

**Indigenous Management of Non-Timber Forest Products
and Their Contribution to the Livelihood of Rural People: A
Study from Yamphudin, Kangchenjunga Conservation
Area, Nepal**



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Letter of Recommendation

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This is to certify that Mr. **Subash Chandra Kharel** has prepared this dissertation entitled **“Indigenous Management of Non-Timber Forest Products and Their Contribution to the Livelihood of Rural People: A Study from Yamphudin VDC of Kangchenjunga Conservation Area, Nepal”** as partial fulfillment of the requirement for the degree of master of Science in Environmental Science (**Mountain Environment**) under my supervision and guidance.

This dissertation bears the candidate's own work has not been submitted for other purposes.

I therefore recommend this dissertation for approval and acceptance.

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Declaration

I, **Subash Chandra Kharel**, hereby declare that the piece of work entitled **“Indigenous Management of Non-Timber Forest Products and Their Contribution to the Livelihood of Rural People: A Study from Yamphudin VDC of Kangchenjunga Conservation Area, Nepal”** presented herein is genuine work, done originally by me and has not been published or submitted elsewhere for the requirements of a degree program. Any literature data works done by others and cited within this dissertation has been given due acknowledgement and listed in the references.

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Letter of Approval

The dissertation presented by Mr. Subash Chandra Kharel entitled " **Indigenous Management of Non-Timber Forest Products and Their Contribution to the Livelihood of Rural People: A Study from Yamphudin VDC of Kangchenjunga Conservation Area, Nepal** " has been accepted as a partial fulfillment of requirement for the completion of Master's degree in Environmental Science.

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Abstract

Poverty in Nepal is widespread and more pronounced in the more remote areas of the hills and mountains. The poorest households in these areas have very small landholdings. Non Timber Forest Products (NTFPs) are among the potential sources of income for Marginal Mountain farmers as they have many uses, can increase household's income, and are suited to the mountain environment. Thousands of tones of NTFPs are collected every year from the forest in raw form without any value addition. The ethnic communities not only know about various uses of the plant diversity but are also aware of biological aspects of the plants e.g. growth, flowering time, seed formation, propagation method, useful parts and varietals/genotypic differences in indigenous uses. The ethno-botanic indigenous knowledge is, therefore, very effective for planning and implementing conservation programs. Understanding the relationship among indigenous knowledge, indigenous people and their threatened economic plants can aid the conservation efforts at many levels. The study area consists of four ethnic groups. Many poor farmers and herders with limited livelihood options collect NTFPs. In the recent years, due to the market expansions and increased need of the local people, natural resources have been heavily harvested without considering their sustenance. Due to the over and premature harvesting, some valuable NTFPs are facing threats in the wild. Therefore, this study was focused on how local people of Yamphudin Village Development Committee (VDC) are managing the NTFPs and how it is contributing to all the livelihood assets of the local people.

Participatory Rural Appraisal (PRA) tools (group meeting, household visit, interview etc.), face-to-face questionnaires, etc were applied for data collection in the field. Besides, preference ranking (using validation by Friedman two-way analysis of variance) to find out economically important NTFPs was carried out along with the preparation and identification of herbarium. Data analysis was done by ANOVA, mean, percentage, Index of Relative Ranking (IRR).

Out of 77 NTFPs, five most preferred were selected to judge the relative contribution to livelihood assets, viz. natural asset, financial asset, human asset, social asset and physical asset in terms of index value. At last, all the index values were summed up and qualitative contribution to livelihood from NTFPs were assessed. In addition, different existing management practices of Yamphudin VDC of these most preferred NTFPs were also studied.

The research work has both academic and practical implications. Academically the research make an effort to investigate the relationship between human and his environment based on uses of plant resources. Practical importance of the study is that the data could be used to develop better strategies for both the protection and sustainable use of the biological resources.

Keywords: Non-Timber Forest Products (NTFPs), Medicinal and Aromatic Plants (MAP), indigenous knowledge, livelihood assets, Kangchenjunga Conservation Area (KCA)

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Acronyms and Abbreviations

ANOVA	: Analysis of Variance
CAUC	: Conservation Area User Committee
CACFUG	: Conservation Area Community Forestry User Group
DFO	: District Forest Office
DFID	: Department of Foreign and International Development
DNPWC	: Department of National Park and Wildlife Conservation
DOF	: Department of Forest
HH	: Household
ICDP	: Integrated Conservation and Development Program
ICIMOD	: International Centre for Integrated Mountain Development
IISD	: International Institute for Sustainable Development
IK	: Indigenous Knowledge
IM	: Indigenous Management
IMS	: Indigenous Management System
IRR	: Index of Relative Ranking
IUCN	: World Conservation Union
KCA	: Kangchenjunga Conservation Area
KCA-MC	: Kangchenjunga Conservation Area Management Council
MAP	: Medicinal and Aromatic Plant
MG	: Mother Group
NTFP	: Non-Timber Forest Product
NWFP	: Non-Wood Forest Product
PRA	: Participatory Rural Appraisal
SG	: Sister Group
SK	: Scientific Knowledge
SLF	: Sustainable Livelihood Framework
SSspp	: Sum of Squares between Species
SSw.people	: Sum of Squares within Species
TTAR	: Tibet Autonomous Region
UG	: User Group
VDC	: Village Development Committee
WWF	: Worldwide Fund for Nature

Chapter – 1: Introduction

1.1 Background

Nepal is a small mountainous country (1, 47,181 sq. km.) between two large countries, India and China and extends from 26°22' N to 30°27'N latitudes and 80°04' E to 88°12'E longitudes (CBS 2002). Its altitude ranges from 60m to 8848 meter above sea level (masl).

About 29% (4.27 million hectares) of the country's area is occupied by forestland (DFRS 1999). Nepalese people have been utilizing the forest product such as food, medicine, ornament, timber, and fodder for their daily requirements since time immemorial. Harvesting of Non Timber Forest Products (NTFPs) is as old as human existence. The role and contributions of NTFPs were crucial in subsistence and rural economies due to their richness of variety such as different source of food, fodder, fiber, herbal portions, etc. Following the industrial revolution, when wood and wood products became a major commodity of trade and forest management emphasized timber production; NTFPs were grouped together as minor forest product. There is a lack of information on their use as well as development (Chaudhary 1998). There has been recently increasing awareness about their importance as a result of many local factors such as the dependence of rural communities on NTFPs, site quality, the new market preference for natural products, increasing concern about the conservation of forest and their biodiversity and occurrence of many NTFPs among the biological richness and ecological complexity of natural forests (FAO 1994, Grimes et.al. 1994). The value of these products can be far higher than of timber harvest or land conversion to pasture or agriculture (Roque 1992).

The term 'indigenous knowledge (IK)' is used to imply knowledge that belongs to and is produced naturally by the people residing in a given geographical area. IK is the out come of trial and error. Reference to such knowledge is made by using various terms like "indigenous technical knowledge" (Howes and Chambers 1980), "People's Science" (Richards 1989), "rural people's knowledge" (Scoones and Thompson 1994), as well as the works labeled as "ethno-botany", "folk-medicine", "traditional knowledge" and "folk taxonomy" (Martin 1995). IK is the initiative of local people, which should be incorporated for the sustainable development of the local people. However, in the past this knowledge was largely ignored in the formulation of natural resource management policy and planning. Participation of community and the use of their knowledge for the environment management were not given importance. As a result, environmental program could not become sustainable and

conservation of environment and alleviating poverty of local people could not be achieved. (Pun 1999).

1.2 Problem Statement and Rationale of the research work

Every year about 10,000-15,000 tons of NTFPs, representing about 100 species, are harvested from mid hills and high mountains of Nepal and traded to India (Edwards 1996). Despite its important, NTFPs resources have been neglected due to the skewed management plan towards the timber (Acharya 2003). The current management practices are still ineffective. The existing practices have some rational basis on indigenous system but they have yet not been analyzed properly to derive ideas on sustainable management practices. There are cases of resource degradation due to prolonged use of NTFP resources that are used without adequate knowledge of sustainability issues (Acharya 2003). Apart from the above, the collectors and local traders at community level have limited options for increased economic returns from NTFP management and trade. As a result, the national and international level traders are getting undue benefits at the cost of local communities. In this way, the local communities are facing two types of problem. One lack of suitable technique know how for the sustainable management and the other, limited economic benefits from inefficient use and management of NTFPs.

Due to the development in modern science, there was increasing trend in the neglecting indigenous technology and practices. That leads to loss in such technology and practices, which were developed from hundreds of year of trial and error process and could be the best option than the modern technology. Indigenous communities were given little importance during the development process by the government. They are living in and around the forestland and utilizing it for their survival. Without giving due consideration to the local communities, many conservation programs were unsuccessful and were shifted from strict protection to communities managed program.

This study was proposed in Eastern Himalayan Region, because of rich biodiversity, cultural heritage and pristine Himalayan landscape. The study has investigated the relationship between human being and environment based on uses of plant resources. Despite agriculture being the primary economic enterprise of Nepal, off-farm activities such as NTFPs is the major source of off-farm employment and income generation for low-income households (Banskota and Sharma 1994; Sharma 1996; Edwards 1996; Olsen 1997). The role of NTFP is important in the subsistence hill economy and these resources have a potential for significant contribution to improving livelihood of local people (Sharma 1996).

In the mountain areas of Nepal, livelihood options are often linked to a range of economic activities, products and productivity (for example diversified cropping, and farming and forestry links), the natural assets of mountains (such as their diverse landscape, extent and productivity) as well as economic and human assets including physical assets (terraced land and water harvesting systems). They are linked as well to social or institutional capital including collective arrangement such as common property resources and other support system, collective risk-sharing arrangements and public transfers, and secondary and tertiary level of activities such as processing and marketing (Jodha 2005).

There are two reasons to study assessing the existing management practices. First, successful improvements in forest management usually reassemble and build on traditional activities already practices in the area. Many attempts to switch suddenly to year-round, capital-intensive activities, which differ drastically from local traditions, have failed (Poole 1993). Second, if innovators do not understand local practices and know which local groups rely on which specific products, they may introduce innovations that are technically feasible but bring negative socio-economic effects. Too often, the actual value that communities on their non-wood resources is not fully understood until after the resource is gone (Wikens 1991).

In the Himalayan and mountainous region of Nepal, medicinal and aromatic plants (MAPs) play an important role in sustaining livelihood. A study conducted in Gorkha district of Nepal, it was found that MAPs contribute approximately 42% of the total annual household income of the rural people (Olsen 1997). Having the similar biophysical and socio-economic condition, the eastern part of Nepal, like Kangchenjunga Conservation Area (KCA) also provides significant contribution to livelihood by collection and sell of MAPs and NTFPs. Even though there are many literatures available on the economic contribution of MAPs/NTFPs in the eastern Himalayan region (Edward 1996; Sherpa 2002, Paudel 2003, Oli and Nepal 2003), no in-depth study on the indigenous management (IM) practices by the local communities are available. As the KCA is handed over the local communities for management, proper IM practices should be identified to incorporate with modern science for conservation and sustainable utilization of natural resources. Similarly, the overall contributions of MAPs/NTFPs to the livelihood of KCA are also not adequately addressed. This research focused on answering the above-mentioned issues.

1.3 Objective of the Study

The overall objective of the study was to find out the contribution of NTFPs to the livelihood of Yamphudin VDC of KCA. The specific objectives were:

- i) to find out the most preferred NTFPs in terms of livelihood
- ii) to find out the contribution of NTFPs to the livelihood of local people
- iii) to assess the indigenous management practices of most preferred NTFPs by local communities of Yamphudin

1.5 Research questions to answered

KCA lies in Sacred Himalayan Landscape, which is rich in biological diversity. It consists of six ethnic groups. These marginal people depend on subsistence farming. NTFPs/MAPs are the important source of livelihood in KCA. The study has aimed to answer the following questions:

1. What are the Major NTFPs commonly harvested in Yamphudin VDC?
2. What is the present resource condition of NTFPs in Yamphudin VDC?
3. How do NTFPs contribute to the local livelihood of Yamphudin VDC?
4. What are the indigenous knowledge's and how they are used in sustainable management of NTFPs in the Yamphudin VDC?

1.6 Limitations of the Study

- The study was carried out on Yamphudin VDC of Taplejung District, which in one of the secluded district, on Nepal. In addition, scatter ness among the settlements made the study difficult. Hence, inaccessibility and marginality of the area became an obstacle to gather sufficient information.
- Forest survey of NTFPs became difficult due to numerous leaches attacks. Hence, limited forest survey was made, which might influence the result of the study.
- The research could not find out the baseline for all the livelihood capitals. However, only the percentage constitution of the five most preferred NTFPs out of major NTFPs could be studied.
- Only five locally most preferred species of NTFPs were studied for their comparative contribution to the local livelihood. The contribution to local livelihood after summing up

all the indicators of the livelihood assets does not imply the concrete value; it only implies the relative value among the five NTFPs i.e., the index.

- Summing up all the capital quantitatively is almost impossible (DFID, 2001); and therefore the qualitative sum of the five assets gave relative ranking of the five NTFPs about the extent of the contribution.
- Time and resource scarcity was another constraint for the study.

Generalization of findings should be made with caution with consideration of above-mentioned limitations.

Chapter – 2: Literature Review

2.1 Non-Timber Forest Products (NTFPs)

De Beer and Mcdermott first coined the term “Non Timber Forest Product (NTFPs)” in 1989, before this it was mainly referred to as “Non Wood Forest Product (NWFP)” (Belcher 2003). De Beer and Mcdermott (1989) proposed the following definition: *The term ‘Non-Timber Forest Products (NTFPs)’ encompasses all biological materials other than timber, which are extracted from forests for human use.* While document prepared by Chandrasekharan (1992) for FAO, the following definition was proposed: *Non-wood forest products include all goods of biological origin, as well as services, derived from forest or any other land under similar use and exclude wood in all its forms.* The definition was revised in 1995 (FAO 1999), based on a series of regional and global consultations: *Non-wood forests products consists of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests.* Many others offer definitions and examples to clarify their own use of the term NTFP in publications. However, the various definitions are inconsistent. In some early discussions, resources such as gravel and rocks were included, and many currently working in the field would include services (e.g. watershed functions, carbon sequestration, ecotourism). Peters (1997) considered both ‘natural or managed forests’. Wickens (1991) excluded ‘Industrial round wood and derive sawn timber, wood-based panels and pulp’ and left the possible sources wide open (‘...extracted from natural ecosystems, managed plantations, etc.’). In addition, many more authors leave the term undefined.

There are many alternative terms that are used more or less as synonyms, each with its proponent. Terms such as ‘wild products’, ‘natural products’, ‘non-timber forest and grassland products’, ‘minor forest products’ and many others entered the vernacular (Belcher 2003). It seems that none of the terms is truly able to capture the full range of ideas that are encompassed in the NTFP concept. Many have difficulty with FAO NWFP definition precisely because it excludes wood. Others prefer alternative terms because the idea of ‘forest’ is too restrictive (they would like to include products originating from grasslands, for example) or that it is not restrictive enough (they would exclude plantation forests). Some focus on wildlife and faunal resources while others exclude them, deliberately or not. Some would include environmental services. More than that, there are some very different ideas about why NTFPs are important and about the role, they can or do play in poverty alleviation, economic development or conservation.

Hammett (1993) proposes a narrower definition of NTFP appropriate for Nepal, where he includes all biological materials other than timber and also excluding fodder and fuel wood as their importance warrants separate consideration whereas Kanel (2000) focuses more on the socio-economic value of NTFPs which include products like bamboo canes, MAPs, and their produce. He further mentioned that NTFPs commercial, socio-economic and economic values. These products provide livelihood to many poor people.

Peachy (1999) formulated a definition which is some how related to the purpose of this study, which is defined as “all materials that may be extracted from a forest or an adjacent environment, other than round wood or an hard wood, and which either, subsistence or market value attached to it.” For the purpose of this study, NTFPs include all the products of biological origin of plants other than timber, fuel wood and fodder.

2.2 Contribution of NTFPs to livelihood

Drawing on a number of seminal works, Arnold and Ruiz Perez outline three propositions central to the idea that NTFPs might contribute to rural development and forest conservation objectives. These were that NTFPs make important contributions to the livelihood of forest adjacent communities; that increasing harvests of NTFPs could increase the perceived value of forest resources and hence provide incentives to conserve forested land and that the exploitation of NTFPs provided a more sustainable base for forest management (Arnold and Ruiz Perez 2001 cited in Ambrose 2003). Application of a pro-poor focused ‘livelihood approach’ to examining and understanding individual or household economies and the ways in which poor groups of people are able to improve their standards of living, has emphasized the fact that natural resources (including NTFPs) are only one set of capital assets available to and used by poor as part of their livelihood strategies (Carney 1998 and 1999, Farrington et.al. 1999, Scoones 1998 cited in Ambrose 2003). This has forced conservationists, forest managers and development practitioners to move away from sectoral perspectives towards a much broader approach in their understanding of the important of the various economic activities that make up the livelihoods portfolios of forest margin communities.

High altitude areas of Nepal are considered the storehouse of highly valued NTFPs, although no data exist of NTFPs being harvested or exported exclusively from these areas. Several reports stress that NTFPs collection and trade is one of the major sources of cash income for the people in these areas. There exists a tremendous management potential for the extraction and value-added production of NTFPs, but traders and processors, who have little concern for management of the resource, tightly control the market (Acharya 2003).

Development of NTFPs have the potential to play key role in high altitude livelihoods. However, there are challenges to be met, identified by ANSAB/ITDG (2002) as: Price fixing by intermediary; inflation of the final selling price; poor product quality due to unsystematic handling and processing and lack of sustainable harvesting knowledge and practice leading to forest degradation.

