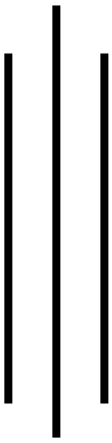
Conservation and Utilization of Medicinal plants: Status and Economic Prospect in Community forests of Kavrepalanchowk district

(For the Partial Fulfillment of the Requirements for M. Sc. Environmental Science Degree)



Submitted to:

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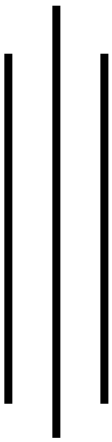

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LETTER OF RECOMMENDATION

This is to certify that the dissertation work entitled **"Conservation and Utilization of Medicinal plants: Status and Economic Prospect in Community forests of Kavrepalanchowk district"** submitted by ***Mr.Pradeep Raj Sitaula*** for the partial fulfillment of the requirement for the completion of Masters' Degree in Environmental Science has been carried out under my supervision and guidance. The entire work is based on the results of his research work and has not been submitted for any other degrees to the best of my knowledge.
I recommend this Dissertation work to be accepted as per the requirement of Central Department of Environmental Science, Tribhuvan University.

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DECLARATION

I, ***Pradeep Raj Sitaula*** hereby declare to the Dean of the Tribhuvan University (TU), Nepal that this is my original work and all sources of information used are duly acknowledged. This work has not been published or submitted elsewhere for academic award.

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Pradeep Raj Sitaula
11 June, 2009

Abstract

Medicinal and aromatic plants (MAPs) are an important part of the Nepalese economy that have a potential for contributing to the local economy, subsistence health needs, and improved natural resource management, leading to the conservation of ecosystem and biodiversity of an area. The study was conducted to understand the conservation and utilization of medicinal plants in terms of economic perspective in the community forests of Kavre district which is aimed at examining the locally preferred medicinal and aromatic plants (MAPs) and choose top-four ranked among them. Forest users were randomly selected and interviewed from the purposively selected seven community forests user groups of Kavre district. Designed schedule and checklists were used to collect data through interviews and group discussion, which were analyzed with Ms-excel and Statistical Package for Social Science (SPSS). The importance of four medicinal plants was tested using Friedman two way analysis of variance.

Common medicinal plants found in the study area include Sugandhawal (*Valeriana jatamansii*), Pakhanved (*Bergenia ciliata*), Chiraito (*Swertia chirayita*) and Kurilo (*Asparagus racemosus*). From the test of preference ranking, top four preferred medicinal plants in the study area were found to be Sugandhawal (*Valeriana jatamansii*) as first, Pakhanved (*Bergenia ciliata*) as second, Chiraito (*Swertia chirayita*) as third and Kurilo (*Asparagus racemosus*) as fourth rank. From the hypothesis testing it is clear that there is preference ranking prevalent in the cultivation of medicinal and aromatic plants for cultivation.

When comparaing the data of 20 years, status of these resources is somewhat decreasing due to the lack of knowledge on these resources, however due to the effort of community forestry user groups for the last decade the status is found to be increasing. Only 13% of the economically active people are involved in income generating activity of medicinal plants related occupation; however this percents also engaged in Agriculture.

The study concludes that the MAPs are contributing in the rural livelihood and national economy. Further research and inventory of the medicinal plants and scientific analysis on policy, improved technology and good market linkage can bring real benefit to the both community and Nation.

Key words: Medicinal and aromatic plants, Preferrence ranking, Status of MAPs

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ACRONYMS

ABS	Access and Benefit Sharing
AFO	Assistant Forest Officer
ANOVA	Analysis of Variance
ANSAB	Asian Network for Sustainability of Agriculture and Bio-resources
B/C	Benefit to Cost Ratio
CBD	Convention to Biological Diversity
CBOs	Community-based Organizations
CECI	Canadian Center for International Studies and Cooperation
CF	Community Forest
CFUGs	Community Forest Users Groups
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
DDC	District Development Committee
DFO	District Forest Officer/ Office
DOF	Department of Forest
DPR	Department of Plant Resources
EFEA	Environment and Forest Enterprise Activity
EIA	Environmental Impact Assessment
EO	Essential Oil
EPR	Environment Protection Act
FAO	Food and Agriculture Organization
FECOFUN	Federation of Community Forest Users of Nepal
FGD	Focus Group Discussion
GMF	Government Managed Forest
GON	Government of Nepal
GTZ	German Technical Cooperation
Ha	Hectare
HHs	Households
HNCC	Herbs and NTFPs Coordination Committee
IEE	Initial Environmental Examination
INGO	International Non Governmental Organization
IoF	Institute of Forestry

IUCN	World Conservation Union
JABAN	Jadibuti Association of Nepal
LFP	Livelihood Forest Program
MAPPA	Medicinal and Aromatic Plant Program in Asia
MAPs	Medicinal and Aromatic Plants
MFSC	Ministry of Forests and Soil Conservation
MOICS	Ministry of Industry Commerce and Supply
MPFS	Master Plan for Forestry Sector
MPs	Medicinal Plants
NCS	National Conservation Strategy
NEPAP	National Environment Policy and Action Plan
NGO	Non Governmental Organization
NMPB	National Medicinal Plants Board
NRs	Nepalese Rupees
NTFPs	Non-Timber Forest Products
PPA	Private Public Alliance
RIMS	Resource Identification and Management Society
SNV	Netherland Development Organization
TCM	Traditional Chinese Medicine
TPC	Trade Promotion Center
USD/$	United States Dollar
VDC	Village Development Committee
WAI	Weighted Average Index
WCS	World Conservation Strategy
WHO	World Health Organization
WTO	World Trade Organization

Chapter I

INTRODUCTION

1.1 Background

Nepal is well known for its high biological and cultural diversities. Variations in physiographic structures and climate have enriched the country with a high diversity of flora, fauna, ecosystem and cultural heritage (Chaudhary, 1998). Nepal has over 7000 species of higher plants out of which, there are over 700 species of medicinal herbs (EFEA, 1999; Jayaswal, 2006; HMGN/IUCN, 1988; Parajuli and Luitel, 2004; Dutta, 2007; Dahal, 2007) including about 250 species are endemic to the country. About 1624 species are of ethno-botanical importance and 100 of them are commercially important for trade and marketing (Bhattacharya *et al*, 2003). These plants have become the important source of medicine for the local healers as well as the basic raw materials for Ayurvedic, homeopathic and allopathic medicines (Ghimire *et al.*, 1999). It has been estimated that approximately 80 percent of the medicine supplied developing world depend on traditional medicines (Sheldon *et al.*, 1997).

