International Master Programme at
the Swedish Biodiversity Centre

Master theses
No. 31
Uppsala 2007
ISSN: 1653-834X

Uncultivated Plants: an option for livelihood support of the people in mid-hills of Nepal

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CBM MASTER THESES SERIES

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Abstract

The aim of this study was to analyze the richness of uncultivated plants, their status and contribution to the livelihoods of two ethnic groups (Gurung in Kaski and Chepang in Dhading) in the mid-hills of Nepal. The uncultivated plants were used by the local people in different forms (food, vegetables, medicine, and for cultural and economical reasons). The links to food security and maintenance of culture and tradition, as well as their present status in terms of availability and use were explored. Initially, exploratory techniques such as diversity fairs, key informant surveys and group discussions were conducted, followed by more detailed individual household surveys. A total of 105 farm households (62 in Dhading and 43 in Kaski) were included in the household survey.

The uses of 112 uncultivated plant species were documented; including 61 species with multiple functions as food, vegetables, and medicines. Details on importance and use of different species are presented in the paper. The uncultivated foods contributed significantly to food requirements of the households. The overall contribution was about 2 months a year, with a significant difference between Kaski (1.3 months) and Dhading (2.6 months). In Dhading, 58% of the households used uncultivated foods more than 3.5 months a year compared to 5% in Kaski. Furthermore, many species were stored for future use. However, marketing of the uncultivated plant species was of small importance in both districts, although some species have a potential market value. Many species also had large cultural importance and were an important source for production of local medicine.

The availability and use of these species has been declining, however, people have started ***in-situ*** conservation and domestication of several important species. The uncultivated plant species were crucial to both ethnic groups, but these resources are neglected by authorities. Further research is needed to assess contribution of uncultivated plant species to food security in terms of quality, quantity and diversity, and the nutritional contribution of such plant species.

Key words: Uncultivated plants, ethnic groups, multiple functions, richness, diversity fairs, culture and tradition, food security, *in-situ* conservation, domestication

Glossary

Baisakh: The first month of Nepali calendar (Mid April to Mid May)

Chepang: A caste group of indigenous ethnic nationalities, considered to be most primitive communities of Nepal. Traditionally were hunters and gatherers

Chiuri: Butter tree, Multiple function as food, feed, fertiliser and cultural

Dalo: A small bamboo basket used to store things

Doko: A basket bigger than dalo made by bamboo and generally used to carry forage and grass in backloads and also used to carry other materials

Ghee: Butter after boiling

Gittha: A wild food normally harvested its bulb and also can used the aerial fruits (*Dioscorea bulbifera*)

Gurung: A caste group of indigenous ethnic nationalities, also known as Tamu

Lhosar: A festival of New Year celebrated by Gurung and other mongoloids people. This is also like a Tibetan new year

Maghe Sakranti: A cultural festival celebrated in the first day of Nepali month Magh (Mid Jan. to mid Feb). There is a tradition to eat the root crops after boiling the eve of last day of previous month and eat in the morning of first day of Magh.

Nanglo: A bamboo made flat and light local materials used for cleaning the cereals and pulses

Nwagi: Chepang's one of the main festivals which is performed on a Tuesday during third week of Bhadra (August and September).

Contents

Introduction

Throughout the world, wild or uncultivated plants provide a '*green social security*' to hundreds of millions of people in the form of food, materials for clothes and shelter (Cunningham 2001). These plants add diversity to local food systems, reinforce culture and contribute with diversity to farming systems, and traditions and are important for household food security, health, and nutrition and income generation (Machakaire 2001, Warinwaa 1999). Between 60% and 70% of populations in developing countries dwell in the interface between agriculture and forest land areas collect various parts of uncultivated plants like roots, leaves, fruits, and nuts (FAO 1992, Hladik et al. 1993).

What are uncultivated plants?

Uncultivated plants in this study are wild or uncultivated plant resources, which are harvested or collected, from natural and semi-natural environments, for the purpose of human use. However, the term 'uncultivated' does not necessarily imply a total absence of human influence as plants may be collected from common property areas in some regions but protected and managed in home gardens in other areas (Cromwell 1997).

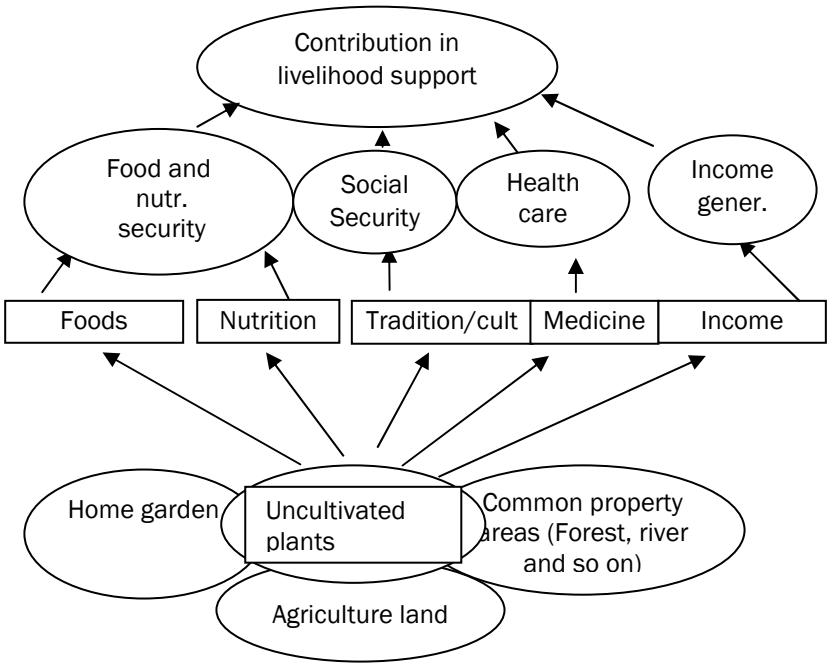

Fig. 1. Multifunctional role of uncultivated plants (Adopted and modified from Ogle, B.M. 2001)

Uses and contributions of uncultivated plants

The contribution of uncultivated plants for livelihood support will depend largely on individual circumstances (FAO 1999). Foods from uncultivated species form an integral part of the daily diets of many rural households (Cromwell 1997, Shrestha 2001). They provide a significant contribution in the food requirements of many rural households of the world. The contributions made to the food supply of farm households by uncultivated plants vary from region to region (FAO 1999). The importance of uncultivated foods differs between countries, and even at the household level. For instance, in Bangladesh, Shore (2000) indicated that uncultivated foods such as leafy greens, tubers and wild fruits constituted nearly 40% of food requirement of the communities. Amongst the very poor, landless members of these communities (comprising some 15% of the rural population, many of whom are women-headed households) dependence on such sources of food and fodder is nearly 100% (SANFEC 2005). In India, most of the rural people, especially the poor, consume uncultivated crops at least 50-80 days in a year. Earlier these were eaten more frequently (DDS 2002).

In addition to providing food directly, uncultivated plants provide an opportunity for cash generation. Value addition may be possible to the collected uncultivated foods if they are processed into edible foods prior to sale (Harris & Mohammed 2003). Many uncultivated plant resources have significant economic value by preventing the need for cash expenditure, and income derived from the collection and sale of these resources is particularly important for the rural poor as a source of cash (Melnyk 1994). Gathering uncultivated products may represent a significant proportion of total household incomes, particularly for landless and people with marginal landholdings. In some cases, collection, use and marketing of wild resources can represent a better option than wage labour or farming (Watson & Hinchcliffe 1996, Scoones et al. 1992).

Uncultivated food and their products are important elements for regional identity. Food provides a means of expressing regional identity and at the same time it is often seen as an opportunity for local businesses to make money, with small-scale producers, traders and restaurants offering special local food items (Pieroni et al. 2005). Moreover, uncultivated food is an important component of the local society and culture. Therefore, the loss of uncultivated foods means loss of important components of culture and religion (Akhtar 2001). Un-cultivated plants are also used as seasonings, for example in curries, leaf extracts are used in teas and infusions or as folk medicines for common ailments (headache, swellings, wounds, scabies, and digestion problems). Some are used as cures of major diseases, e.g. jaundice and diabetes (DDS 2002). The use of uncultivated plants for dietary and health purposes needs to be seen in a

social and economical context of the societies in general and communities in particular (Yakub & Ajmal 2001).

Use of uncultivated plants in Nepal

Nepal is endowed with very high biodiversity due to the extreme variations in topography, climatic conditions, and presence of a great variety of ecosystems and habitats. Over 90% of the Nepalese people live in the interface between farmland and forest and depend on natural resources for their basic needs. In particular, the hill people depend on a combination of forest products, livestock and agricultural products, and their livelihoods would not be sustainable without them (Manandhar 1995, 2002). Although detailed data is lacking, reports show that a large number of uncultivated plant products are still used as a food supplement in rural areas (Shrestha 2001). Some claim that the availability of uncultivated plants is indispensable for food security and closely linked to the conservation and enhancement of biodiversity and genetic resources and that a majority of Nepalese continue to use uncultivated plant resources for their subsistence (Chaudhary 1999).

Traditionally, people have considered forest resources as a source of life and a symbol of creation (Manandhar 2002). Farmer's traditional agricultural practices (shifting cultivation), including wild relatives of crops maintained by indigenous communities, and community forestry are linked to a rich cultural diversity.

Shifting cultivation is the traditional occupation or livelihood for farmers from various ethnic groups in Nepal, and is practiced in around 20 districts across the country (Regmi et al. 2003). The Chepang of central Nepal, are one of the ethnic groups best known for practicing shifting cultivation, but also for being among the most marginalized communities (Kerkhoff and Sharma 2006) food security is a major concern, as they have strong community ties and only very few have left agriculture. As their land is hardly fit for permanent cultivation, the ability to practice shifting cultivation is crucial for their subsistence, this leads to the shifting cultivators food insecure and search for wild and uncultivated foods for livelihood support (Aryal et al.2006).

The management of uncultivated food sources as common resources accessible when necessary is not only a food security issue for the community. Some claim that it is a missing link for poverty programs (SANFEC 2005). Biodiversity is a development issue; thinking of policies in relation to uncultivated foods is a way to link food, ecology and livelihoods. An understanding of the role of uncultivated foods in the food systems of the poor reveals the multiplicity and richness of life affirming agricultural practices and community relations which support livelihoods (SANFEC 2005, Watson & Hinchcliffe 1996). The government and public sector is keen to invest

resources in the research and development of agriculture and forest sector. This, however, does not include the uncultivated plants that make agricultural and forest systems diverse and sustainable (Scoones et al.. 1992, Akhtar 2001). The promotion of uncultivated foods requires support to conservation and management, facilitation of equitable access and sustainable use. In some cases, highly valuable uncultivated food plants may be considered for cultivation, for instance in home gardens. In fact, the domestication of many crops evolved from an increased value and use among people (Gari 2002).

Rationale of the study

Uncultivated foods have received little attention in the research and development activities globally. The diversity of uncultivated plant species, their occurrence and relationship with cultivated species, and their use by humans have rarely been studied systematically (Grivetti and Ogle 2000, Vazquez-Garcia, 2004). The value and potential of uncultivated foods in the food security and nutrition of rural people is also neglected in agricultural and environmental programs (Gari 2002). Study of uncultivated foods requires an interdisciplinary approach that can examine the role of these foods in the context of local people's livelihoods (Scoones et al. 1992).

The sustainability of uncultivated food and its use has also received little attention in the literature. Sustainable harvesting levels from different plant populations remain largely unknown (Scoones et al. 1992). On the other hand, a number of studies have reported that these food sources are diminishing due to changing traditions and evolution of ready made foods in the market accelerated by changes in attitude in the younger generations towards uncultivated resources (Ladio & Lozada 2003, Aryal 2006).
In Nepal, Shrestha (2001) reported that uncultivated plant resources were one of the major sources of the food supply for many rural households. He estimated that it contributed about 20-30 per cent of the food needs of a household in rural communities. Although globally there is increasing understanding that the conservation and use of uncultivated plants are essential elements for increasing food security, eliminating poverty, and maintaining the environment (IPGRI 2005), research activities and governmental programmes of Nepal are restricted to cultivated crops only (Regmi et al. 2006). Shifting cultivation is a farming system that has been practiced by people in various countries for generations as an option for their livelihoods. The great variety of land use types, cultural knowledge of indigenous people and the vast number of uncultivated plant species associated with shifting cultivation are often ignored by policymakers, authorities and scientists (Kerkhoff and Sharma 2006). A number of uncultivated plant species have been used by many rural households in Nepal for their daily life; however,

detailed studies regarding their availability, status, and contribution in the livelihood support are lacking (Shrestha 2001, Regmi et. al 2006, Shrestha and Dhillion 2006). Hence, efforts should be made to document and integrate the issues regarding the uncultivated plants and their role in livelihood support as well as maintenance of these species.

Aims of the study

The major aim of this study was to assess the richness of uncultivated plants, their status and role in contribution in the livelihood support of the people in middle hills of Nepal.

The specific objectives were:

- To assess the richness and status of uncultivated plants in two ethnic groups, Chepang and Gurung.

- To analyse the relationship between use of uncultivated foods and food security

- To identify the different use values, and storing these plants in the two different ethnic groups

- To explore the role of gender in conservation and utilization of uncultivated plant species

- To analyse general trends in use of uncultivated plants in the two areas.

- To asses if people are involved in marketing of uncultivated food plants and if there are economically important plant species

Materials and Methods

The main objective of this study was to assess the richness of uncultivated food plants, their status and contribution in the livelihoods of farmers in Nepal. Therefore, the participation of farmers in the study was recognized as of vital importance. The farmer's participation in this study was ensured through participatory research methods, including group discussions (GD) and other Participatory Rural Appraisal (PRA) tools. In addition, methods like diversity fairs, field observations, household interviews and consultation with experts were used in this study.