Study carried out in Koshi Hills of eastern Nepal estimated that total cash income to the rural population from NTFPs is in the order of ten million dollars, which is distributed between collectors, porters and village based traders (Edwards 1996).

Oli and Nepal (2003) conducted a study in Kangchenjunga Conservation Area (KCA). They found 139 species of NTFPs in which 9 species of NTFPs were the most important for the rural livelihood of the KCA. Among these NTFPs, Alainchi and Chiraito contribution was the 60% to 90% of the total household expenses of lower belt of KCA.

2.3 Indigenous Management System (IMS)

“Indigenous” is sometimes confused with the term “traditional”, but they are not necessarily the same. “Indigenous” refers to the point of origin, the source of initiative. Indigenous system may incorporate element and processes from the outside world, provided the initiative for their incorporation is local. Traditional system may not be of local origin, as their adoption may have been imposed from outside. Traditional systems are old by definition, but indigenous systems are often quite new and constantly evolving. Thus, although traditional system may be indigenous and vice versa, this is not necessarily the case (Gill 1992).

Figure 2.1 illustrates the relationship between traditional and indigenous systems and their evolution. In this example (fig 2.1a), the system is originally both traditional and indigenous (Stage 1), but it is disturbed by the imposition of an alien regime, as often happens, for example, within a feudal social structure or in the process of colonization (Stage 2). In this stage the system is neither indigenous nor traditional, but if it remains undisturbed for sufficiently long, it will by definition eventually revert to being traditional, without, however, becoming indigenous. Stage 4 represents the second system disturbance. This occurs a long time after the first disruption, but this time the change takes place because of a purely local initiative. For this reason, the system is now indigenous, but it is obviously not traditional since it is new. As in the case of the previous disturbance, the system reverts to being traditional, purely as a function of time (Stage 5).

Figure 2.1b presents a very different situation. Here the system is caught in a “loop” in Stage 4, not because there are no changes, but because disturbances are so frequent that although the system remains indigenous, due to the repeated introduction of new elements and processes it is never permitted to settle down into a traditional one. It should again be stressed that the introduction of element and processes from the outside world does not make the system non-indigenous.

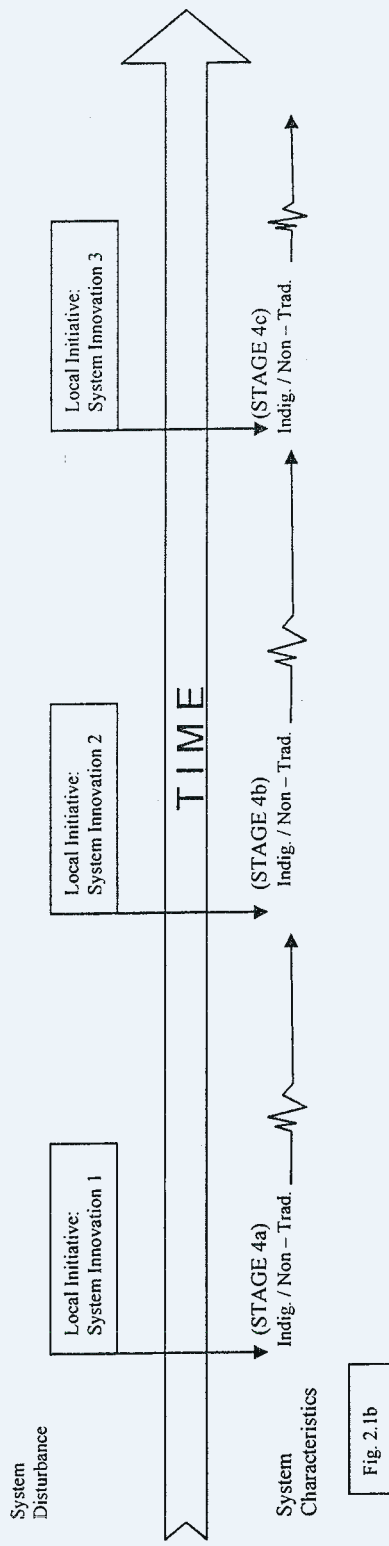
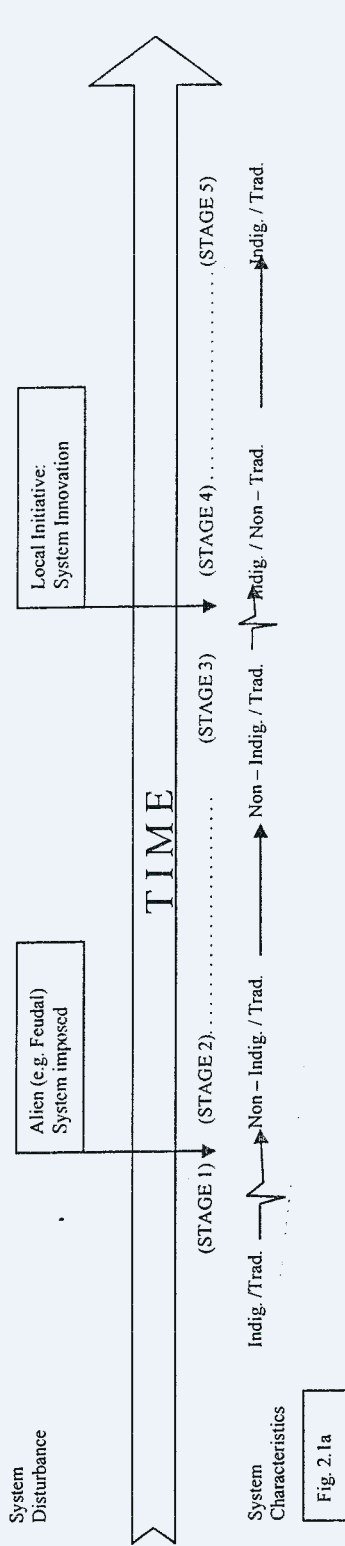


Fig 2.1 Relationship between Traditional and Indigenous system and their evolution (Adopted from Gill, 1992)

Figure 2.2 illustrates in Venn-diagram form the relationship between traditional, indigenous and other systems and technologies. While, by definition, “traditional” and “non-traditional” systems do not overlap, indigenous systems such as those described here embrace both. They characteristically retain what their designers see as “good” in traditional systems, while simultaneously reaching out to capture and assimilate elements of the outside world, which can either replace or augment what is seen as “not-so-good”.

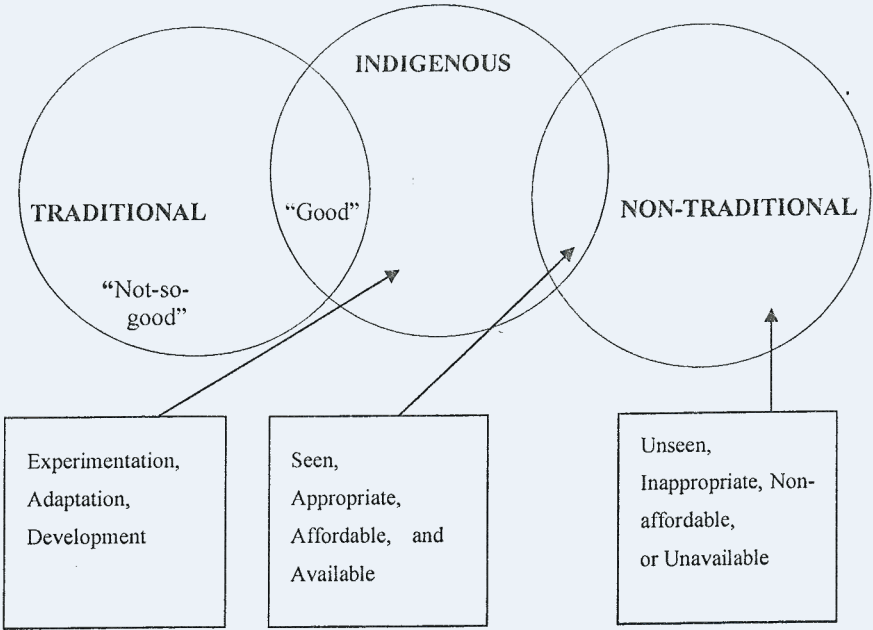


Figure 2.2 Traditional and Indigenous Systems (Adopted from Gill 1992)

Indigenous Knowledge (IK) is also named as ‘Popular knowledge’ since it involves the people as owners and active participants in its application. Knowledge stems from the active and reflection process of ‘the masses’ rather than the educated elites. The masses in turn produce and reproduce it as cultural knowledge that creates mutual understanding and identity among indigenous group as the peasant or laborer or any other cultural groups (Beauclerk et. al. 1988 cited in Dhakal 2004).

Defining ‘IK’ appears to be a very difficult task and therefore people tend to avoid providing such a definition (Brokensha et. al. 1980, Chambers 1983 cited in Dhakal 2004). Any attempt to describe IK seems to involve contrasting it with western or Scientific Knowledge (SK).

Table 2.1: Comparison between Indigenous Knowledge (IK) and Scientific Knowledge (SK).

Parameters	IK	SK
Analytical frame	Holistic	Reductionistic
Logical basis	Subjective, Intuitive	Objective, supposed purely rational
Data type	Mostly qualitative	Qualitative and quantitative
Relationship to nature	Inter-dependency of all life forms	Seen human as the superior life forms
Time frame	Cyclical, diachronic	Linear, Synchronic
Storage	Primarily oral	Primarily written
Transmission	Oral, observation	Written
Major concern	Immediate necessities of livelihood	Construction of general explanation of law
Knowledge production	Generated through observation and experimental experimentation	Learned in abstract manner, not always linked to application

Adopted from Mathias-Mundy 1993, Gurung 1994 and Agrawal 1995 and modified by Dhakal 2004

The study of Indigenous Management (IM) of natural resource is both fascinating and rewarding from a scientific viewpoint. There are two compelling reasons for studying IMS in Nepal. First and foremost, such study represent a genuine efforts to achieve people's participation in the development process. The other reasons that the study of IMS is important for policy analysis is that those system are by-and-large extremely cost effective (Gill 1992a).

Village communities make distinction between the terms "indigenous", "traditional" and "sponsored" in the following ways (Baral et.al. 1991). The term 'indigenous' is used in preference to 'traditional' implies continuity. An indigenous system may be a new development. The crucial difference is between system that are largely the result of local initiatives and those, which are set up by outside agencies (government or project). The later are called externally sponsored systems.

In recent times, there is a growing optimism that indigenous systems of forest management are common at least in many of the hill districts of Nepal. Fisher et. al. (1990) have documented the presence of such systems in the different parts of Kavrepalanchowk and Sindhupalanchowk districts of the central hills.

The occurrence of an indigenous system (IS) of forest management is, probably, the best indicator of the neediest areas. A decision to start working initially with indigenously managed site is equally rewarding, because it can also provide an opportunity of learning how the system can work without any investment or involvement. The essential parameters that are responsible for the self-operation of IS of forest management could be documented and applied elsewhere too.

Muller-Boker (1991) found out that knowledge about nature is closely related to the utilization of natural resources. The evaluation and perception of natural environment, however, is greatly influenced by a culturally and religiously toned concept not directly comprehensible to an outsider.

Richards (1993) considers indigenous knowledge as a 'performance' rather than a system or combinational logic for action. According to him, a farmer generates agricultural knowledge through the process of sequential adjustments to the environmental circumstances in a temporal continuum.

Chapter 3: Conceptual Framework for Analyzing Livelihood Contributions from NTFP

3.1 Concept of Livelihood

Conceptually, “livelihoods” connote the means, activities, entitlements and assets by which people make a living. Assets, in this particular context, are defined as not only natural/biological (i.e., land, water, common-property resources, flora, fauna), but also social (i.e., community, family, social networks, participation, empowerment, human (i.e., knowledge, creation by skills) and physical (i.e., roads, markets, clinics, schools, bridges).

The Brundtland Commission in 1987 introduced Sustainable Livelihood in terms of resource ownership and access to basic needs and livelihood security, especially in rural areas. The International Institute for Sustainable Development (IISD) defines sustainable livelihoods as being “concerned with people's capacities to generate and maintain their means of living, enhance their well-being, and that of future generations” (Elasha et. al. 2005).

The definition used by the UK's Department of Foreign and International Development (DFID) incorporates these sentiments.

'A livelihood comprises the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base' (Chambers and Conway 1992 cited in Elasha et.al. 2005).

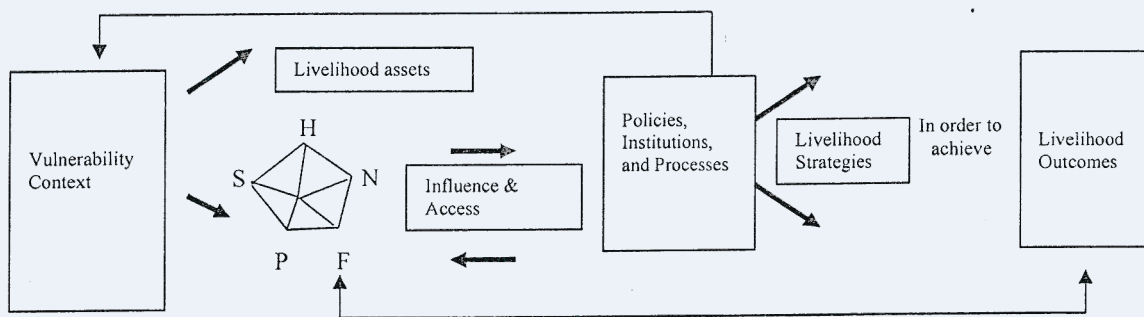
3.2 Sustainable Livelihood Framework (SLF)

The livelihoods framework is a tool to improve our understanding of livelihoods, particularly the livelihoods of the poor. It was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (amongst others). The SLF (Figure 2.3) present the main factors that affect people's livelihoods and typical relationship between these. It can be used in both planning new development activities and assessing the contribution to livelihood sustainability made by existing activities (DFID 2001).

In particular, the framework:

- Provides a checklist of important issues and sketches out the way these link to each other
- Draws attention to core influences and processes and
- Emphasizes the multiple interactions between the various factors, which affects livelihoods

The framework is centered on people. It does not work in a linear manner and does not try to present a model of reality. Its aim is to help stakeholders with different perspectives to engage in structured and coherent debate about the many factors that affect livelihoods, their relative importance and the way in which they interact. This, in turn, should help in the identification of appropriate entry points for support of livelihoods (DFID 2001).



Here, H = Human capital N = Natural capital F = Financial capital
P = Physical capital S = Social capital

Figure 3.1: Sustainable Livelihood Framework (DFID 2001)

The SLF has a number of basic elements. The key question to be asked in any analysis of sustainable livelihood is (scones 1998 cited in Karna 2003):

“ Given a particular *context* (of policy setting, politics, history, agroecology, and socioeconomic conditions), what combination of *livelihood strategies* (agriculture intensification/extensification, livelihood diversification and migration) with what *outcomes*? Of particular interest in this framework are the *institutional process* (embedded in a matrix of formal and informal institutions and organizations) which mediate the ability to carry out such *strategies* and achieve (or not) such *outcomes*.”

The form of framework is not intended to suggest that the starting point for all livelihood (or livelihood analysis) is the *Vulnerability context* which through a serious of permutations yields *Livelihood outcomes*. Livelihoods are shaped by a multitude of different forces and factors that are themselves constantly shifting. People-centered analysis is most likely to begin with simultaneous investigation of people’s assets, their objectives (*the livelihood*

outcomes which they are seeking) and the *Livelihood Strategies* which they adopt to achieve these objectives. There are important feedback relationship between *Transforming structures* and *processes* and the *vulnerability context* and *livelihood assets* and others (DFID 2001).

The framework is intended to be a versatile tool for use in planning and management. It offers a way of thinking about livelihoods that helps order complexity and makes clear the many factors that affect livelihoods.

A more important task than perfecting the framework itself is putting the ideas that it represents into practice. If that calls for adaptation of certain boxes or revision of certain definitions to make the framework more useful, all the better, the framework becomes a living tool.

Use of the framework is intended to make a distinct contribution to improving DFID's ability to eliminate poverty. It is not simply a required step in project/program preparation, nor does it provide a magic solution to the problems of poverty elimination. In order to get the most from the framework:

- The core ideas that underlie it should not be compromised during the process of adaptation. One of these core ideas is that (most) analysis should be conducted in a participatory manner.
- Use of the framework should be underpinned by a serious commitment to poverty elimination. This should extend to developing a meaningful dialogue with partners about how to address the underlying political and economic factors that perpetuate poverty.
- Those using the framework must have the ability to recognize deprivation in the field even when elites and others may want to disguise this and skew benefits towards themselves (this will require skill and rigor in social analysis).

3.3 Livelihood assets

The livelihoods approach is concerned primarily with people. It seeks to gain an accurate and realistic understanding of people's strengths (assets or capital endowments) and how they endeavor to convert these into positive livelihood outcomes. The approach is founded on a belief that people require a range of assets to achieve positive livelihood outcomes; no single category of assets on its own is sufficient to yield all the many and varied livelihood outcomes that people seek. This is particularly true for poor people whose access to any given

category of assets tends to be very limited. As a result, they have to seek ways of nurturing and combining what assets they do have in innovative ways to ensure survival.

The asset pentagon lies at the core of the livelihoods framework, 'within' the vulnerability context. The pentagon was developed to enable information about people's assets to be presented visually, thereby bringing to life important inter-relationships between the various assets. The shape of the pentagon can be used to show schematically the variation in people's access to assets. The idea is that the centre point of the pentagon, where the lines meet, represents zero access to assets while the outer perimeter represents maximum access to assets. On this basis different shaped pentagons can be drawn for different communities or social groups within communities.