Nepal is also a repository of traditional knowledge and it has a rich tradition of folk practices for utilization of wild plants (Manandhar, 1993a) especially as medicinal plants. Different ethnic group within Nepal use an estimated 23% of flowering plants for their medicinal properties (Shrestha *et al*. 2000).

Forest products have been realized as a good source of income to rural people. Beside timber, non-timber forest products (NTFPs) have also played a significant role in national economy. Medicinal plants are also an important part of NTFPs. Non timber forest products constitute an important source of livelihood for the millions of people from forest fringe communities across the world. In Nepal 5% of total GDP comes from the trade NTFPs (Subedi, 1998).

Every year large volume of medicinal and aromatic plants is collected unsustainably causing depletion of resources and degradation of habitats. This is due to economic incentive for such resources. These resources are available for certain groups only and even these groups are not able to fully understand the potential benefits that these plant and their products brings. The resources are being marketed in India with and without proper channel and proper price (Subedi, 2006). Ninety percent of NTFPs are exported to India in raw form from Nepal.

Amala (*Phyllanthus emblica*), Atis (*Aconitum heterophyllum*), Chiraito (*Swertia chirayita*), Tejpat (*Cinnamomum tamala*), Guchhi chyau (*Morchella sp*.), Jatamansi (*Nardostachys grandiflora*), Jhyau (*Lichen sps*), Kutki (*Neopicrorhiza scrophulariflora*), Pipla (*Piper longum*), Ritha (*Sapindus mukorossi*), Sugandhawal (*Valeriana jatamansii*), Sugandha Kokila (*Cinnamomum glaucescens*) and Timur (*Zanthoxylum armatum*) are the major MAPs in such trade to India (Poudel, 2007). Due to unregulated transfer of such resources across the boarder; Nepal government is losing its revenue on one hand and local and marginalized people are losing their effort just for little benefits. Proper conservation and fair and equitable sharing of benefits of such resources would yield benefit from the precious MAPs. With a view to benefit the indigeneous and local communities, in recent years, the national level Herbs and NTFPs Coordination Committee (HNCC) has prioritized, 12 MAPs for cultivation and researches (MFSC, 2004).

A Nepalese term for medicinal and aromatic herbs 'Jadibuti' is frequently used. The commercial collection of these medicinal plants Jadibuti is known to have taken place for centuries. The collection and trade was encouraged earlier by Prithvi Narayan Shah, the first ruler who unified Nepal from 1725 to 1775 (Regmi, 1972), and was reported by early British visitors to Nepal (Kirkpatrick, 1811; Hamilton, 1819). The export of MAP during the earlier period is difficult to quantify as no historical records of exported volume exist and as contemporary official records are highly inaccurate (Amatya and Sthapit, 1994). A study reported, on the basis of data from 15 randomly selected districts, that about 30 species constitute the bulk of the current Nepalese medicinal plant export, and that export in the case of year, 1997/98 amounted to 6254 tones at a value of USD 8.1 million (Larsen, 2004).

The worldwide use of plants and their parts to enhance physical and spiritual well-being goes back thousands of years. Initially, medicinal plants may have been just elements of a tribe's nourishment, not necessarily consumed for their medicinal effects. Knowledge of their healing power was most likely gained through a process of trial and error and handed down over generations as an integral aspect of tribal tradition. Every plant contains a large number of different groups of chemical compounds, some of which have been observed to have healing effects. In the course of evolution, methods were discovered for processing medicinal plants and using their active compounds for different purposes.

For example the cosmetics industry uses a large number of medicinal plants as ingredients in soaps, lotions, ointments, shampoos and natural colorants amongst other products. There is

increasing consumer interest in all natural things. Consumers are demanding healthier and more natural products. Increased consumer sophistication and awareness of ingredients, performance and health benefits are thus changing the personal care and cosmetics industry. Moreover, there is a growing trend away from products that superficially enhance beauty but have no biological effect, to "therapeutic" products-cosmeceuticals that might repair damaged tissues, smooth and moisturize the skin, and provide protection from the sun. This has led to an expansion in the use of new, active ingredients, including natural products with defined constituents and specific biological effects. The increasing popularity of aromatherapy- the use of essential oils obtained from plant, to promote balance and harmony between mind and body- is a good example of the trend towards, "therapeutic" products.

In Nepal medicinal and aromatic plants are increasingly used and exported for their value to India and other countries. Such export have supported the local economy and helped to improve the livelihood of Mountain people. The process of hunting the medicinal and aromatic plants is ongoing for long time for quick economic gains. This has resulted some unsustainable harvests of valuable plants leading to the demise of such resources. Although assessments on the extent of declining medicinal and aromatic plants resources have not been authenticated, the conservation and their sustainable use has become priority in many parts of the middle mountains of Nepal.

The study is carried out in order to analyze the conservation and use of focused medicinal plants in terms of economic perspective. The study mainly address two aspects a) general national scenario of Nepal and covering the market and economic aspect of herbs b) community scale investigation that is based on CFUGs from the selected site i.e. Seven community forests from Kavre district.

This study will focus on the assessment of status and economic prospect of selected Medicinal plants found is selected community forests of Kavre district in the mid hills of Nepal. The findings will be complimentary to the status of knowledge on the medicinal and aromatic plants of Nepal.

1.2 Justification of the study:

The MAPs is an important resource which is used to produce medicines and to export them in crude or in processed form generating source of income of the country. The income and

livelihood is affected by the value of products and their availability, trade structure, degree of competition, ethnic identity of the plants by the traders and harvesters, density of population of the areas, degree of poverty among the rural populations, reliability of market information among the harvesters and traders. If these resources are commercialized and harvested wisely, they can act as good source of income.

With the increase in Human population in the hills and mountain areas of the country, the pressure on the resource use has also been increased. The primary pressure is on forest resources under public domain. Since such resources belong to the government, they becomes no mans property. Therefore the pressure on such plant resources like the NTFP and medicinal and aromatic plants are tremendous. Because of this it has been anticipated that the harvest of such resources has been unsustainable. This will eventually effect in the livelihood options of the people. Although unsustainable harvest of NTFP and Medicinal and aromatic plants have been much touted, the authentication has been far from adequate. This study is required to carry out to assess whether the pressure on such plant resources are there and whether such resources are endangered, if so what alternative options have to be taken for sustainable use and harvest of such resources.

There is need to clarify gaps and fill up constraints in terms of MAP cultivation and marketing problems and prospects. This study provides market information and aware the MAP cultivators and professionals to get encouraged for MAPs cultivation.

There is possibility of cultivation of MAPs in study area for commercial purpose but most of the people yet have not practiced this. Only some people are collecting and trading them from community forests. So these resources have not played effective role on their economy. So this research work was done to find out suitable MAPs for cultivation in the study site and their economic impacts on livelihood.

