healers and local people, many important medicinal plants were found in Karyabinayak Forest, which fifty years ago was still dense. Now, reckless grazing practices and deforestation have led to the loss of important and valuable medicinal plants such as ‘dronapushpi’ and ‘amultas’, which have become extinct from this area. Plants which had been abundant, such as ‘asuro’ (*Justicia adhatoda*), ‘titepati’ (*Artemisia indica*), ‘sugandhawal’ (*Valeriana jatamansi*), and ‘chutro’ (*Berberis asiatica*) have declined drastically over a few years. According to one herbal healer, ten years ago he would prepare herbal medicines from the plants that were locally available. Now he has to buy several medicinal plants from outside. This is another reason for the unwillingness of the younger generation to adopt herbal healing practices.

In addition to the study summarized above, the research group initiated a project with the Bungmati Village Development Committee on the cultivation of 32 species of economically useful medicinal plants in a demonstration area situated within the premises of the Tri Ratna Cooperative School.
Ethno-medicobotanical studies of the Gurung community of Bichuar Village in the Lamjung District of Nepal, by I. Shrestha

Highlights of the study

There are many remote areas in the Himalayan region where modern medical health-care support is not available. Therefore, traditional healing systems play an important role in maintaining the physical and psychological wellbeing of the vast majority of people in such areas. It has been observed that when allopathic health-care is introduced into a village, the idea that the two systems can be integrated is not emphasized. In fact, there is a certain level of mistrust towards the traditional medical system.

This project focused on the current use pattern of herbal medicines, and the problems of ‘dhamis’ and ‘jhakris’ (local healers). A local workshop was also organized to build two-way communication between ‘dhami-jhakri’ and allopathic health-care workers; to promote appropriate and to discourage inappropriate traditional health practices. Another objective of the workshop was to enhance awareness of prophylactic measures such as immunization, family planning, nutrition, and environmental hygiene.

The study, led by Ms Ila Shrestha of the Nepalese Society for Systematic Collection, also produced a detailed inventory of all the medicinal plants, together with a herbarium collection. Those involved in the study conducted household surveys using structured questionnaires, identified and interviewed key informants, and carried out interest group meetings.

Gurungs are hardy hill people living along the southern slopes of the Anapurna Himalayas in west central Nepal. Their tribal territories extend from Gorkha District east through Lamjung and Kaski to the Syangja District, in the Gandaki Zone. Their economy is based mainly on agriculture and sheep breeding. They grow rice, wheat, maize, millet, and potatoes. The lower parts of their terraced fields are irrigated and sown with rice in summer and wheat in winter. In addition to growing cereals and potatoes they keep sheep as a source of meat and wool.

A great majority of Gurungs joined the Indian and the British armies, working in various parts of India, Malaysia and England. A small number joined the Royal Nepal Army. Gurungs who are not enrolled in army service stay at home to look after their fields and livestock, and make trips to the border regions of Tibet to exchange salt for food grain, and vice versa. Some people take ghee to exchange for Tibetan sheep wool and Himalayan goat hair.

This study is designed to improve the traditional healing system, with a view to improving the health of the people in remote areas of Nepal. Twenty-four people from Bichaur VDC and nine from Dudhpokhari are recognized as traditional healers involved in the health-care of the people of Bichaur.

The heterogeneous community in Bichaur VDC consists of Gurungs, Tamangs, Brahmins, Chhetris, Newars, Kamis, and Damais. The Gurung and Tamang communities are found to be much more influenced by traditional healing systems. It was found, however, that the local traditional healers use medicinal plants which are not found in the locality. These herbs are collected from higher altitudes. It became clear that, although many medicinal herbs do occur in many parts of the region, local people do not know how to conserve and preserve them and so are not benefiting fully from the traditional system. Thus the study has strongly recommended that the development of traditional healing systems in many remote areas of Nepal be emphasized.

The results of this study show that cuts, wounds and bone fractures are the most commonly occurring ailments of the inhabitants of Bichaur VDC. This is partly due to the geo-topographical variation of the locality. However, during the summer, water-borne diseases such as typhoid, cholera, dysentery, and jaundice occur predominantly. During the winter, pneumonia, asthma, colds, coughs, and high fever are reported.

An effective allopathic treatment or modern health-care system has not yet reached remote areas of Nepal, including Bichaur, where a variable number of medicinal herbs still exist. As illustrated in many of the case-studies, most of the diseases occurring in the villages have always been treated with traditional healing systems, using medicinal herbs.

Knowledge about the healing system is transferred orally from generation to generation without any written documentation, and many of the traditional methods have a superstitious element. Moreover, lack of documentation of traditional healing methods has resulted in confusion amongst users. Thus, the report has strongly recommended the necessity of proper documentation of the actual healing methods, along with the main characteristic features of the medicinal plants. Furthermore, it is suggested that a proper scientific study of the traditional healing system is carried out.

Altogether 127 species of 119 genera of medicinal plants belonging to 62 families have been reported as used by Gurung communities, including the traditional healers of Bichaur. Among these species, six are monocotyledons and eight are pteridophytes. Of the dicotyledons the majority (16 in number) belong to the Asteraceae and 11 are members of the Fabaceae.
Indigenous knowledge of the Qiang community about the conservation and development of ethnomedical plants in Maoxian County of Western Sichuan, China, by Wu Ning

Highlights of the study

In China, Tibetan medicine (Sowa Rigpa), Mongolian medicine, Uguar medicine, and Dai medicine are officially recognized as traditional medical systems in addition to Chinese Traditional Medicine (Zhong Yi), and are formally included in public health-care. However, there are more than 20 traditional herbal medicine systems being practiced in different ethnic minority areas. The Qiang’s traditional herbal medicine is one of these.