3.3.1 Natural Asset/Capital

Natural capital is the term used for the natural resource stocks from which resource flows and services (e.g. nutrient cycling, erosion protection) useful for livelihoods are derived. There is a wide variation in the resources that make up natural capital, from intangible public goods such as the atmosphere and biodiversity to divisible assets used directly for production (trees, land, etc.).

Within the sustainable livelihoods framework, the relationship between natural capital and the *Vulnerability Context* is particularly close. Many of the shocks that devastate the livelihoods of the poor are themselves natural processes that destroy natural capital (e.g. fires that destroy forests, floods and earthquakes that destroy agricultural land) and seasonality is largely due to changes in the value or productivity of natural capital over the year.

Clearly, natural capital is very important to those who derive all or part of their livelihoods from resource-based activities (farming, fishing, gathering in forests, mineral extraction, etc.). However, its importance goes way beyond this. None of us would survive without the help of key environmental services and food produced from natural capital. Health (human capital) will tend to suffer in areas where air quality is poor because of industrial activities or natural disasters (e.g. forest fires). Moreover, although our understanding of linkages between resources remains limited, we know that we depend for our health and well-being upon the continued functioning of complex ecosystems (which are often undervalued until the adverse effects of disturbing them become apparent).

3.3.2 Financial Asset/Capital

Financial capital denotes the financial resources that people use to achieve their livelihood objectives. The definition used here is not economically robust in that it includes flows as well as stocks and it can contribute to consumption as well as production. However, it has been adopted to try to capture an important livelihood building block, namely the availability of cash or equivalent, that enables people to adopt different livelihood strategies.

There are two main sources of financial capital.

- Available stocks: Savings are the preferred type of financial capital because they do not have liabilities attached and usually do not entail reliance on others. They can be held in several forms: cash, bank deposits or liquid assets such as livestock and jewelry. Financial resources can also be obtained through credit-providing institutions.
- Regular inflows of money: Excluding earned income, the most common types of inflows are pensions, or other transfers from the state, and remittances. In order to make a positive contribution to financial capital these inflows must be reliable (while complete reliability can never be guaranteed there is a difference between a one-off payment and a regular transfer based on which people can plan investments).

Financial capital is probably the most versatile of the five categories of assets.

- It can be converted – with varying degrees of ease, depending upon *Transforming Structures and Processes* – into other types of capital.
- It can be used for direct achievement of livelihood outcomes – for example when food is purchased to reduce food insecurity.
- Rightly or wrongly, it can also be transformed into political influence and can free people up for more active participation in organizations that formulate policy and legislation and govern access to resources.

However, it is also the asset that tends to be the least available to the poor. Indeed, it is because the poor lack financial capital that other types of capital are so important to them.

There are, in addition, assets or desirable outcomes that may not be achievable through the medium of money (such as different components of well-being and knowledge of human rights).

3.3.3 Human Asset/Capital

Human capital represents the skills, knowledge, ability to labor and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives. At a household level human capital is a factor of the amount and quality of labor available; this varies according to household size, skill levels, leadership potential, health status, etc.

Human capital appears in the generic framework as a livelihood asset, that is, as a building block or means of achieving livelihood outcomes. Its accumulation can also be an end in itself. Many people regard ill-health or lack of education as core dimensions of poverty and thus overcoming these conditions may be one of their primary livelihood objectives.

As well as being of intrinsic value, human capital (knowledge and labor or the ability to command labor) is required in order to make use of any of the four other types of assets. It is therefore necessary, though not on its own sufficient, for the achievement of positive livelihood outcomes.

3.3.4 Social Asset/Capital

There is much debate about what exactly is meant by the term 'social capital'. In the context of the sustainable livelihoods framework, it is taken to mean the social resources upon which people draw in pursuit of their livelihood objectives. These are developed through:

- networks and connectedness, either vertical (patron/client) or horizontal (between individuals with shared interests) that increase people's trust and ability to work together and expand their access to wider institutions, such as political or civic bodies;
- membership of more formalized groups which often entails adherence to mutually-agreed or commonly accepted rules, norms and sanctions; and
- relationships of trust, reciprocity and exchanges that facilitate co-operation, reduce transaction costs and may provide the basis for informal safety nets amongst the poor.

The above are all inter-related. Of all the five livelihood building blocks, social capital is the most intimately connected to *Transforming Structures and Processes*.

Mutual trust and reciprocity lower the costs of working together. This means that social capital has a direct impact upon other types of capital:

- By improving the efficiency of economic relations, social capital can help increase people's incomes and rates of saving (financial capital). (Isolated studies have shown that communities with 'higher levels' of social capital are wealthier – but questions remain about measuring social capital.)
- Social capital can help to reduce the 'free rider' problems associated with public goods. This means that it can be effective in improving the management of common resources (natural capital) and the maintenance of shared infrastructure (physical capital).
- Social networks facilitate innovation, the development of knowledge and sharing of that knowledge. There is, therefore, a close relationship between social and human capital.

Social capital, like other types of capital, can also be valued as a good in itself. It can make a particularly important contribution to people's sense of well-being (through identity, honor and belonging).

3.3.5 Physical Asset/Capital

Physical capital comprises the basic infrastructure and producer goods needed to support livelihoods.

- Infrastructure consists of changes to the physical environment that help people to meet their basic needs and to be more productive.
- Producer goods are the tools and equipment that people use to function more productively.

The following components of infrastructure are usually essential for sustainable livelihoods:

- affordable transport;
- secure shelter and buildings;
- adequate water supply and sanitation;
- clean, affordable energy; and
- access to information (communications).

Infrastructure is commonly a public good that is used without direct payment. Exceptions include shelter, which is often privately owned, and some other infrastructure that is accessed for a fee related to usage (e.g. toll roads and energy supplies). Producer goods may be owned on an individual or group basis or accessed through rental or 'fee for service' markets, the latter being common with more sophisticated equipment.

Many participatory poverty assessments have found that a lack of particular types of infrastructure is considered a core dimension of poverty. Without adequate access to services such as water and energy, human health deteriorates and long periods are spent in non-productive activities such as the collection of water and fuel wood. The opportunity costs associated with poor infrastructure can preclude education, access to health services and income generation. For example, without transport infrastructure, essential fertilizer cannot be distributed effectively, agricultural yields remain low and it is then difficult and expensive to transport limited produce to the market. The increased cost (in terms of all types of capital) of production and transport means that producers operate at a comparative disadvantage in the market.

Insufficient or inappropriate producer goods also constrain people's productive capacity and therefore the human capital at their disposal. More time and effort are spent on meeting basic needs, production and gaining access to the market.

Contribution to these assets from NTFPs were judged in terms of index value and summed up qualitatively to find out total contribution to livelihood.

Chapter 4: Material and Method

4.1 Research design

In order to conduct the study and fulfill the objectives as outlined above, a systematic and integrated methodology was followed. Major elements of the methodology includes the use of primary and secondary information, field observation, key informant interviews, focus group discussion, preparation and identification of herbarium and enumeration, face to face questionnaire and checklist, finding out economic important NTFPs and their contribution to local livelihood in terms of livelihood assets.

4.2 Data collection and analysis

This study was carried out to assess the indigenous management of NTFPs and their contribution to local livelihood. Study was included both primary data collected by extensive field survey, public consultation and direct observation as well as from the analysis of secondary data available from different literatures, and sources.

4.3 Finding out economic important NTFPs

The method adopted by Karna (2003) for finding out the economic important NTFPs was used in this research. In this method, local collectors, local traders, middle man etc. (10 % respondents) were asked to rank five most preferred NTFPs on the basis of locally developed criteria in a participatory way. Different respondents prefer different species as their highest – preferred – species; and same species get different rank – values by different respondents. In this way, a list of NTFPs was obtained, that was analyzed to find out the most preferred five species, which get in overall the highest ranks. For this, the combined rule dealt by Kapali (1993) was used which includes the Friedman two-way analysis of variance test for validation of the ordered lists by the combined rule. It includes the following:

- a) All species are arranged in descending order of rank sums and then new ranks are allocated such that a species with the highest rank sum gets the rank value one, and so on. This is the rank sum rule.
- b) Two or more species may have equal rank sums but different response frequencies. In such case, a species with a higher response frequency is given the lower new rank value. This rule thus gives more preference to the more popular species. This is the rule of response frequencies.
- c) Two or more species may have equal rank sums and equal response frequencies but different combinations of original rank values. In such a case, a species with the higher

sum of squares of the original rank value is given the lower new rank value. This rule insures that a species with more replications of higher rank values is given preference. This is the inverse least square rule.

- d) Two or more species may have equal rank sums, equal response frequencies, and same combinations of original rank values. In such case, new ranks of equal weight are allocated to each of the species. We may allocate tied average rank values as well. This is the rule of identical ties.

The new ranking of the species is valid only if the difference of rank sums are statistically significant, which is determined by the Friedman two-way analysis of variance test, defined as:

$$\chi^2 = \{n(t-1) SS_{spp}\} / \{SS_{w.people}\},$$

which approximately follows chi-square distribution with $t-1$ degree of freedom (d.f.). Here SS_{spp} = sum of squares between species, n = total number of respondents, and $SS_{w.people}$ = sum of squares within species.

Local collectors, middleman, healers etc. (10%) respondent was asked to rank most preferred NTFPs on the basis of locally developed criteria in a participatory way.

4.4 Wealth ranking

Wealth ranking was done to find out the relative economic position of each household of the VDC. For this, card method (Adams et.al. 1997) was used, involving local people to rank each and every household in three ranks, namely, poor, medium and rich. The name of each household head was written on a card and ranked by three respondents independently, which were averaged to get the final rank of particular household. The criteria given for the ranking were: land holding size, size of cardamom production land, house quality, number and quality of livestock, presence/absence of *Goth*, income sources, educational background etc.

The wealth ranking was used for the socio-economic stratification, which formed the basis for selecting the respondents (20%) of all the wealth ranks to find out the contribution to livelihood.

4.5 Face to face questionnaire and Checklist

Questionnaire was useful to increase the response rate since most of the respondents were illiterate, which was also used by Gentle (2000). 20% respondent was selected for this

purpose. The questionnaire survey was done after the rapport building was done very well i.e. after the observation and group meetings. The model of the questionnaire is given in appendix-4

A checklist was prepared to collect additional data regarding the Village Development Committee, Users group, sister groups etc.

4.6 Informal discussion

Information on the use and trade of NTFPs and possibilities of trade links were obtained through informal discussion with intermediary, forest official, local healers etc.

4.7 Contribution to livelihood

Contribution made to local livelihood by the economic important NTFPs was found out by Participatory Resource Assessment (PRA) methods and face-to-face questionnaire, in terms of the five capitals of livelihood (Karna 2003) that is (i.e.): Natural capital, human capital, social capital, physical capital and financial capital as described below.

a. **Natural Capital:** Resource of the selected NTFPs is itself an asset and was assessed by PRA. In this, answers to the followings questions were found out:

- i) Is the resource of NTFPs accessible to all the wealth ranks equally?
- ii) What is the resource condition of the NTFPs (Increasing or decreasing)?

b. **Financial Capital:** Contribution to annual income of the households (HHs) was found out in terms of:

- i) Money income (average annual income per household)
- ii) Indirect money value to the local people

c. **Human Capital:** Contribution to human capital was measured in terms of:

- i) Awareness about policies, regulations etc.
- ii) Feeling about lack of information
- iii) Human health improvement
- iv) Human skill and knowledge improvement
- v) Education sector improvement

d. **Social Capital:** Contribution to social capital was measured in terms of:

- i) Membership of organization due to the NTFPs

- ii) Networking between and among the organization due to the NTFPs
- iii) Group cohesion
- iv) Equity in the collection and carriage of NTFPs
- v) Publicity due to the NTFPs

e. **Physical Capital:** Contribution to the physical capital was measured in terms of:

- i) Road building
- ii) Electricity
- iii) Water supply
- iv) Telephone and other services
- v) Contribution to other physical facilities such as to the production equipment and means that enable to pursue their livelihood

4.8 Summing up the contribution to livelihood

At last, all the contribution to the capital was summed up qualitatively and the total relative contribution of each of the economic important NTFPs was judged. For this, the value of 0.75, 0.50 and 0.25 were given to high, medium and low contribution to the particular livelihood indicator. Same value was given to all other species for the same indicator if they contribute almost equally to the indicator. The total marks for each capital was divided by the number of indicators of that capital to get the average value (regarded as an index) for that capital. The average values thus obtained are summed up and finally divided by five (total numbers of assets) to obtain the final index value. Thus, the contribution of one NTFPs was found out in relation to other four NTFPs. Here, the index value i.e., the average value of one species changes as the numbers of indicators of one capital is increased, but still the relative contribution of the five species almost remain the same. Moreover, the indicators of the livelihood assets, used here for the analysis, are more or less exhaustive, which follows the indicators developed by DFID (2001)

The contribution of the five NTFPs to indicator of livelihood assets was analyzed by the Index of Relative Ranking (IRR), wherever applicable, to analyze the hypotheses regarding the perceptions.

4.9 Index of Relative Ranking (IRR)

Scales (from one to five, i.e., strongly agree to strongly disagree) were developed to find out the perception of respondents regarding the hypotheses. From the scales, the IRR was calculated. The scales and indexes are used for the quantitative interpretation of qualitative

data, particularly ranking and scaling. They can be used to measure or assess attitudes and other forms of qualitative reactions. Their use in the social sciences is common and they “are significant because they provide quantitative measures that are amenable to greater precision, statistical manipulation and explicit interpretation” (Miller 1983 cited in Tiwari 1998).

An index of relative ranking was calculated to analyze the perceptions regarding the following matters:

- Access over the resources of NTFPs
- Resource condition of the NTFPs (increasing or decreasing),
- Greatness of indirect money value from the NTFPs,
- Awareness about the policies, legislation and regulations concerning the NTFPs,
- Feeling of people about lack of information about the NTFPs,
- Improvement in human health from the use of NTFPs,
- Increase in skills and knowledge from participation in trainings and workshops etc.,
- Contribution to education sector of local people from the NTFPs
- Equity in participation in collection, carriage etc. of NTFPs,
- Publicity due to the NTFPs,
- Contribution of NTFPs to infrastructure development and
- Contribution of NTFPs to formation of producer goods.

The Index of Relative Ranking (IRR) is calculated as follows:

$$IRR = (R_1 S_1 + R_2 S_2 + \dots + R_n S_n) / nr,$$

Where, R_1 = Index of the first order

S_1 = Score of the highest order

R_n = Rank of the last order

S_n = Score of the last order, i.e. 1

n = Number of observations

r = Total ranks given to the particular attribute.

The scales of perceptions was given value from 1 to 5 indicating strongly agree to strongly disagree. Then, the value of 0.1 was given to perception 1 (i.e. strongly agree) and 1.0 to perception 5 (strongly disagree). Then, the difference between strongly disagree and strongly agree (i.e. $1.0 - 0.1 = 0.90$) was divided by four to find out the equal intervals to calculate coefficient for other perception scales. In this way, 0.90 was divided by 4 and obtain the equal interval of 0.225. Then index value $0.1 + 0.225 = 0.325$ was obtained for perception scale 2 and similarly 0.55 and 0.775 were the value for perception scale 3 and 4. Thus, the coefficient

of each of the perception scale was found out. Each coefficient of each perception scale was multiplied by the respective frequency and divided by the total of the frequency to obtain the index value (IRR).

4.10 Ethnobotanical Methods

Participatory Rural Appraisal (PRA) tools (interviews, focus group discussion, key-informant consultation, etc.) were carried out to explore the indigenous knowledge of the rural people.

4.11 Preparation of herbarium and identification

Herbarium of the collected sample was made and identified with the help of standard literatures (Hooker 1872-1897, Hara et. al. 1978, 1979, 1980 and 1982; Malla et. al. 1986, Polunin and Stainton 1997 etc.) and comparing with specimens at National Herbarium and Plant Laboratories, Godawari, Kathmandu. The nomenclature of the plant species follows Press et al. 2000).

4.12 Enumeration

The plants were enumerated on alphabetical order according to Botanical name. The vernacular name, uses, parts used, methods of preparation and administration whenever possible was noted.

4.13 Secondary data

Secondary data was acquired and maintained from variety of sources. Relevant information on the population structure, ethnic composition, socio-economic condition, land use pattern, volume of NTFPs collected annually from the KCA and other necessary data was collected from District forest office (DFO) of Taplejung, Department of national parks and wildlife conservation (DNPWC), Department of Forest (DOF), Worldwide Fund for Nature (WWF) KCA office, KCA management Council, etc.

4.14 Study Area

4.14.1 Kangchenjunga Conservation Area (KCA)

KCA has four village development committees (VDCs), namely Lelep, Tapethok, Wolangchung-Gola and Yamphudin of Taplejung districts and covers about 56% of the most northern part of the district. Kangchenjunga is a part of Sacred Himalayan Landscape (SHL), and world's third highest peak (8586m). After its name, Nepal's Government declared Kangchenjunga conservation area as 'gift to the earth' in 1997 considering its rich biodiversity, cultural heritage and pristine Himalayan landscape (GoN/WWF Nepal 2006). It is located between the latitudes 27°30'-28°00' N and the longitudes 87°45'-88°15' E, sharing an international border with Sikkim of India in the east and the Tibet Autonomous Region (TAR) of China in the north. The first gazette area of 1650 km² was expanded to 2,035 km² in 1998 in order to facilitate the community based management of natural resources (WWF-NP 1999, WWF-NP 2005).