1.3 Objective

The overall objective of the study is to understand the conservation and utilization of medicinal plants in terms of economic perspective in the community forests of Kavre district.
Specific objectives of the study are as follows;

- To assess the status of major medicinal plants and management aspect of the medicinal plants in the study area.

- To assess contribution of major medicinal plants to economy and market system in the study area
- Find out the locally preferred MAPs and choose top- four ranked among them for cultivation.
- To test whether all four medicinal plants are equally important or not.

1.4 Scope and limitation of the study

The findings of this study will be useful for researchers, academicians for further research in the MAP sub-sector. This study might also give guideline to policy makers for improving strategies and plans for the benefit of the local people. The general contribution and issues of MAPs sub sector in national concern can be assessed using secondary information and stakeholder's consultation. The biophysical and socio-economic condition across Nepal varies greatly so the findings at community level will be useful for those having similar socio-economic and biophysical condition with research area.

Purpose of this study is for the submission of dissertation as the partial fulfillment of the masters' degree of environmental science. Owing to various constraints, the study was completed with the following limitations.

- Study on only seven community forests is made out of 522 community forests in Kavre district to analyze the contribution and status of MAPs at grass root level. However the models and findings in the study may be replicable for other medicinal plants too.
- This study was focused only on some major herbs. Community level analysis was made through house hold survey, field survey to all FUGs however the field level analysis is made to understand the contribution of medicinal plants at the community level.
- The study was carried out with limited time and resources. Market price obtained through market appraisal varied a lot, so reliable data on market price was obtained from the NGOs and INGOs, working in the same field.

1.5 Study area

Kavrepalanchowk is the third largest district and one of the eight districts of Bagmati zone, located in the Central Development Region of Nepal. It borders with Kathmandu, Lalitpur and Bhaktapur districts in the west; Ramechhap and Dolakha districts in the east; Sindhupalchowk district in the north and Sindhuli and Makawanpur districts in the south.

Dhulikhel, the district headquarters is approximately 31 km east of Kathmandu.The district lies between the north latitudes of 27º20' and 27º85" and the eastern longitudes of 85º24' and 85º49'. The total area of the district is 1404.86 sq. km.

The main part of the district lies in the hills and mountain between Mahabharat Lekh and lesser leading to agro-climatic variations in different pockets of the district. The topographical setting of the district is made up of undulated terrain, tars, lowland areas and riverbanks. The altitude ranges from 318 m to 3,018 m above sea level (msl).Geographically the district can be divided into two major geophysical settings the mountain land and plateau. About 80 percent of the total landmass of the district fall under the mountain region and rest 20 percent belong to plain valley and plateau.

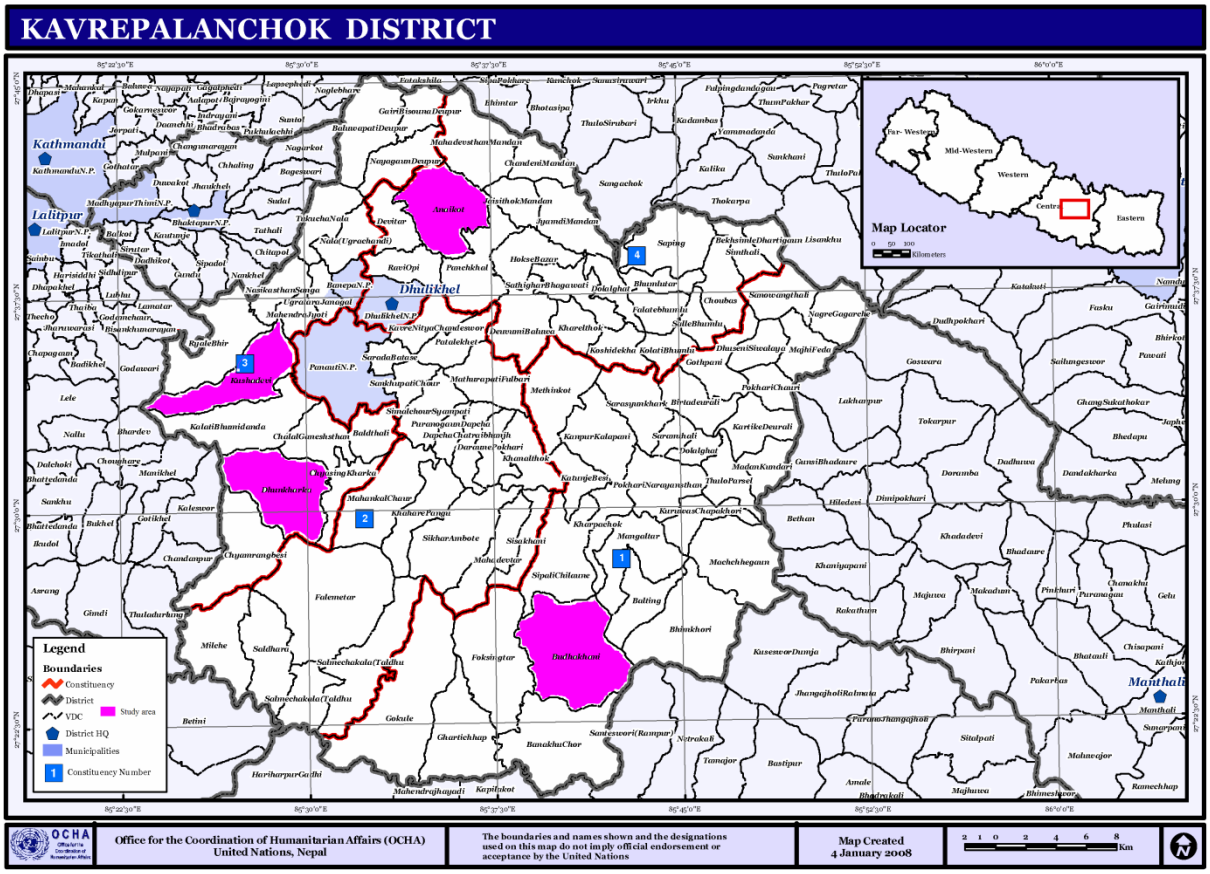
The river network is distributed over the whole district. The three major rivers with sources within the district are Indrawati, Sunkoshi and Bagmati. The Sunkoshi and Indrawati River acts as a border to the northern district, Bagmati and Kokhajor river to the southern districts and Sunkoshi river to the eastern districts.The district is divided into three electoral constituencies; 15 Ilakas and 87 Village Development Committees (VDCs) and 3 Municipalities, namely Banepa, Dhulikhel and Panauti.