The use of medicinal plants and animals in Chinese traditional systems varies from one system to another. At the same time, the traditional medicine systems of minority communities are poorly represented in the major ‘Zhong-yi’ (Chinese medicine) system prevalent in China. Communities such as the Qiang ethnic community are undergoing rapid transition. This, together with an overall trend of decline in the biodiversity of medicinal plants, is fast leading to erosion of the knowledge base. A systematic record of the Qiang’s traditional health-care system is very sparse as most of the knowledge is passed down orally, and the community have their own writing script. Furthermore, most of the young people learn to read and write in the main Chinese script. Furthermore, most of the young people learn to read and write in the main Chinese language of Mandarin.

This study aims to document the Qiang’s indigenous knowledge with a view to promoting a wider understanding and legitimization of the traditional skills and health-care practices of the community. As briefly outlined in the following framework, Dr Wu Ning of the Botany Division of Chengdu Institute of Biology used various methods of investigation.

The major findings of the research are summarized in the following paragraphs:

(1) The diversity of medicinal plants and human dependency

In the ‘Herbal Encyclopedia’ compiled by Ben Cao Jin, reference is made by Tao Hong-jin to about 20 Qiang medicinal plants from western Sichuan. These include species of Notopterygium, species of Heracleum, Astragalus membranaceus, Rheum officinale, and Angelica sinensis. The ‘Annals of Maozhou’, published in the Qing Dynasty, recorded the distribution and efficacy of Notopterygium, Rheum officinale, species of Fritillaria and Saussurea, and others. There are 574 species of medicinal plants in Maoxian and these belong to 184 families. From 1992 to 1996 the Public Health Bureau of Maoxian collected and documented 118 folk recipes, which contain references to about 190 medicinal plants, 12 animal products and four mineral medicines. During almost the same period, the Sichuan Institute of Traditional Chinese Medicine investigated the distribution of Qiang medicine in the entire region inhabited by the Qiang people. It was reported that there are 2,301 species of medicinal plants in the region, belonging to 586 genera and 182 families.

The plants popularly used by the Qiang people can be categorized into 103 families, 136 genera and 225 species, among which there are 204 species of medicinal plants and 4 mineral medicines (such as plaster stone). It was found through the analysis of these reports that many species are particularly concentrated in this area because of the unique environmental conditions. For example, there are 14 species of medicinal plants belonging to the Compositae, 11 species of Umbelliferae, 10 species of Ranunculaceae, 10 species of Crassulaceae, 10 species of Liliaceae and 5 of the Gentianaceae, among which many species are typical of the Himalayas.

In the Qiang area, the collection of wild medicinal plants for sale is also a traditional source of income. According to records in the ‘Annals of Maozhou’, at the beginning of this century the sale volumes of some medicinal plants were very high. For example, the sales volume of Rheum officinale per annum was 10-15 tons; Astragalus membranaceus (together with other Astragalus species) 10 tons; Notopterygium incisium (including N. fonseesi) 15-20 tons; Bupleurum chinensis (including B. microcephalum) 25-30 tons; Heracleum candicans and H. hemsleyanum five tons; Vladimiria souliei five tons; and Fritillaria, thousands of kilograms. In addition, some medicines came from traditionally exported products, such as musk, and the fungus Cordyceps sinensis. The trading of products collected from mountains was carried out in the free market in the county town. Private traders would transport these products to urban centers by way of Guanxian County (now called Dujiangyan City).

(2) Localized medicinal knowledge

In the Qiang area, plants have historically been the principal source of drugs used in the cure and prevention of illness. Only recently,
with the advances in synthetic chemistry, have clinics begun to break away from their dependence on plant-based cures. Generally, the features of Qiang medicinal knowledge and technology are based upon the local biological and socio-cultural background, which is different from that of the Hans and the Tibetans. The Han system typically uses roots or rhizomes, whereas in Qiang medicine, flowers and whole plants are preferred. For example, *Rhododendron cephalanthum* is used to cure dropsy, *Mecanopsis quintuplilinervia* to cure diseases of the stomach and lung as well as muscle contraction, and *Delphinium kamaonense* var. *glabrescens* for the treatment of ringworm. Of the drugs mentioned, 70% of them are typically distributed on the eastern Qinghai-Tibetan Plateau. Some plants, such as *Fritillaria* spp., *Notopterygium incisium*, *N. forbesii*, *Astragalus membranaceus*, and *Rheum officinale*, grow at their best in this location, although they also occur in other parts of the Plateau.

The methods and forms of using medicine are unique. Most of the medicines are indigenous and use fresh herbs. Some medicinal herbs which are limited by their growing season are collected and processed at the appropriate time. Poisonous medicines are prepared using suitable methods. Qiang’s folk doctors prescribe the plants of the Ranunculaceae, Papaveraceae and Solanaceae as a refrigerant, febrifuge, sedative or pain remedy. They recommend various poisonous herbs, such as *Corydalis edulis*, *Cimicifuga* sp. and *Physalis* sp. for curing fever. In general, poisonous herbs are used more frequently in Qiang medicine than in Chinese medicine. Plants such as *Aconitum* spp. and *Viola* spp. are common in recipes for remedying pain. Many local species are used in tonic preparations, more than 20 of these deriving from *Astragalus* and *Codonopsis*. The important cash crop for this region, wild pepper, is also a commonly used medicine among Qiang people. All of its fruits, roots and leaves can be used as a refrigerant, sedative, anthelmintic, and for stomach invigoration. Most Qiang medical prescriptions are composed of compound ingredients, made up into pills, tablets, and powders, but the prescriptions themselves are distinctly different from those of Chinese medicine.