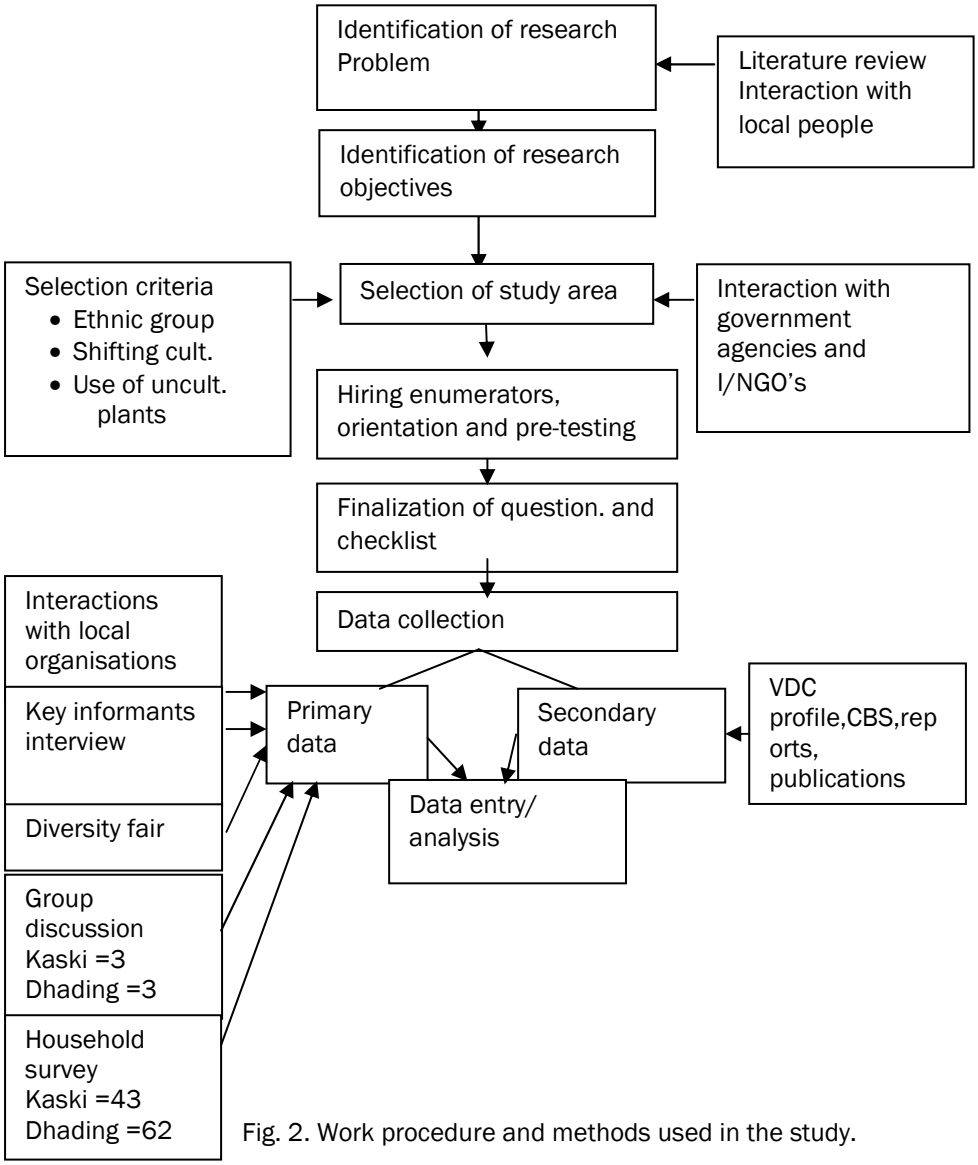

Fig. 2. Work procedure and methods used in the study.

Study Sites and study Population

District based agencies, institutions and individuals were consulted for the identification of potential sites for the study. District forest Offices (DFO) and District Agriculture Development Offices (DADO) (particularly from Gorkha, Dhading and Kaski), Nepal Chepang Sang, Local Initiatives for Biodiversity, Research and Development (LI-BIRD) and International Centre for Integrated Mountain Development (ICIMOD) were consulted for identification of potential sites for the study. Based on the information provided, five potential sites were identified for the preliminary survey.

The five identified preliminary sites were Bhunglichowk VDC of Gorkha, Jogimara and Dhusa VDCs of Dhading and Hangsapur and Rupakot VDCs of Kaski. A preliminary survey was made in the potential sites during July 2006 with the help of professionals from the LI-BIRD and Nepal Chepang Sang. Finally Dhusa VDC and Hangsapur VDC of Dhading and Kaski districts were selected for more detailed studies. The major criteria used were are the area having shifting cultivation farming system (Past or at present), settlement of indigenous ethnic groups and known to use of uncultivated plants for their livelihood support.

A visit was made to both of sites in early August 2006. The purpose of the visit was to brief the community people about the proposed study. Discussions were held with the community members and farmers suggested villages in the VDC suitable for data collection. The same meeting identified local motivators from the community people that later were involved in the study. They were mainly responsible for arrangement of meetings and identification of individual households during the survey

The description of study sites

The selection of study areas was based on settlement or political division i.e. VDCs, which is the smallest local authority for planning of rural development activities. A VDC area has a total of nine wards, which consists of one or more villages. The number of households in a village varies from 10 to 20 households up to several hundreds of households.

Dhading

Dhading district is situated in the Central development regions of Nepal (Fig. 3). The district headquarter Dhading besi, is located 90 km west of Kathmandu. The district is situated between 27° 40' to 28° 14' N to 84° 0' to 85° 1' E. The altitude ranges from 488 m to 7500 m above sea level with warm sub-tropical climate in areas below 1000 meter and alpine conditions at high

altitudes (>3000 meter). The mean annual rainfall is 1800 mm (Rimal et al. 2002).

The Dhusa study site (fig.3) is situated southeast of the Charaundi Bazar at the Prithivi Highway. There are no alternatives besides walking by foot to reach the site and it requires 6-7 hrs walking from the road head. Chepangs, considered as primitive and the most backward ethnic groups of Nepal are the ancient settlers in the area. They are living in the highly fragile and difficult terrains close to the forest and the households are highly scattered. The total household number of the VDC is 1012 (CBS 2003) out of which only around 350 households are of Chepang (Chepang district profile, Dhading 2006). These households are scattered in 8 wards of the VDC.

Chepang

Chepangs whose population is about 52, 000 (0.23% of total population) with only 13.9 per cent literate are considered to be one of the most primitive communities of Nepal (CBS 2003). They are distributed in six districts of Nepal's 75 districts. However, the population is concentrated to Chitwan, Makawanpur, Dhading and Gorkha (Chepang Voice 2006). Chepang has their own language but most of them can speak Nepali as well. Chepangs are traditionally hunters who use bows and arrows and hunting dogs. As hunting is an important source of their livelihood, two words are central in their language: *che,* dog, and *pang*, arrow (Manandhar 2002).

Chepangs have lived semi-nomadic depending on shifting cultivation farming systems supplemented with hunting and gathering. For centuries, Chepang have been a forest tribal community with their own mythology, customs, rituals and life style (Manandhar 2002). They are influenced by both Hinduism and Buddhism and their main festival is *Nwagi Puja* (which is performed on a Tuesday during third week of Bhadra (August -September). Moreover, the economy of the Chepang is forest and stream-based with simple and indigenous technology. The major crops are Maize (*Zea mays*) and Finger Millet (*Eleusine coracana*). On average their own production is sufficient for about 5 months per year and only one percent of the Chepang have sufficient food for the whole from their own production (Gurung 2006). The rest of the months they depend on wild and uncultivated foods and wage labour work to meet their food demand (Regmi et al. 2006). The land tenure is the biggest problem among the Chepang communities as most of the shifting cultivators do not have land registration certificate (Regmi et al. 2003).

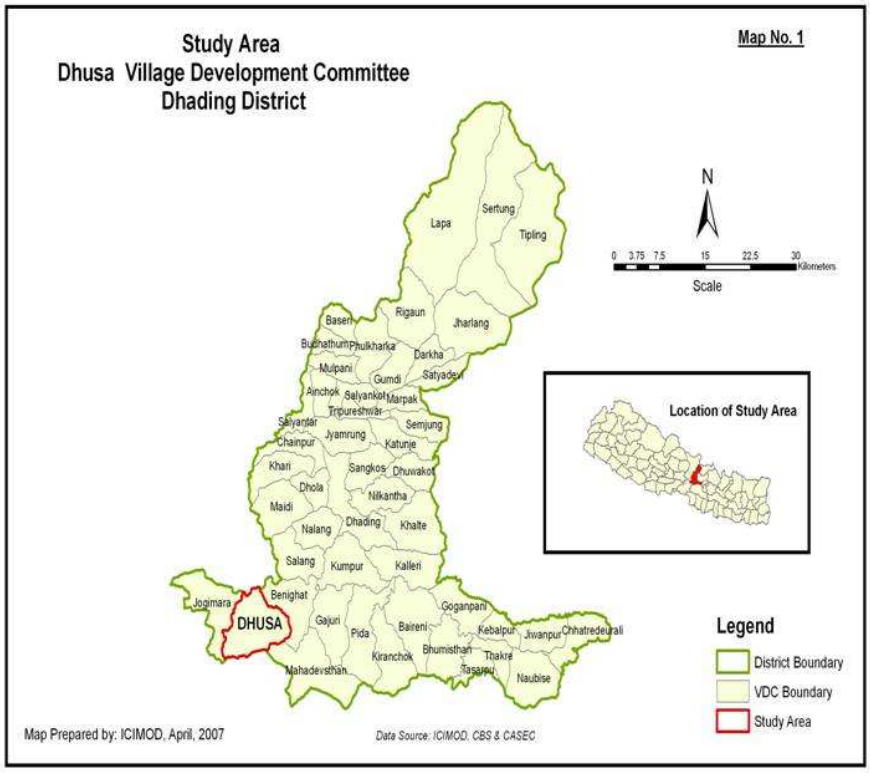

Fig.3. Study area Dhusa VDC of Dhading district

Kaski

The Kaski district in the mid-hill region is situated in the Western Development regions of Nepal. Pokhara the district headquarters is located 200 km from Kathamndu. The altitude is ranging from the 450 m to 7939 m above sea level. The district is situated from 28° 6' to 28° 36' N and 83° 40' to 84° 12' E (Rimal, et al.., 2002). The topography of the region is dominated by ancient lakes and river terraces in moderate to steep slopes. The Kaski district has high rainfall (> 3900 mm per annum) with subtropical to alpine climate. Mean daily minimum temperature of the coldest month is 7°C and the mean daily maximum of the hottest month is 30.5°C (Rana et al. 2000). Hangsapur Village Development Committee (VDC) is situated the north-east from the district headquarters (Fig. 4). It is about 2 hours driving in rough (muddy road) road from Pokhara and a one hour walking distance from the road head. *Gurung* is the dominant ethnic group residing in the area. The altitude ranges from 600 meter to 1425 meter above mean sea level, mainly

between 800 -1300 m. The total household number in the VDC is 1261 (CBS 2003).

Gurung

Gurung whose population is about 543 000 (2.4% of the national population) with 46.9 per cent literate are one of the indigenous ethnic group of Nepal (CBS 2003). They have their own language and they are concentrated to the hill districts of Nepal. In their language, they refer to themselves as *Tamu,* where *ta*, means horse, and *mu* means man, i.e. horse trader (Manandhar 2002). Generally, *Gurungs* live in large villages, among the largest settlements in the mid-hill regions.

Gurung are Buddhists and their main festival is *Lhosar,* the festival of New Year, similar to the festival in Tibet. Agriculture, including animal husbandry is their main occupation. The major agricultural crops are Finger Millet (*Eleusine coracana)*, Maize (*Zea mays*), Rice (*Oryza sativa*) and Potatoes (*Solanum tuberosum*). A major source of income is the pensions and salaries from the military. A majority of Gurungs join the Indian and British armies. A small number join the Nepal army and police. Few have other kinds of employment (Bista 2004), although they are involved in trade and business as well.

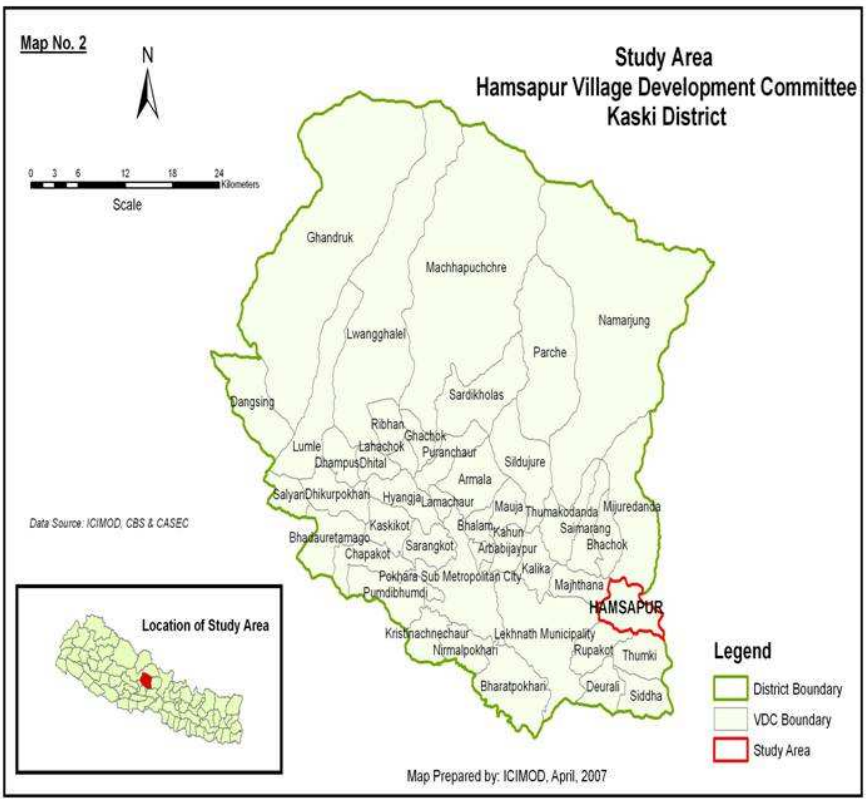

Fig.4. Study area Hangsapur VDC of Kaski district

Methods

Surveys of individual households, key informant interviews of community members as well as personnel from relevant institutions/ organizations, group discussions, diversity fairs, field observations, were all employed as methods of data collection.

Key Informants survey and Group Discussion

Household survey questionnaires were not sufficient for collecting the required information, so key informant interviews and group discussions were carried out in the two sites. Key informants were selected from two groups, one from the farmer's level (Seven from each site) and another from the institutional level (Three from each site). Key informants farmers were identified by the community people whereas researcher identified the key informants from institutions on the local level. Key informants were interviewed about their

perceptions, experience and their opinion about the role of uncultivated foods in conservation and sustainable livelihood for the benefit of the local people. During repeated visits to each site further group discussions (8-12 people) were held with old-aged key informants, one in a mixed group and one with women who were known to be especially knowledgeable on the use of uncultivated vegetable plants. A checklist was used for key informants survey (Appendix 1) and general discussion points for group discussion (Appendix 3)

Diversity Fair

Diversity Fairs provides unique opportunities to individuals and community members to display their local plant material, as well as to share and document associated knowledge (Rijal et al.1998). This is an interesting participatory method for raising awareness from local community to policy levels in the promotion, conservation and use of local plant genetic resources (Sthapit et al. 2003, Upadhyay et al. 2001). These fairs are organized in the target environments by local community in collaboration with the institutions working in the area (Adhikari et al. 2004).