Due to different geo-physical conditions the climate varies from sub-tropical to temperate. The climate of the district changes according to the altitude. It is hot along the bank of river. The climate is subtropical in the middle mountain and cool temperate in the high mountain region. The average maximum and minimum temperature of the district is 28 ^{0}C and 9 ^{0}C respectively. The average annual rainfall in the district is 1,785 mm.

According to the draft 2001 population census, the total population of the district is 385,672 with 188,947 male and 196,725 female populations. There are about 70,509 households and settlements randomly scattered over the district. The average household size is 5.5. The average population growth rate is 1.9 percent and population density is 275 inhabitants per sq. km.

Almost all the area of this district is covered by maniferous ecosystem. Due to elevation difference of about 3000m; this district is rich in biodiversity and medicinal plants like *Emblica officinalis* (Amla), *Swertia chiraita* (Chiraito), *Lichen spp.*(Jhyau), *Zanthoxylum armatum* (Timur), *Gaultheria fragrantissima* (Dhasingre), *Acorus calamus* (Bojho), *Discorea deltoidea* (Bhykur), *Sapindur mukorossi* (Riththa) and so on.

Map: 1.1 Map of Kavre district with study area



1.5.2 Profile of the study area

The study area covers mainly seven community forests of Kavre district. These community forests lie on different four VDCs. Fifty eight percent users of CFs were Brahmin and Chettri. These FUGs were selected at an altitude varying from 1000 to 2400m. There were total of 478 HHs i.e. users of these seven community forests.

Table 1.1 Name of the community forests selected for the study

SN	Name of CF	Place/VDCs	Ward no.	Area (Ha)	Forest working plan date	HHs
1	Kalapani Ban	Dhungkharka	9,1	87.5	2053-3-25	54
2	Khahare Ban	Dhungkharka	8	110.3	2054-3-31	78
3	Kalidaha Ban	Anaikot	3,4	27	2053-3-21	61
4	Madandevi Ban	Anaikot	7	36.25	2053-3-21	61
5	Koili Ban	Budhakhani	5	79.25	2058-3-29	43
6	Ghamailo Khola Mudhe Ban	Budhakhani	2	205.3	2058-3-29	124
7	Dharapani Mahila Ban	Kushadevi	2	2	2053-2-13	57
Total				547.6		478

Source: Monitoring and Evaluation report 2064/065

Chapter II

LITERATURE REVIEW

2.1 Concepts on Non timber forest products and medicinal plants

Non Timber Forest Products have been defined by different people working in this field. Subedi 1997 defined NTFPs as 'all the goods of biological origin other than timber, fuel wood and fodder'. Non timber forest products are defined as forest products other than timber, fuel wood and fodder. The most important category regroups medicinal and aromatic plants (MAPs) used by herbal medicine and essential oil industries. (ANSAB, 2003)

A medicinal and aromatic plant database of Nepal (MAPDON) is prepared by ethnobotanical society of Nepal (ESON) in 2000 in which there is list of 1624 medicinal and aromatic plants of Nepal, out of which there are some species which are commonly available as crude drug in the market, under cultivation and in wild form (Shrestha *et al*, 2000). A close definition of jaributi is "medicinal, aromatic and spice plants". It also equates to the officially used term "minor forest products", all of which are taxable if collected from government- managed land and traded from the district of origin. (Edwards, 1993; Dhakal, 2005).The Medicinal Plants is an English terminology of Jaributi of Neplease expression that represents the herbs containing medicinal values. Jaributi can be disintegrated as 'Jar' means root and 'Buti' means plants (Shrestha, 2004).

Open access to medicinal plants in the wild is perhaps one of the main reasons for the current unsustainable levels of harvesting. Other factors contributing to unsustainability include lack of sufficient data on wild plant populations, marketing and trading; inadequate regulations and legal protection (including intellectual property rights for local practitioners with local knowledge); and poor access to appropriate technology for sound harvesting and plantation development (World Bank, e-report).

NTFPs have become the major source of livelihood of farmers in the mid hills of Nepal and continue to be in future also as there lacks off-farm employment opportunity. But the natural resource base of NTFPs has been decreasing over time with increased population and high demand for the products. This increased demand due to high commercial value of certain species has lured the poor people to exploit the resource base in an unsustainable manner. Some unsustainable methods like over-harvesting and premature harvesting has been increasing. As a result, many NTFPs like Jatamansi (*Nardostachys grandiflora*), Chiraito

(*Swertia chiraita*), Yarshagumba (*Cordyceps sinensis*) and Lokta (*Daphne bholua*) which are in high demand have become vulnerable to and endangered by extinction (Edward, 1996).

2.2 Status of Medicinal and Aromatic plants

Nepal is rich in medicinal and aromatic properties and out of 6,500 flowering plants, there are over 2000 species of plants with ethno-botanical importance out of which about 1,600 species of plants have been estimated to be used in traditional medicine and a majority of which awaits proper documentation (Shrestha *et al.* 2000). It is estimated that only 15-20 percent of the population of Nepal living in and around the urban areas have access to the modern medicinal facilities, whereas, the rest depend on traditional medicines. (Baral and Kurmi 2006).

Edward (1996a) estimated 10-15 thousand tones of MAPs composed of 100 species with a border value of USD8.6 million are exported from Nepal annually, while Subedi (1997) estimated the value of trade in medicinal plants at USD27 million: both studies indicate the importance of commercial medicinal plants as the source of income in rural areas (Olsen and Larsen 2003). Olsen (2005b) estimated annual export value of MAPs as USD7-30 million, with a value USD16 million in 1997-1998. Olsen (2005a) has estimated annul harvest of 7000 to 27 000 tons of medicinal plants from Nepal.

Plant research Godavari has identified Chiraito as major a Medicinal plant that is traded. Thirty four Districts of Nepal have been found to contribute in supply of Chiraito traded. Total of 419300 Kg of Chiraito has been estimated to trade during 1995/96. They identified market channel as: collector----Middle man/ village trader----Road head trader---Wholeseller---Industries. (Bhattarai & Acharya, 1998).

Human beings have explored ways of using parts of trees, shrubs, and other plants to treat diseases and increase longevity since ancient times. Knowledge on the use of medicinal and aromatic plants has accrued through thousands of years, and such plants have continued to gain prominence even in modern medicines and as essential ingredients in different types of cooking (ICIMOD, 2006).

The important Medicinal Plants found in the Kavre District and traded are; Lauth Salla (*Taxus wallichiana*), Sugandhawal (*Valeriana jatamansii*), Chiraito (*Swertia chirayita*),

Jatamansi (*Nardostachys grandiflora*), Kutki (*Neopicrorhiza scrophulariflora*), Pakshanved (*Bergenia ciliata*), Kurilo (*Asparagus racemosus*) etc. (DOF, 2065)

2.3 Relevant National Policies

Over the last decades, the government has become more proactive to facilitate the process of supporting the livelihood of communities dependent on the forest products. This has resulted in the improvement of several policies and legal measures. In the following an attempt is made to present the brief review of the policy measures that were instrumental for the improvement of livelihood of the community at the same time conservation of the biological resources.