However, the influence between cultures is reflected in Qiang recipes. Through the analyses of 118 recipes collected by the Public Health Bureau of Maoxian, it was found that many Chinese medicines are used in Qiang remedies; about one-third of Qiang medicines come from Chinese medicine, and many are supplied locally. A similar relationship with Tibetan medicine can also be found in these recipes. As for the diagnosis of diseases, cultural mutual exchange is also apparent. Traditionally, four methods are used by Qiang’s folk doctors in diagnosis. These are: (1) to observe the inner spirit and the outside shape of the patient; (2) to auscultate and to smell the patient; (3) to ask the patient the causes of the disease; and (4) to take the pulse of the patient.

These methods can be found not only in the Chinese health-care system but also in Tibetan medicine.

(3) Current practices and trends

In the last four decades, the region inhabited by the Qiang people has changed, both ecologically and in terms of the Qiang way of life. Local people now depend less on the traditional health-care system than in former generations. Nowadays, fewer and fewer young indigenous people have the traditional knowledge of herbal healing practices used by their great-grandfathers. This knowledge is in danger of disappearing altogether.

Until the 1950s, the traditional healers of this mountainous region played an important role in curing both physical and spiritual illnesses. Medicinal plants collected from the wild lands or cultivated in home gardens were used not only by folk doctors but also by the farmers themselves. In the 1950s, employed doctors increased from 31 to 198, and hospital beds from 40 to 155. These figures indicate a rapid development in the modern health-care system, which has undoubtedly played an important role in the public health of rural areas.

During this process there has been a decreasing dependency upon the traditional health-care system. Fortunately, this tendency was recognized by the scientific world. In 1992 the Institute of Qiang Medicine was established in Maoxian, and the government sponsored a project with the aim of collecting and documenting traditional recipes. The cultivation of some endangered and marketable medicinal plants has been encouraged for the purpose of integration into ongoing reforestation projects. Thus traditional health-care practices and knowledge are in the process of rejuvenation.

(4) The cultivation and trading of medicinal plants

In addition to the collection of existing plants, there is also a strong tradition among the Qiang people of growing trees and medicinal species. The history of cultivating medicinal plants in home gardens or communal woodlands goes back thousands of years. There are references in chronicles to communal tree-planting practices, and home gardens planted with medicinal plants and fruit-bearing trees. For example, Qiang people traditionally like to plant several
varieties of medicinal plants, such as *Rheum officinale*, *R. palmatum*, *Astragalus membranaceus*, *A. norielus*, *Paonia veitchii*, *Gastrodia elata* etc., in their home gardens or on marginal lands, for self-consumption or marketing. These strong traditions have given environmental stability to large parts of the mountains.

However, research into medicinal plant cultivation processes has revealed that most of the methods were developed on a large scale only in the last three decades. A good example is the production of Chinese angelica (*Angelica sinensis*) and wild Asiabell (*Codonopsis pilosula*). In Maoxian County, Chinese angelica had begun to be planted as a crop from 1963, and Asiabell from 1964, when there were not enough resources for collection. In the 1970s, when state-owned enterprises felt the shortage of wild resources, cultivation of some valuable herbal medicines was encouraged in order to meet the increasing demands in the markets. Thus, the yield of Chinese angelica in the entire Qiang region reached 20 tons in the late 1980s and made up 50% of the provincial total; the yield of Asiabell was about 8 tons and amounted to 70% of the provincial total.

Another example is milkvetch (*Astragalus membranaceus*), which is a traditional herbal medicine among the Qiang people. The processed roots of milkvetch are traditionally sold in the domestic markets and Southeast Asia. This herb is always planted by villagers in the mountain forests, where the shade of the forest canopy and the humus-rich soil provide a suitable habitat for its growth. Yield of milkvetch has increased by a factor of fifteen from the 1950s to the 1990s.

Western Sichuan is an important area for the production of tendril-leaved fritillary (*Fritillaria cirrhosa*). Owing to its high price in markets and great demands for its medical uses, plants have been rooted out in huge quantities. The purchasing amount in Aba Prefecture increased 5.74 times from 24,348 kg in 1975 to 139,680 kg in 1988. This then fell to 72,084 kg in 1990, which indicates a decrease in the resource base. By the 1970s people realized the urgency of conserving and developing this regional resource. Seven species of fritillary were tested for planting with seeds or bulbs in Maoxian. In 1983 the fields for fritillary cultivation covered on area of 0.77 ha. The state-owned stations set an example for the improved household cultivation of fritillary at the end of the 1980s. In 1995 the planted area in Maoxian reached 20 ha.

Wild pepper (*Xanthoxyllum bungeanum*) is not only a traditional flavouring of southwestern China, but also a traditional Qiang medicine. Its leaves and fruits are used in many traditional prescriptions. Wild pepper was being cultivated about 300 years ago, but it was only planted occasionally by mountain farmers on the edge of their fields and did not become an important cash crop until the 1950s. At present, the cultivation of wild pepper on barren slopes in dry valleys has not only become one of the most important sources of income for the villagers, but has also increased vegetation coverage. In conjunction with the national conservation project, about 600 thousand pepper trees were newly cultivated in Maoxian on slopes with an elevation below 2,600 m during the period of the ‘Eighth Five-Year Plan’ (from 1990 to 1995) and, by 1995, there were 6.4 million pepper trees in this county, with a yearly yield of 186 tons.

With the advent of substantial improvements in biotechnology and insufficient naturally occurring plants to meet the increasing demands of the medical markets, more wild medicinal plants with promising economic value have been identified and cultivated. Among these, wild yam (*Dioscorea* spp.) is a good example. The discovery of diosgenin, a steroidal sapogenin that occurs naturally in very high levels in some yam species, led to a revolutionary means of synthesizing birth control agents. Since the strict Birth Control Plan was carried out in China from the 1970s onwards, demands for contraceptive pills increased very rapidly, leading to the investigation, analysis, cultivation, and processing of yams. Over-exploitation has threatened yams in the wild and they are now being cultivated in western Sichuan especially for diosgenin production. From 1996 until about 2000, the number of households in Maoxian County involved in the cultivation of wild yams rose to around 1,000. Due to the simple skills required, a minimal input of labour, a guaranteed output of products, and the fact that farming field space did not have to be taken up, more and more farmers are involved in this industry on a voluntary basis. This scheme has contributed to farmers’ participation in development projects sponsored by government or development agencies aiming at poverty alleviation in this region.