Fig. 5. Researcher with local women asking about the use of plant she brings during fair

Fig. 6. List of local plant species and species displayed during fair

Diversity fairs were organized in both sites with the objective to assess the richness and status of uncultivated plants in the study sites. In Kaski sites, Local Initiatives for Biodiversity, Research and Development (LI-BIRD) a national non governmental organisation was the leading organizer of the diversity fair and it was the good venue for the researcher to document the uncultivated plant species that were brought in the fair. These fair were very useful mean to identify and monitoring of the uncultivated species as well as understand the use values. This approach though it's participatory fashion, helped to measure the richness of uncultivated food crops in the target areas. A protocol was developed to facilitate inventories of species displayed during the

diversity fairs (Appendix 2). This was found to be a very effective way to raise awareness among people as they directly see their rich diversity with their own eyes in a single place. Important plant specimens were collected for group discussions regarding habitat, uses of the plants as food, vegetables, medicine, in cultural or religious ceremonies etc,.

The household survey

The household survey (a questionnaire used during an interview, see appendix 4) was designed to get data on existing farming practices, livelihood dependency, use of uncultivated plants and their management, role of gender in decision making as well as personal demographic features.

An informal announcement for enumerators was made before the field survey through friends and colleagues working in the different institutions. As the questionnaires was developed in English (later translated into Nepali) and was covering agriculture and forestry, enumerators had at least an undergraduate degree in a similar field. A total of nine enumerators have been involved in the field survey. The enumerators were informed about the purpose of study and they were trained to have a common understanding of the research project and the use of the questionnaire. This was followed by pre-testing of questionnaire with limited number of representative farmers from near-by wards to judge the soundness of the questions being asked and to look into the flow of questions and structure of questionnaire. Based on the outcome of the pre-test the questionnaire was finalized for the detailed study.

The questionnaire consisted of four sections. The first section consisted of demographic and socio-economic information from the household, including variables such as sex, age, wealth categories, education, household size, major occupation, food sufficiency, and household income. The second section was devoted to information regarding the shifting cultivation farming practices, the third section focused on uncultivated plant species. In the final section information regarding the conservation and management of uncultivated plant species were dealt with.

Fig.7. Researcher during household survey

Fig. 8. Enumerator during household survey

The motivators introduced the enumerators to the community people in general, and also facilitated contacts with the randomly selected households in the detailed household survey. The reconnaissance survey was found to be very useful for getting familiar with larger groups of people and gave confidence to the enumerators to proceed with the final data collection.

Field Observation

Areas where the respondents collected the uncultivated species were visited with the local motivators, and some key informants, to see the species and their habitat. During the visit the team also noted the availability of uncultivated species found in that particular season. During the visit, harvesting methods, parts used, harvest quantity as well as treatment and storage of different species for future use was discussed.

Sample size and sampling method

In general, sample size depends on the characteristics of the population, the sampling techniques and selection of variables and statistical confidence levels. A general rule is that 30 households are sufficient for household surveys although homogenous populations require smaller samples than heterogeneous populations (Salkind 2003).

The sample size in this study was based on characteristics of the two targeted groups (Gurung from Kaski and Chepang from Dhading). The village development committees (VDC) in the study sites cover large area where households are highly scattered. Only people living near roads and market areas live close together in villages. The process of household selection was made in several stages, first, wards were selected from each of the two VDCs after discussions with ward members and institutions working in the areas. Stratified proportionate random sampling was done for identifying the actual study sites within the VDC because the study population was heterogeneous in terms of their settlements and social status. The total numbers of households in the wards were identified, and finally, 40% of household were randomly selected using simple random sampling methods (lottery) from each study sites for the individual household surveys (Table 1). Considering the probability that some of the household representatives might not be available for interviews an additional 5% of the households were included. In total, 105 households, 62 from Dhading and 43 from Kaski were randomly selected for the household surveys (Table 1). Each household represented a sampling unit, and therefore the household member who was involved in agriculture was selected as a respondent for household survey.

Table 1. Selected VDCs, wards, number of households in total and number (and proportion) of sampled households in the two districts.

VDC	Household no. VDC	Selected wards	No. of household	Sampled households	Percentage HH sampled
Dhusa	1174	5, 7, 8, 9	155	62	40
Hagsapur	995	7 and 4	108	43	40
Total	2169		263	105	40

Data analysis

Both qualitative and quantitative data were collected from primary and secondary sources. The primary data was collected in the study areas (see below), while secondary data was derived from available statistics in District Development Committees (DDC), Nepal Census Indicators 2001 and Trends, Central Bureau of Statistics (CBS). Also other relevant governmental and non-governmental institutions were consulted and visited for collection of information for this study.

The qualitative data were obtained from Group Discussions (GD), Participatory Rural Appraisal (PRA) and Key Informants Surveys (KIS). The quantitative data were mainly obtained from household surveys was analysed using SPSS computer software package. In general, non parametric tests were used (Mann Whiney U-test, Kruskal Wallis test and Chi-square tests). All statistical tests were done in SPSS (11.5 versions).

Results

Socio-Economic Status

Farmers' in the selected areas live under different socio-economic conditions in terms of education, income sources, food sufficiency levels, family size, age and occupation. Overall the number of interviewed men (52.4%) and women (47.6%) was similar, although the proportion of interviewed women and men differed slightly between Kaski and Hading (Table 2). The mean age of all respondents was 44 years, and 39 and 50 years in Dhading and Kaski, respectively. 64 % of the respondents were between 26-55 years, 25% were more than 56 years and only 11% between 15-25 years (Table 2). In Kaski a large proportion of the people were in the age classes over 40 years, while most people in Dhading were between 26 and 55 years (Table 2). Respondents below 25 years were very few because older members of the household were selected for the household survey, due to expected knowledge about uncultivated food plants.

Table 2. Socio-economic features of the respondents (number of respondents) in the two study areas (Dhading and Kaski) Proportions (within study areas and in total) in different categories are presented within brackets.

Categories	District		Total respondents
	Dhading n = 62	Kaski n = 43	n = 105
Sex *			
Male	35 (56.5)	20 (46.5)	55 (52.4)
Female	27 (43.5)	23 (53.5)	50 (47.6)
Age group **			
15-25 years	9 (14.5)	3 (7.0)	12 (11.4)
26-40 years	26 (41.9)	8 (18.6)	34 (32.4)
41-55 years	18 (29.0)	15 (34.9)	33 (31.4)
> 56 years	9 (14. 5)	17 (39.5)	26 (24.8)
Average HH size ***	6.5	6.7	6.6
Education ****			
Illiterate	45 (72.6)	12 (27.9)	57 (54.3)
Literate	17 (27.4)	11 (25.6)	28 (26.7)
Primary level	0	10 (23.3)	10 (9.5)
Secondary level	0	8 (18.6)	8 (7.6)
Post secondary	0	2 (4.7)	2 (1.9)

Statistical comparisons between districts
*Sex. $\chi 2=1.0$, df=1, $p>0.3$
**Age (in years). Mann Whitney U-test. $Z=-3.3$, $p<0.001$
***Household size (no. of persons). Mann Whitney U-test. $Z=-0.4$, $p>0.6$
****Education (three categories, illiterate, literate, at least primary level). $\chi 2=43.9$, df=1, $p<0.001$

The average household size (number of people) in Kaski (6.7) and Dhading (6.5) was similar. In general the level of literacy in the study sites was low. More than half of the total respondents were illiterate (54%). Comparatively, illiterate respondents were more common in Dhading (72.6%) than in Kaski (27.9%). About 47% respondents in Kaski had at least education at the primary level (Table 2).

Livelihood Features

Occupation and income

Agriculture was the main source of livelihood for majority of the households in the two study areas. Overall, agriculture was ranked as the most important occupation by the overwhelming majority of the respondents (97%), with similar proportions of people with agriculture as the most important occupation in the two study areas (Table 3). However, agriculture was not sufficient to sustain their livelihood throughout the year, and about 86 % of the respondents in Dhading ranked wage labour as the second most important occupation, while 51 % in Kaski ranked pension/remittance as the second most important income source. Selling of homemade liquor, handicrafts, vegetables etc. (local business) was a source for cash income for 22% of the households (32 % in Dhading), although it's contribution to overall income was very low.

Table 3. Number of respondents with primary, secondary and tertiary sources of occupations (ranking). Figures within brackets are percentages of occupations with different ranking (primary-tertiary) within districts.

Occupation	Dhading (n =62)			Kaski (n =43)		
	Primary	Second.	Tertiary	Primary	Second.	Tertiary
Agriculture	61(98)	1 (2)	0	41(95)	2 (5)	0
Temporary labour	1 (2)	53 (85)	5 (8)	0	10 (23)	7 (16)
Permanent job	0	2 (3)	0	0	5 (12)	6 (14)
Pension/remittance	0	0	0	2 (7)	22 (51)	4 (9)
Local business	0	3 (5)	17(27)	0	2 (5)	1 (2)

Wealth categories

The wealth status in this study was based on secondary source of information collected from the baseline survey study carried out by Nepal Permaculture Group (NPG) in Kaski (NPG 2006). In Dhading, Chepang Sangh, Dhading provided the information (Chepang District profile 2006). Generally, land holding size, food sufficiency level (from own production) and income sources were found the major criteria used to define the different wealth categories. Overall about half of the respondents were from the low wealth category, 31% from the medium category and 19% were from the rich wealth category (Table 4). The overall mean household income was $593 in the study area, but the mean household income in Kaski (1147 US$) was more than five times higher than in Dhading (209 US$) (Mann Whithey U-test, Z=-6.9, p<0.001).

Table 4. Wealth categories, food sufficiency levels and contribution from uncultivated foods (no. of months) of the households in Dhading, Kaski and in total. Proportions in different categories within the two study areas and in total are presented in brackets.

Categories	District		Total respondents
	Dhading (n =62)	Kaski (n = 43)	(n = 105)
Wealth categories *			
Rich	9 (14.5)	11 (25.6)	20 (19.1)
Medium	19 (30.6)	14 (32.5)	33 (31.4)
Low	34 (54.8)	18 (41.9)	52 (49.5)
Food sufficiency levels (months from own production) **			
Up to 6 months	10 (16.1)	4 (9.3)	14 (13.3)
7-10 months	43 (69.4)	25 (58.1)	68 (64.8)
> 10 months	9 (14.5)	14 (32.6)	23 (21.9)
Contribution from uncultivated foods (months per year) ***			
Contribution	2.6	1.3	2.1

Statistical comparisons between districts
*Wealth categories (man rank) (Mann Whitney U-test, Z=-1.5, p=0.13)
**Food sufficiency levels (mean rank) (Mann Whitney U-test, Z=2.9, p<0.01)
****Contribution uncultivated foods (mean rank) (Mann Whitney U-test, Z=2.3, p<0.05)

Food sufficiency levels

In both study sites, food surplus was negligible and most of the people had to purchase food. Only 10% respondents' households were enjoying food sufficiency from their own production. Overall about 22% of the households produced food sufficient for more than 10 months a year, whereas majority of the households (65%) experience only 7-10 months a year with food self sufficiency. For 13% of the households the own production was sufficient for less than 6 months a year. However, the level of food self-sufficiency varied significantly between sites (Table 4). Food sufficiency (>10 months) from own production was more common in Kaski (33%) than Dhading (15%) (Table 4).

During the food deficit months, these households adopted different strategies to meet their food demands (Table 5). Share cropping (i.e. growing of crops on land owned by others), wage labour, selling of livestock, collection of wild foods, local business and selling of products were major strategies adopted by the people in order to survive food scarcity periods. A majority of the households in Dhading (92%) depended heavily on wild and uncultivated foods to supplement their food during food deficit months, which was a significantly higher proportion than the 65% in Kaski (Table 5). In average, a household depended on these resources during 2 months per year. Dependency on uncultivated foods was twice as long in Dhading (2.6 months/year) as in Kaski (1.3 months/year) (Table 4). The dependency on wage labour was significantly higher in Dhading than in Kaski , while other strategies (mainly selling of liquor) was more common in Kaski than in Dhading (Table 5).

Table 5. Frequency of different strategies (and proportion of respondents within brackets) used during food deficit months in Dhading and Kaski. The proportion of respondents differed significantly between strategies for food shortage periods ($\chi 2$ test, df=6, $\chi 2$=181.7, p<0.001). The proportion of respondents with different strategies for food shortage periods differed significantly between districts ($\chi 2$ test, df=1, $\chi 2$=12.0, p<0.001).

District	Strategies						
	Share cropping	Wage labour	Selling of animals	Collection of wild foods	Small business	Product selling	Others*
Dhading	25 (40)	56 (90)	35 (56)	57 (92)	6 (10)	15 (24)	17 (27)
Kaski	13 (30)	13 (30)	19 (44)	28 (65)	2 (5)	9 (21)	20 (47)

* Mainly selling of liquor

Richness of Uncultivated plants and their status

A total of 112 uncultivated plant species have been documented (see in appendix 5). The greatest richness of the uncultivated species was found from

the forest environments. These resources have been used by two ethnic groups in the study sites. Moreover, we found that the Kaski and Dhading study sites have more or less similar species richness, with a great number of shared species. A total number of 99 species have been recorded from Kaski district where 85 were recorded from the Dhading. These species have multiple use value. Maximum number of species 54% (61) uncultivated plants were found with the multiple function followed by 20% (22) medicinal (Figure 9). The total number of species solely used for fruits, vegetables and foods were 12, 11 and 3 respectively (Figure 9).