2.3.1 Master Plan for Forestry Sector, Nepal, 1988

Medicinal and Aromatic Plants and other non-timber forest products are among six primary programs formulated in the Master Plan for Forestry Sector, 1988. The Master Plan for the Forestry Sector (MPFS) discusses development aims and objectives for seven groups of NTFPs: medicinal and aromatic plants, Daphne paper, pine resin, kattha (from Acacia catechu), sabai grass, and canes and bamboo. Likewise, the Forest Based Industrial Development Plan of the MPFS emphasizes creation of jobs and processing facilities as well as cultivating many of the wildly collected medicinal plants.

In the schedule -1 of Environment protection rule, there is provision of IEE for some forest based industries. IEE is needed for the industry which commercially produces or collect medicinal plants and aromatic plants from public forest area. Similarly IEE is needed for the Industries which do not emit pollution but which commercially collect and commercially process MAP. EIA is needed for the industries which commercially collect and process MAP and emits pollution (EPR, 1997)

2.3.2 The National Conservation Strategy (1988)

Based on the World Conservation Strategy HMG/N in collaboration with IUCN prepared, the National Conservation Strategy that highlights the necessary to establish appropriate policies, regulations and management approaches to ensure the sustainable extraction of medicinal plants.The basic objectives of the NCS are;

• To satisfy the basic material, spiritual and cultural needs of the Nepalese people,

• To ensure the sustainable use of land and renewal resources to preserve biological diversity, and

• To maintain ecological and life support system.

2.3.3 Forest Act, 2049 (1993) and Forest Regulation

Forest Act 1993 and its Regulations 1995 provide regulatory framework for NTFP trade in Nepal. There is the provision that CFUGs can manage and utilize forest products including NTFPs in accordance with an approved operational plan. The CFUG can issue a collection permit for the products that are prescribed for harvesting. The policy also recognize CFUGs as agents for rural development by permitting user groups to legally cultivate NTFPs and perennial cash crops in the forest, as well as commercially process timber and other forest products for sale in the market.

Government of Nepal may impose a ban on the collection, use, sale and distribution and transportation of any specified category of forest products (forest regulation 1995). Panch Aule (*Dactylorhiza hatagirea*), Okharko Bokra (Bark of *Juglans regia*), Kutki (*Picrorhiza scrophulariflora*) are banned for collection, utilize, distribution, transportation and export. Jatamasi (*Nardostachys grandiflora*), Sarpagandha (*Rauvolfia serpentina*), Sugandhkokila (*Cinnamomum glaucescens*), Sugandhwal (*Valeriana jatamansi*), Jhyau (*Lichen spp.),*Talish Patra (*Abies spectabilis*), Lauth Salla (*Taxus wallichiana*) have been banned for crude export

2.3.3.1 Collection Permits

Collection permits have to be obtained from the District Forest Office (DFO) for the collection of NTFPs from the government forests or in pasture land. Transport/export permits of unprocessed NTFPs have to be obtained from the DFO. The Department of Plant Resources issues exports permit for the processed products of those plant species those are banned to export in unprocessed form. The Cottage Industry Department issues license to establish a micro-enterprise. The Department of Plant Resources is a Management Authority of CITES for flora.

2.3.4 Nepal Environmental Policy and Action Plan (NEPAP) 1993 and 1998

NEPAP (1993) is one of the major HMG's environmental policies to manage efficiently and sustainably natural and physical resources including forest and rangeland resources**.** It recommended that forestry researches that address the utilization of lesser-known forest

species could include their use as a resource for NTFP. NEPAP II (1998) is the first policy document to recognize NTFPs as source of income in rural communities. It recommended that community owned land that is suitable for purposes other than forestry be utilized under community management for the production of NTFP resources. It has three main components that includes (1) immediate follow-up to solve problems pertaining to collection, marketing, and related concern, (2) cultivation of MAP and selected NTFPs, (3) development of industries based on MAPs and other NTFPs.

2.3.5 National Planning Commission

Ninth Five Year Plan (1997-2002) of the country has extremely stressed on the alleviation of the poverty. Unless and until, the resources of the country are properly mobilized, in reality, the alleviation of poverty is quite impossible. As part of the plan's overall thrust to reduce poverty, the conservation of environment must be integrated into all sectorial development programs. The Ninth Five Year Plan to increase income and employment opportunities to the people residing in the remote areas through the training and extension activities on collection and cultivation of MAPs and promotion of their processing plants. The plan has intended to conduct inventory of endangered MAPs and research on cultivation of these species in order to conserve them.

In the year 1998/99, National Planning Commission (NPC) formed the Special Area Development Program (SADP) with the objectives of poverty alleviation by sustainable use and proper management of natural resources like MAPs, marginal lands, pasture lands, rearing of beasts and agriculture development. MAPs, one of the major components of SADP, possess enough potentialities for the upliftment of the social and economic status of the country. Herbs Production and Processing Company Ltd (HPPCL) has started programs on MAPs in 25 mountains and remote districts of Nepal.

The Tenth Five Year Plan (2002-2007) emphasized to formulate separate policy for NTFPs conservation and utilization to generate employment opportunities and poverty reduction through cultivation, processing and market management of Jadibuties (MAPs) and NTFPs to actively participate and make benefited to the poor, women and marginalized groups of the nation. The activities of NTFPs and Jadibuties production, collection, processing and sale must be on the basis of liberalism and competitive markets for which, suitable separate policies must be formulated and enforced.

NTFPs and MAPs can earn foreign currency from international markets if competitive markets can be developed by the government. The tenth plan also documented that sustainable supply of the MAPs will be guaranteed after analyzing the national and international demand.

2.3.6 Access to Genetic Resources and Benefit sharing Bill 2008

In order to conserve genetic resources with sustainable use and equitable sharing of benefits arising from such use, and to have equal access and control over the resources HMG/N has prepared and tabled the bill that ensures *sui-generis* system and rights for the protection of Genetic Resources, Traditional knowledge, innovations and practices. It proposes a provision of registering of genetic resources and its derivatives, related knowledge and innovations by individuals, community, organization and country itself.

It is hoped that there will not be the loss of genetic resources including NTFPs and real producers and indigenous local people will get fair benefits of their products, practices and innovations if registered in time. In the mean time, it enables us (Nepal) to be a qualified member of World Trade Organization (WTO) in near future.