The cultivation of high-value wild or introduced plants by farmers has played an important role in their economy. Meanwhile, the policy of encouraging diversified economic activities, as adopted by the provincial government in 1980, has also had a positive impact on the development of sideline production. When the state monopoly for the purchasing and marketing of all specialized local products (except musk) was rescinded in 1985, the farmers perceived this as a crucial incentive to exploit wild plant resources. Subsequently, business organizations at all levels (including private peddlers) have been engaged in the purchasing and marketing of all medicinal plants. Indigenous agro-ecosystems have played an important role in the conservation of biodiversity, and some ethnobotanical practices of agro-forestry management have been integrated into the reforestation projects.
A study of the ethnobotany and conservation of *Podophyllum hexandrum*, *Diphylleia sinensis* and *Fritillaria cirrhosa* in the Zhongdian Tibetan Autonomous County in Yunnan, China, by Hu Zhihao and Qi Shunhua

Highlights of the study

North-west Yunnan covers an area of 72,531 sq km and is located in the Hengduan Mountains (29°N; 98°E). The eastern appendages of the Himalayas consist of the Dali Bai Autonomous Prefecture, Lijiang Prefecture, and Diqing Tibetan Autonomous Prefecture of Yunnan Province, and link up the Tibetan plateau in the north and the Yunnan-Guizhou plateau in the east. The altitude ranges from 1,200 to 6,700 m above sea level. Mountains and river valleys occur alternately, stretching from north to south and forming an undulating terrace. Zhongdian is a Tibetan-inhabited district in Northwest Yunnan.

The collection of medicinal plants from mountain forests, pastures and other ecosystems is a common practice amongst mountain communities in the area. In addition, the cultivation of certain medicinal plant species in herbal gardens and farmlands has a long tradition in the local villages. This includes the production of plant drugs for marketing in the area.

Historically, this area is well known for its exceptionally rich diversity of medicinal plants, and as an important provider of crude drugs (of both plant and animal origin) for Chinese medicines. Almost 600 species of medicinal plants used in Tibetan medicines are reported from Zhongdian. Two species, *Podophyllum hexandrum* and *Diphylleia sinensis*, were scientifically validated a decade ago to contain anti-cancerous compounds. This led to a very high level of demand for these two species for chemical extraction. There is an urgent need to supplement the availability of this drug from cultivated sources. *Fritillaria cirrhosa* is considered one of the best wide-spectrum medicines for the treatment of respiratory diseases.

The aims of this project were to document the local classification and use of the three species and to set up demonstration plots in farmers’ fields to standardize and promote their cultivation and marketing. Important questions about the economic viability of the small-scale and decentralized production of medicinal plants were also addressed.

This project was undertaken by Mr Qi Shunhua of Yunnan University under the supervision of Professor Hu Zhihao. With the help of a semi-structured questionnaire, they interviewed local traditional health-care practitioners and Tibetan doctors working at the local hospital. They made personal observations and interacted with several farmers in the village, encouraging them to take up the cultivation of the three plants. Phytochemical analysis, from the collected rhizomes and seeds, was carried out in the laboratory. Over one year of case-study work on the three species of Tibetan medicinal plants, their classification, botany, biology, ecology, and distribution patterns were studied. It became clear that natural resources can meet the needs of traditional medical usage, but cannot meet the rapidly expanded demands of the modern pharmacy industry. These resources are diminishing, rare, and even threatened. These findings provide opportunities for developing the local economy, but also issue a danger-signal in terms of the possible over-harvesting of wild resources from natural habitats.

Among the three medicinal plants, *Fritillaria cirrhosa* is most familiar to local people, and is being studied more in detail. The natural environment and technical foundation necessary to develop *Fritillaria* for cultivation are available in the Zhongdian area. *Podophyllum hexandrum* is also known among villagers, but many do not understand why they should grow it rather than collecting it for medicinal use. They dislike growing this plant in their gardens because the economic benefit is very low. The same applies to *Diphylleia sinensis*. The strategy is therefore to protect the germplasm resources in situ and/or ex situ (especially the plants of *Diphylleia sinensis*), and to set up conservation areas to protect local populations of the species. For local economic development based on modern pharmacology and techniques, it is necessary to form new medicine-manufacturing lines and to organize the market in order to open the way for the raw material products. Only market demands can encourage the local people in the cultivation of medicinal plants in the area.
An ethnobotanical survey of the propagation of rare medicinal herbs by small farmers in the buffer zone of the Valley of Flowers National Park, Chamoli, Garhwal Himalaya, India, by C. P. Kala

Highlights of the study

The Valley of Flowers (VOF) National Park is a high-altitude protected area in Garhwal Himalaya. The park and its buffer zones are rich in medicinal plants, and the local people of this area have a considerable knowledge of ethnomedicine. These people are gradually shifting from a subsistence to a market economy, mainly due to enhanced tourism and mountaineering activities. In addition to adverse impacts on the habitats, over-extraction of medicinal plants for commercial purposes due to increased demand has exerted tremendous pressure on the existing plant populations. In all, 112 species of medicinal plants have been recorded as used by the local population. Of these, 23 species are rare and endangered, including five species listed in the Red Data Book of Indian Plants.