The landscape is dominated by high mountain peaks (with 10 additional peaks over 7000m high) and one of the longest non polar glaciers on earth (Gurung and Gurung 2002). The altitude of KCA varies from less than 1200m to 8500m above sea level.

Topographically, the KCA is characterized by five main river valleys with steep sided slopes i.e. the Ghunsa, Simbua, Tamur, Yangma and Kabeli. The area consists of rocks, ice /rivers, different forest types, shrubs, alpine meadows and agricultural land.

Climate of KCA ranges from sub-tropical to alpine due to an extreme altitudinal gradient of over seven thousand meters within a short distance of less than 100 km. According to Dhakal (1996) about 80% of the rainfall (above 2,625mm annual average) in the Kangchenjunga conservation area occurs during the monsoon while the rest is fairly and evenly distributed throughout the year.

KCA belongs to the Kangchenjunga mountain ecosystem and 'biodiversity hotspot' (WWF-NP/ICIMOD, 2001), that harbors species of 844 plants, 253 birds, 83 insects and 22 mammals (KCA-MC 2005). The conservation area covers diverse vegetation type including Sal-Schima mixed forest at 1,200m altitude, through mixed broadleaved forest between 1200-2800m, coniferous forest between 2,800-3,500m and Larix-Juniperous forest between 3000-3700m. Oli and Nepal (2003) reported at least 139 species of NTFPs in the area out of them 16 are actively traded.

The fauna which occur in KCA include, Common Leopard (*Panthera pardus*), Grey Wolf (*Canis lupus*), Assamese Monkey (*Macaca mulata*), Common Longur (*Presbytis entellus*) and a number of endangered species such as Snow Leopard (*Panthera uncia*) red panda (*Ailurus fulgens*), Musk Deer (*Moschus moschiferus*), Blue Sheep (*Pseudois nayaur*), etc. (Chaudhary 1998).

4.14.2 Yamphudin

Study was carried out in Yamphudin, which lies in the eastern part of the KCA and occupies an area of 311.46 sq.km. (HMGN 1996). It is bordered by *Timbung Pokhari* and *Deurali* from east and west respectively and Mt. Kangchenjunga and *Khewang VDC* of Taplejung from North and South. The area can be reached by two-day walk from *Phungling Bazaar*, the districts headquarters or from Tharpu of Pachthar district up to which public bus are found rarely. This makes this area very inaccessible.

The altitude of the area varies from 1700 m to height of Kangchenjunga with in short distance which makes this area rich in biodiversity. Large number of flora and fauna including endangered species get their place for harbor. High rainfall and humidity generally characterize the climate (Shrestha and Ghimire 1996). Kabeli watershed area especially covers the Yamphudin VDC. Kabeli is fed with *Tumiya Khola*, *Ghatte Khola*, *Barule Khola*, *Rate Khola* and numerous waterfalls such as *Pahelae*, *Simmia*, *Khage*, *Maghe*.

It has population of 804 among them 416 are male and 388 female. The main ethnic groups of the VDC include Rai, Sherpa, Gurung, Bhote, Limbu (CBS 2002). Sherpa and Bhote are mainly found in higher belt whereas Rai, Gurung and Limbu in the lower belt. However, one of the ethnic groups among these dominates each ward of the VDC. Only one family of Chheri has permanently resided in the area, other high hill cast like Brahmin and Chhetris are not permanent resident. They are occupational and work as civil servants, police officer and teachers. Nevertheless, most of them reside almost year round. For example, many schoolteachers have lived in the area for over 10 years.

Education status of the area is very poor. Almost all-old generation are illiterate. There is one secondary school and two primary schools namely Kangchenjunga Secondary School (263 student), Krishna Primary School (>40) and Yamphudin Primary School (>40). For the remote student there is one *Ghumti* (temporary) school up to grade 3. There is not any college in the area. They go to nearest college in *Khewang VDC* or *Phungling Bazaar*, district headquarter. Some of the rich families send their children to accessible town.

mix of Buddhism, Hinduism and animistic beliefs is prevalent. All the beliefs system in the area strongly reflects the surrounding environment because the local inhabitants worship specific forests, trees, rivers, waterfalls, lakes and mountains as some form of abode of the deities and respect wildlife (Gurung 2006). Major festivals in the area are *Lhosar*, *Dasain* and *Tihar*.

Many traditional institutions are still prevalent in the area such as Kiduk, Kipat, Gompas, Dhuntshangs etc. Community based local institutions of area comprises Yamphudin sector office of KCA-MC, two conservation area users committees (*Pathivara* and *Kangchenjunga*), ten user group, one snow leopard conservation sub- committee, four proposed conservation area community forestry users group, seven women group and agriculture cooperative organization.

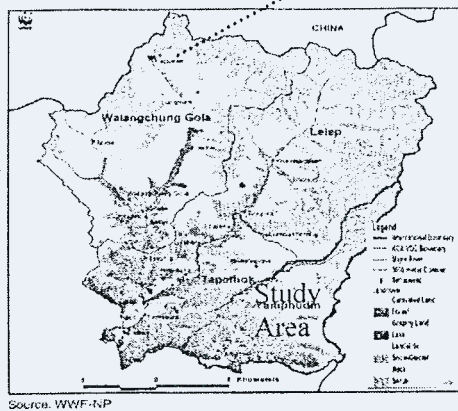
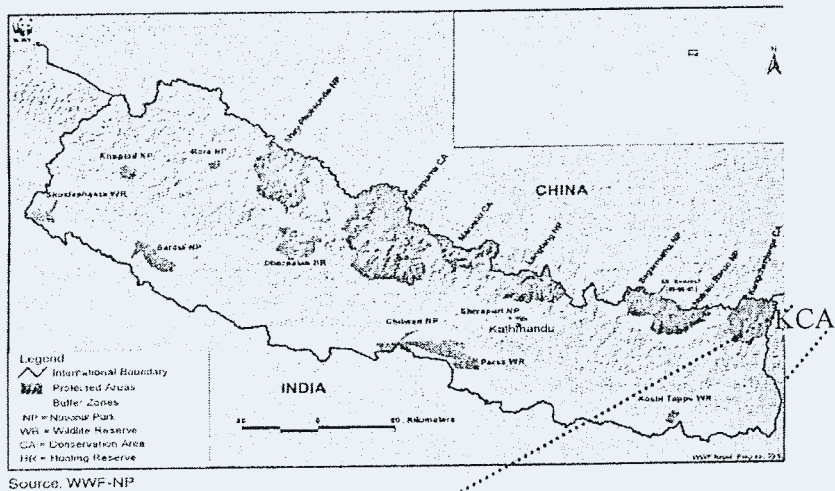


Figure 5.1 Map of Study Area

4.14.3 Livelihood Strategies

Main Livelihood strategies of Yamphudin comprise agriculture, agroforestry, forest product use and animal husbandry. Although mostly people practice subsistence agriculture, off-farm activities play a significant role in local livelihood (Loksam 2003). Agriculture is the primary occupation and two crops a year can be planted. These villagers produce a wide variety of primary crops depending upon the whether they have access to irrigated '*Khet*' land or dry '*Bari*' land (Brown, 1994). Many households (HHs) of lower part of Yamphudin own '*Khet*' fields. On the other hand, HHs of upper areas of the Yamphudin rely entirely on rain-fed '*Bari*' land for their subsistence. The primary crops grown on '*Khet*' are rice and millet in the summer and corn in the spring or autumn. '*Bari*' land is most commonly planted with corn, but dry millet, beans, wheat and potatoes are also grown. Nowhere in the study area is a community entirely food self-sufficient throughout the year. As a result, almost all residents must purchase or barter for a significant portion of their nutritional needs.

Residents of lower altitude communities also practice limited shifting (or *Khorea*) cultivation. The ancestors of both the Rai and Limbu historically relied entirely on shifting cultivation but over the centuries their agriculture intensified and most *khorea* lands were turned into permanent '*Bari*' or '*Khet*'.

The primary agro forestry activity in the area is the inter-cropping of Uttis (Himalayan Alder) and Alainchi (Cardamom). Cardamom cultivation has had several very positive benefits in the area (Brown 1994). First, it has given a boost to many farmers households income. Secondly, alder trees are not only fast growing, but they provide much needed fodder, fuel wood and timber for the local population. Third, it provides significant employment opportunities, since it takes about 10 labors to produce and process 20 kg of cardamom.

The primary forest resources used in the study area are fuel woods, construction timber, fodder and edible and medicinal plant. Fuel wood is the most obvious and labor-intensive forest resource gathered in the area. Timber is also used extensively in construction. Since large sturdy houses are built almost entirely of wood. Since monsoonal floods wash-out many locally constructed bridges on yearly basis, logging is also essential for bridge construction and maintenance. Fodder supply is a critical component of agricultural production. Fodder trees species are either planted or actively selected for within the forest.

Several other important products were harvested from forest and scrub land. At least 77 NTFPs have found in the area among them 32 are important for livelihood. Edible plants are often gathered to either supplement or spice-up the diet of local people. Some of the more

economically marginal families gather greens, fruits, rhizomes and bulbs to help starve off hunger during the lean season before harvest. The omnipresent Malingo bamboo (*Arundinaria maling*) is used extensively in construction and basket making. Argeli (*Edgeworthia gardneri*) bark is one of the sources of cash income by selling it in the nearby processing factory to making hand made paper and used in household to make rope, sacs, *patiya/chakati*. Allo (*Girardinia diversifolia*) is also used for weaving cloth and a number of other household uses. Chiraito is harvested early in the month of *Mangsir* (Mid-Nov through Mid-Dec), dried. Chiraito (*Swertia chirayita*), a remedy for fevers and colds is a significant source of local income.

Chapter 5: Result

5.1 List of NTFPs

About 77 NTFPs were recorded in the study area (Appendix 3). Certainly, not all are equally important for livelihood of Yamphudin. Some are economically important, some ethno botanically, some are important for household use where as some have high potential to contribute livelihood. Lists of some NTFPs which are important for livelihood of the area (table 5.1).

Table 5.1: List of Major NTFPs found in the Study Area

S.N.	Local name	Scientific Name
1	Alainchi	<i>Ammomum subulatum</i>
2	Argeli	<i>Edgeworthia gardneri</i>
3	Bikh	<i>Aconitum spicatum</i>
4	Bikhma	<i>Aconitum bisma</i>
5	Chimfing	<i>Heracleum nepalense</i>
6	Chiraito	<i>Swertia chirayita</i>
7	Dhupi	<i>Juniperus indica</i>
8	Hadchur	<i>Viscum articulatum</i>
9	Jaringo	<i>Phytolacca acinosa</i>
10	Jatamansi	<i>Nardostachys grandiflora</i>
11	Khokim	<i>Rheum australe</i>
12	Kutki	<i>Neopicrorhiza scrophulaiflora</i>
13	Laghupatra	<i>Podophyllum hexandrum</i>
14	Lokta	<i>Daphne sp.</i>
15	Maikopila	<i>Saussurea tridactyla</i>
16	Majitho	<i>Rubia manjith</i>
17	Malingo	<i>Arundinaria maling</i>
18	Nigalo	<i>Arundinaria sp.</i>
19	Pakhanved	<i>Bergeria ciliate</i>
20	Pinase Lahara	<i>Unidentified</i>
21	Okhar	<i>Juglans regia</i>
22	Panchaule	<i>Dactylorhiza hatagirea</i>
23	Siltimur	<i>Lindera neesia</i>
24	Sunpati	<i>Rhododendron anthopogon</i>
25	Thotne	<i>Aconogonum molle</i>
26	Allo	<i>Girardinia diversifolia</i>
27	Gunyelo	<i>Elaeagnus parvifolia</i>
28	Titepati	<i>Artemisia indica</i>

29	Dhasingre	<i>Gaultheria fragrantissima</i>
30	Budo Okhati	<i>Astilbe rivularis</i>
31	Boketimur	<i>Zanthoxylum armatum</i>
32	Chutro/Jamanimandro/Daruhaldi	<i>Mahonia nepaulensis</i>
33	Lauth Salla	<i>Taxus baccata</i>
34	Nagbeli	<i>Lycopodium clavatum</i>

5.2. Preference Ranking of NTFPs

Five most preferred species as perceived by the 10 % respondents are tabulated in their choice order as first, second, third, fourth and fifth choice (table 6.2). This is the fundamental table, analyzed to find out in overall the five most preferred NTFPs.

Table 5.2: Preference ranking of NTFPs

Respondent No.	Choice order				
	First	Second	Third	Fourth	Fifth
1	Alainchi	Argeli	Chiraito	Malingo	Kutki
2	Alainchi	Chiraito	Lokta	Argeli	Malingo
3	Chiraito	Kutki	Argeli	Timmur	Lokta
4	Alainchi	Chiraito	Argeli	Lokta	Timmur
5	Alainchi	Argeli	Kutki	Malingo	Timmur
6	Argeli	Lokta	Alainchi	Malingo	Chiraito
7	Alainchi	Chiraito	Allo	Malingo	Bikhma
8	Chiraito	Alainchi	Kutki	Argeli	Lokta
9	Alainchi	Kutki	Argeli	Allo	Lokta
10	Chiraito	Argeli	Alainchi	Kutki	Bikhma
11	Kutki	Chiraito	Lauth Salla	Argeli	Malingo
12	Alainchi	Chiraito	Argeli	Kutki	Timmur
13	Alainchi	Argeli	Kutki	Chiraito	Malingo
14	Argeli	Alainchi	Chiraito	Timmur	Kutki
15	Alainchi	Chiraito	Timmur	Malingo	Argeli
16	Chiraito	Alainchi	Kutki	Timmur	Malingo

The value of 5, 4, 3, 2 and 1 given to choice orders first, second, third, fourth and fifth respectively (Appendix-1) and thus the following table derived from the above table. This

gives (table 5.3) the final ranking of the most preferred NTFPs (table 5.4) following the rules of response frequency, ranks sums, sums of squares, etc.

Table 5.3: Ranking of Most Preferred NTFPs

	Species									
	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
Response frequency (R _j)	14	14	14	11	9	6	7	2	1	2
Sum of Ranks (T _j)	63	53	45	31	14	12	12	5	3	2
T _j ²	3969	2809	2025	961	196	144	144	25	9	4
Sum of square of ranks	291	219	163	103	24	32	24	13	9	2
Mean of ranks	3.94	3.31	2.81	1.94	0.87	0.75	0.75	0.31	0.19	0.12

S₁ = Alainchi, S₂ = Chiraito, S₃ = Argeli, S₄ = Kutki, S₅ = Malingo, S₆ = Lokta, S₇ = Timmur, S₈ = Allo, S₉= Lauthsalla, S₁₀ = Bikhma

Table 5.4: Final ranking of the most preferred NTFPs

Species										
	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
R _j	14	14	14	11	9	7	6	2	1	2
T _j	63	53	45	31	14	12	12	5	3	2
New ranks	1	2	3	4	5	6	7	8	9	10

The Friedman two-way Analysis of Variance test:

H₀: All the NTFPs are equally preferred

H₁: There is preference ranking prevalent in the use of NTFPs

Alpha = 0.05

Table 5.5: ANOVA table

Source of variation	Sums of squares	d.f.	Chi-square
Between species	282.875	9	$\{n(t-1)SS_{sp}\}/S_{sw.people} = 144 \times 282.875/520 = 78.335$
Within subjects (species)	520	144	
Residual	237.125	135	

Calculated chi-square = 78.335

The tabulated value of chi-square at alpha 0.05 and d. f. 9 equals to 16.919.

Therefore, the calculated value exceed the tabulated value, and therefore, the null hypothesis is rejected, i.e. all the NTFPs are not equally preferred. Therefore, the new ranking of table 5.4 is valid. Thus, the most preferred five NTFPs are **Alainchi, Chiraito, Argeli, Kutki, and Malingo** as S_1, S_2, S_3, S_4 and S_5 respectively.

5.3 Wellbeing Ranking

Table 5.6: Percentage of people from different wealth ranks

Percentage of		
Rich	Medium	Poor
24.24	54.54	21.21

The wellbeing ranking stratified the people of the study area and thus formed the basis for the selection of the respondents for the study. Out of total (33) respondents, eight were from Rich, eighteen were from Medium and seven were from Poor (table 6.6).

5.4 Contribution to Natural Capital

5.4.1 Access over the resources of NTFPs

Hypothesis: Access over the resources of NTFPs does not differ as per the economic status of people.

Table 5.7 Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P	1	2	2	2		0.486
M	4	8	3	3		0.387
R	4	2	2			0.269

Here in the perception scale 1 denotes the strongly agree, 2 denotes agree, 3 denotes intermediate, 4 denotes disagree and 5 denotes strongly disagree. This scaling system is followed whenever the index is used.

All the indexes of poor, medium and rich fall between strongly agree to intermediate (table 5.7). However, some of the respondents show their view negative from the poor and medium group.

5.4.2 Resource Condition of the NTFPs

Hypothesis: The resource conditions of the five NTFPs are increasing over time despite the prevalent harvesting practices.

Table 5.8: Frequency of perception and indexes for the five NTFPs

NTFPs	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
Alainchi	2	6	5	10	10	0.686
Chiraito	4	5	7	8	6	0.639
Argeli	10	14	8	1		0.325
Kutki	8	15	5	5		0.373
Malingo	15	12	6			0.266

Here the respondents show varying degree of response according to species. For the species *Alainchi* and *Chiraito*, the indexes show that resource condition is decreasing. However, these are the main two species, which contribute up to 90 percent of the household economy (Oli and Nepal 2003). For the *Alainchi*, it is may be due to diseases like *Chirke Furke* (dotted spot on leaves) and *Gano kuhine* (decaying of tuber). People say that production of *Alainchi* is decreasing over the time. Other reasons may be fluctuating price. If there is high demand of *Alainchi* from India and foreign countries, price increases. Almost 4 years ago, its price was 18000 Nrs/Mon (one Mon = 40 kg) but now its price is only 8500 in their nearby market (*Tharpu*). One of the report said that due to decrease in price, farmer bear at least 20-25 corer loss from the whole Taplejung district, which is one of the largest producer of *Alainchi*.