2.3.7 Jadibuti and Non-Timber Forest Products' Policy, 2061

In Nepal, Jadibuti and NTFPs cultivation, collection, marketing and utilization have been conducting on the basis traditional methods since time immoral. Although international demand is sufficient, new technologies for value addition of MAPs have not yet been developed. So, the value addition activities, i.e., processing, packaging, etc should be conducted and 'jadibuties' and NTFPs should be managed systematically so that poor farmers can be benefited from the cultivation. Government of Nepal should establish micro and macro-enterprises rely on MAPs. To meet the national goal, i.e. Government has put forward this policy in 2061.

The objectives of the policy is to encourage commercial cultivation of important Jadibuties and NTFPs and national income and job opportunities will be increased through ex-situ conservation. Similarly, Initial processing unit will be set up locally to collect the jadibuties of remote areas. Participatory approach should be incorporated participating local government. Trainings and Skill development centers must be developed. Local markets must be encouraged to reduce poverty. Competition markets if developed, MAPs can contribute to GDP of the nation.

2.3.8 Royalty rate of the focused medicinal plants

Different royalty rates have been assigned to different MAPs. Royalty rate has been reviewed from time to time. The royalty rate of focused Medicinal plants as per the revision in 2062/06/10 is mentioned in table below.

Table 2.1 Royalty rates of major medicinal plants

S.N	Name of MPs	Royalty rate (NRs/Kg)
1	Sugandhawal *(Valeriana jatamansi*)	15
2	Pakhanved (*Bergenia ciliata*)	2
3	Chiraito (*Swertia chirayita*)	15
4	Kurilo (*Asparagus racemos*)	5
5	Yarshagumba (*Cordyceps sinensis*)	10,000

(Source: GON, Forest regulation 2051, Revised in 2062/06/10)

2.3.8.1 Revenue policy:

Currently a royalty is levied on all NTFP collected on public lands for commercial purposes. This policy is primarily used as a mechanism of revenue generation by the government, many districts development committee (DDC), municipalities and village committees also collect fees on NTFP resources transiting through their respective territories. The excessive emphasis on revenue generation is an issue in the NTFP sector of Nepal (Karki, 1995)

2.3.9 Three Year Interim Plan (064/065 – 066/067)

The plan aims at implementing the Jadibuti and NTFP Development Policy, 2061 on the priority basis after critical amendment. The information will be provided to the concerned stakeholders about the essential elements after analyzing their constituents. Similarly, additional knowledge will be provided about the conservation, cultivation, promotion and marketing of Yarshagumba (*Cordyceps sinensis*) and valuable NTFPs. The interim plan has proposed to implement special programs in Seti, Mahakali, Rapti and Karnali Zone declaring those zones as Jadibuti Area. Selection and implementation of Development Programs on the basis of market mapping concept including value chain management, for which private sector, cooperatives and NGOs will be involved actively.

As per the plan, new cultivation technology, research and promotion for six species, program implementation of Jadibuti development at four places of mid and far-western regions,

biodiversity conservation and review of rules and regulations and their implementation will be enforced strictly. Herbs Production and processing Company Limited will be supported to purchase two machines.

Table 2.2 Organizations involved in supportive and legal functions in medicinal and aromatic plants sub-sector in Nepal

Activities	Responsible organizations
Establishing company	Department of cottage and small industries (Under MOICS)
License /Collection permit, Methods	DFO,FUGs
Royalty payment	DFO,CFUGs
Checking and verification of herbs	Rangepost, checkpost
Release order	DFO
Local taxes	DDC
Product verification and export permission	DPR
Import and export	Custom office
Market information	TPC, FNCCI, NGOs, INGOs, Lotus opportunities,
Financial support	ADB, Commercial banks, World bank
Processing	HPPCL, Department of industries, Department of cottage and small industries, Gorkha Ayurved, Dabur Nepal, Other private companies, NGOs
Research and inventory	ANSAB, GTZ-PSP, DPR, DFO, CFUGs, SDC, UNDP, UNEP, ICIMOD, IUCN, SNV, DFID, BDS-MAPs, USAID, Universities, Ayurvedic Hospital, Other NGOs and INGOs

(Source: Subedi,2006)

2.4 Trade, Economy and Market channel of Medicinal Plants

The estimates indicate that NTFPs worth up to US$26.5 million are traded annually from Nepal. The Environment and Forest Enterprise Activity (EFEA) is one of the forestry projects that supports the rural community in NTFP-based small enterprise development in a region of

Nepal from where the annual trade of NTFPs is worth US$4.08 million. Among many, the prioritized NTFPs for enterprise development are Jatamasi *(Nardostachys grandiflora* D.C.*),* Sugandhawal *(Valeriana jatamasi* Jones), Kutki *(Picrorhiza scrophulariflora* Pennell*),* Chiraito (*Swertia chiraita* Roxb. Ex Fleming, Karst*),* Guchchi chyau (*Morchella conica),* Timur (*Zanthoxylum armatum* D.C.*),* Tejpat *(Cinnamomum tamala (*Buch-Ham*),* Riththa (*Sapindus mukorossi* Gaertn*),* Nirmansi (*Delphinium himalayai* Munz*.) and* Sal *(Shorea robusta)*. (Jayaswal, 2001)

Environment and Forestry Enterprise Activity (EFEA) has realized that NTFP-based enterprise development is a feasible as well as a desirable strategy for increasing rural incomes from community forestry. In order to have NTFP-based enterprise development, sustainable community forest management incorporating the conservation and commercial utilization of potential products (NTFPs) is necessary as a pre-condition. (Jayaswal, 2001)

Medicinal Plants from Nepal were traded to the borders to Tibet as early as 600 AD (Sung and Yiming, 1998). Presently, over 90% of the total export every year from Nepal is to India and mostly in crude form (Bhattarai, 1997).

Conservative estimates of the annual Nepalese alpine and sub-alpine medicinal plant vary from 480 to 2500 tons, with a total harvest value of US $ 0. 8 – 3. 3 million (Olsen and Larsen, 2003). *Nardostachys grandiflora, Swertia chirayita, Neopicrorhiza scrophulariiflora, Zanthoxylum armatum and Sapindus mukorosi* are the top five species of NTFPs currently in trade (Olsen, 2005).

Edwards 1996 found that every year 10,000 mt to 15,000 mt of non-timber forest products, representing around 100 species, are harvested from forestland in the middle hills and high mountains of Nepal and traded to India. In Nepal, all products other than timber, fuelwood, and fodder are classified as NTFPs. Among NTFP, the most important category is ‘medicinal and aromatic plants’ that are traded fall roughly into two groups: high value products from high altitudes, and low value products from lower altitudes. The species that grow in the middle hills and high mountains are the main source of the high value NTFPs demanded by Indian markets. A large variety of low value NTFPs come from Siwaliks and Terai. The high altitude products are harvested form government managed forestland. A few important low-altitude products are grown on private land.