This study was carried out by Mr C. P. Kala, Wildlife Institute of India, Dehradun, under the guidance of Dr G. S. Rawat. He collected ethnomedical information using semi-structured and unstructured questionnaires as well as direct observations in the field. Each household was surveyed for information on the quantity of their extraction of medicinal plants from the wild. Data were verified by repeated interviews with more than one informant. To study the effects of various anthropogenic activities on the population of medicinal plants, 25 quadrats of 50 x 50 cm were laid out in the different pressure zones. Various landscape elements in each of the pressure zones were identified. The entire study area was stratified into three broad pressure zones: (1) the Valley of Flowers, being a protected area, considered as a control site; (2) the buffer of the park, which is under severe pressure due to tourism and livestock grazing, taken as a high pressure zone and; (3) Khiron Valley, which is grazed mostly by sheep and goats, taken as a moderately disturbed (grazed) area.

The major findings of this case-study are highlighted below:

(1) Status of medicinal herbs

The inhabitants of the project area in the Khiron Valley and the buffer zone of the VOF (Bhyundar, Ghangaria and Pulna) have traditionally used a total of 112 species of medicinal plants. Of these, herbs were the most numerous (92), followed by shrubs (ten), trees (seven) and ferns (three). Of the 54 total rare and endangered species of the VOF and its environs, 31 species were used for medicinal purposes, of which five species are listed in the Red Data Book of Indian Plants. Out of 31 rare medicinal plants, 23 species were recently categorized for rarity according to new IUCN Red List Criteria laid out in the Conservation and Management Assessment Plan (CAMP) meeting held in Lucknow, UP, of which 12 are critically endangered, four are endangered, and seven are categorized as vulnerable.

The VOF and its environs harbour almost 600 plant species, of which 112 were used for medicinal purposes by the local people. Some of the rare medicinal herbs, for example Picrorhiza kurrooa, Fritillaria roylei and Cyananthus integrus, were found only in the park and not seen in the Khiron Valley or buffer zones of the park. This is possibly due to various anthropogenic pressures, such as grazing, burning, over-collection, and deforestation. It is estimated that in the high altitudes of Garhwal Himalaya, the underground parts (roots, tubers and rhizomes) of these medicinal herbs are used in the highest number of cases (45%), followed by the leaves (26%). Most of the alpine plants reproduce vegetatively by tubers, rhizomes, and roots, and their populations decline severely if the underground parts are extracted. Exploitation of rhizomes and tubers at a commercial scale has led to substantial loss of medicinal plants from their habitats in many parts of the Garhwal Himalaya.

(2) Traditional knowledge about medicinal plants among the villagers

Among the youth, who formed 23% of the total population, 95% had no knowledge of medicinal plants, and only 5% had some knowledge. Adults formed 29% of the total population, and of these 68% had no knowledge of medicinal plants, 27% possessed adequate knowledge, and 5% had good knowledge. Elders formed only 19% of the total population; 35% had no knowledge of medicinal plants, 27% possessed adequate knowledge, and 5% had good knowledge. Elders formed only 19% of the total population; 35% had no knowledge of medicinal plants, 52% had adequate knowledge, and 13% had very good knowledge.
In comparison with men, women were less knowledgeable about medicinal plants. However, among the elders, both men and women had almost equal knowledge (1:1) of the use of medicinal plants. This supports the hypothesis that old people have more knowledge of medicinal plants than the younger generations. The attitude of the younger towards the traditional healing system was neutral. They are keen to pursue other business professions which may seem less tedious than the pastoral and agricultural practices in this region of the Himalayas.

The villagers had a considerable faith in medico-religious and religious plants. *Saussurea obvallata* is collected on occasions of deity worship, especially in offering to a local Goddess, Nanda Devi. The bark of ‘bhoj patra’ (*Betula utilis*) is known to have been used as paper in ancient times. Sometimes ‘mantra’ or spells are written on the bark of this tree in red ink by a priest or saint. It is given to the devoted, preserved in a small casket and is believed to cure certain diseases. *Cannabis sativa* is another religious plant. Hindu Shiva devotees relish the drink prepared from its dried seeds. The flowers of *Jasminum humile* are offered especially to Lakshmi (the wife of Lord Vishnu) in the months of Chaitra (March-April) and Baisak (April-May). Devotees write the names of gods or deities on the leaves, sometimes count the flowers, and prepare garlands to offer to gods and goddesses.

An old tree of *Morus serrata*, located in the middle of Joshimath town, has a special significance in this region. It is called ‘Kalpavriksha’ (tree of eternity). Lord Sankaracharya is said to have meditated under this tree 800 years ago. The root of *Hedychium spicatum* has a special religious significance at marriage ceremonies. Its decoction is applied to the body of the bride and groom to keep them cool. *Origanum vulgare* is another medico-religious plant which is offered to Lord Vishnu and Shiva in Badnath and Kedarnath temples.

(3) Dependency of local people on medicinal plants

Three main medicinal herbs, ‘faran’ (*Allium humile*), ‘choru’ (*Angelica glauca*), and ‘dolu’ (*Rheum australe*), were collected by local people from the adjacent areas. These herbs were collected for personal use and would be offered by villagers to their relatives and friends as gifts. Besides these herbs, men also collect ‘mitha’ (*Aconitum balfourii*), ‘balchhadi’ (*Arnebia benthamii*), ‘hathajan’ (*Dactylorhiza hatagirea*), ‘salam mishri’ (*Polygonatum verticillatum*), ‘mamira’ (*Thalictrum foliolosum*) etc. The bark of ‘thuner’ (*Taxus baccata*) is also collected, mainly for making tea. It was noticed that the dependency of local people on medicinal plants has decreased over the past 10-15 years due to the easy availability of allopathic medicines and rapid socio-economic changes in this region. The younger generation now has a greater belief in allopathic medicine but still trusts many medicinal plants for curing certain diseases. For instance, the use of *Thalictrum foliolosum* is still in practice for curing eye complaints and skin diseases, *Dactylorhiza hatagirea*, *Eulophia dabia* and *Gymnadenia orchidis* are considered good tonics, and also effective for curing gynaecological disorders, and *Picrorhiza kurrooa* is used for example in cases of fever and headache.