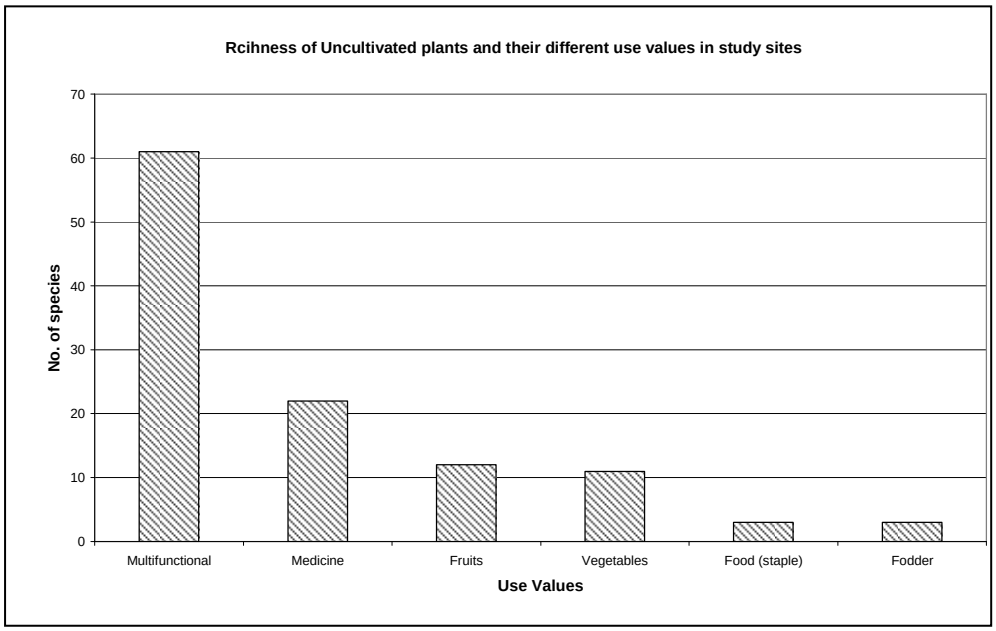

Fig.9. Different use of species found in the study sites, during the diversity fair

In general, the availability of the uncultivated plants recorded in the areas was medium (58%). For 26 % of the species, the status in their habitat was found to be very low and only for 16% the status was found to be fair enough in their natural habitat. Interestingly, almost all the species found to have low availability were from the medicinal purpose species.

Use of uncultivated foods

Uncultivated foods in this study include all plant resources, which are collected for human consumption from natural and semi-natural environments. All respondents reported that they are using uncultivated resources in their daily life. Overall, 86% responded that it was a tradition to use uncultivated foods

(94% in Dhading and 74% in Kaski) and 75% of the respondents used uncultivated foods due to lack of food and 90% because they are freely available (Table 6). However, lack of food was a significantly more common reason for the use of uncultivated foods in Dhading than in Kaski (Table 5). In Kaski a major reason for using uncultivated foods was nutritional arguments, while this reason was significantly less common in Dhading (Table 6). Medicinal reasons were also relatively common (overall 50%) and the proportion of respondents giving medicinal reasons for the use of uncultivated foods did not differ between the two areas (Table 6).

Fig. 10 A local man selling uncultivated fruits in the market (left: *Phyllanthus emblica*, right *Castanopsis indica*)

Fig. 11 A man using *Arundinaria falcate* for making basket for sale in the market

Uncultivated foods were a relatively unimportant source for income, although it had some importance in Dhading (Table 6), with small scale marketing in particular seasons. In Kaski the possibility to eat these plants directly at the place for collection was a relatively important reason for the use of these resources (Table 6).

Table 6. Reasons for using uncultivated foods in Dhading and Kaski. Proportions of respondents are given within brackets. The proportion of respondents with different reasons for using uncultivated food crops differed significantly between groups ($\chi 2$ test, df=5, $\chi 2=242.8$, $p<0.001$). The proportion of respondents with different reasons for using uncultivated food crops differed significantly between districts ($\chi 2$ test, df=1, $\chi 2=4.3$, $p<0.05$).

District	Lack of food	Nutritious	Medicinal	Freely availa.	Income source	Others (eaten raw,
Total n =105	79 (75)	59 (56)	52 (50)	94 (90)	5 (4.8)	24 (23)
Dhading n =62	58 (94)	20 (32)	27 (43)	58 (94)	5 (8)	4 (6)
Kaski n=43	21 (49)	39 (91)	25 (58)	36 (84)	0	20 (47)

Contribution from Uncultivated foods to food support

The uncultivated foods contributed significantly to food requirement of the households. The overall contribution was about 2 months a year, with a significant difference between Kaski (1.3 months) and Dhading (2.6 months) (Table 3). In Dhading 58 % of the households used food from uncultivated sources more than 3.5 months per year, while only 5% of households in Kaski used these food resources >3.5 months. In general the dependency on uncultivated foods was significantly higher in Dhading than in Kaski (Fig. 12).

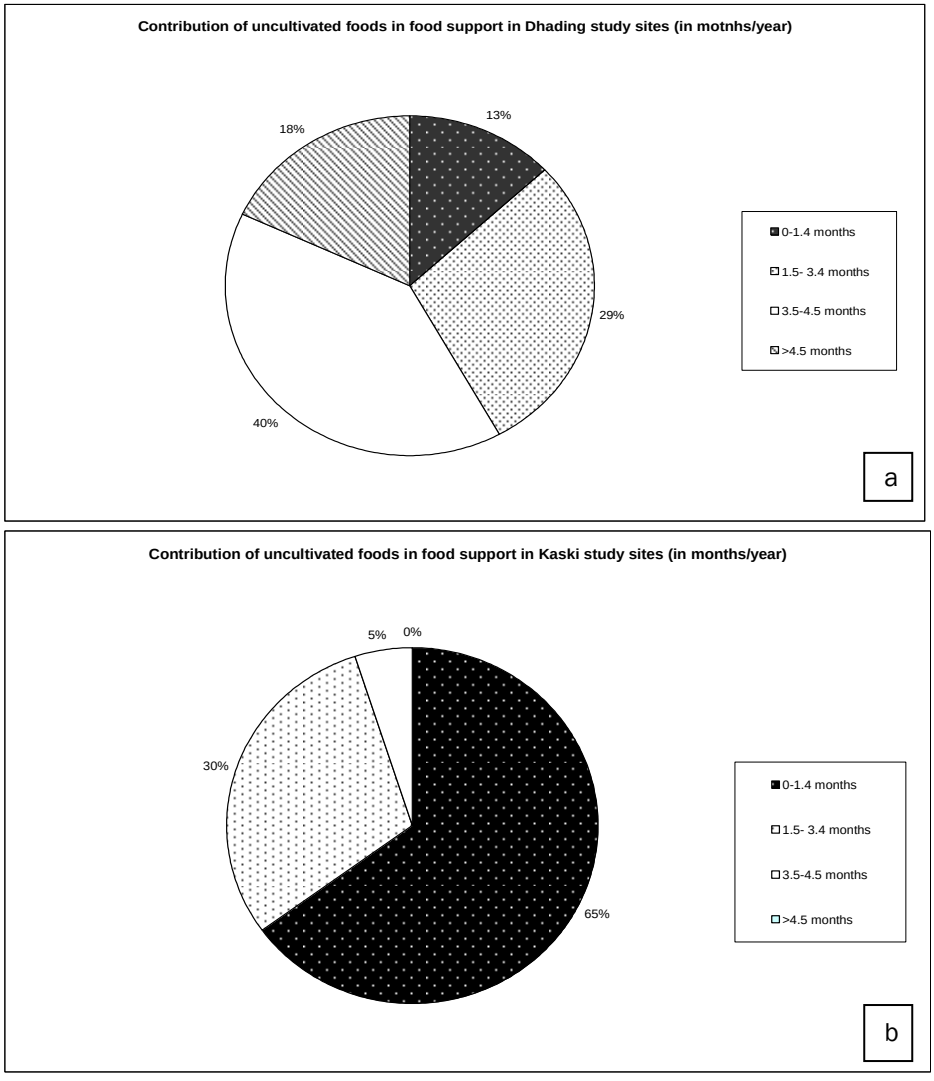

Fig.12. Proportion of respondents for which uncultivated foods contributed 0-1.4 months, 1.5-3.4 months, 3.5-4.5 months and >4.5 months in Dhading (a) and Kaski (b).

However, the contribution from uncultivated foods is negatively correlated with households own food production (Pearson correlation, = - 0.47, $p<0.001$). Overall 67% of the households mentioned catastrophes like drought and landslides or erosion, which lead to low production and loss of the crops as major reasons for using uncultivated food crops. Such catastrophes were more common in Dhading (77%) than in Kaski (56%).

Fifty-six per cent of the households suffered from food shortage, which lead to the use of different strategies to fulfill their food requirements. A majority of the households (59%) expressed that collection of uncultivated food was an important factor during food shortage periods. Exchange of goods (49%) and buying of foods (31%) was also relatively important. Seasonal migration and use of processed foods during the stress period was mentioned as important by only 6% and 8% of the households, respectively.

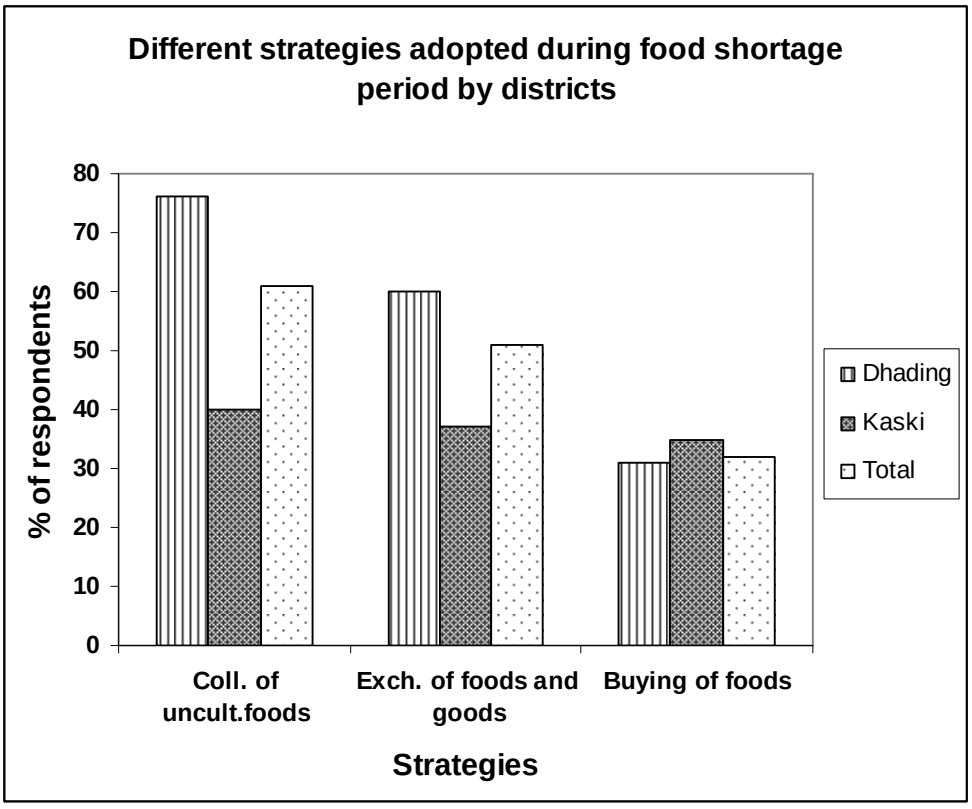

Figure 13. Percentage of households in Dhading, Kaski and in total mentioning use of uncultivated foods, exchange of goods and buying of food as important factors during periods of severe food stress.

Products gathered from uncultivated sources

This study shows that the households in both district used uncultivated resources for food and other necessary requirements. Regarding the use of uncultivated plants the majority of the people in Dhading (89%) ranked uncultivated plants as a primary source of food, while 93% of the households in Kaski reported it as a secondary source of food. In contrast, a majority in Kaski (93%) that the primary uses of uncultivated foods was as vegetables as compared to 11% of the households in Dhading (where 89% mentioned vegetables as a secondary). Overall, food, vegetables and fruits were the most use categories, while traditional/cultural, medicinal and market value reasons were less frequent (see table 7).

Table 7. Number of households (percentage in brackets) using uncultivated plants as food (as staple), as vegetables, fruits, medicine, for selling and for cultural or traditional reasons. Primary and secondary sources for different uses were given and multiple responses were possible (i.e. several use categories could be classified as primary or secondary)

Resource category	Dhading (n =62)		Kaski (n =43)		Total (n =105)	
	Primary source	Secondary source	Primary source	Secondary source	Primary source	Secondary source
Food	55 (89)	7 (11)	0	40 (93)	55 (52)	47 (48)
Vegetables	7 (11)	55 (89)	42 (98)	1 (2)	49 (47)	56 (53)
Fruits	0	60 (97)	15 (35)	28 (65)	15 (14)	68 (64)
Medicine	0	52 (84)	1 (2)	34 (79)	1 (1)	86 (82)
Market value	1 (2)	6 (10)	0	0	1 (1)	6 (6)
Tradition/cul	0	54 (87)	4 (9)	36 (84)	4 (4)	90 (86)

Frequently used species and their use values

In total a large number of uncultivated plant species (112 species) were recorded during the study (see appendix 5), but some of these species were especially important for livelihood support. Below (Table 8) species important as food items (staple), vegetables, fruits, medicine, market products and species of cultural value are listed, and the use values of different species are specified.

Table 8. Frequently used uncultivated plant species. Species names (in Latin and local Nepali name), plant type (description), use value and remarks on use taste, preparation etc. are presented.