Oslen 1997 on commercial non-timber forestry in central Nepal has focused especially on medicinal and aromatic plants (MAPs) of Gorkha district. The research emphasized on i. Analysis of resource base and related issue, ii. Analysis of trade and marketing issues, iii. Analysis of policy and legislation issues, iv. Evaluation of the impact of trade on resource base. According to the study, a number of species that are commercially utilize elsewhere in Nepal are found in the district but are not presently harvested and sold. The main reasons for this appear to be due to, i. lack of communications the species are not known to be valuable, ii. Collectors can not recognize species in the field and iii. The returns of labour are perceived unsatisfactory.

The price received by the collector depended on the length of the market chain and the political context of the market. The marketing channels suggested by Bhattacharya et al., (2003) as follows:

Figure 2.1: Existing marketing channels

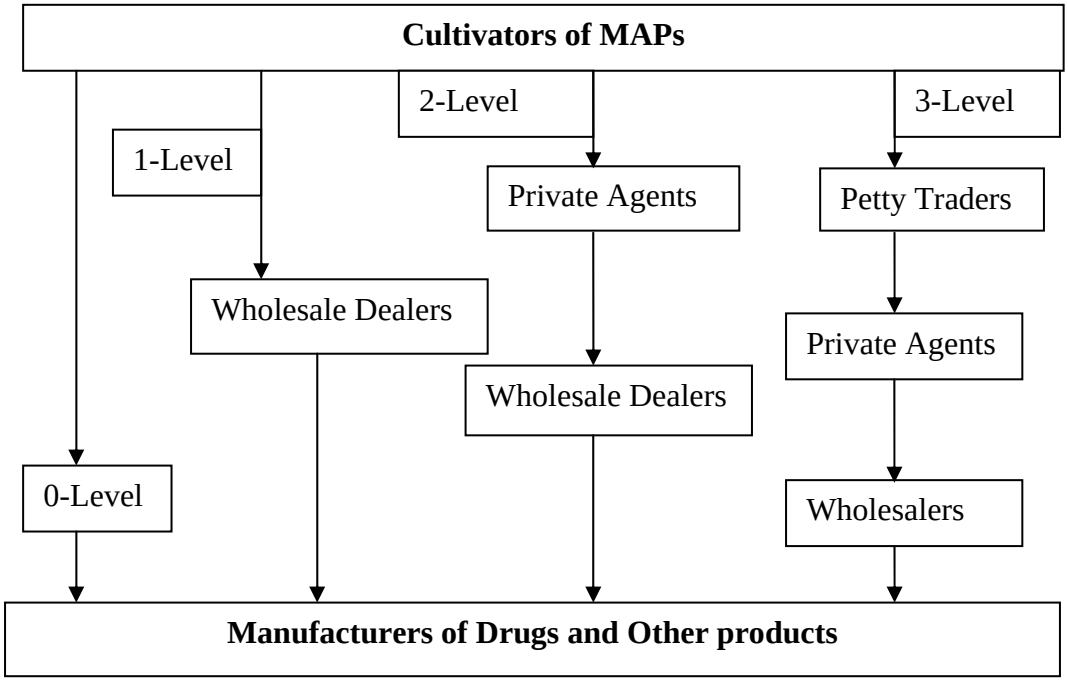


Figure-2.2: The most prevalent channel of MAPs cultivators

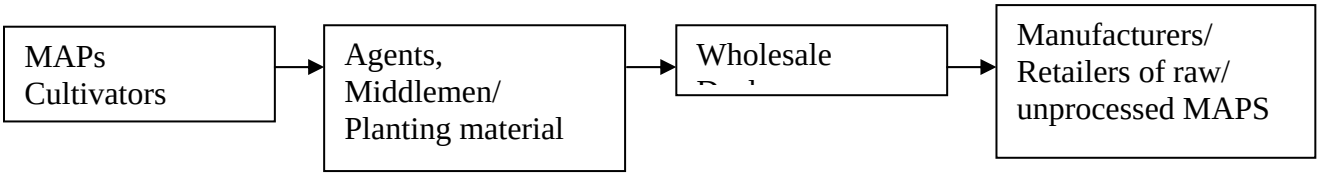
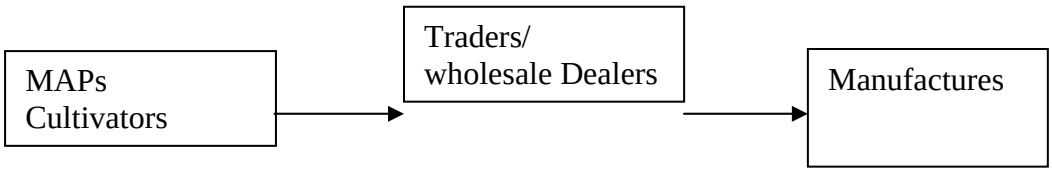


Figure 2.3: Proposed Marketing Channel



In the existing trade channel local collectors harvest the raw materials from national forest lands, carry them back to their houses where they are dried and then either sold to a trader at village or district center. (Subedi, 1998). The principal buyers of Nepal's NTFPs are the Ayurvedic medicine and essential oil industries of India. Seven hundred species listed in the Indian pharmacopeia as being used in traditional medicine are found in Nepal (HMG/N, 1998; cited in Shrestha, 2004). Perhaps 90 percent of NTFPs traded from Nepal are used in Ayurvedic medicine, although this industry is not always the main market (Edwards, 1996).

2.4.1 Markets and marketing systems

Economists use market and marketing for different meaning. Literally, market refers to the purchase and sale transactions of a commodity and the formation of its price and thus to the decisions made by producers and consumers of a commodity which taken together determine the price level of the commodity (Ellis, 1992).

Marketing system refers to the channels through which commodity passes through a sequence of stages or events. Marketing function is the role played market functionaries. Marketing involves basically two types of functions, transmission of price signal between consumers and producers and physical transmission of commodity from points of production by the producers to the points purchase by consumers. Market works in different ways according to number and size of participants, information flow between consumers and producers and physical infrastructures. (Ellis, 1992; cited in Poudel, 2007).

2.4.2 Marketing margin

Market price of a commodity refers to the value of the commodity in terms of money at a point of time and space agreed by buyers and sellers. Marketing functions add costs to the value of commodity to increase the price of commodity. Therefore, commodity price is variable as per variation in time, space and form dimensions. In other words, prices of commodities vary as they pass from producers through different levels of functionary's up to the final consumers. The overall difference between the purchase price of commodity by

consumers and its sale price by producers is called the marketing margin (Ellis 1996). It is the actual amount received by different market functionaries for the services rendered by them (Sindhu, 1997).