People were attracted to cultivate this NTFP for the cash income but now they have no option too.

Chiraito was ranked the second source of cash income for the rural people of Yamphudin having market value around 200-300 Nrs/Kg in India and Tibet market. This has promoted unsustainable resource competition among local people to collect higher bulk of *Chiraito* which has resulted severe decline of *Chiraito* in wild. Other reason may be that it needs open and sunny areas but there is lack of such areas due to establishment of Kangchenjunga Conservation Area Project (KCAP). Forest coverage is almost increased to 2% (KCA-MC 2005). The most important reason is that due to discourage in *Bhasme Fadani* (Slash and Burn) to conserve biodiversity by KCAP where people used to cultivate maize with *Chiraito*. There is still *Bhasme Fadani* practiced in the ward no 9, 5, 4 and 1. Among them around 400-500 ropani of *Chiraito* is cultivated in *Barule* of ward no. 9.

Argeli has the index value equal to perception – “agree” (2 in the perception scale), and thus the hypothesis that the resource of *Argeli* is increasing, is accepted. Bark of *Argeli* is the source of income for villagers and they only cut its mature branch and take out bark in rainy season. Bark can be harvested annually. Plantation of sapling was also observed in the many marginal land in both private and KCA forest.

Index value of *Kutki* is near to the perception scale 2. Thus, it can be said that resource condition is increasing. It may be due to ban on collection, use, distribution, transportation and export by government. But still it is found to be used in almost all household and exported to Sikkim, Tibet and cities of Nepal like Kathmandu and Dharan illegally (Oli and Nepal 2003). Herders, some of locals and peoples from Sikkim, collect it.

The index value of *Malingo* is near to perception scale 1 and 2. Thus the hypothesis is strongly agreed. *Malingo* has no trade value. It is only used for domestic purpose such as baskets, mats, thatching material etc. and young shoots are used for vegetable. *Malingo* and *Nigalo* forest is the prime habitat for the one of the threatened faunal species Red Panda (*Ailurus fulgens*). Therefore, its regeneration is encouraged by KCA - MC.

5.5 Contribution to Financial Capital

5.5.1 Average annual income per household (HH)

Table 5.9: Average income and percentage contribution from different sectors per HH per year (Nrs/year) in thousands

Wealth ranks	Income (Nrs) from in 000						Total (Nrs)	Mean of Total (Nrs)
	Agriculture	Livestock	NTFPs/MAPs	Remittance	Goth	Others		
Poor	-	5-8 (10.83%)	45-50 (79.16%)	-	-	5-7 (10%)	55-65	60
Medium	2-5 (2.11%)	7-10 (5.13%)	65-70 (40.78)	30-40 (21.15)	40-50 (27.19)	5-7 (3.62%)	149-182	165.5
Rich	5-7 (2.78%)	7-10 (3.93%)	70-80 (34.72%)	50-60 (25.46)	50-75 (28.93)	8-10 (4.17)	190-242	216
Total								

Table 5.9 shows the average annual income of the inhabitants of Yamphudin VDC in different wealth ranks based on income source. Average annual income per household of poor comes to ranging from Nrs 55-65 thousands, out of which 79 % is contributed by NTFPs/MAPs, that of medium comes to ranging from Nrs 149 to 182 thousands, out of which 41% is contributed by NTFPs/MAPs, similarly that of rich households income range from Nrs 190 to 242 thousands, out of which 35 % is contributed by NTFPs/MAPs. In the overall economy, including rich, middle-class and poor, the contribution from NTFPs/MAPs to average annual income per HH accounts for 51.553 %, which is solely in monetary term.

Contributions from NTFPs have been counted both from forest and from cultivated land. *Alainchi* is mainly cultivated in private land, which shares highest in the income among NTFPs. Almost all HHs have cultivated *Alainchi* in the shed of their nearby *Uttis* forest. *Alainchi* gives higher yield in the shaded and moist areas. However, from the last year its production is decreasing by almost 50 % due to diseases like *Chirke Furke* and *Gano kuhine*. At the same time, its market price has also decrease from its normal price Nrs 10,000 to 8,500 per *Mon* in nearby market. Due to these reasons, people lost almost 70 % of their income. However, in resent time, due to removal of *Thawa Pratha* (from each *Mon*, local trader demand additional 1 kg to balance their loss in drying of *Alaichi* in time), farmers are getting some advantage.

Chiraito is mainly cultivated in *Khorea* (Slash and Burn) land with maize and collection from forest. Last year its price was nearly Nrs 150 when 50-60 *Mon* were collected/harvested. Its production is also decreasing. Eight years ago, its production was up to 200 *mon* from the Yamphudin. Low production is due to unsustainable resource exploitation. *Kutki* is found in abundant quantity in the higher altitude and is collected mainly by herder's as part time, sell to intermediary and is a good source of cash income. It is sold in Nrs 8000 to 8500 per *Mon* in village to intermediary. Other major NTFPs such as *Manjitho*, *Lokta*, *Bikhma*, *leaf of Dhupi*, *Maikopila*, *Jantamansi*, *Panchaule* etc contribute greatly to the financial capital.

Argeli is becoming one of the major income sources of the poor. Its bark is harvested from forestland or own land. Harvesters get Nrs 20 for forest and 25 for own land per k.g. in nearby hand made paper factory. After drying and cutting outer skin of bark, 5 kg of raw material for paper production can be made from one full sac (1 sac = around 30 kg). At least two sacs can be harvested from the forest in a day depending upon the distance of forest.

Poor have limited options for income other than NTFPs. Therefore, they are very prone to unsustainable harvesting practice of NTFPs. Many medium class and most of the rich households act as intermediary. They collect and sell to road head trader in *Tharpu* and *Phungling Bazaar*.

5.5.2 Indirect Money Value of the NTFPs/MAPs

Hypothesis: NTFPs/MAPs have a great indirect money value as it treats most of the maladies and diseases.

Table 5.10 Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P	2	3	2			0.325
M	3	8	5	2		0.4
R	1	3	2	2		0.466

Due to the facility in the modern medical treatment in the area, people have shifted from traditional treatment to modern treatment. However, on all household kitchen gardens, they have planted medicinal plants such as *Chiraito*, *Phakhanbed*. Due to regular use of these, they may have good health for long time. The degree of dependency for the treatment from MAPs varies from socioeconomic classes of people i.e., from poor to rich. The poor and middle class people are much more dependent on the treatment from the medicinal plants. Index value (0.466) for the rich shows that they just agree with the hypothesis.

5.6 Contribution to Human Capital

5.6.1 Awareness about policies, regulations

Hypothesis: The people are quite aware of their policies, legislations and regulations concerning the NTFPs.

Table 5.11 Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P	2	2	1	1	1	0.454
M	5	6	4	2	1	0.4
R	2	3	2	1		0.381

Indexes shows that people are to some extent aware of policies and regulations of NTFPs but the value is different for different wealth ranks. Index value is higher in case of poor and lesser in case of medium and rich. It is due to higher access to information in medium and rich.

Regular meetings, workshops and awareness programs are organized by KCA-MC. There are several experts involved in research and consultation from different organization such as WWF, Mountain Sprit, Darwin institute etc for NTFPs development activities. Their numerous interactions with local have been helpful to aware NTFPs policies, legislation and regulations.

5.6.2 Feeling about lack of information

Hypothesis: People feel that they are lacking in the information (about processing, final product, final market prices etc.) about the NTFPs.

Table 5.12: Indexes for the NTFPs as per wealth ranks

Wealth ranks	Index for				
	Alainchi	Chiraito	Argeli	Kutki	Malingo
P	0.261	0.196	0.55	0.164	0.711
M	0.325	0.312	0.60	0.187	0.70
R	0.662	0.381	0.66	0.325	0.691

In case of *Alainchi* the hypothesis is accepted for poor and medium wealth ranks as the index value is between perception scale 1 and 2 but index value is near scale 4 – disagree for the wealth ranks rich. Poor and almost medium ranks were involved in cultivation, harvesting, and sale to intermediary or to trader coming from *Tharpu*. There is barter system in *Alainchi*. During off-season people brings necessary goods for subsistence from *Tharpu* and during on season trader coming from there takes *Alainchi* equal to the price of their goods. In this way

trader got double profit system. Some of medium and almost rich are actively involved for the trading of *Alainchi* as intermediary. They do have good knowledge on final market price of *Alainchi* as they visit different market place for their products sale. Still they lack knowledge about processing and products. It is mainly exported to India and finally to European Market by Indian Trader (Oli and Nepal 2003).

In the case of *Chiraito*, as the index value is between scale 1 and 3, the hypothesis is accepted as they have lack of information. However, some of the rich ranks are involved in trading of *Chiraito* to District headquarters, Tibet, and Sikkim. Manbir Rai is one of them of ward no.6 who is teacher and secretary of KCA-MC Yamphudin sector. He collected 50-60 *Mon* among them 20-22 *Mon* from the local and remaining from the cultivation of himself past year. He sold it 5500Nrs/*Mon*.

The indexes for the *Argeli* are indifference to disagree i.e. between perception scale.3 and 4. There is processing plant in Yamphudin and hence they got knowledge of processing. Only one person is involved in its final product marketing. Local harvest the bark of *Argeli* and bring to processing plant from where paper is produced.

The indexes for the *Kutki* are between scale 1 and 2 – hypothesis is accepted. However, some of the wealth rank rich are involved in its marketing. Due to abundant resource condition, herders and some local people collect it and sale to intermediary. They bring to *Tarai* market and sale to 7000-8000 Nrs/*Mon*.

Malingo has no trade value. Therefore, it does not need to know its final market price but it is important in household purpose. People use it to make baskets, mats, thatching materials roof etc and young shoots are used in vegetable. It has great potential for economic contribution, as the resource is abundant.

5.6.3 Human health improvement

Hypothesis: The human health has been improved from the use of NTFPs.

Table 5.13: Indexes as per wealth ranks of the species and overall NTFPs

Wealth ranks	Indexes for					
	Overall	Alainchi	Chiraito	Argeli	Kutki	Malingo
P	0.261	0.293	0.164	0.839	0.196	0.486
M	0.30	0.275	0.237	0.775	0.25	0.525
R	0.409	0.381	0.269	0.775	0.353	0.606

As most of the NTFPs in the mountain region have medicinal property, the hypothesis is accepted. However, due to lack of knowledge to use MAPs and time consuming for the cure of diseases, local prefer to use modern medicine, which are now easily and cheaply find in the health post.

Indexes value for the *Alainchi* lies between scales 1 to 3 hence the hypothesis is accepted. It is used as spices locally. It has many medicinal properties such as relieving from stomachache, lung diseases (IUCN 2004). Its regular use contributes positive health effect of the local.

Almost all the households of the VDC grow *Chiraito* in their Kitchen Garden for their own use. Hence, the hypothesis is accepted. It is one of the most important MAP due to its medicinal properties and fetch good market price. It is used as tonic, febrifuge, stomachic, antimalarial, antidiarrhoetic etc. (IUCN 2004). Local used it to relieve from fever, cold and cough.

Argeli has no such medicinal property.

Kutki has important role for the contribution to human health. Although it is not found in their village periphery at low altitude, people go to collect it in some distant away or request to other villagers for household use. Indexes for the *Kutki* are also in between scale 1 to 3. Poor use highly than rich. Local people are used to cure fever, cold and cough.

Malingo has not been used as medicinal purpose. However, its young shoots are mostly used by poor and medium wealth ranks for vegetable. During lean season, it provides good alternative for vegetable and might has some role for the human health improvement.

5.6.4 Human skill and knowledge improvement

Hypothesis: The skills and knowledge about the NTFPs have got increased from participation in trainings, workshops etc.

Table 5.14 Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P	2	4	1			0.357
M	4	9	3	2		0.362
R	2	4	2			0.325

All the indexes are near to the perception scale 2. There are regular trainings, workshops organized by KCA-MC. It is a group of villagers itself supported by the DNPWC and WWF-Nepal. In addition, different researcher and organization are involved in NTFPs development.

Without considering locals, they cannot get success in their objectives. During field visit, a consultant of WWF-Nepal was encountered visiting all the four VDCs of KCA for NTFPs trainings. Before that, Dr. T.P. Barakoti Chiraito expert had given training for Chiraito and Important NTFPs Cultivation (Barakoti, 2007). Altogether 8 member of Yamphudin VDC received such training.

Ten villagers of Yamphudin has got training for making paper (*Nepali Kagaj*) from the nearby Argeli processing factory. Now they can run processing plant from their own initiation. Some of them were running factory getting support from there.

5.6.5 Education sector improvement

Hypothesis: NTFPs are very much contributing to the education sector of the local people.

Table 5.15 Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P	1	4	2			0.357
M	3	8	4	3		0.412
R	1	2	3	2		0.494

Indexes are between 2 and 3 perception scale. NTFPs are not directly contributing the formal education sector. However, indirectly it is playing great role in bordering the knowledge of locals. They are getting informal education during various workshops, training programs related to NTFPs.

5.7 Contribution to Social Capital

5.7.1 Membership to Institutions/organization:

KCA was handed over to local community through the government in 2006, from then Kangchenjunga Conservation Area Management Council (KCA-MC) manages it. It is responsible and accountable for resource distribution, monitoring and the overall management of the area (Gurung, 2006, WWF-NP 2004). It is 12-member body, 10 from Conservation area User Committees (CAUCs), two CAUCs per VDC, except in Walangchumg-Gola. Chairpersons of CAUCs are automatically became the member of KCA-MC. Kangchenjunga Conservation Area User Committee and Pathivara Conservation Area User Committee are two CAUCs in Yamphudin VDC. CAUCs are 9-member body, which is formed by 5 chairpersons of User Groups (UGs), 3 chairpersons of Mother Groups (MGs), now called Sister Groups (SGs) and 1 VDC Chairperson. There are 10 UGs and 7 SGs in Yamphudin VDC (for UG, at least 1 person from each household, and for MG, 1 female from each

households should be a member). In addition, there are other sub-user group such as four Conservation Area Community Forestry user Groups (CACFUGs), eco-clubs, Eco-youth clubs. These local institutions are responsible and dedicated for conservation and sustainable utilization of natural resources.

5.7.2 Equity in the collection/harvesting and carriage of NTFPs

Hypothesis: The male and female do equally participate in collection/harvesting and carriage of NTFPs.

Table 5.16: Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P	4	2	1			0.228
M	5	6	5	2		0.375
R			3	3	2	0.747

Indexes are varies as per the wealth rank. For wealth rank poor and medium, the value is between 1 and 3 but for the rich it is near to 4 perception scale. Poor cannot hire labor, both male and female member of the family do equally involve in the collection /harvesting, and carriage of NTFPs. *Alainchi* cultivation, harvesting and carriage is labor extensive work. To reduce this pressure they help each other households. This is somewhat similar with the case from medium but in many family mature male has gone to foreign country for labor work and only female was involved in both field and households.

However, case is extremely different in the case of rich. They can hire labor for cultivation/harvesting and carriage of NTFPs and many male members of these families involve as intermediary for NTFPs trading while female are engaged in overall households activities.

5.7.3 Publicity due to NTFPs

Hypothesis: The people have gained good publicity due to NTFPs.

Table 5.17: Indexes as per wealth ranks of the species and overall NTFPs

Wealth ranks	Indexes for					
	Overall	Alainchi	Chiraito	Argeli	Kutki	Malingo
P	0.325	0.261	0.293	0.261	0.196	0.646
M	0.237	0.262	0.262	0.325	0.225	0.712
R	0.241	0.269	0.212	0.381	0.241	0.719

KCA was established to conserve and sustainable utilization of natural resources. Recently it is handed over to the local for its management and it gets importance due to implementation

of ICDP (Integrated Conservation and Development Program) worldwide. Various INGO/NGO in collaboration with DNPWC and foreigners and national researchers are engaged in conservation and sustainable utilization of natural resources of the area. Due to various workshops, conference, publication, brought the publicity of NTFPs; overall index values for the NTFPs are agreed to the hypothesis. They feel that they got good publicity both in national and international level.

Taplejung district is famous for Alainchi production and it shares large portion for the national production. Many national and regional newspapers, radio have already reported the news related to *Alainchi*. From indexes value, it is clear that locals agree with hypothesis that they get enough publicity due to *Alainchi* cultivation.

Chiraito is one of the important medicinal plants, which is mostly exported to India. It has not any processing plant till date in Nepal. It is important ingredients of many medicines so it has high demand in the worldwide market.

Argeli bark is processed to make paper in the VDC. It is exported to Capital city of Nepal and high quality paper is exported to Japan to make Japanese yen. This shows that their production of paper is not limited to country but also outside the country.

Kutki has been banned for collection, use, sale, distribution, transportation and export by government. Its presence in the area makes the important place for its conservation.

From the index values, it is clear that *Malingo* does not contribute to the publicity of the locals. It is only used in household level. However, it is best habitat for endangered species *Ailurus fulgens*. Therefore, for its conservation *Malingo* should be conserve properly.

5.8 Contribution to Physical Capital

5.8.1 Contribution to infrastructure development

Hypothesis: NTFPs have contributed largely to the transportation system (e.g. to the road construction), school construction, water-tap construction, energy source and access to information.