(4) Cultivation of medicinal plants and enterprise development

The success of medicinal plant cultivation initiated at Bhyundar village could not be assessed during the project tenure. Farmers have shown a keen interest in taking more trials and following other methods in the event of failure. The medicinal herbs selected for the present project are:

(1) *Dactylorhiza hatagirea*
(2) *Rheum australe*
(3) *Podophyllum hexandrum*

For enterprise development in the study area, local communities, the Forest Department, Block Development authorities, the Herbal Research Institute at Gopeshwar (Headquarters of Chamoli District), the High Altitude Plant Physiology Research Centre, Srinagar Garhwal, Co-operative societies, and many local social workers were approached. The following points emerged during discussions with them:
(a) About 12-15 medicinal herb species were collected from the wild by the villagers in the region before 1992 and supplied to the co-operative societies without any restrictions from the Government.

(b) A second problem in the medicinal plants trade is the inadequacy of the market.

(c) Despite these challenges the farmers are keen to cultivate the medicinal herbs.

A total of 112 medicinal plants were known to local people. Before 1992 the local inhabitants would collect 15-20 species of medicinal plants for commercial purposes, but now this collection from the wild has been stopped by order of the Government. Local people then collected three species. To relieve the pressure on these medicinal plants the need was felt to cultivate them in order to:

(a) promote *ex situ* conservation of these herbs;

(b) encourage small farmers to use the village wastelands and;

(c) develop local enterprises for the farmers.

Local inhabitants were keen to cultivate these medicinal plants, so a short project was launched in Bhyundar Valley, funded by the HKH ethnobotany project, and attempts were made to cultivate the three medicinal herbs, known locally as ‘hathajari’, ‘bankakri’ and ‘dolu’. Attempts are also being made to develop local enterprises and rationalize prices with the help of local institutions, and so far these have yielded encouraging results.

**General points and lessons learned**

The ethnobotanical information generated from these five case-studies is very useful; the messages from community herbal doctors, practitioners and healers, and rural people are important, and the field observations, experimentation and studies of medicinal plants are meaningful in terms of the sustainable utilization and conservation of medicinal plants in the mountain areas of the region.

The case-studies demonstrated a general trend in approach. Most of the researchers started by reviewing secondary information and data and then visiting the site for informal discussions and personal observations to sharpen research questions. These unstructured interviews were followed by the administration of semi-structured or structured questionnaires, largely at the household level. In the process, a number of key
informants were identified for detailed discussion on particular traditional practices and aspects of indigenous knowledge. The collected information was analyzed. This approach can be described as a ‘Rapid Rural Appraisal’ method. An additional important aspect of ethnobotanical studies is the inventory of useful plants, and so due effort was spent by researchers on floral collections, herbarium preparation, and identification. Some researchers also attempted to draw resource maps, seasonality calendars and walk transects, so complementing the information from market surveys. A summary of the various methods used by the researchers is presented below.

**Methods used**

1. Review of secondary information;
2. Personal observation;
3. Setting up site-selection criteria;
4. Socio-economic and resource surveys (these include interviews and questionnaires, seasonality calendars, looking at the division of family labour and gender roles, informant identification, and preference ranking);
5. Case-studies;
6. Market surveys;
7. Floral inventories (free-listing, herbarium collections, local classification systems);
8. Demonstration trials for the cultivation of medicinal plants.

In general, the four most widely used tools are:

(a) review of secondary information,
(b) making personal observations,
(c) introducing key informants, and
(d) preparing a herbarium collection.

This approach seems to have been the most popular one. While many more methods were discussed in the training workshops, only a few investigators used a variety of methods systematically, although the participants seemed to think that all the methods discussed would be useful.

It appears that the aptitude of all the members of the research team was important. For those researchers who were associated with universities, the interest of their academic supervisors and their understanding of how the work should be carried out played an important role.

Another important factor is that most of the researchers were not residents of the place where the research was conducted. They visited the site as frequently as they could and stayed for some time, at best several weeks per visit. During these visits the emphasis was on data collection by the quickest means. Therefore the use of questionnaires and interviews was popular, as a wealth of information could be accumulated in a short time. In training workshops due emphasis was laid on measuring and physically carrying out various methods to verify and supplement the information collected through interviews. Unfortunately, only a few researchers followed this advice.

The need to prepare maps, walk transects, and conduct ecological surveys in the various resource areas of the local community was also highlighted during the training workshops, but these aspects have also been largely neglected by most researchers. The reasons given for this were that these were time-consuming and required a good rapport with the community, which needed certain special skills such as negotiation and conflict resolution. Above all, such exercises would raise certain levels of expectations amongst the people, which would have required follow-up after the study. In most cases, researchers came from academic institutions or organizations far away from the place of research and thus had little confidence in any concrete contribution to be made beyond the level of research.

Another important factor that has come to light is that there has been little discussion with all the stakeholders; this would have presented a more balanced and complete picture of the issues related to the thematic subjects of the research. In general it is true that all traditional societies are going through some rapid changes in their value systems. These changes affect the ways in which resources are used, as well as ideas and opinions about their use. It is therefore essential to assess all the issues from as many aspects as possible, and to discuss them with all the major stakeholders and decision-makers. Researchers have tended to concentrate on the custodians of indigenous knowledge only and have not sought the opinions of other interested parties.