Species name	Plant types	Use value	Remarks
Uncultivated plant species used as food items (staple food)			
Dioscorea bulbifera L. (Gittha)	Perennial herbaceous wild climber, with aerial tubers	Used as a staple food, like potato after boiling, can be used as vegetables,	Tubers are boiled with ashes, tradition in gurung culture to eat at least once in Baisakh (April-May).
Dioscorea deltoidea Wall. (Bhyakur)	Climbing herb, propagated by tuber	Eaten after boiling or used as vegetable	Bitter in taste, need a special cooking procedure
Dioscorea pentaphylla L. (Tyaguna)	Wild climbing herb, stems slender	Root tubers are boiled and eaten like potatoes	Need special processing before use
Uncultivated plant species used as vegetables			
Urtica dioca L. (Sisnu)	Perennial herb with stinging bristles	Tender shoots and leaves cooked as vegetable, also used in maize to make porridge	Irritates the skin when touched due to bristly stinging hairs with hooked protrusions
Crataeva unilocularis Buch.-Ham (Siplikan)	Deciduous tree	Tender leaves and buds are boiled and used as vegetables	Generally, after boiling squeezed to lessen the bitterness.
Dryopteris cochleata D. Don (Niuro)	Terrestrial fern, propagated the rhizomes	Tender shoots used as a green vegetables	Sold in urban markets as well. Stored after boiling for future use (up to 15 days)
Uncultivated plants used as a raw fruits			
Rubus elipticus Sm. (Ainselu)	Straggling shrub with rusty brown bristles	Ripe fruits are eaten fresh	Difficult to pick due to rusty brown bristles
Castanopsis indica (Roxb.) Miq. Katus)	Evergreen tree	Cotyledons are edible a	High market value
Myrica esculenta Buch. (Kaphal)	Evergreen tree	Ripe fruits are edible and used raw	Market value, bark is also used as medicine
Uncultivated plant species used for medicinal purposes			
Pogostemon glaber Bentham (Rudilo)	Shrub	Juice of the root is used as a medicine during indigestion	Is domesticated, especially in Kaski home gardens
Berginia ciliata (Haw.) Stemb (Pakhanbed)	Herbaceous plants with thick root stocks	Used mainly for medicinal purposes	Squeezed rhizomes are boiled and the filtered water is used against pain
Tinospora sinensis(Loureiro) Merrill (Gurjo Lahara)	Deciduous climber with rambling stems	Used against stomach problems, medicinal value	Commonly used in various parts of Nepal, especially in sub-tropical regions
Uncultivated plants used for marketing			
Arundinaria falcata Nees (Nigalo)	Short type bamboo (about 4 m high)	Heavily use for making small baskets, mats,	Chepang have started marketing of products like Doko, Dalo, naglo etc
Asparagus racemosus	Straggling, slender shrub	Tender shoots are used and cooked as a	A few households have started domestication, high

Willdenow (Kurilo)	with high branches	vegetable, Roots is used as medicine	market value, however production is very low.
Phyllanthus emblica L. (Amala)	Deciduous tree	Fruits are eaten fresh or used as pickled	Sold on markets
Uncultivated plants used for their traditional and cultural values			
Diplokenma butyraceae (Roxb.) (Chiuri)	Deciduous tree, generally crowded near the ends of branches	Juicy pulp of ripe fruit is eaten as raw, seed used to extract vegetable butter	Important source of nectar for bees. it is given to daughters at marriage like a dowry.
Schima wallichii Korthals (Chilaune)	Evergreen tree	Fruits, leaves and stem are used during the worship of land	Chepang people used to worship every Sunday at the base of this tree
Buddleja asiatica (Loureiro) (Bhimsen pati)	Evergreen shrub	Leaf and flowers are used as religious offer to gods and goddesses	Juice of plants leaf is widely used to treat skin diseases in the rural areas

Status of uncultivated plants in terms of availability

The current status in terms of availability shows that the availability trends of numbers of species are decreasing. The diversity fair shows that out of 112 species documented so far, 29 species were listed in the low availability category whereas 65 were in the medium availability and 18 were considered fair enough available in the area. Out of 29 species reported to have low availability in nature, 18 were found in Dhading and 11 in Kaski. The majority of the ones (9) in Dhading were plants with food value rather than of medicinal and market value. In the other hand, seven species having medicinal value and two used as vegetables were reported to be decreasing from Kaski.

Frequency of harvest and use

Information on the frequency of harvest and use was compiled for species that were used often (Table 9 and Table 10). Species used as staple foods were harvested from one to more than 25 times per month. *Dioscorea bulbifera* and *Dioscorea deltoidea* were harvested regularly and used more than 20 times a month by a large proportion of the households (Table 9). Also other *Dioscorea* species were harvested and used on a regular basis, although not as frequently as the two species above (Table 9). Several of the species can be stored for future use and therefore the frequency of harvest was lower than the frequency of use (Table 9).

Table 9 Proportion of households with different frequency of harvest/use of important food species in Dhading.

Species name	Frequency of harvest/use per month				
	1-6	7-12	13-18	19-24	> 25
Dioscorea bulbifera L.	31/0	37/5	23/8	8/32	2/55
Dioscorea deltoidea Wall.	44/5	27/27	18/21	6/27	2/16
Dioscorea pentaphylla L.	71/39	42/44	13/26	3/21	0/0
Dioscorea spp. (Bharlang)	13/26	3/5	0/2	0/0	0/0
Dioscorea spp.(Ban Tarual)	39/31	15/18	3/8	0/0	0/0

The contribution from uncultivated vegetables to the daily life of people was significant. The most common uncultivated species used were *Dryopteris cochleata, Urtica dioca, Crataeva unilocularis, Morchella spp, Fagopyrum diabotrys*, *Chenopodium album, Remusatia vivipora*, *Tectaria macrodonta, Veronica beccabunga, Bauhinia purpurea*, *Asparagus racemosus*, *Amaranthus spinosus*, *Amaranthus viridis*, *Rorippa nasturtium-aquaticum* and *Crataeva unilocularis*. In general the vegetables were used less frequently than the most common food items in Dhading (see above). However, they were used regularly (up to 20 times a month) and *Urtica dioca* was used > 20 times a month by many households in Dhading (Table 10). Several of the other vegetables (*Dryopteris cochleata and Crataeva unilocularis*) were more frequently used in Kaski than in Dhading (Table 10).

Table 10. Percentage of households with different frequency of harvest/use of some important vegetable species in Dhading and Kaski.

Species name/District	Frequency of harvest and use (times/month)				
	1-6	7-12	13-18	19-24	> 25
Dryopteris cochleata					
Dhading	40/19	10/27	5/6	2/3	0/0
Kaski	67/23	21/35	7/23	2/16	0/2
Morchella spp.					
Dhading	26/16	3/13	8/6	0/0	0/0
Kaski	28/21	2/7	0/2	0/0	0
Crataeva unilocularis					
Dhading	13/11	6/8	0/0	0/0	0/0
Kaski	91/17	2/37	0/32	0/7	0/2
Urtica dioca L.					
Dhading	0/0	10/11	31/27	31/32	21/21
Kaski	19/9	1/2	0/0	0/0	0/0

The study revealed that more than 15 different medicinal plants were used as and when required by the households. The dependency on the local medicines was higher in Dhading (about 90% of the households) than in Kaski (60%). However, the number of species currently used for medicinal purposes was higher in Kaski (11 species) than Dhading (9 species). Common species used in both districts were *Pogostemon glaber*, *Berginia ciliata*, *Viscum album*, *Centella asiatica*, *Tinospora sinensis* and *Terminalia chebula*. Some of the species were confined to one of the sites; those commonly used in Kaski only were *Drymaria diandra*, *Adiantum caudatum*, *Periploca calophylla* and *Asparagus racemosus. Swertia chirayita, Aeschynanthus parviflourus* were commonly used in Dhading, while *Maianthemum fuscum* was the most frequently used species for medicinal purpose in Dhading.

Normally, the plant parts were used for making medicines prescribed by local healers. Generally, the different parts (Root, stem, bark, leaf, fruits, seeds etc.) were used in the form of juice, paste, infusion or powder. For instance, the bark of *Viscum album* L. was used for making paste to treat dislocated bones of both humans and livestock in both study sites. Similarly, *Pogostemon glaber* (plant juice) was used to cure headache and fever problems. It was still a common practice to use such plants in Dhading while it is uncommon in Kaski.
A number of species were used in both sites as a tradition in culture. People in Dhading used the Chyuri tree *(Diplokenma butyraceae)* as a dowry to their daughters at marriage. The kernels were pressed for butter (Ghee), which could

be sold during periods of food shortage. Species like *Schima wallichii* and *Buddleja asiatica* were used in many religious activities. In Kaski the rhizomes (bulbs) of *Dioscorea bulbifera* and *Dioscorea deltoidea* species should be eaten at least once during Baisakh-Jestha (April-May). This tradition has been practiced since generations. *Dioscorea* spp. is heavily used during the *maghe sakranti* (a popular winter festival).The stem of *Rhus javanica* was used in Gurung culture during funerals and various ceremonies.

Domestication of Uncultivated plant species

A considerable numbers of uncultivated plant species (15 species in Dhading and 6 species in Kaski) were domesticated in home gardens (Table 11). In general, the species with medicinal and cultural values were domesticated in Kaski, while plant species used as food, vegetables, fruit and species with a market value were domesticated in Dhading (Table 11). Common species domesticated in both districts were *Dioscorea bulbifera* L., *Dioscorea deltoidea* Wall., and *Pogostemon glaber* Bentham.

Table 11. Uncultivated plant species domesticated in home gardens in Dhading and Kaski, and their use

Dhading	Use	Kaski	Use
Dioscorea bulbifera L.	Food, tradition	*Pogostemon glaber* Bentham	Medicinal
Dioscorea deltoidea Wall.	Food	*Crataeva unilocularis* Buch.-Ham	Vegetable, Pickles
Diplokenma butyraceae (Roxb.)	Food, Butter, Cultural	*Tinospora sinensis*(Loureiro) Merrill	Medicinal
Asparagus racemosus Willd.	Vegetable, market value, medicine	*Dioscorea deltoidea* Wall.	Cultural
Bauhinia purpurea L.	Vegetable, pickles	*Dioscorea bulbifera* L	Cultural
Arundinaria falcata Nees	Preparation of baskets	*Buddleja asiatica* (Loureiro)	Cultural
Urtica dioca L.	Vegetable, Local porridge		
Pogostemon glaber Bentham	Medicinal		
Maianthemum fuscum Seto Jara	Medicinal		
Dioscorea spp.	Food, Cultural		
Arundinaria falcata Nees	Making local basket		
Crataeva unilocularis Buch.-Ham.	Vegetable, Pickles		
Amaranthus spinosus L	Vegetable		
Buddleja asiatica (Loureiro)	Medicine, religious		
Thysonaleana maxima (Roxb.)	Marketing, fodder		

Processing and storage of uncultivated foods

In total, about 90% of the respondents reported that they stored uncultivated foods for future use. A larger proportion of the households in Dhading (97%) than in Kaski (79%) stored uncultivated foods. The major species stored by the respondents in Dhading were *Dioscorea bulbifera* L. (95% of the households) and *Dioscorea deltoidea* Wall. (42%). Both species were highly prioritized food crops in the area. Collection of these species has shown that people used to harvest up to 50 Kilograms per harvest. One respondent (aged 40), Dhading reported that he collected 200 Kilogram of the roots (Bulb) of this plant from his 4 harvest. The analysis on the quantity per harvest showed that 71% of the household used to harvest in ranges 11-30 Kg/harvest in Dhading as against only 5% of Kaski. Eight percent of people in Dhading have reported a quantity per harvest of more than 31-50 Kg. The quantity per harvest was directly dependent on their food sufficiency status. The highest quantity harvest in Kaski was 10 Kilogram per harvest reported by one respondent (aged 66) on his just two harvests. A majority of respondents in Kaski (72%) reported their range of harvest from one Kg to 10 Kg per harvest.

Fig. 14 *Dioscorea spp* harvest in a bulk and stored for future use

Fig. 15 *Dioscorea deltoidea*

Crataeva unilocularis Buch.-Ham and *Dryopteris cochleata* D. Don are (uncultivated vegetables) were stored by 79% and 23% of the households, respectively, in Kaski. One species, which was stored in both districts, was *Bambusa nepalensis* (Stapleta), which was stored by 8% and 19% of the respondents in Dhading and Kaski, respectively.

Gender roles in Uncultivated Plant species collection, utilization and management

All members (men, women and children) of the households participated actively in the harvesting, collection, processing, storing, marketing and management of the uncultivated plant species. Irrespective of gender more than 40% of the respondents in both the districts stated that harvesting is shared between genders in the households.

Still, there were differences between women and men and between the two districts. Women's involvement in collection of uncultivated foods was five times higher in Kaski (54%) than in Dhading (10%). In Dhading whole families collected these foods. In the major household indoor activities like processing and preparation were women's role was central in both districts (52-92% of the households), e.g. >85% of the women were involved in preparation of the uncultivated foods in both sites.

Table 12. Respondent's views on division of work and decision-making among men (M), women (W), both (M+W) and children (C) in harvesting, preparation and storage of uncultivated food resources. (number of respondents and percentage of respondent within brackets)

Role and respons.	Dhading (n=62)				Kaski (n=43)			
	Women	Men	Both (M+W)	W+M+C	Women	Men	Both (M+W)	W+M +C
Harvesting, preparation and storage								
Harvest	5 (8)	18 (30)	32(52)	6(10)	12 (28)	8 (19)	19 (44)	4 (9)
Collection	6 (10)	13 (21)	16(26)	26(43)	23 (54)	7 (16)	9 (21)	4 (9)
Process.	32 (52)	9 (14)	20(32)	1 (2)	39 (91)	1 (2)	3 (7)	0
Prepar.	53 (86)	3 (5)	6(10)	0 (0)	39 (91)	1 (2)	3 (7)	0
Tasting	16 (26)	22 (36)	20(32)	3 (5)	37 (86)	1 (2)	5 (12)	0
Storage	21 (36)	6 (10)	31(53)	0 (0)	38 (88)	1 (2)	4 (9)	0
Mark./exc	6 (13)	11 (24)	27(60)	1 (2)	29 (81)	1 (3)	6 (17)	0
Decision Making								
Harv./coll	10 (16)	18 (30)	33(54)	0	17 (40)	7 (16)	19 (44)	0
Process.	25 (41)	12 (20)	24(39)	0	30 (70)	3 (7)	10(23)	0
Storage	25 (42)	5 (8)	30(50)	0	30 (70)	4 (9)	9(21)	0
Mark./exc	6 (14)	8 (19)	28(67)	0	22 (61)	2 (6)	12(33)	0
Mainten.	2 (3)	7 (12)	51(85)	0	25 (58)	2 (5)	16(37)	0

Thirty-six percent of the women in Dhading and 88% in Kaski indicated that the storage of uncultivated foods was entirely their responsibility. Concerning marketing and exchange of materials, women's involvement was high in Kaski (81%) compared to Dhading (13%) (Table 12).

The decision on harvesting and collection was made by both men and women. Fifty four percent in Dhading and 44% in Kaski reported that role of men and women were equal in decision-making. However, for most of the activities regarding the uncultivated foods the decision-making role of women was more important in Kaski than in Dhading (Table 12). For marketing and exchange of goods, about two thirds (67%) of the men and women in Dhading mutually decided whether to sell their products and/or exchange them. The corresponding figure for Kaski was 33%. Eighty five percent of the respondents in Dhading indicated that the responsibility in conservation and management of these resources was mutual between sexes, which are significantly higher than in Kaski (37%). In contrast, the role of women in decision making in conservation and management was more important in Kaski (58%) than in Dhading (3%), see Table 12.

Conservation and management practices

General Perception regarding uncultivated plants

The focus group discussion and key informants' survey suggested that the availability of the uncultivated foods from the area has declined during the last 40 years. More than 70% of the informants mentioned that the major reasons for such changes were the depletion of the natural vegetation and, uncontrolled harvesting as well as a heavy dependency of local people on uncultivated plants. During the group discussion (12 peoples) people were asked about the general trends of these resources availability in last 40 years and more than 90% reported that 40 years back (AD1965) the uncultivated foods availability was not a problems but at present availability of uncultivated foods is almost half in both the areas. Even less in case of Dhading i.e. 45% compared with about 60% In Kaski. However, the respondents' survey showed that people were thinking that there were several problems regarding the use of such resources like time consuming, lack of manpower and problems with identification of wild species (see Table 13), which made them hesitate to go for collection of such plants. Parts of that, in the long run perhaps, will lead to decreasing use trends due to conservation and management practices.