Table 5.18: Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P			2	3	2	0.775
M			6	8	4	0.75
R			2	4	2	0.775

Indexes of the all the wealth ranks are near or equal to perception scale 4 – reject the hypothesis. NTFPs have no contribution to transportation system as there is no transportation network, water tap construction. However, NTFPs make greatly to the information access to the local. There is one STM telephone, operated by sister groups. Some of the Tax coming from NTFPs has been used to its operation.

5.8.2 Contribution to producer goods

Hypothesis: NTFPs have contributed largely to the tools and equipments that people use to function more productive.

Table 5.19: Frequency of perception and indexes as per wealth ranks

Wealth ranks	Scale					Index
	1 (0.1)	2 (0.325)	3 (0.55)	4 (0.775)	5 (1.0)	
P		2	2	2	1	0.614
M	2	9	2	3	2	0.475
R	3	2	2	1		0.353

NTFPs have contributed to the tools and equipments largely to the wealth ranks medium and rich. However, they have not contributed largely to the poor hence they disagree with the hypothesis. Their yearly income is just enough to run households smoothly from all source of income. Hence, they are unable to purchase tools and equipment that can be used to function more properly.

Almost all the households are still running traditional *Bhatti* (incinerator) for Alainchi drying. Construction of Modern *Bhatti* supported from KCA-MC is underway. After its completion, quality of Alainchi can be improved and get higher price. In addition, it needs low fuel wood, which will help to conserve forest.

There are three Argeli processing plants. They produce approximately 3600 *Kori* (1 *kori* = 100 piece) of paper per year. From this year, there is available NTFPs loan through KCA-MC. For each VDC of KCA it is Nrs 350,000. It is distributed to the locals for cultivation and processing of NTFPs as micro credit. For this, they have to drop application and planning of work. Accepted plan can get up to 50,000 Nrs. From this money, they can buy tools and equipments to function more productive.

5.9 Summing up the Contribution made to all the Livelihood Assets

Table 5.20: Summing the total contribution to the livelihood assets made by the Five NTFPs

Livelihood Assets and their indicators	Relative Value of Contribution				
	Alainchi	Chiraito	Argeli	Kutki	Malingo
Natural Capital	0.50	0.50	0.75	0.625	0.75
▪ Access over the resources of NTFPs	0.75	0.75	0.75	0.75	0.75
▪ Resource condition of the NTFPs (increasing or decreasing)	0.25	0.25	0.50	0.50	0.75
Financial Capital	0.50	0.50	0.375	0.50	0.25
▪ Money income	0.75	0.50	0.50	0.50	0.25
▪ Indirect money value	0.25	0.50	0.25	0.50	0.25
Human Capital	0.55	0.65	0.4	0.35	0.35
▪ Awareness about policies, regulations etc.	0.75	0.75	0.50	0.25	0.25
▪ Feeling about lack of information	0.50	0.50	0.50	0.25	0.75
▪ Human health improvement	0.25	0.75	0.25	0.75	0.25
▪ Human skill and knowledge improvement	0.75	0.75	0.50	0.25	0.25
▪ Education sector improvement	0.50	0.50	0.25	0.25	0.25
Social Capital	0.75	0.66	0.50	0.33	0.25
▪ Membership to institutions/organizations	0.75	0.75	0.50	0.25	0.25
▪ Equity in the NTFPs collection etc	0.75	0.50	0.50	0.50	0.25
▪ Publicity due to the NTFPs	0.75	0.75	0.50	0.25	0.25
Physical Capital	0.375	0.25	0.375	0.25	0.25
▪ Infrastructure development	0.25	0.25	0.25	0.25	0.25
▪ Producer goods development	0.50	0.25	0.50	0.25	0.25
Index	0.535	0.512	0.48	0.411	0.37

Contribution made by NTFPs to livelihood assets is highest due to Alainchi followed by Chiraito, Argeli, Kutki and Malingo (Table 5.20). Among the assets, *Argeli* and *Malingo* contribute highest to the **Natural Capital** (0.75). It indicates that there is sustainable harvesting of bark of *Argeli*. During field visit, it was observed that felling of whole stand from the KCA forest not in their private land. If harvested sustainably, a single stand can give income for long period. There were increased trend in cultivation of *Argeli* in local own land for cash income. Whereas *Malingo* has limited uses, it is used in household purpose only.

For **financial capital**, Alainchi, Chiraito and Kutki have equal contribution (0.50) however; money value is highest for Alainchi. It is playing good alternative for their livelihood against

subsistence agriculture, which only support for few month. Alainchi also contribute highest to the Social capital. It is integrately associate with local people of Yamphudin.

Chiraito play a highest contribution to the **Human Capital**. However, its unsustainable harvesting practices among local people have made it vulnerable from the wild state.

There is low contribution of NTFPs to the **Physical Capital**, which is seen in the table 5.37, that highest contribution by *Alainchi* and *Argeli* is 0.375.

5.10 Indigenous Management of Natural Resources

The residents of the area are all from ethnic groups (*Jana Jati*). There are four ethnic groups namely Limbu, Sherpa, Rai and Gurung. They have been residing in the area from very long time. Among them, Limbu were the first settlers in the area known as 'Kiranti' with a history going back to thousands of years (Bista 1967 and Amatya et.al. 1995 cited in Gurung 2006). Due to its remote location, rugged terrain, and Nepal's past political isolation, the region has historically been affected very little by external influences, either domestic or foreign. For their survival, they have developed a number of livelihood strategies such as subsistence agriculture (terraced and shifting cultivation), animal husbandry, collection of forest products, wage labor, pottering, temporary migration, wildlife hunting. To manage natural resource of the area they have developed a number of traditional institution such as *Kiduk* and *Kipat* and practices such as Slash and burn (*Khorea Fadani*).

Functionally, *Kiduk* and *Kipat* have very little difference. Perhaps the main difference is that clans and/or individuals and families hold land title under the *Kipat* system, unlike the *Kiduk* system, which is mainly a regulatory body. *Kiduk* system is found among the Sherpa communities and the *Kipat* is found among the Limbu ethnic group (Gurung 2006).

The *Kipat*, as a form of communal land ownership, dates back to the period of the Sen Kings, prior to the Gorkhali conquest of the region in 1774 (Regmi 1976 cited in Gurung 2006). This traditional institution still regulates pastures and the use of forest products (Kollmair et. al. 2003), despite the fact that the system was officially abolished after the Land Reform Act 1964 followed by land survey. The village *Kiduk* and herder's *Kiduk* are the two main traditional institutions that regulate many village functions, such as the planning and implementation of agricultural, pasture, livestock movement and fodder harvesting calendars (Sherpa 2002). In general, the nationalization of forest and pastures has made a very little difference to the utilization patterns of forest resources in KCA.

Resident of lower altitude communities practice limited shifting (*Khorea*) cultivation. The ancestors of the Rai and Limbu historically relied on entirely on shifting cultivation, but over the centuries their agriculture intensified and most *Khorea* lands were turned into permanent Bari or Khet. However, this transformation has not been universally and throughout Eastern Nepal, *Khorea* lands remain common features of the landscape, particularly in the places that are either far from permanent settlement or on marginal slopes (Brown 1994). This was observed in the *Barule* of Yamphudin – 9 where Chiraito was cultivated in 400-500 ropani of *Khorea* land. Like all forms of shifting cultivation, *Khorea* relies on the nutrient contained in ground cover for soil fertility. To prepare *Khorea* land, trees are removed; the undergrowth is set alight, the land is tilled and then planted with crops mainly maize and dry millet. Once planted, crops are generally left untended until harvest time. Rai and Limbu farmers tend to use the same *Khorea* Plots on a rotational basis, after one season of use; a particular plot of *Khorea* is left fallow and allowed to regenerate over a number of years, while others are tilled. However, due to short fallow period, output from *Khorea* is much lower than both *Khet* and *Bari*. In the past, uncontrolled *Khorea Fadani* lead to loss in biodiversity and it was discouraged by KCAP after its establishment in 1998.

Alainchi is cultivated in the shed of *Utis*. They earn cash income from *Alainchi* and timber and fuel wood from *Utis*. Another advantage of cultivating *Alainchi* with *Utis* is that Nitrogen is accumulated by *Utis* in the soil and utilized by *Alainchi* hence the production increase.

Today KCA has been handed over to KCA-MC in September 2006 to manage, which is a body of 12 members out of which 10 members from the local communities, under which number of sub-groups are worked all are formed from local communities. These local institutions are based on a combination of traditional and modern conservation value, interests and priorities. None of the traditional institutions was dissolved while establishing the KCA institutions. Instead, their strengths and potentials were incorporated into new-community based organizations (CBOs). For instance, the informal women's groups became mother's groups and village level institutions became user groups and so on. Similarly, *Kipat* and *Kiduk* institutions continue to function within the framework of the newly created KCA institutions.

5.11 Existing Management Practices of Most Preferred NTFPs

Alainchi (*Ammomum subulatum*)

The resource management of *Alainchi* includes cultivation, weeding, harvesting, utilization and marketing. There was no processing and value addition practices.

Cultivation: it is a major agro forestry crop in the area and the major source of household income. It is mainly cultivated in 1000-2000m altitude (IUCN 2004) in sloppy, moist and well-drained places under the shed of *Alnus nepalensis*. Two types of practices have been employed to cultivate the *Alainchi*. In one case, Rhizome was grown from seed in nursery and planted in new area where farmers wanted to cultivate *Alainchi*. In another case, usually in the existing planted land, single old plant of *Alainchi* was left from each cluster after the harvesting and that single plant again gave to clusters. From a single plant, 15-20 plants grow making a single cluster.

Weeding: Before harvesting of *Alainchi*, farmers removed weeds two times during the early and late phase of cultivation to improve the production. They dig around the each cluster that helps to circulate air, moisture and nutrients in the field.

Harvesting: It is harvested in September-October in *aul* (lower altitude) and in November in *lake* (higher altitude) when the seeds turn brown. For the harvesting practices, a special type of knife (having curve at tip) is used to collect seeds. Both sides of tip are spiky in which outer part is used to separate fruiting part from root while inner part is usually used to collect it. After harvesting from the forestland, each fruits of *Alainchi* is separated, cleaned and dried over a fire (*Bhatti*). The *Alainchi* is then stored in house and sold later.

Utilization: In household of Yamphudin, it was mainly utilized as spice to increase the taste of tea and curry.

Marketing: Farmers sell their product either in household or to local intermediary or in nearby road head trader (*Tharpu*). From *Tharpu* it goes to Tarai market and then to India or other foreign countries. It is also consumed in Nepalese market as spice. No further processing and value addition process occurs within Nepal.

Chiraito (*Swertia chirayita*)

It is an important medicinal plant and found in 1200-3000m altitude in open area (DoP 2004). Due to its bitter nature, it is called *Tite* in many place of Nepal.

Regeneration and Domestication Practices:

The natural regeneration of plant takes place by seeds, when the seeds become biologically mature having high potentiality of viability during November (Bhattarai 1996). The viability of seeds are very low if seeds are collected after November and cleaned properly, the percent of germination is reported to be up to 90% (Bhattarai 1991).

In Yamphudin, due to untimely harvesting practices, the viability of seeds has been reported to be decreasing and resource condition was declining from the wild state. Now there is hard to find it in forested land. However, after handover of KCA to the local communities, there has been control over unsustainable harvesting practices.

Domestication of Chiraito was recently started after getting training from the expert of WWF. Altogether eight individual of different ward of Yamphudin have got training. Some of them have started to cultivate Chiraito in *Kanla* (edge of the agriculture land) by sowing the seeds along with the paste of cow dung and sand or planted Chiraito seedlings that were grown in nursery in their own land. However, Cultivation of Chiraito was continued from 10 years back in the slash and burn land (*Khorea*) with maize mainly in government land. Now, it is discouraged by KCAP, to conserve biodiversity. Earlier way of cultivation has attracted other majority of farmers as Chiraito grown in such areas was quite thick, tall and mature early than that of Chiraito grown in forest (6 months prior than grown in natural habitat).

Harvesting Practices: Chiraito was mostly harvested without considering any system. The resource, which had no control over collection and the resource, who came to collect first, collected more and earned more money. Thus, there is always competition for collection and collection was carried out before seed disposal. Seeds are only the medium for the propagation of this plant. So if the plant is collected before the maturation of seeds that will be no further germination.

November-December is the appropriate time for harvesting but it is not practiced in Yamphudin. Collection starts September onwards. Collection is done manually without using any instruments. Whole plant is pulled out and sun-dried for few days and then wrapped by *Choya* (rope made from fibrous of plant) in small bundles. Then small dried bundles of Chiraito was collected in a big bundles and sold to the local traders or road head traders. It was estimated that more than 3 metric ton of Chiraito were harvested from both private and government land last year, each contributed half of total production.

Utilization:

Subsistence: Chiraito is an important medicinal herb used for curing various diseases. The plant was dipped in water overnight and the bitter juice was taken in the next morning. It was used in common ailments like cough, cold and fever. This plant is bitter with a sharp taste; it is used as an astringent tonic and stomachache. It relieves inflammations and improves eyesight. It is given as a sedative to pregnant uterus. Chiraito is considered good for pain of joints, scabies, asthma, ulcer and chronic fever.

Commercial: The main active principle is 'Chiretin'. The bitter principles are the main constituents of the plants. Recently an increased demand for it has been noticed. The product has been discovered by beverage industry as an alternative bitter product. Chiraito is also used as one of the ingredients in "Chandra Prabati" which is an Aurvedic drug.

Marketing: Majority of Chiraito produced is exported to India and Tibet as there are no any processing and value addition practices in local and national level (Oli and Nepal, 2003). It has second trade value after Alainchi. Its market price in local level was about Nrs 130 per K.G. and in nearby road head was about Nrs 150 per K. G.

Variability and Risk:

Fluctuation of market price is one of the risky factors for the traders. They have said that its price was Nrs 200-250 per kg some years ago. Its price depends on several factors such as demand, quality. During storage, 10-12 % of the weight is lost as the dry Chiraito losses its weight when leaves break away from the branches.

Adulteration of Chiraito with other low quality species of *Swertia* is very common in the trade of Chiraito.

Argeli (*Edgeworthia gardneri*):

The resource management of Argeli includes regeneration in natural and domestication practices, harvesting practices, utilization, marketing and processing and value addition.

Regeneration and domestication practices:

Natural regeneration of plants takes place by seeds, when the seeds become biologically mature having high potentiality of viability during July. Natural regeneration of plants also takes place by vegetative parts i.e. rootstocks.

Cultivation of Argeli has been promoted in the area to increase greenery as well as to enhance the livelihood of local by selling its bark to nearby processing factory. It can be cultivated at the North aspects, sloppy, moist, and well-drained places in between 1500-2600m altitude range. Climate of Yamphudin is suitable for Argeli plantation.

Harvesting Practices: The harvesting of Argeli can be done after 3 years of plantation. February is the most appropriate time for harvesting. The plants with minimum 1.5m height and having 7-11 cm thick branches are suitable for harvesting, but in practices, harvesters do not consider this while harvesting the Argeli. Sometimes, they harvest small size since children are involved to collect the raw material. Collection started from November and

continues until February. Collection is done manually using a sharp knife. After this, there is a ban on collection of plants since it flowers from March. The plant can be harvested if plants attains 7-11 cm height with three forked branches.

Utilization: Traditionally, Argeli is used for making ropes for the cattle and to carry loads and making fences for cultivated land. Nepali handmade paper locally called *Hate Kagaj* also made locally from the bark of this plant, but the quality is not as good as the Lokta paper. Recently, technology has improved and paper from Argeli is being popular. Within the Yamphudin, three factories are involved for processing the Argeli bark to make Nepali Paper which were brought to the Kathmandu and sold to paper factory as well as exported to Japan to make high quality paper such as Japanese Yen.

Marketing: In Yamphudin, farmers are involved in harvesting of Argeli bark for cash income either from private land (their own or other land) or KCA forest. If they are harvest it from their own land than they get Nrs. 25 per kg otherwise Nrs 20 per kg if they were harvested it from other land or KCA forest. Nrs 5 per kg was given for landholder. After harvesting of bark from sizable Argeli stem, they removed outer skin of bark and sun dried. From one *Bhari* (almost 20 kg) of Argeli bark, only about 5 kg is remained after cleaning and sun dried and then sold to nearby paper factory. After processing in the factory, 20 x 30 size of paper is made and than taken into Kathmandu. Until it could not reach to Kathmandu, different type of tax was to be paid during transport, which increases cost for transportation.

Kutki (*Neopicrorhiza. scrophulariiflora*)

Resource management of Kutki includes natural regeneration, harvesting, utilization and marketing. There is no cultivation of Kutki and its processing and value addition.

Natural regeneration: Kutki is distributed in patches and is common on open moist site, rock crevices as well as organic soils, in stony slopes, cliffs, and turf of glacial flats formed by winter snow on the sub-alpine zone of 3300m to 3800m asl mostly on the Northern, Western and Northwest aspect, commonly at the slopes ranging from 30-60 degree (Shrestha and Shrestha 2004). It is a clone type plant, which spreads by the multiplication of ramets (vegetative offshoots) and seeds in the natural areas.

Harvesting Practices: Rhizomes is collected with roots in October-December. Suitable rotation period for its harvesting is 4-5 years. However, premature collection is one of the major threats for its conservation. Other major threat includes, over harvesting by both local collectors/herders and cross-border communities (Sikkim Border) from upper belt of Yamphudin who are actively involved with illegal sort of activities to hold their household

economy. Despite ban on collection and sale of Kutki by government, people were collecting it as means of moneymaking source in a given limitation of unemployment and alternative income generation. Moreover, competitive, unselective and harvest by uprooting the whole plants leaving nothing behind has led to continuous threat and decrease in population of this plant (Oli and Nepal 2003). However, it was reported that Kutki in natural areas was increasing after establishment of KCAP.