These are some of the lessons that can be learned from the process and the results of these case-studies and study grants. Bearing these in mind, and emphasizing the need to generate a spatial understanding of the resource environment and the way in which it is used (particularly important in mountain areas), methods such as participatory mapping, resource dependence profiling, the making of profile diagrams, and the systematic collecting of data for statistical analysis should be considered in future studies.

The most important factor relating to any applied research with the community is that the results of the study should be useful to them. There were very few public meetings at which people could have learned about the nature of the work they would be doing and, at the same time, only limited efforts were made to return the results of the study to the community. It is important to reinforce these as key principles for researchers working on applied ethnobotany in future.
Relevance of the studies to future work

The case-studies mentioned above have, in general, been successfully implemented, and identify some of the important issues involving indigenous medical systems in the Himalayas. They provide good examples, showing that traditional societies in this mountain region are highly dependent upon traditional medicine.

Ethnobotany can make a positive contribution by facilitating community participation in the development of the rural health-care system. This can be accomplished by identifying locally available plant resources, indigenous knowledge, and traditional healers, by strengthening local institutions through capacity building, by providing training opportunities for community members, and by supporting development projects such as those for the cultivation of valuable medicinal plants.

Development activities which put indigenous knowledge into the context of natural resource management are particularly important. These can start with a focus on medicinal plants and with the training of younger villagers in traditional medical knowledge.

Proper documentation of the healing methods, including the main features of the health-care system and the basic characteristics of plants used is also recommended by the case-studies.

Such work has been carried out in initial ethnobotany studies in many countries, but remains far from complete. Therefore, future studies are needed in order to establish a medicinal plant information database in the countries of the Himalayan region.

Conclusion

The use of herbal medicine has a long tradition amongst all mountain communities in the Himalayan region. It involves a diversity of indigenous knowledge and cultural beliefs and constitutes an important basis for the development of society.

Due to rapid changes in socio-economic, environmental and cultural beliefs in the region, the use of herbal medicine is in transformation. The impact on societies of introduced allopathic medicines and modern medical systems has varied, but the general trends are that:

- traditional knowledge of herbal medicine is disappearing;
- traditional healers are becoming rare and less respected;
- medicinal plants are over-harvested;
- changes in land-use patterns are resulting in the degradation of natural ecosystems.

The conservation of medicinal plants and traditional medicinal knowledge run in parallel and are important and interrelated. Necessary factors include:

- community participation in *in situ* conservation;
- the cultivation of economically important medicinal plants;
- support to a younger generation of healers at community level.

Traditional and modern medical practices must be integrated into a new medical system. Important factors include:

- development of new drugs based on herbal medicine;
- training of doctors with the skills both of a traditional healer and of a modern physician;
- law-enforcement to support the establishment of integrated institutions which would include pharmacopoeia, hospitals, training centres, pharmaceutical companies, drug stores, and research centres.
The Himalayan region

The Himalayan region is characterized by its diverse biophysical environment and by the extremely rich cultural milieu of its inhabitants, who belong to hundreds of ethnic groups and indigenous communities. Though many systems of exchange exist between the numerous societies of the Himalayan region, it remains very marginalized politically and economically. This is because firstly the small societies living in remote mountain environments are not well represented in centralized political governments, and secondly because its remoteness does not facilitate access to education, health services or significant industrial or agricultural developments. Major religions prevailing in the Himalayan region include Buddhism, Hinduism and Islam, as well as more local religions often based on the cult of ancestors or Shamanism.

Plant resource management

Plant resource management is the way plants are used, harvested, cultivated or protected on the basis of a common knowledge system and special rules shared by the members of a given society. Management implies a system which aims at conserving the resource base: indeed exploitative and extractive methods which lead to the destruction of the resource base are the result of mismanagement.

Management also implies a sound empirical knowledge about the amount of plants or plant parts which can be extracted without affecting the plants’ populations (Peters, 1994). Other aspects of sustainable management relate to the society level, i.e. how all members of one society co-ordinate their efforts to achieve sustainable management. This implies the existence of specific rules governing access to the resources whilst maintaining proper limitation and control systems.

Biological resources of the Himalayas

Wild plant resources provide a variety of basic needs to rural and urban communities, such as building materials, fuel, food supplements, materials for crafts, and medicines. They are also a source of income. The depletion of favoured plant resources results in a loss of self-sufficiency and economic opportunity for local people. It can also lead to resource management problems in conservation areas, as they can become focal points for the harvesting of selected species, resulting in a loss of diversity, and growing conflict between resource users and resource managers.

Mountain systems in the Himalayas have long been neglected by the rest of the world because of their inaccessibility and poverty. As the fundamental building blocks for development, biological resources provide the basis for the subsistence of mountain people and the potential for the development of mountain economies. Mountain people use a wide variety of species, and communities manage the environment as a whole, integrated system rather than as separate ecosystems. From such perceptions and practices over time, mountain people have constructed a system for the use and maintenance of natural resources. This is referred to as the ‘informal knowledge system’ or the ‘indigenous knowledge system’.

Modern systems of resource utilization and methods of economic development compete for resources from the natural environment by using formal knowledge and modern technology. Operations under these systems concentrate on exploiting a particular species with a high economic value, either in wild harvesting or in agriculture, and neglect the important variations of use of cultural mountain society traditions. This has resulted in the degradation of the mountain environment and its resources.

The traditional utilization of biologically diverse resources in the mountain region of the Himalayas reflects a diverse resource use pattern and thus diffused exploitation of one species. Natural resource management systems are localized systems which form the basis for decision-making for rural people. Since the majority of land-based production systems in the Himalayan region operate under indigenous knowledge systems, they are of value not only to the cultures from which they evolve, but also to scientists and planners striving to improve conditions in rural societies. However, there is tremendous pressure for socio-economic change. With this the ethnobotanical knowledge and cultural traditions which have been continuously developed and transferred from generation to generation are beginning to be lost.