Table 13. Number (percentage in brackets) of households in Dhading and Kaski perceiving different problems with the use of uncultivated food plants.

Districts	*Farmers perceived problems*					
	Wild animals	*Time consuming*	*Identification*	*Lack of manpower*	*Processing*	*Over Grazing*
Dhading(n=62)	*6 (10)*	*31 (50)*	*39 (63)*	*15 (24)*	*9 (15)*	*0*
Kaski (n=43)	*1 (2)*	*11 (26)*	*8 (19)*	*6 (14)*	*2 (5)*	*7 (16)*
Total (n=105)	*7 (7)*	*42 (40)*	*47 (45)*	*21 (20)*	*11 (10)*	*7 (7)*

Farmers' management initiatives

Farmers were aware about management and utilizations of uncultivated plants. Ninety eight percent of the respondents in Dhading and 93% in Kaski reported that they were involved in management of important uncultivated plant species populations. Farmers generally practiced *in-situ* conservation as a major strategy for conservation of the uncultivated species (98% in Dhading and 90% in Kaski). Another approach in management was domestication, which was reported to be used by 71% of the respondents in Dhading and 60% in Kaski. Some farmers in the study area have also practiced local rules and regulations to control over-exploitation of the uncultivated plant resources (15% of the respondent in Dhading and 33% in Kaski).

The two major factors suggested to facilitate sustainable use of uncultivated food plants was increased awareness (17% of the households) and restrictions in the use of these plant resources (36%). Fewer households suggested technical solutions or increased cooperation between households. However, the general conclusion from key informants interview and group discussion suggest that participatory natural resources management programmes are

needed which encourage local people for it's better conservation and management.

Discussion

Uncultivated plant species contribute significantly to the livelihoods of the Chepang people in Dhading and the Gurung people in Kaski. The total number of uncultivated plant species recorded during the diversity fairs was large (112 species). Moreover, a similar number of species was used in the Kaski (99 species) and Dhading districts (85 species), with a large number of species (73 species) used in both districts. However, the use value and the actual contribution to food support of uncultivated food plants, and their medicinal and cultural importance, varied between the two ethnic groups and between households due to socio-economic and cultural factors.

The current study revealed that the people in Dhading district depend more heavily on uncultivated foods for their food supply, while these resources were somewhat less important in Kaski. The average dependency on uncultivated foods was 77 days in Dhading and 38 days in Kaski. A similar contribution from uncultivated foods have found in the study carried out Balla et.al (2002) in Tanahun and Chitwan district of Nepal. Fifty eight per cent of the respondents in Dhading depended on uncultivated food plants for more than 105 days per year compared to just five percent of the households in Kaski. A similar study carried out by Shrestha (2001) reported that around 20-30 per cent of the food requirements in rural communities of Nepal were met by uncultivated food crops. The importance of uncultivated foods is supported by studies in other countries and regions of the world. For instance, a study carried out in India, where most of the rural people, especially the poor; consumed uncultivated crops at least 50-80 days in a year although these resources used to have larger importance (DDS 2002). Similarly, data from rural communities in Bangladesh illustrate that 40% of the food requirement came from uncultivated foods (Shore 2000) and in a study in Burkina Faso, 20% of all food items were from the wild (Smith *et al.* 1995). Thus, these resources can contribute significantly to the national economy. Various studies carried out in other countries illustrate such contribution, for example Tanzania, where Cromwell (1997) showed that the value of all wild plant resources to rural communities was calculated to more than eight per cent of the agricultural Gross Domestic Products (GDP). The present study suggests that uncultivated resources might contributed significantly to the national GDP of Nepal, however detailed calculations are lacking. Thus, contributions made to the food supply of farm households by uncultivated plants are considerable but they vary from region to region (FAO 1999).

The dependency on uncultivated plants was higher in Dhading than in Kaski mainly because in Dhading people are practicing shifting cultivation since generations and still a major agriculture practice and there are limited livelihood options and alternatives compared to Kaski. People in Kaski have more cash income sources (e.g. pensions and remittance) and can buy food during food

scarcity periods. The mean household income in Kaski (US$1147) was more than five times higher than in Dhading (US$209). Furthermore, the Dhading district is situated almost six times further away from roads and markets than Kaski (about 6-7 and 1 hours normal walking respectively), which make it difficult to market and buy products.

It was also interesting to see that the different ethnic groups had such different knowledge and use habit of uncultivated plants when they have been living in the similar environment for so long (Harris and Mohammed 2003). There was a significant difference in the use of single plant species between the ethnic groups. The most common species used in both the district was *Dioscorea bulbifera,* which is used as a staple food (boiled like potatoes) in Dhading district, while in Kaski it is used as a traditional species during cultural ceremonies. The quantity harvested also differed, as the study showed that people in Dhading harvested up to 200 kg whereas the maximum harvest was 15 Kg in Kaski. The consumption of this particular species as a staple diet indicates an ancient history of use, from generations back as Chepang people were hunters and gatherers and these root crops was their major source of food supplemented with fish and meats (Chepang Voice 2006). Furthermore, the use (frequency and type of use) of other common species with large geographical distribution also differed between districts. *Dioscorea spp, Urtica dioca, Diplokenma butyraceae* were the most used species in Dhading, whereas *Crataeva unilocularis, Dryopteris cochleata and Dioscorea spp.* was most frequently used in Kaski. It might be due to the difference in use habit between the groups. These species are also used by other ethnic groups in similar environments (Neupane 2000, Shrestha 2001, Manandhar 2002). Clearly, uncultivated foods add to food diversity and contribute to the nutritional requirements for the people. Many uncultivated foods have nutritional benefits and they can have higher fat, protein, mineral and vitamin content than cultivated species (Ogle et al. 2003, Ogle 2001, Grivetti and Ogle, 2000). It is access to a wide range of wild foods and the resulting dietary diversity that contributes to nutritional well-being of people (IIED 1995). However, there is a dearth of information and knowledge in case of Nepal like what will happen in a long run of its continuous use? One reason for this is that modern agricultural and forest research programmes have not seriously considered the role of such important uncultivated plant resources in the diets of rural people.

Many uncultivated plant resources have significant economic value by preventing the need for cash expenditure, and income derived from the collection and sale of these resources could be important for poor people as a source of cash (Melnyk 1994). However, uncultivated plants were not a major source of income in the studied sites, but people have started to sale some species with potential market value. People in the Dhading have started to sale products of species like *Asparagus racemosus, Tamarindus indica, Diplokenma butyraceae, Phyllanthus emblica, Thysonaleana maxima, Castanopsis indica* and *Dryopteris cochleata.* More than ten percent (11.3%) of the households in Dhading had started marketing of these species, although in a low amount at present but with significant potential in the future as the demand arises in the market. However, none of the respondents reported any sale of uncultivated foods in

Kaski. The selling of uncultivated foods is not new in the areas however; people who used to collect and sell products were from other areas with a tradition of marketing wild food plants. In some cases, collection, home use and marketing of wild resources can represent a better option than wage labour or farming (Watson & Hinchcliffe 1996, Scoones et al. 1992). One of the most prominent examples is coffee in the western part of Ethiopia; part of the coffee production is still being harvested from 'wild', non-domesticated coffee trees growing naturally in the forests (Guinand & Lemessa 2001). In parts of Botswana, collection and sale of wild palm and beer brewing from wild fruit provides a more secure income where unpredictable rains make farming a risky business (Bishop & Scoones 1994). In general, the economical contribution from uncultivated foods to farm households varies widely between regions and ethnic groups. It is very difficult to obtain basic information on quantities harvested, processed or traded, and when foods are used primarily for subsistence it may be difficult to estimate their value (FAO 1999).
Food (staple diet) and vegetables were the major uses of the uncultivated crops; however medicine was an important secondary use in both districts (Table 7). The study revealed that the use of medicinal plants for health care is still prevalent in both study areas. However, the trend of using such plants as medicines is declining. Such decline was more pronounced in Kaski compared to Dhading. The access to the hospital and capacity to afford for the treatments are the major reasons at present by which people of Kaski using more modern type of health care and medication. Despite of having such facilities the older generation of the area prefers to use local medication as far as it works. On the other hand, Dhading people have no alternatives besides using such resources; however the younger generation in Dhading used to go to hospital if they can arrange money. An important reason for this change is that the traditional healers, who used to treat people, are very few at present and the transfer of knowledge and practice to prepare such medicines is very low. The younger generation is not interested in studying such traditional way of medication (Lazio and Lozada 2004, Bista 2004). The collection and marketing of *Nelumbo nucifera, Allium hyposistum, Swertia chirayita, Phytolacca acinosa, Asparagus racemosus, Astilbe rivularis* for medicinal purpose have been shown to have good profitability in parts of the country (Manandhar 2002). However, the over-exploitation and illegal harvesting and trading is threatening some of the species (Chaudhary 1999).

Gathering wild products may represent a significant proportion of total household incomes, particularly for the landless and those with marginal landholdings. Furthermore, a number of species have traditional and cultural values in the studied districts. Species like *Diplokenma butyraceae, Schima wallichii, Dioscorea bulbifera, Shorea robusta* and *Buddleja asiatica* are used in various cultural and religious ceremonies. These species are linked with tradition and culture since generations and therefore ceased use of uncultivated plants will result in loss of important components in culture and religion (Akhtar 2001). Some species like *Dioscorea bulbifera* L is essential for people in Kaski sites during a festival celebrated during the winter - *Maghe Sakranti.* There is a tradition that you should eat at least a piece of *Dioscorea* or other tuber crops on the particular day i.e. *Maghe Sakranti.* During this festival, large number of uncultivated roots

and tubers are brought for sale and there was almost like a fair of these crops. Another example is the chiuri tree *(Bassia butyracea syn.)* used by people in Dhading, as a marriage gift (dowry) to the girl from her parent to be of help during period of food scarcity (Regmi et al. 2006). Similar example is the celebration of "Shoonyam panduga", a festival celebrated in India in December, when most of the cereals and grain crops are at maturity stage. The farming community worships mother earth by walking around a field, singing special songs while offering food specially made from more than twenty uncultivated greens. A major reason for this celebration of diversity is the fact that uncultivated foods traditionally have been the source of food for the poor (Yesudas 2004).

Domestication of wild and uncultivated plant species is necessary and it would be beneficial to encourage cultivation and or domestication of plants used for food, fodder, medicine and other different purpose (Manandhar 2002). Generally, people used to domesticate in to home gardens, as home gardens offer increased availability of water, mostly organic based production system, easier protection against predators (Harlan 1975) and close monitoring by the household members, many new species are domesticated in the garden. Local people, because of their close associations with nature and natural system have developed often sophisticated knowledge systems about the plant uses and the surrounding ecosystems (Etkin 2002, Dhillion and Shrestha 2005). The local people in both the districts have developed very good knowledge and techniques to grow some of the preferred species in their home gardens which provide a basis for species domestication. It has been observed that a total of 17 species were found to be domesticated in home gardens in the study sites (Table 11). The number of species domesticated as well as their preferences to choose the species varied between the sites. Out of 17 species, only four species were found common in both the districts, where as 15 were found in Dhading and majority of them were food species and species that had market values, whereas only six species having vegetable, medicinal and traditional value were found in Kaski. The process of domestication in the area is going on however; there is some reservation like if the product is still available in sufficient quantity and quality from natural environments than why to domesticate? In the other hand, domestication is not easy and there may be some technical difficulties for some species to adjust to new environments. Similar studies in domestication suggest that if there are market opportunities of such species and if a product that is indispensable for household consumption is no longer available and there is no substitute for it, then farmers can be expected to make the first steps towards domestication (Herzog et.al 1996).

Besides domestication, people in the study sites also stored uncultivated staple foods, vegetables and medicines for future use. The uncultivated vegetables and starchy foods were processed in local ways for storage to prolong their availability (Sullivan 2000). Some were sun dried when fresh, others are boiled or blanched, sun dried and stored for use during the dry season (Ngugi 1999, Regmi et al. 2006, Gautam et al. 2006. The storage of *Dioscorea spp* was common in the Dhading as it was generally used as a reserve food during food

deficit periods where as *Dryopteris cochleata* was stored as a steamed vegetable and used during vegetable scarce periods in Kaski. Bhandari et al. (2003) shows that the rootstocks of the *Dioscorea bulbifera* and *Dioscorea deltoidea*, which are rich in carbohydrates serve as a welcome source of calories can be stored over a greater part of the year. The processing and storage was directly linked to the food sufficiency level and availability of human labour to collect it. The lower the food sufficiency, the higher will be the collection and storage and vice-versa with labour availability.

The result indicates that the availability of most of the uncultivated species is decreasing. Of the 112 species recorded as uncultivated food plants 29 were considered as very low availability in the study sites, where as 65 species are found medium at present but people perceived that these species would decline if conservation and management actions were not put in place. This also seems to be the case on a national and international level (Shrestha 2001, Begossi et al., 2002, Gari 2002). Tabuti et al. (2004) has mentioned that the availability and use of wild plants in Uganda is declining due to the erosion of ecosystem diversity. For several species (e.g. *Dioscorea bulbifera, Dryopteris cochleata*) in Kaski and Dhading increased use trends have been reported despite decreasing trends of the species availability in nature. The occurrence of these species in the area was very low indicating the over exploitation pressure on the species (see also Balemie and Kebebew 2006). The general perception of people during the group discussion regarding reasons to the decreasing of uncultivated plant species was similar in both two study areas. Deceasing forest cover, heavy dependency of people on these resources and illegal harvesting and trade were suggested as the major causes to declining abundance of these species.

On the other hand, a group of older people during the group discussion mentioned that changing human lifestyle and taste, negligence of traditional methods, availability of foods in the market and development of transport systems are factors which lead people, specially the younger generation, to use more readymade fast foods. These factors have often been cited as underlying causes of a decline in use of uncultivated resources by various studies (Wood et.al 2001, Akhtar 2001, Fouere et al. 2000). Furthermore, young people are less familiar with uncultivated plant species and forest environments. In Kaski, the younger generations are attending schools and colleges, while very few in Dhading were reported to study. Comparatively, the younger generation from Dhading district used to collect more uncultivated resources than the Kaski youth. In relation to available foods on the market, the collection and use of uncultivated plants (for food, medicine and cultural reasons) was considered risky and time consuming. However, seasonal fruits (for immediate consumption) were gathered more frequently by the children. Thus, the use of uncultivated foods is likely to decrease in the future, and important factors contributing to livelihood, culture and tradition are threatened to be lost (see also Akhtar 2001, Ladio & Lozada 2004).