Spades were commonly used to dig out the roots of Kutki as rhizomes of this plant are densely and widely distributed. Kutki is a high altitude MAP and it is often found in long distance away from the villages. Collection of such MAP is generally carried out in groups, most commonly by men and occasionally by women and children depending up on the values and demand of that particular species. Collectors goes for harvesting in a group along with foodstuffs and tent/cloths and night halt in the harvesting site, so called *night-halted collectors* while the herders, who owned the *goth* in the high pastures, collected in leisure period and considered as *non-halted collectors*.

Utilization: Rhizomes including roots are the main part for medicinal use. The rhizome and root of Kutki are bitter in taste. Traditionally, it was used in fever, urinary discharge, cough, high blood pressure, jaundice, leucoderma, bronchitis, back-ache, anemia, hepatitis, leprosy, ringworm, rheumatism etc.

Marketing: In the study area, local collectors, herders and cross-border communities are actively involved in harvesting of Kutki. It was mainly traded to Sikkim from higher belt of Yamphudin or to Tibet through *Walangchung Gola/Yagma* as illegal rout. It can be traded through legal rout from *Tharpu/Dahalgaun* to Tarai market and than to Indian city for further processing or Kathmandu and other city of Nepal for traditional medicinal use. In local market, its price ranges from Nrs. 5000-8000/*Mon* depending up on its demand.

Chapter 6: Discussion

About 77 NTFPs/MAPs were reported from the study area. This study could not conclude that they are limited in this number. Due to inaccessibility, time and other constraints, this study unable to explore the exact number of NTFPs. High altitude areas of Nepal are considered the storehouse of highly valued NTFPs, although no data exist of NTFP being harvested or exported exclusively from these areas (Acharya 2003).

Out of total NTFPs, not all are equally important in terms of livelihood. 34 out of 77 NTFPs have more or less contributed to the livelihood. Again, not all are able to contribute all the livelihood parameters equally. Some are economically important; some are ethno botanically important, some are important for household use only where as some have high potential to contribute livelihood. 16 out of 139 identified NTFPs/MAP species found in the area are traded actively (Oli and Nepal 2003).

Five most preferred NTFPs were found out as perceived by the 10% respondents. They were Alainchi, Chiraito, Argeli, Kutki and Malingo. Most of the farmers of lower belt of Yamphudin planted Alainchi in their farmland, which was the main household income source. It was traded through road head away from one full day walk and exported to outside the Country through Tarai market.

Chiraito was collected from KCA forest and their own forest. Some of them were cultivating it in *Khorea* land with maize. Few have domesticated it in the nearby farmland after making nurseries. It was exported to Tibet, India and within country without any value addition which lowered their income. It is also locally used to cure fever and common cold.

Argeli bark is collected from KCA forest and private forestland for making *nepali kagaj* in local level, which help to increase their income. Due to immature harvesting, regeneration was slow and future income will be affected.

Kutki has medicinal properties and has a good market value. Collection of Kutki has been banned from the forest but illegal collection by local and cross border make it vulnerable. Domestication of it will contribute livelihood of local people.

Malingo is abundant in KCA forest. Many households' equipments were made from this such as baskets, rope etc.

Contribution made to local livelihood by the five most preferred NTFPs has been calculated in terms of livelihood assets based on index value. Total contribution made by NTFPs to all the livelihood assets was highest due to *Alainchi* (0.535) followed by *Chiraito* (0.512), *Argeli* (0.48), *Kutki* (0.411) and *Malingo* (0.37).

NTFPs/MAPs play an important role in sustaining and improving the livelihoods of the KCA inhabitants due to their contribution to household income (Sherpa 2002, Paudel 2003, Oli and Nepal 2003). 16 out of 139 identified NTFPs/MAP species found in the area are traded actively (Oli and Nepal, 2003). Among them, *Alainchi* and *Chiraito* have become an important source of income in recent years and production is increasing in the lower belts of the KCA (Gurung 2006). From the study it is also found out that 79 % of average annual income of poor were contributed from NTFPs/MAPs, that of medium group was 41% and 35% was contributed to rich. In the overall economy, the average annual income per households accounts for 52 %, which is solely in monetary term. Study carried out in Koshi hills, Gorkha districts and Salyan districts showed that contribution made by MAP to the annual household income was 17%, 22% and 12% respectively (Edwards 1993, 1996, Olsen 1998, Olsen and Hellens 1997, Hertog 1997).

All the resident of the study area are from indigenous group namely Limbu, Sherpa, Rai and Gurung who were settled in the area from long time ago and away from mainstream. They have developed a number of livelihood strategies, practices and traditional institutions to manage natural resource by their own. Managing natural resources by indigenous management systems in Nepal was from ancient time. Indigenous group developed these practices through the process of sequential adjustment to the environmental circumstances in a temporal continuum (Richards, 1993. Fisher et. al. (1990) have documented the presence of such systems in the different parts of Kavrepalanchowk and Sindhupalanchowk districts of the central hills.

Existing management practices of NTFPs include enhancing natural regeneration, domestication, cultivation, weeding, harvesting, storage, utilization and marketing. Their management practices were sustainable when the demands were limited. However, due to increase in demand, resource condition of most of the NTFPs such as *Chiraito*, *Bikhma*, *Panchaule* declined. Production of *Alainchi* from farmland is also decreasing due to diseases and long-term regeneration of old plant or lack of implantation of new seedlings. Still the resource condition of *Argeli*, *Malingo*, *Kutki* etc is increasing because of effective management of Kangchenjunga Conservation Area Management Council (KCA-MC).

Chapter 7: Conclusion and Recommendations

7.1 Conclusion

Yamphudin VDC is rich in NTFPs/MAPs. About 77 NTFPs were recorded. Among them 34 have high potential to contribute livelihood. Some of them have high medicinal properties such as *Chiraito*, *Kutki*, *Panchaule*, *Bikhma*, some have high market value such as *Alainchi*, *Chiraito*, *Argeli*, *Kutki* and also some have great useful to household purpose such as *Malingo*, *Nigalo*, *Allo* etc.

Five species of NTFPs were found out as most preferred in regard to contribution made to local livelihood. They were *Alainchi*, *Chiraito*, *Argeli*, *Kutki* and *Malingo*. They were selected based on preference ranking of local people.

Oli and Nepal (2003) found out that *Alainchi* and *Chiraito* in combination have contributed 60-90% to the total household economy. This study has also found that still *Alainchi* and *Chiraito* were the first two among the most preferred NTFPs to contribute livelihood.

Total contribution made to local livelihood by most preferred NTFPs was calculated in terms of the five capital of livelihood assets i.e. natural capital, financial capital, human capital, social capital and physical capital as defined by DFID (2001). Based on this, different indicators of livelihood assets were tested based on index value.

For natural capital, *Argeli* and *Malingo* have high index value, means both have high access over resources and resource condition is increasing. For financial capital, *Alainchi*, *Chiraito* and *Kutki* have high index value, mean them directly or indirectly contribute to high cash income. *Chiraito* contribute highest to the human capital as calculated from five indicators of livelihood asset whereas *Kutki* and *Malingo* contribute least. *Alainchi* has contributed highest in case of social capital, as it is amalgamate associated to local residence. In the case of physical capital, all these five NTFPs have index value between low to medium, as Yamphudin is poor in physical development.

All the residents of the study area are from indigenous group namely Limbu, Sherpa, Rai and Gurung who had settled in the area from long time ago and away from mainstream. For their survival, they have developed a number of livelihood strategies, practices and traditional institutions.

Existing management practices of NTFPs include promoting natural regeneration, domestication, cultivation, weeding, harvesting, storage, utilization and marketing. Their

management practices were sustainable when the demands were limited. However, due to increase in demand, resource condition of most of the NTFPs such as *Chiraito*, *Bikhma*, *Panchaule* has declined. Production of *Alainchi* from farmland is also decreasing due to diseases and long-term regeneration of old plant or lack of implantation of new seedlings. Resource condition of *Argeli*, *Malingo* and *Kutki* etc is increasing because of effective management of Kangchenjunga Conservation Area Management Council (KCA-MC).

Implementing effective management plan with coordination of indigenous management practices can highly contribute local livelihood as well as nation's economy through processing and exporting of NTFPs and help to conserve biodiversity as well.

7.2 Recommendations

Following recommendations were made from the study:

- Extensive documentation and resource condition of NTFPs/MAPs of the area should be carried out.
- Awareness program could be more effective to sustainable harvesting of NTFPs.
- Study area is rich in high value NTFPs/MAPs, so NTFPs certification can help conservation and sustainable utilization.
- Effective taxing system should be regulated. Illegal taxing in the route discourages its legal trade. Cross border, collection of NTFPs from Sikkim as well as Tibet should be effectively monitored.
- Training in cultivation, domestication and harvesting, processing and value addition should be given to the local to increase the livelihood and conserve biodiversity as well.
- There should be equal benefit sharing between local and trader. KCA-MC should act as facilitator between them.
- Detailed study on livelihood contribution should be studied in terms of other livelihood indicator in detail to assess the actual contribution.
- For effective conservation of NTFPs in the area, indigenous management practices could not be neglected. Appropriate incorporation with modern conservation value might be effective tool for conservation.

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Appendix-1

Ranking of Most Preferred NTFPs

Respondent No.	Species									
	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
1	5	3	4	1	2	-	-	-	-	-
2	5	4	2	-	1	3	-	-	-	-
3	-	5	3	4	-	1	2	-	-	-
4	5	4	3	-	-	2	1	-	-	-
5	5	-	4	3	2	-	1	-	-	-
6	3	1	5	-	2	4	-	-	-	-
7	5	4	-	-	2	-	-	3	-	1
8	4	5	2	3	-	1	-	-	-	-
9	5	-	3	4	-	1	-	2	-	-
10	3	5	4	2	-	-	-	-	-	1
11	-	4	2	5	1	-	-	-	3	-
12	5	4	3	2	-	-	1	-	-	-
13	5	2	4	3	1	-	-	-	-	-
14	4	3	5	1	-	-	2	-	-	-
15	5	4	1	-	2	-	3	-	-	-
16	4	5	-	3	1	-	2	-	-	-
Response frequency (R _j)	14	14	14	11	9	6	7	2	1	2
Sum of Ranks (T _j)	63	53	45	31	14	12	12	5	3	2
T _j ²	3969	2809	2025	961	196	144	144	25	9	4
Sum of square of ranks	291	219	163	103	24	32	24	13	9	2
Mean of ranks	3.94	3.31	2.81	1.94	0.87	0.75	0.75	0.31	0.19	0.12

Appendix - 2

Revenue collection trend from NTFPs in the Taplejung district

Name of NTFPs	Amount of NTFPs exported from Taplejung District (in kg)	Revenue Rate (Nrs.)	Total Revenue Collection (Nrs)
2060/61			
Lokta	6000	3	18000
Chiraito	33789	3	101367
2061/62			
Lokta(white)	6700	3	20100
Chiraito	17970	3	53910
Bisjara	41	7	287
Sunpati	8	2	16
Leaf of Dhupi	319	1	319
2062/63			
Chiraito	9863	15	147945
Lokta	6000	3	18000
Leaf of Dhupi	1300	2	2600
Jatamansi	1300	15	19500
Bisjara	4530	7	31710
Bhutkeshjara	4900	4	19600
2063/64			
Chiraito	12700	15	190500
Manjitho	11600	3	34800
Bisjara	1800	7	12600
Jatamansi	500	15	7500
Banlasun	1000	-	-
Lokta	10800	3	32400
Leaf of Dhupi	4100	2	8200
Jhau	1000	15	15000

Source: District Forest Office, Phungling, Taplejung

Appendix - 3

NTFPs database of Yamphudin VDC

S/N	Scientific Name	NTFPs Name	Family	Habit	Parts used	Remarks
1.	<i>Aconitum bisma</i> (Buch.-Ham.) Rapais	Bikhma (N), Phung/Bhongser/Bhungma (S), Kuphora Bikhma	Ranunculaceae	H	Rt	Seto, Pahlenlo and Rato (Roots used for fever, headache, stomachache and is also popular antidote in the area)
2.	<i>Aconitum spicatum</i> (Bruhl) Stapf.	Bikh (N), Chenduk/Tuhuk (S), Ning (L)	Ranunculaceae	H	Rt	Poisonous plant used as dyeing agent, Ts used as pickle
3	<i>Aconogonum molle</i> (D.Don) Hara	Thotne (N), Bhancha/Nyalo/Phamiya (S)	Polygonaceae	S	Ts & St	Whole plant is used as dyeing agent, Ts used as pickle
4	<i>Acorus calamus</i> L.	Bojho (N), Sadakppa (L)	Araceae	H	Rz	Cough, fever and scabies
5	<i>Ammorium subulatum</i>	Alainchi (N)		H	Rt	Used as flavor
6	<i>Arisaema</i> sp.	Laduwa	Araceae	H	Tb	Brewing Raksi – cures stomachache, gano
7	<i>Arisaema speciosum</i> (Wall.) Mario. ex Schott	Sarpa ko Makai (N)	Araceae	H	Fr	Brewing Raksi
8	<i>Artemisia indica</i> Willd.	Titepati (N), Namyohoba (L)	Compositae	H	Lf & Ts	As incense
9	<i>Arundinaria maling</i>	Malingo (N), Nyungma/Bak (S)	Gramineae	S	St & Lf	Young shoots are consumed as vegetable while mature stems are used to produce baskets, mats and thatching materials
10	<i>Arundinaria</i> sp.	Nigalo (N), Nyungma Rongyuk (S)	Gramineae	S	Wh	Doko, Namlo, Rope, broom, Ts eaten
11	<i>Astilbe rivularis</i> Buch.-Ham. ex D. Don	Budo Okhai (N), Ban Supari (L)	Saxifragaceae	H	Rz	Rhizome used for sinus and also for good eyesight, also taken in body pain
12	<i>Begonia picta</i> Sm.	Magarkanchi (N)	Begoniaceae	S	Fr	As pickle and antileech
13	<i>Berberis asiatica</i> Roxb. ex DC	Chutro (N), Kerba (S)	Berberidaceae	S	Fr	Dry fruits are consumed with buckwheat, fresh fruits edible
14	<i>Bergenia ciliata</i> (Haworth) Sternb. f.	Pakhanved (N), Kopsyokpa (S)	Saxifragaceae	H	Rz	Rhizome used for sinus and also for good eyesight, also taken in body pain
15	<i>Choerospondias axillaries</i> (Roxb.) B. L. Brutt. & A. W. Hill	Lapsi	Anacardiaceae	T	Fr	Fr edible as pickle and eaten raw as well
16	<i>Cissampelos pareia</i> L.	Gudargano (Rato and Pahelo)(N), Kenfun (L)	Menispermaceae	Cl	Rt/Tb	Root juice taken in stomach pain and diarrhea
17	<i>Cuscuta reflexa</i> Roxb.	Indrabeli/Akasbeli (N)	Cuscutaceae	Cl – para	Wh	Jaundice
18	<i>Dactylorhiza hatagirea</i> (D. Don) Soo	Panchaule (N), Wangpolakpa/ Ongbulakpa (S), Nahasilukchok (L)	Orchidaceae	H	Rt	Roots are used medicinally for cuts and wounds, cold, cough, pneumonia. Also used as incense
19	<i>Daphne bholua</i> Buch-Ham ex Steud	Lokta/Kalo Baruwa (N)	Thymelaceae	S	Br	Bark used in production of handmade paper on a cottage industry scale
20	<i>Daphne papyracea</i> Wall. ex Steud	Lokta/Seto Baruwa	Thymelaceae	S	Br & Rt	Bark used in production of handmade paper on a cottage industry scale and Rt medicinal
21	<i>Drymaria cordata</i> (L.) Willd. ex Roemer & Schultes	Abjialo (N), Wana (L)	Caryophyllaceae	H	Ts & Lf	Medicinal
22	<i>Edgeworthia gardneri</i> (Wall.) Meisn	Argeli	Thymelaceae	S	Br	Used to make rope, sacs, patiya/chakati and paper
23	<i>Elaeagnus conferta</i>	Mallido (N)	Elaeagnaceae	S	Fr	Fr edible, Raksi brewed from Fr
24	<i>Elaeagnus parvifolia</i> Wall. ex Royle	Gunyelo (N)	Elaeagnaceae	S	Fr	Edible
25	<i>Engelhardtia spicata</i> Lsch. ex Bl.	Mauwa (N), Yakpohama (L)	Juglandaceae	T	Br	Bark paste in bone fracture & also in diarrhea and dysentery