The natural settings of the Himalayas have also influenced resource management. Biophysical characteristics include hills ranging from slopes to very steep highlands, mild to extreme
temperatures, relative aridity, fragmented landscapes, and high variations in altitudinal range and sun exposure. All these characteristics give rise to a number of ecozones, within which is found a large diversity of microclimates and microenvironments. Biological resources are very varied; vegetation types are highly diverse, and endemism is high (Shrestha and Joshi, 1996). Due to a scarcity of resources, together with climatic constraints, mountain societies frequently exploit different ecozones at different periods of the year, or rely on two or more types of activity such as agriculture, herding, trade, and natural resource use.

As a result of these natural and socio-economic constraints, people depend heavily on natural resources, and future development is tied into their sustainable use. Decentralized community-based management systems are vital in this region. However, any attempts to develop community-based management systems should not remain isolated; such experiences should be exchanged and shared, on a horizontal level with other societies sharing either common biophysical or cultural settings, and vertically in order to include scientific, developmental and conservation views from the national level. Today all societies are linked to the more global environment, especially through trade, which was probably the first industry to reach the remotest places of the world. Networking for the exchange of knowledge and information related to trade as well as technologies and opportunities is essential for the Himalayan societies.

Traditional use and management of medicinal plants in the Himalayas

Medicinal plants play an important part in the health-care systems of traditional mountain societies. In the Himalayan region, it is estimated that 70-80% of the rural population depend on traditional medicine for primary health-care today, even though allopathic medicine is available in many parts. Food, health-care and wood-energy are the basic needs of mountain people. There are no alternative resource options to ensure the survival of traditional mountain communities under the harsh conditions which characterize the region.

Medicinal plants are also an important source of income in this region, contributing to the economic development of mountain communities, and supporting modern industrial development both inside and outside the region. The total number of medicinal plants in the Himalayas is approximately 7,500 species (Pei, 1998). These plants play an important role in the biodiversity of the region and have great conservation value for global biodiversity.

The Himalayas host the three largest traditional medical systems in the world: Ayurvedic medicine, Chinese medicine, and Unani medicine. This region is the only geographical area among the world’s large mountain systems (e.g. the Himalayan, Andean, African, and European mountain systems) that possesses both rich medicinal plant diversity and great traditional medical knowledge. It has been documented in literature from ancient times, allowing methods for treating illness to be passed down from generation to generation. The traditional management of medicinal plants and practices of herbal medicine are built on the basis of local knowledge. There is a long tradition of using medicinal plants for both preventive and curative health-care by rural societies. Local people have developed reliable knowledge and effective methods to identify, harvest, utilize, maintain and preserve medicinal plants and their habitats for sustainable use and protection. The ethnomedical and ecological knowledge, and cultural traditions involved, have been continuously developed, and transferred from generation to generation.

The transition from centuries of isolation to intense interaction with the outside world since 1950 has been rapid and abrupt. Traditional systems of knowledge, including medicine, have disintegrated in the mountainous areas of the region. Modern development interventions, access to modern allopathic medicine and improved health-care facilities have resulted in population growth. These have furthermore caused changes in the consumption pattern of medicinal plants amongst mountain societies, from home and local use in small quantities to massive harvesting for marketing in large quantities. Changes in resource tenure systems resulting in uncontrolled over-harvesting of wild medicinal plants and the loss of traditional knowledge about medicinal plants and conservation traditions are further consequences.

Field-based research and community participation in the documentation, application and proliferation of indigenous knowledge about medicinal plant resources and their management can be a part of the process for coping with such changes, without losing valuable local tradition and biodiversity. Hence the importance of ethnobotany applied in conservation and community development. Understanding the indigenous knowledge of mountain people in relation to biodiversity resource management and cultural traditions is important for the development of the Hindu Kush-Himalayan region. It is necessary to identify changes in resource management, culture, decision-making, and tenure systems, as well as overall changes in the social and economic relationships to resources in order to face the changing realities of mountain societies in the region.
References


Case Studies


Applied Ethnobotany

Ethnobotany for Conservation and Community Development

Applied Ethnobotany in Natural Resource Management - Traditional Home Gardens

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The People and Plants Initiative

was started in July 1992 by WWF, UNESCO and the Royal Botanic Gardens, Kew to promote the sustainable and equitable use of plant resources through providing support to ethnobotanists from developing countries.

The initiative stems from the recognition that people in rural communities often have detailed and profound knowledge of the properties and ecology of locally occurring plants, and rely on them for many of their foods, medicines, fuel, building materials and other products. However, much of this knowledge is being lost with the transformation of local ecosystems and local cultures. Over-harvesting of non cultivated plants is increasingly common, caused by loss of habitat, increase in local use and the growing demands of trade. Long-term conservation of plant resources and the knowledge associated with them is needed for the benefit of the local people and for their potential use to local communities in other places.

The diversity of traditional plant-resource management practices runs through a spectrum from “cultivation” through to gathering “wild” plants, all of which are included in the People and Plants approach.

Ethnobotanists can work together with local people to study and record the uses of plant resources, identify cases of over-harvesting of non-cultivated plants, find sustainable harvesting methods and investigate alternatives such as cultivation.

The People and Plants initiative is building support for ethnobotanists from developing countries who work with local people on issues related to the conservation of both plant resources and traditional ecological knowledge. Key participants organize participatory workshops, undertake discussion and advisory visits to field projects and provide literature on ethnobotany, traditional ecological knowledge and sustainable plant resource use. It is hoped that a network of ethnobotanists working on these issues in different countries and regions can be developed to exchange information, share experience and collaborate on field projects.

Please visit our website at: http://www.rbgkew.org.uk/peopleplants