The gender aspects on collection, preparation, use and decision –making concerning uncultivated food plants were complex (Table 12). There is an informal type of division of gender roles based on social and cultural factors

(Neupane 2000). In Kaski, the women were more involved in activities related to uncultivated food plants (especially collection, preparation and storing) than men. A major reason was that males often are working within the army (Table 3), so the women have larger responsibility for farming and collection of wild food plants. In Dhading the options for income generation are very limited and food deficiency problems forced both sexes both to collect food from uncultivated plants. Traditionally, women's' involvement has been confined within household where as men are involved outside of the household (Neupane 2000).

Availability of uncultivated food is linked to the conservation, utilization and management of biodiversity and genetic resources (Chaudhary 1999). The people role in management of these species is crucial for the sustainable utilization of these resources. The uncultivated plant species collected from the forest (Ladio and Lozada 2003) and near by common property areas were crucial strongly contributed to the subsistence of people in both districts. Additionally, the cultural identity of the Chepang and Gurung people is historically linked with the use of forest plants to cover an ample range of needs such as food, vegetable, medicine, firewood, construction, handicrafts, and other various cultural and religious purposes. (Manandhar 2002). The results also revealed that many uncultivated species are under growing pressures from various anthropogenic factors. Thus, public awareness and community based management need to be encouraged at all levels alongside of urgent collection of germplasm for ex-situ conservation too.

Conservation and sustainable use of uncultivated foods have, however, received relatively little attention in research and development activities (Johnston 2001, Gari 2002, Vazquez- Garcia 2004). The current study shows that people in both districts have been using uncultivated resources for generations. The present trends in harvesting of some of the uncultivated species are not sustainable and the way of harvesting might have negative impacts on the species availability in the future (Dhillion and Shrestha 2005, Shrestha and Dhillion 2003, Chaudhary 1999). Unsustainable harvesting from the wild especially those having high demand to meet the food demand as well as commercial demand may lead to genetic erosion. This is the case for oregano (*Origanum onites)* in Turkey (Kitiki 1997). Policy support mechanisms, especially on effective management and conservation of uncultivated species are lacking (Kerkhoff & Sharma 2006, Shrestha 2001). People have started in-situ conservation, domestication and/or restriction in the use of these resources. However, sustainable use and management is still a prime concern and if we failure to address this issue will lead to increasing marginalization of uncultivated plants with disastrous consequences for millions of people those whose lives depend on them to a significant degree (FAO 1999).
In these circumstances, maintenance and use of these uncultivated resources is therefore more important than just for botanical study and ecological exercise. Uncultivated plants remain important resources, therefore, continuous study and updated inventories and information of these resources in terms of availability and use is essential. Till date, little emphasis has been made for the promotion of uncultivated species that are of significant importance to local

farmers in Nepal. Just think what a tragedy it would be if people like Chepang who are maintaining their livelihoods by the combination of different strategies like gathering of uncultivated foods, hunting, wage labouring and subsistence agriculture (Shifting cultivation) lost one of the key components of their food i.e. uncultivated plants.

Conclusion and recommendations

This study has revealed that uncultivated plant species used for consumption at times of food shortage, have the potential to become valuable staple foods and important alternatives to the usual food crops cultivated by farmers. The option to improve food production through exploiting the potential of uncultivated food plants might be a sustainable, cheap and local alternative for decreasing the food shortage problem. At the same time, development of use of uncultivated food plants might contribute to biodiversity. There is a need of integrated research and development programmes for forest dwelling communities like Chepang in Nepal (with food sufficiency problems), where uncultivated foods provide key supplements to the main diet and are of great medicinal and cultural importance. Without the understanding of the importance of both staple crop foods and uncultivated foods, agricultural planning will continue to fous on a few major crops and exclude the diverse and important uncultivated food resources.
The contribution of uncultivated plants needs to be taken into account in planning and investment in the development of these resources will make a major contribution to the alleviation of poverty. However, additional investigations on the use and availability of uncultivated plants in different regions and countries are needed.

Recommendations

One of the greatest difficulties for including uncultivated plant species in agricultural research and development is lack of basic information. So there is little appreciation by planners, policy makers and developers. Emphasis must therefore be placed on national and local actions to develop a standardized inventory of use values of these resources.

The uncultivated plants are important sources of food and nutritional security to the thousands of people especially in the rural areas, so there is a need of integrated research and development activities.

A number species are being gradually eroded so, conservation of these resources should be initiated by the government and research institutions with participation of local community people. In the same time, the traditional knowledge, skills regarding utilization and management of uncultivated resources should be documented and protected.

Acknowledgements

Many individuals and institutions have contributed to this research and made it possible for me to complete my thesis. I wish to thank all the respondents and community members of Dhusa and Hangsapur VDC of Dhading and Gorkha districts who patiently shared their time, insights and views about uncultivated foods with me and study teams. I am thankful to enumerators Amber, Anil, Buddhi, Dhruba, Gyanbandhu, Madhu, Krishna, Lekhnath and Prakash for your support in data collection.

Special thanks to my supervisor Assistant Professor/Researcher Dr. Åke Berg for your tiredless effort and continued guidance for whole study period. I have appreciated your readiness to always read and re-read, your analytical questions and your great inspiration all the time. Researcher, Dr. Britta M. Ogle, co-supervisor, I highly appreciated your support and guidance especially in technical matters. Your critical comments, suggestions and inputs always encouraged me to go deeper into the subject.

My research in Nepal had not been possible without the collaboration and help from many individuals and institutions. I owe special thanks to my home country supervisor Dr. Eklabya Sharma for your invaluable guidance and direction. I am also grateful to ICIMOD for providing me an institutional base and logistic support. I wish to thank all NRM staffs and Govinda Joshi of MENRIS for your kind cooperation and support.

I am thankful to LI-BIRD for organising the diversity fair in Rupakot where I had the opportunity to develop the inventories of uncultivated plants. Special thanks to Dr. Pratap Kumar Shrestha, Resham Gautam, Bimal Regmi and Tara Lama for your encouragement and inspiration. Thank you Diwakar for your suggestion on questionnaire and data analysis and Parshu (Guru) for teaching me the SPSS programme. Thanks also to the all staff of LI-BIRD for your support.

I wish to Acknowledge Dr. Madhav Aryal (Bandhu) for your assistance with preliminary data analysis. Thanks also to Sanjaya Dai, Sharmila, Devi, Ram, Alok, Tara for your support and encouragement. I wish to thank all my colleagues of master's of science programme for your kind cooperation and support. Special thanks to Swedish Biodiversity Centre (CBM) and Swedish International Development Agency (SIDA) for financial support.

I wish to thanks my parents in Chitwan and Biratnagar, Diwakar Dai and family and all my family members for your continue love and warm wishes. Last but not least, my deepest thanks to my wife. I have appreciated your patient encouragement and support during entire study period.

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Appendix 1: Checklist for Key informants' interview

S.N	Information	Sources of information
1.	Situation of present and past shifting cultivation practices How they affect the diversity of uncultivated foods in shifting cultivation areas	Key informants Local leader District soil conservation office District agricultural development office District forest offices Local institutions working in the areas
2.	Perception about the use of uncultivated foods over the time period in the areas	Old age people
3.	Major problems regarding the uncultivated foods Conservation Development	Key Informants
4.	Status of uncultivated foods in the area What are species composition and diversity in shifting cultivation? Most common species Endanger species Key species	Key Informants
5.	Relationship between the fallow shifting cultivation and uncultivated foods (Past and present fallow system)	Key informants
6.	Relationship between uncultivated foods and food availability Food sufficient months supported by Uncultivated foods How they manage the demands of family members during the food scarce periods?	Key informants
7.	Policies about the use of uncultivated foods	District agricultural development office District forest offices

Appendix 2: Format for inventories developed to document uncultivated plants during the diversity fair

S.N	Nepali name	Bota. name	English name	Family	Growth habit	use-value	Avai. Status	Parts used	Kaski	Dhading

Appendix 3: Common issues for Group Discussion

Agricultural activities and changes
Major off-farm activities
General dependency of people on uncultivated foods
Trend of using these resources over the time period
What are the effects of harvesting on plant population and which species are most vulnerable to over exploitation?
What are the effects of harvesting in case of multiple use species? What will be the effect of harvesting one species on the availability of others?
Local believes and tradition about harvesting
Which species or resources categories are most valued in the community

-Food -Culturally
-Medicine -Economically
-Nutritionally

Appendix 4. Questionnaires Survey

Uncultivated foods: Options for livelihood support
Master-thesis
2006

District:
Ward no.
Village:
Ethnicity:
Interview date:

A. Demographic information

1. Name of respondent:
2. Sex: Male ( ) Female ( )
3. Age: ..... Years
4. Wealth categories: Rich..... Medium..... Poor
5. Total family members:..... Male..... Female..... Children
6. Respondents educational status: Illiterate ☐
   Literate ☐
   Primary School ☐
   Secondary school ☐
   Post secondary ☐
7. When did your family move to this village? Year ☐
8. What is your main occupation? Rank 1-5
   - Agriculture ☐
   - Wage and labour ☐
   - Service (Govn and non.govn) ☐
   - pension and remittance ☐
   - Business ☐
   - Others (Specify) ☐
9. If agriculture is your main occupation what are the major crops you grow in your farm?
   - Cereals ☐
   - Pulses ☐
   - Vegetables ☐
   - Fruits ☐
   - Others (Specify) ☐

10. Are your own agriculture products sufficient to feed your family for the whole year?

    Yes ☐ No ☐

11. If not, how many months your farm production is sufficient for? Motnhs... ☐

12. How do you manage in those scarce periods? ☐
    - Share cropping ☐
    - Wage labouring ☐
    - Selling of small animals ☐
    - Collection of uncultivated foods ☐
    - Small business ☐
    - Selling of local products ☐
    - others ☐

13. Do you have any source of cash generation besides agriculture?

    Yes ☐ No ☐ (If No go to QN 15)

14. If yes, what are the major sources of cash income for your family (Priority ranking 1-5)?
    - Seasonal labor ☐
    - Hunting and gathering ☐
    - Business ☐
    - Services (Job) ☐
    - Profession ☐
    - NTFPs ☐
    - Others ☐

B. Shifting Cultivation Practice ☐

15. Do you practice shifting cultivation farming system?

    Yes ☐ No ☐ (If No go to QN 20)

16. If yes, which types of shifting cultivation system do you practicing?
    - Slash and burn practice ☐
    - Slash and no burn practices ☐
    - Others ☐

17. How long do you keep your field under fallow after harvesting of crops?
    - 6 moths ☐
    - One year ☐
    - Three years ☐
    - Five years ☐
    - More (Specify) ☐

18. Do you collect any products from the fallow land?

Yes ☐ No ☐

(If No go to QN 20)

19. If yes, what are the different products?

- wild foods and vegetables ☐
- Medicine ☐
- fodder ☐
- others (Specify) ☐

C. Uncultivated species information

20. Do you use uncultivated foods?

Yes ☐ No ☐ (If No go to QN 25)

21. What are the major reasons of using uncultivated plant species

Lack of food sufficiency ☐

Nutritious ☐

Medicinal ☐

Freely available ☐

Income sources ☐

Tradition ☐

Others (Specify) ☐

22. How do you utilize the uncultivated foods?

Only for household use ☐

Both for consumption and for sale ☐

Only for sale ☐

23. Question number 23 is in separate sheet (please use the separate before going to QN 25)

24. How many months or days the above uncultivated foods contribute in food sufficiency?

Month ☐ days ☐

25. Did you face any kind of major stresses/Shocks during last five years?

Yes ☐ No ☐
(If no go to Qn 29)

26. If yes, what are the major stresses you faced?

	Year
• Drought	☐
• Landslides/Soil erosion	☐
• Disease/pest outbreak	☐
• Loss of whole crops	☐
• Declining of production	☐
• Un sufficient human capacity	☐
• Others (Specify)	☐

27. How did you manage to cope with these stresses?

Collection of wild foods	☐
Seasonal migration	☐
Exchange of goods and labor	☐
Use of processed foods	☐
Others (Specify)	☐

28. Do you think there will be market demand of these food species in the future?

Yes ☐ No ☐

29. Who is involved in the different stages of these species used? Fill the table below

Activities	Female	Male	Children	Remarks
Roles and responsibilities				
• Locate the area				
• Harvesting				
• Collection				
• Processing				
• Preparation				
• Tasting				
• Storage				
• Marketing/exchange (if any)				
Decision making				
• Harvesting/collection				
• Processing				
• Storage				
• Marketing/exchange				
• Maintenance of species				

30. Which resources categories are most in demand for you? Rank with priority

Resource categories	Rank (1-5)
Food	
Vegetables	
Medicinal	
Market value	
Religious	
Fruits	

31. Have you domesticated any uncultivated plant species in your home garden?

Yes ☐ No ☐

(If No go to QN 33)

32. If Yes List the species
    -

33. Do you store such uncultivated foods for future use?

Yes ☐ No ☐

(If no go to QN 35)

34. If yes, which species
    -
    -

D. Management and conservation

35. Do you have any local practices for conservation and management of these uncultivated resources?

Yes ☐ No ☐

(If no go to Qn 38)

36. If yes what are the practices

In-situ conservation	☐
Domestication in homegarden	☐
Local rules and regulation	☐
Others (Specify)	☐

37. Do you know any institutions working in the conservation and management of natural resources?

Yes ☐ No ☐

(If No go to QN 40)

38. If yes, do you know what they are doing?

Institution	Area of work (conservation, management)	Starting year

39. Do you think there are problems regarding the use of these resources?

Yes ☐ No ☐

(If No go to QN 42)

40. If yes, what are the three major problems in your view?
    -

41. What might be the solution of these problems in your opinion?
    -
    -

Thank you for your kind cooperation and support

23. List species in each category (Food, Vegetables, medicine, market value and Traditional/cultural) that you use most frequently

Resource Use Category	Species Name	Colle. Place @	Collect. time (Mon	Freq. of Harve /mo (no)	Quantity kg/no/ pa	Parts used #	Freq. use No./mon.	Ava.Status $	Coll. time (hour)	Availty trends * (Last five Years)		Use trends ** (Last five Years)		Reasons of use
										*	Reasons	**	Reasons	
Food														
Veget														
Medi														

@ Collection Place = 1. Jungle; 2. Cultivated land; 3. river/stream; 4. Shifting cultivation area; 5…
# Parts used = 1. Roots; 2.leaves; 3. stem; 4.Flower; 5. Fruits; 6. Seeds; 7.Buds; 8. Shoots; 9. Bark; 10. Tendril; 11.bulb; 12……
$ Available Status= 1. High; 2. Medium; 3. Low
* Available trends =1. Increasing; 2. Decreasing; 3. Same
**Use trends =1. Increasing; 2. Decreasing; 3. Same