26	<i>Equisetum debile</i> Roxb.	Kurkur ghan (N), Hodokppa/hundok (L)	Equisetaceae	II	Rt	Juice taken in fever and asthma
27	<i>Eupatorium odoratum</i> L.	Bannara	Compositae	II	Lf	Antiseptic
28	<i>Fragaria nubicola</i> Lindley ex Lacaita	Bhuin Ainselu (N), Chihilum (S)	Rosaceae	II	Fr	The ripe fruit are edible
29	<i>Gaultheria fragrantissima</i> Wall.	Dhasingre/Limbuni phool/Danda Phool (N), Chhyaro (S), Singhanggo (L)	Ericaceae	S	Fl, Fr & St	Fr edible, Fl aromatic – used in ritual ceremonies to make run away the evil spirit, functions as Kapur, Taking loan from KCAMC to run microcredit
30	<i>Girardinia diversifolia</i> (Link.) Friis	Allo (N)	Urticaceae	S	Br	Stem bark as fiber to make mat, Jalo, Thailo money bag, sac, rope etc.
31	<i>Heraclium nepalense</i> D. Don	Chimling (N/S), Chimbung (S)	Umbelliferae	II	Fr, Fl & Rt	Fruits are used as spice, seeds are used in cases of headache and faints
32	<i>Imperata cylindrical</i> (L.) Pal	Siru (N), Poholo (L)	Gramineae	II	Rt	Juice taken to cure intestinal worm
33	<i>Juglans regia</i> L.	Okhar	Juglandaceae	T	Fr and exocarp of Fr	Fr edible and exocarp used in dying carpet
34	<i>Juniperus indica</i> Bertol.	Dhupi (N), Shukpa/ Pama (S)	Cupressaceae	T	Lf	Leaves are used as incense
35	<i>Lindera neesiana</i> (Wall. ex nees) Kurz	Siltimur (N)	Lauraceae	S	Fr	Fr taken in cough and cold, fever and I lainja. Also taken as pickle
36	<i>Lobelia pyramidalis</i> Wall.	Eklebir (N)	Lobeliaceae	II	Rt	Rt used in Tonsil
37	<i>Lycopodium clavatum</i> Linn.	Nagbeli (N), Sanbamfyathia (L)	Lycopodiaceae	Cr	Pl	Dust applied in cuts and wounds, plant used for making gates in ceremonies and use on the floor by yak herders
38	<i>Maesa chisia</i> Buch.-Ham. ex D. Don	Bitouni (N), Chhorne (G)	Myrsinaceae	S	Rt, Br & Lf	Rt bark is insecticidal, Br used to treat ringworm & Rt, Br & Lf used as fish poison
39	<i>Mahonia nepaulensis</i> DC.	Jamanimandro/Chutro (N), Kerpa/Chetrok (S)	Berberidaceae	S	Fr	Ripe fruits are eaten
40	<i>Myrica esculenta</i> Buch.-Ham. ex D. Don	Kaphal (N)	Myricaceae	T	Br & Fr	Br taken in Sinusitis and Fr edible, Br for worm in livestock
41	<i>Nardostachys grandiflora</i> DC.	Jatamansi (N), Japyo (S), Pangbo/Pangbwang (L)	Valerianaceae	II	Rz	Rhizome is used as incense (Used to be exported to tibet & Taplejung)
42	<i>Neopicrohiza scrophularifolia</i> (Pannell) Hong	Kutki (N), Hunlen/Hungle (S)	Scrophulariaceae	II	Rz	The root decoction is used to cure cold and cough and fever. Illegally collected by both the Tibetan & Locals
43	<i>Nephrolepis articulata</i> (L.) Trimen	Pani Anala (N), Kathewa (L)	Nephrolepidaceae	II	Tb	Cures fever, tonsil, pneumonia and also as cooling agent
44	<i>Oxalis corniculata</i> L.	Chariamilo (N), Kesuppa (L)	Oxalidaceae	II	Lf	Eye infection, snake bite, stomachache and diarrhea
45	<i>Parmelia</i> sp (Lichen)	Dunghe Jhyau	Parmeliaceae	Lichen	Spore or dust	Dust applied in cut and wounds
46	<i>Phytolacca acinosa</i> Roxb.	Jarango (Scto and Rato)	Phytolaccaceae	II	Rt	Roots used for Jaundice
47	<i>Plumbago zeylanica</i> L.	Chhitu	Plumbaginaceae	S	Rt & Lf	Root and paste applied in bone fracture and swollen area of the body
48	<i>Podophyllum hexandrum</i> Royle	Laghupatra (N), Upala/Bamasisi/Ramasisi (S)	Berberidaceae	II	Fr	Ripen fruits are edible
48	<i>Potentilla fruticosa</i> L.	Bajadanti/Bhairung pati (N)	Rosaceae	II	Lf & Fl	Lf and Fl used in making tea
49	<i>Pyrus pashia</i> Buch.-Ham. ex D. Don	Mehel (N)	Rosaceae	S	Fr	Fruits taken in dysentery
50	<i>Rheum australe</i> D. Don	Khokkim (N), Chibricha/Chhucha (S)	Polygonaceae	II	Lf & Rt	Petiole of the leaves are taken as pickle while the Rt parts are used as medicine, tea & plant is used as dying agent

51	Rheum nobile Hook. f. & Thomson	Padamchal (N), Kenjo/Chhulama	Polygonaceae	H	St & Rh	The young stem is eaten raw and the rhizome used in cases of bone fracture and body pain
52	Rhiodendron anthopogon D. Don	Sunpati (N), Phalu/Bhalu (S)	Ericaceae	S	Lf & Ts	Commonly used as incense
53	Rhiodendron arboreum Sm	Laligurans (N), Sendok Dongbu (S), Thukphewa (L)	Ericaceae	T	Fl	Fl are eaten for its sweet juice & applied around the eyes for good eye sight
54	Rhododendrom lepidotum Wall. ex G. Don	Bhale Sunpati (N), Sulu (S)	Ericaceae	S	Lf	Lf used as incense, plant is poisonous for cattle
55	Rhus javanica L.	Vakymlo (N)	Anacardiaceae	T	Fr & Lf	Fr edible, vinegar prepared from the leaves
56	Rubia manjith Roxb. ex Fleming	Majitho (N), Chyo (S)	Rubiaceae	Cl	Wh	As dying agent
57	Rubus ellipticus Sm.	Ainselu (N), Chhilum (S), Tingsek (L)	Rosaceae	S	Rt & Fr	Fr edible, Rt medicinal. Raksi is brewed from Fr
58	Rumex nepalensis Spreng.	Halhale (N)	Polygonaceae	H	Tb & St	Gastric, Dye is extracted to color carpet & Yaks ornament
59	Saussurea tridactyla	Maikopila (N), Yazenbawa/Kyachhenbhabu (S)	Compositae	H	Fl	The woody parts of Fl used in cuts and wounds for a quick healing. It is also burnt and the smoke is inhaled in cases of fainting and headache, Fls collected in 3 y period
60	Selinum wallichianum (DC.) Ratzada & Saxena	Bhutkesh (N), Chyadukpa (S)	Umbelliferae	H	Lf/Rz	Rz is burnt & smoke is inhaled in fainting, headache and fever. It is also used as amulet
61	Smilax aspera L.	Kukurdaino (N)	Liliaceae	Cl	Rt	Juice taken to cure stomachache, bowels and vomiting problem
62	Solanum virginianum L.	Kantakari (N)	Solanaceae	H	Rt & Fr	Root is applied to treat asthma. Fruit is chewed to protect teeth
63	Swertia chirayita (Roxb ex Fleming) Karsten	Chiraito (N), Tikta (S)	Gentianaceae	H	Wh	The whole plant is used to relieve fever, cold and cough. Highly traded
64	Swertia multicaulis D. Don	Sarmaguru (S), Serpugudum (S)	Gentianaceae	H	Rz	Rz is used for cuts and wounds
65	Swertia nervosa (G. Don) C. B. Clarke	Bhale Chiraito (N)	Gentianaceae	H	Tb	Tb used for the treatment of cold and cough after boiling
66	Swertia sp.	Mahaguru (N)	Gentianaceae			
67	Taxus baccata	Lauth Salla/ Dhengra salla (N), Sanda (S)	Taxaceae	T		No any use
68	Thysanolaena maxima (Roxb.) Kuntze	Amriso (N)	Gramineae	S	Fl & Lf	Fl as broom and leaves used in making mat and as fodder
69	Urtica dioica L.	Sisnoo (N), Shyathukpa/ Shyadukpa (S)	Urticaceae	H	Lf & Ts, Rt	Eaten as vegetable, Rt paste applied in dog bitten area
70	Viburnum sp.	Asare (N)	Caprifoliaceae	S	Rt	Juice taken to cure fever and sore throat
71	Viscum articulatum Burm. f.	Hadchur/Hodjod (N)	Loranthaceae	Parasit	Wh	Paste applied in bone fracture
72	Zanthoxylum armatum DC.	Boke timbur (N), Mehading (L)	Rutaceae	S	Fr	Used as poison in fishing, Fr as pickle and as spices. Antileech
73	Unidentified	Bhuin Chiple		H	Tb	Tb paste is applied in Pittho during roti cooking, the paste is also mixed with Argeli to make paper of good quality (locally developed technique)
74	Unidentified	Dhoti Saro		H	Lf & Fr	Production of mat from Lf, Fr edible
75	Unidentified	Machhajadi			St	Paste applied in cut and wounds
76	Unidentified	Pinasa Lahara (N)		Cl	Rt & Lf	Juice or decoction inhaled to cure sinusitis
77	Organic exudate	Silajit				Applied in cut area, used to reduce fertility in women

Appendix - 4

FACE – TO – FACE QUESTIONNAIRE

Questionnaire no.:

Date:

General information:

VDC: Ward No. Hamlet: Aspect:
 Name of respondent: Ethnicity/Caste:
 Age: Sex: M/F Profession/Designation:
 Household size: MaleFemaleChildren
 Cattle holding: Cow Buffalo Goat/Sheep Chicken
 Others
 Land holding: (Bari.....Khet.....Kharbari.....Others.....) ropani or katha .

Natural capital and its contribution:

1. Distance from forest to your house:.....Km.(estimated)

2. What kind of material do you bring from the forest? If you bring any thing please give an estimate to your requirement in one year is fulfilled?

S.N	Material type	Nothing	$\frac{1}{4}^{\text{th}}$	$\frac{1}{3}^{\text{rd}}$	$\frac{1}{2}^{\text{th}}$	$\frac{3}{4}^{\text{th}}$	All
1	Fodder						
2	Fuel wood						
3	Thatch grass						
4	Medicinal herbs						
5	Timber						
6	Vegetable						
7	Wild fruit/nut						
8	Animal bedding						
9	Other (specify)						

3. What are the NTFPs found in your forest? (Use blank pages if more space needed)

S. N.	Local Name	Common Name	Scientific Name	Abundance (Dense/moderate/sparse)	Places	Do you collect?
1						
2						
3						
4						
5						
6						
7						

4. Do you cultivate NTFPs in your farmland?

S. N.	Local Name	Common Name	Scientific Name	Abundance (Approx.)	Places	Purpose
1						
2						
3*						

5. Characteristics of NTFPs on which you prefer or rank those species.

S. N.	Characteristics	Most important characteristics (Species name)
1	High market price	
2	High abundance	
3	Very scarce/endangered	
4	Medicine	
5	Processing easy	
6	Always used in household	
7	Easy to propagate	
8	Marketing easy	
9	Others	

6. Please give your perception about the comparative importance of the preferred NTFPs as 5 = highest preference, 4 = important, 3 = Moderate important, 2 = Not important and 1 = weed/harmful.

S. N.	Species	Perception				
		1	2	3	4	5
1						
2						
3						
4						
5						

7. Uses of NTFPs

Species	Uses	Parts used	Method of Use	Method of collection	Fault in the collection method (if any)	Remarks (Ethnic group)

8. How much time do you spend in collecting the NTFPs?

Species	Time of the year	Person engaged	Labor cost (estimated)	Remarks

9. How much do you collect for your household use?

Species	Season	Amount (Approx)	Equivalent grain (Approx)	Approx money value

10. How much do you collect for marketing?

Species	Season	Amount (Approx)	Equivalent grain (Approx)	Approx money value

11. What is the resource condition of NTFPs?

Very Abundant... Abundant... Normal.... Dwindling..... Rare.....

Reasons for the resource condition:

a) Free grazing Yes No b) Encroachment Yes No c) Over exploitation
 Yes No d) No management Yes No e) Not identified Yes No
 f) Others.....

12. Accessibility to the natural resources of the NTFPs?

Easily accessible Ban posed on collection, harvesting etc. Others practices

13. Do you think the resources of these NTFPs affect other flora and fauna of the area?

Yes No Don't know

If yes, what? e.g., some wildlife is dependent on these species highly, etc.

- Promotes growth of plant species
- Promotes regeneration of Plants species
- Disturbs/competes with the growth of species
- Makes the site/ soil harse / or moist less etc.
- Attracts some insects/pests....
- Affect animals, which and how?

14. Are these NTFPs are much more important for soil conservation, watershed conservation, environmental amelioration, scenic-beauty etc.?

Yes No Don't know

If yes, which species are those types?

Species	Important for soil conservation	Important for watershed conservation	Important for env. amelioration	others

Contribution to Financial Capital:

1. Price of the NTFPs in market or if exchanged with any goods, with what goods and how?

Species	Price in market	Market place	Income/yr	Barter system (if prevalent, whats the practice)

3. Income from farming of those NTFPs

Species	Cultivated land area (ha)	Income (NRs or in terms of food grains if barter system)	Remarks

4. Household income (approximate)

From agriculture	From livestock	From NTFPs	Others (remit., business, jobs, etc)	Saving	Expenditure
..... % of total % of total % of total % of total	...% of total	...% of total

5. Are there any credit programs for cultivation or management of those NTFPs?

Yes No. If yes, bank loan facility, training or others.....

6. How easily is the loan available for the cultivation of the NTFPs?

Contribution to Physical Capital (For group)

1. Is there amount of income from those NTFPs being used (in any way) for

road-building telephone..... Electricity.....

school-construction..... water-tap construction....

Others.....

If yes, when? Do you remember? Your comments

2. If the income from NTFPs plants is used in these infrastructure development, do you think it is of considerable amount?

Physical facilities	Contribution from NTFPs income %	Remarks
Road building		
School Construction		
Water tap construction		
Telephone		
Electricity		
Others		

Rank from 1 to 5

Contribution to Human Capital:

1. Employment from the NTFPs

People engaged	Wealth rank	Ethnicity (DAG/NDAG)

2. Do you remember the cases when lives were saved or diseases cured by those medicinal plants (NTFPs)?
If yes, when and what?

3. Contribution of these medicinal plants to your health, your perception (from 1 to 5).....

3. NTFPs as food? Your perception (From 1 to 5)

4. Were NTFPs useful during famine? Your perception (from 1 to 5)

5. Contribution to the education sector made by these NTFPs, your perception (from 1 to 5)...
6. Have anyone of you started any entrepreneur or micro-enterprises related to NTFPs?
 Yes No
 If yes, what are those?....
7. Were there any trainings/seminars/workshops organized related to the NTFPs?
 Yes No
 If yes, which trainings?...
- 7.2. Did you learn something valuable from those events? Yes No
- 7.3. Do you use those learning from the events? Yes No
 If yes, what and where?.... if no, why?....

Contribution to Social capital:

1. Are there any cooperative or any other institutions/ organizations concerning the trade, processing, collection, harvesting, etc. of these NTFPs?

Institutions	Related to			
	Harvesting	Processing	Trade	Marketing
Cooperatives				
Local organizations				

- 1.1. How are these functioning? Well Not functioning well

- 1.2. If functioning well, why is it so?

- 1.3. If not functioning well, why is it so?

- 1.4. Is there equity in decision-making, benefit-sharing, participation in NTFPs collection, harvesting, management, conservation, etc. (within male and female, DAG and NDAG, people of different wealth ranks)?
 If no, why?

2. Are you member of any organizations related to those NTFPs? Yes No
 If yes? Of which organization?....

3. Are there any organizations to support the cultivation of these NTFPs?
 If yes what are these?....

4. Sedentary population.....Caste: Dependence on NTFPs: (from 1 to 5)

5. Mobile population.....Caste: Dependence on NTFPs: (from 1 to 5)

6. Have you got any rewards or medals for something related to the outstanding forestry practices?
 Yes No
 If yes, what?...

7. How much public are you being made by those NTFPs, what do you think about that? Give the value 5 = very much publicity to 1 = no publicity.

Species	Your publicity due to the plant species				
	1	2	3	4	5

8. Trend of migration- due to poverty or due to other reasons....what...?

10. What is the condition of labor availability in the society?
- | | | | |
|---------------------------|----------|--------|----------|
| for farming..... | Abundant | Scarce | Moderate |
| for NTFP collection..... | Abundant | Scarce | Moderate |
| for NTFP cultivation..... | Abundant | Scarce | Moderate |

Appendix-5

Photo- Plates



Photo 1: Plantation of *Ammomum subulatum*



Photo 2: *S. chirayita* grown in kitchen garden



Photo 3: *Edgeworthia gardneri*



Photo 5: *Girardinia diversifolia*



Photo 4: Drying of *Neopicrorhiza scrophularifolia*



Photo 6: Yamphudin sectors office of KCA

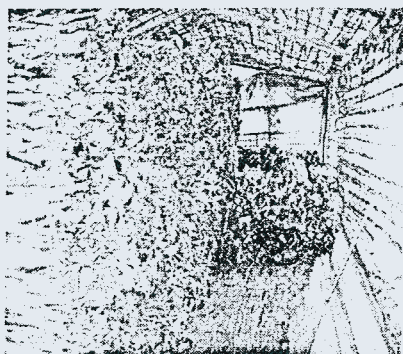


Photo 7: Store of Argeli bark

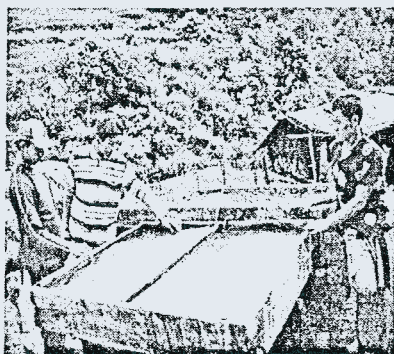


Photo 8: Processing of Argeli bark



Photo 9: Alainchi drying in traditional Bhatti



Photo 11: Modern incinerator



Photo 12: Knife used for Alainchi seed collection



Photo 13: Taking interview with local