Appendix 5: List of Uncultivated Plant species recorded from the two districts of mid hills (Kaski and Dhading)

S.N	Nepali name	Botanical name	English name	Family	Growth habit	Local use-value	Av. Status	Parts used	Kaski	Dhading
1	Aakas beli	Cuscuta reflexa Roxb.	Dodder	Convolvulaceae	P	M	2	W	1	1
2	Aank	Callotropis gigantean (L)	Swallo wort	Asclepiadaceae	P	M, O	2	La, Fl		1
3	Abijalo	Drymaria diandra Blume		Caryophyllaceae	A	M	3	R	1	1
4	Ainselu	Rubus elipticus Sm.	Rasp berry	Rosaceae	P	Fr	2	F	1	1
5	Ainselu (Rato)	R. acuminatus Sm.	Rasp berry	Rosaceae	P	Fr	3	F		1
6	Amala	Phyllanthus emblica L.	Emblic myrobalan	Rutaceae	P	Fr,M, O	2	F	1	1
7	Amaro	Spondias cytheria Sonn.	Goldem apple	Anacardiaceae	P	M, Fr	3	F	1	1
8	Amrisho	Thysonaleana maxima (Roxb.) Ktz.	Broom grass	Gramineae	P	O, Fo	2	S, L	1	1
9	Angeri	Lyonia ovalifolia	Angeri	Ericaceae	P	M	3	W	1	1
10	Asuro	Justicia adhatoda L.	Malabar nut	Acanthaceae	P	O,Fo, M	1	S, L	1	1
11	Babari	Ocimum sanctum L.	Holy Basil	Labiatae	P	R, M	3	W	1	
12	Badmade	Fagopyrum diabotrys D. don		Polygonaceae	A	V	1	L	1	
13	Badhar	Artocarpus lokoocha Wall.	Monkey jack	Moracea	P	Fo,O,Fr	2	F, L	1	1
14	Batulpate	Stephania japonica (Thunberg)		Menispermaceae	A	M	2		1	
15	Ban Kapas	Thespesia lampas (Cavanillies)		Malvaceae	P	M,O	2	L,B	1	
16	Bayar	Zizyphus mauritiana.Lawmark	Bayar	Rhamnaceae	P	Fr	2	F	1	1
17	Ban Kera	Musa balbisiana Colla.	Banana	Musaceae	P	Fr,V	3	F		1
18	Ban tarul	Dioscorea bulbifera L.	Yam	Dioscoreaceae	P	F, R,O	3	B	1	1
19	Ban tarul	Dioscorea sp.	Wild Edible yam	Dioscoreaceae	P	F	3	B	1	1
20	Bankakri	Solena heterophylla Loureiro		Cucurbitaceae	A	F,V	2	F	1	1

21	Bans	Bambusa nepalensis (Stapleta)	Bamboo	Gramineae	P	F,Fo,O	2	Sh, S	1	1	
22	Bel	Aegle marmelos (L.) Merr.	Wood apple	Rutaceae	A	R,O	2	F, L	1	1	
23	Bethe sag	Chenopodium album L.	Lamb's quarter	Chenopodiaceae	A	V	1	Sh	1		
24	Bhuin kafal	Fragaria dalteniana Goy		Rosaceae	A	Fr	2	F	1	1	
25	Bhalayo	Semecarpus anacardium L.	Marking nut tree	Anacardiaceae	P	Fr, M	2	F, B		1	
26	Bhakyamlo	Rhus javanica L.	Nepalese sumac	Anacardiaceae	P	M,R	3	F	1	1	
27	Bhimsen pati	Buddleja asiatica (Loureiro)	Butterfly bush	Buddlejaceae	P	R, M	2	L		1	
28	Bhorla	Bauhinia vahlii Wight & Am.	Camel's foot climber	Leguminosae	A	V,Fr	2	F, Te	1	1	
29	Bhyakur	Dioscorea deltoidea Wall.	Cush-cush yam	Dioscoreaceae	A,P	F	2	B	1	1	
30	Bilaune	Maesa chisia Buch.Ham.ex.don		Myricaceae	P	M	2		1		
31	Bojho	Acorus calamus L.	Sweet Flag	Acoraceae	A	M	2	C	1	1	
32	Camuna	Syzigium cerasoides		Myrtaceae	P	M, Fr	2	F, Ba	1	1	
33	Chariamilo	Oxalis corniculata L.	Creeping sorrel	Oxalidaceae	A	Fr, M	3	L	1	1	
34	Chalne sisnu	Boehmeria platyphylla D.don	China grass	Urticaceae	P	M, R	2	L, Fl	1	1	
35	Chillo badulpate	Cissampelos pareira		Menispermaceae	P	M	3	W	1	1	
36	Chuiyan/Tyaguna	Dioscorea pentaphylla L.		Dioscoreaceae	A	F	2	B		1	
37	Chiuri	Diplokenma butyraceae (Roxb.)	Butter tree	Sapotaceae	P	Fo,R,,O,T	2	F, Se, L		1	
38	Chilaune	Schima wallichii Korthals	Needle wood	Theaceae	P	M	3	B	1	1	
39	Chiraito	Swertia chirayita (Roxburgh ex fleming)	Chiretta	Gentianaceae	A	M	3	W		1	
40	Chyau	Morchella spp.	Mushroom			V	3	Fl	1	1	
41	Dante okhar	Juglans regia L.	Thin shelled walnut	Juglandaceae	P	Fr, R	2	F	1		
42	Dansinki	Adiantum caudatum L.		Pteridaceae	A	M	2	B, L	1		
43	Dhayari	Woodfordia fructicosa		Lythraceae	P	M	3	W	1	1	
44	Dumri	Ficus racemosa L.	Cluster fig	Moraceae	P	F, Fo	2	F, L	1	1	
45	Ganja	Cannabis sativa L.	Indian hemp	Cannabinaceae	A	M,S	3	Se	1		

46	Ghod tapre	Centella asiatica L.	Water pennywort	Umbelliferae	P	M	2			R	1	1
47	Gayo	Bridelia retusa (L.) Sprengel.	Gambles man	Euphorbiaceae	P	Fo, R	2			S	1	
48	Gideri	Premna barbata L.		Leguminosae	P	Fo	2			L	1	1
49	Githa	Dioscorea bulbifera L.	Air potato/potato	Dioscoreaceae	A	V,F, T		2		B	1	1
50	Gogan	Saurauria napaulensis DC.		Saurauiaceae	P	Fo		2			1	1
51	Gol Kankri	Coccinia cordifolia	Ivy gourd	Cucurbitaceae	A	F,V		3	F		1	
52	Gujargano	Cissampelos pareira L.	Valvet-leaf	Menispermaceae	P	M		3	W		1	1
53	Ghiukumari	Aloe barbadensis Miller	Indian Aloe	Asphodelaceae	P	M,O		2	L		1	
54	Gurjo ko lahara	Tinospora sinensis(Loureiro) Merrill	Guancha	Menispermaceae	P	M,O		2	W		1	1
55	Hadchur/Hadjorni	Viscum album L.	Mistletoe	Viscaceae	P	M		2	W		1	1
56	Harro	Terminalia chebula		Combretaceae	P	M	2		F		1	1
57	Jangali aanp	Mangifera indica L.	Wild mango	Anacardiceae	P	Fr	3		F		1	1
58	Imli, Titri	Tamarindus indica L.	Tamarind	Leguminosae	P	Fr	1		F		1	1
59	Jaluko	Remusatia vivipora (Roxburgh)		Araceae	A	V		1		Sh	1	1
60	Jamun	Eugenia formosa Wall.	Black plum, java plum	Myrtaceae.	P	Fr		2		F	1	1
61	Jamun	Syzygium cumini (L.) Skells	Indian gooseberry	Myrtaceae.	P	F,Fo	2			F	1	1
62	Jaringo	Phytolacca acinosa Roxb.	Indian Poke/Poker weed	Phytolacaceae	A,P	V		3	L		1	
63	Jimbu / Dung dung	Allium hyposistum Stearn	Nepal aeromatic leaf garlic	Lilicaceae	P	S,M,V		3		F	1	
64	Kabro	Ficus lacor Buch.-Ham.	Elephant fig	Moraceae	P	V, Fo		2		Bu	1	1
65	Kadam	Anthocephalus chinensis (Lam.) Rich.ex Wall.		Rubiaceae	P	F,Fo		2			1	1
66	Kali nieuro	Tectaria macrodonta	Fern	Aspidiaceae	A	M, V	3		Sh		1	1

67	Kamal	Nelumbo nucifera Gaertner	Lotus	Nelumbonaceae	A	M,F	3	F		1		
68	Kansi amala (Pate amala)	Phyllanthus acidus (L.) Skeels	Star Goose berry	Euphorbiaceae	P	Fr	3	F		1	1	
69	Kaphal	Myrica esculenta Buch.	Box myrtle	Myricaceae	A	Fr	1	F	1	1		
70	Katus	Castanopsis indica (Roxb.) Miq.	Chestnut	Fagaceae	P	Fr,R	2	F	1	1		
71	Khaniyo (Rai)	Ficus semicordata Buch.-Ham.ex Sm.		Moraceae	P	Fo, Fr	1	F, L	1	1		
72	Kharane	Viburnum cylindricum Buch.		Caprifoliaceae	P	F, M	2	Sh		1		
73	Khasreto	Ficus hispida L.	Hairy fig	Moraceae	P	Fo,fr	2	L	1	1		
74	Khole sag	Veronica baccabunga L.	Brooklime	Scrophulariaceae	A	V	1	L	1	1		
75	Khirro	Sapium insigne (Royle) Benth.ex		Euphorbiaceae	P	Fo,M	2	L, Ba	1	1		
76	Kimbu	Morus alba	Mulberry	Moraceae	P	F, Fo,	2	F,L, R	1	1		
77	Koiralo	Bauhinia purpurea L.		Leguminosae	P	Fo, V	1	Bu	1	1		
78	Kutilkosa	Vicia angustifolia L.	Clover vetch	Leguminosae	A	F, Fo	1	F, W	1	1		
79	Kukurdaino	Smilax perfoliata Loureiro		Smilacaeae		V, O	2	Sh, S	1			
80	Kurilo	Asparagus racemosus Willd.	Wild asparagus	Asparagaceae	A,P	V,M,O	3	Sh	1	1		
81	Lali Gurans	Rhododendron arboreum Sm.	Rhododendron	Ericaceae	P	M, O	2	Fl	1			
82	Lapsi	Choerospondias axilloris (Roxb.) Brutt.&Hill	Monbin	Anacardiaceae	P	Fr,O	2	F	1	1		
83	Latte sag	Amaranthus spinosus L.	Amaranth	Amaranthaceae	A	V	1	Sh	1	1		
84	Lajabati	Biophytum sensitivum L.		Oxalidaceae	A	M	1	L	1			
85	Lunde	Amaranthus viridis L.	Pigweed	Amaranthaceae	A	V	1	Sh		1		
86	Marcha Jhar	Veronia cinerea L.	Iron Weed	Compositae	A	M	1	L		1		
87	Mel	Pyrus pashia Buch.-Ham.ex D.Don	Wild pear	Rosaceae	P	V,F,R	3	F, S	1			
88	Mulapate	Elephantopus Scaber L.	Rough elephant foot	Compositae	A	M	2	W	1			
89	Nigalo	Arundinaria falcata Nees	Himalayan bamboo	Gramineae	P	Fo, O	2	S	1	1		
90	Nimaro	Ficus auriculata Loureiro	Eve's apron	Moraceae	P	Fo, Fr	2	F, L	1	1		
91	Niuro	Dryopteris cochleata D.Don	Edible fern	Polipodiaceae	A	V	3	Sh	1	1		

92	Pakhanbed	Berginia ciliata (Haw.) Stemb.	Rock foil	Saxifragaceae	P	M		2	W	1	1
93	Pandel	Ziziphus incurve		Rhamnaceae	P	Fr	2		F	1	1
94	Pani amala	Nephrolepis cordifolia (L.) Presl.	Fern	Davalliaceae	P	Fr	2		F	1	1
95	Pudina	Mentha arvenis L.	Mint	Labiatae	P	M, O		1	L	1	1
96	Raikhanyu	Ficus semicordata Buch.-Ham.ex Sm.	Nepal fodder fig	Moraceae	P	Fo,Fr		2	F, L	1	1
97	Ratigeri	Abrus precatorius L.	Bead vine	Leguminosae	P	F, M	2		F, Ba	1	
98	Rudilo	Pogostemon glaber Bentham		Labiatae	P	M	2		W	1	1
99	Sal	Shorea robusta	Sal		P	R, O	2		La, L	1	1
100	Shiplican	Crataeva unilocularis Buch.-Ham.	Garlic pear	Capparaceae	P	V	1		Bu	1	1
101	Siltimur	Lindera neesiana (wall ex.Ness)Kurz.		Lauraceae	P	S,M,		2	F	1	
102	Sim sag	Rorippa nasturtium-aquticum L.	Water cress	Cruciferae	A	V		2	L	1	
103	Simali	Murraya paniculata (L.) Jack	Orange jasmine	Rutaceae	P	M		2	S	1	1
104	Sisno	Urtica dioca L.	Netal plant	Urticaceae	P	V, M		1	L, Sh	1	1
105	Shikari Lahara	Periploca calophylla (Wight) Falconer		Asclepiadaceae	P	M	2		W	1	1
106	Siundi	Euphorbia spp		Euphorbiaceae	P	M		2	F, S	1	
107	Tanki	Bauhinia purpurea L.	Pink bauhinia	Leguminosae	P	Fo, V		1	Bu, F	1	1
108	Tindu	Diospyros malbarica (Desr.) kostel	Tindu	Ebenaceae	A	Fr		2	F	1	1
109	Thulo okhati,	Astilbe rivularis Buch.-Ham. ex D.Don		Saxifragaceae	P	M		3	W	1	
110	Timoor	Zanthoxylum armatum Dc.	Nepal pepper	Rutaceae	P	M, S		2	F	1	
111	Titepati	Artemisia indica wild.	Mug wort	Compositae	P	R,M		1	L	1	1
112	Thirjo	Aeschynanthus parviflorus (D. Don) Sprengel		Gesneriaceae	P	M		2	W, L		1

Local use value: F = Food, Fr= fruits, V = Vegetable, M = Medicine, S = Spices, R =Religious, Fo = Fodder, T = Tradition, O = Other
Parts Used: W = Whole, R = Root, S = Stem, L = Leaf, Ba = Bark, Bu = Buds, Sh = Shoots, F = fruits, Fl = Flower, S = Seeds, La = Latex, B=Bulb, O = Others, Available status : 1 = Fairly enough, 2 = Medium, 3 = Low