2.4.3 Medicinal Plants Trade in Nepal

With all traded MAPs, the viability of collection appears to be function of the walking distance to the market. As the road network pushes further north throughout the country, collection becomes viable from currently less accessible sources. Products with the highest value can be collected from the remotest locations. In Nepal, remoteness is related to altitude. In general medicinal plants fall into two category, high value plants are found in high altitude and low value plants are available in low altitude. The high value medicinal herbs are collected from vast areas of government owned land, used as often and incidental activity for agro-pastoralists alongside the essential job of watching livestock. In other areas collecting forage are discrete activities that can last days of weeks, for example herb collection in the Annapurna region, central Nepal, provides an income for migrant Tamang (Edwards, 1996). In general, there is no management: Plants are uprooted and access to them is open to all. Markets for the high-value products are normally the nearest road head settlement. According to traders in Hill and Basantapur, the most important commodities leaving the Koshi-Hills are Chiraito and large cardamom. Cardamom is traded alongside MAPs throughout East Nepal and share processing and marketing constraints faced by true NTFPs. Excluding cardamom, Chiraito comprises of 75% of the total cash value and 60% of the total volume of trade from Koshi-Hills (Edwards, 1996).

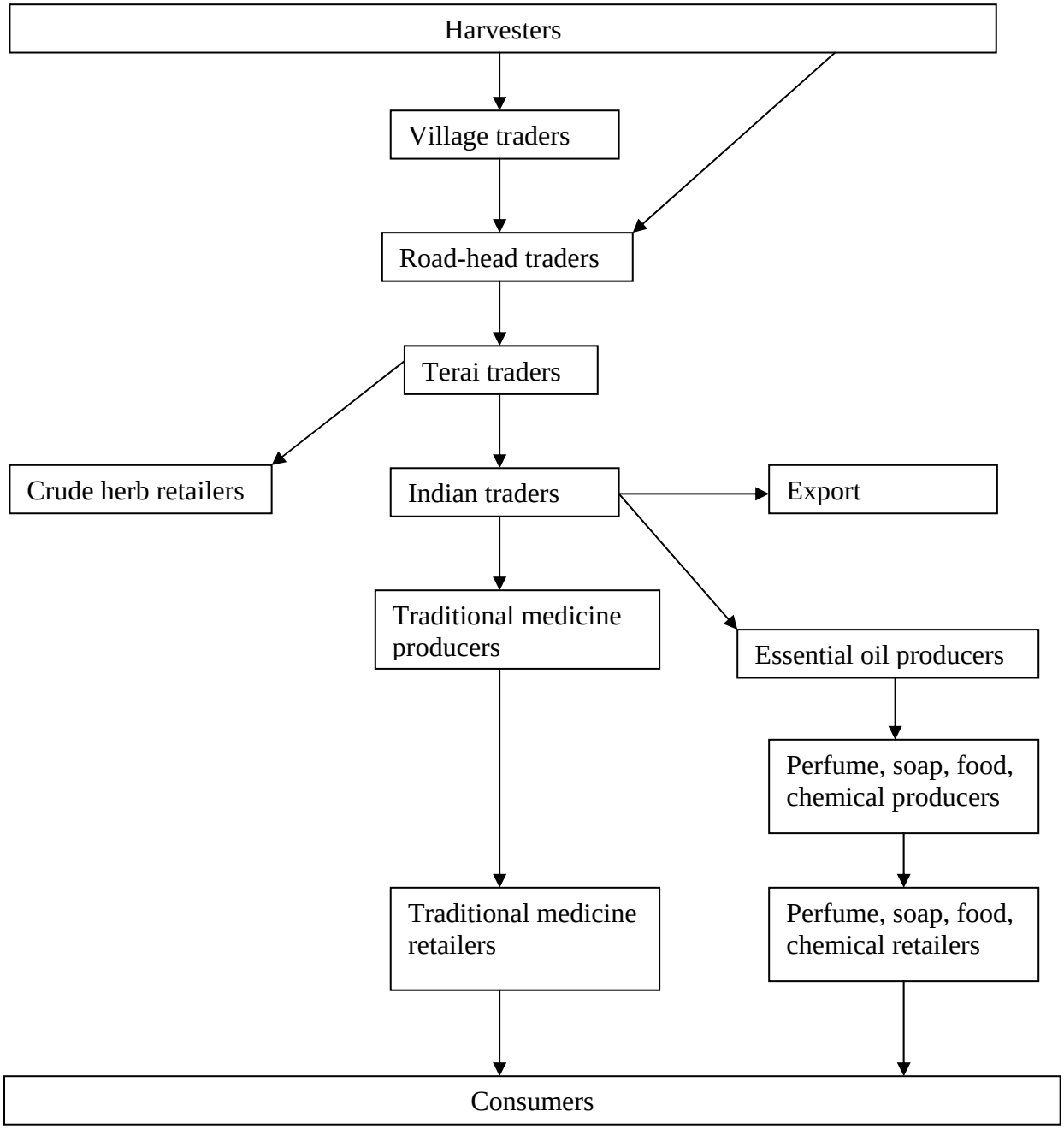
2.4.4 Trade Route of MAPs

The trade route of MAPs throughout the Himalayan region is a flow of raw materials from northern high altitudes to the Indian plains in the South. After the harvest, the NTFPs especially MAPs are ported to collection points on the road system- road heads- where they are loaded on to lorries for transport to India. A limited trade route in MAPs also follows in reverse, from the High Himal of Nepal into Tibet and China. A notable example is Yarsa Gumba, the parasitic fungus of a caterpillar found at high altitudes. (Shrestha, 2004)

In the remote districts of northwest Nepal, the collection points are domestic airstrips: the high value of the products justifies the cost of airfreight to Nepalgunj in the western Terai.

The most important airstrips in the NTFPs trade are probably Simikot (Humla), Dunai (Dolpa), Jomsom (Mustang). Between the source and the markets in India, intermediaries at four levels normally handle the raw materials. Three are based in Nepal-village traders, road head traders and Terai traders. The Terai traders sell the products to the fourth intermediary, the numerous agents and buyers in India. Majority of traders are male (Edwards, 1996 cited in Shrestha, 2004)

Fig 2.4: Levels of intermediary in the trade in MAPs between harvesters and consumers in India



2.5 Problems and Potentials of Medicinal and Aromatic plants

High fluctuations of prices, seasonality, very few established markets, lack of certification and lack of region specific tested cultivation technology are few of the most important lacunae in this trade making the marketing of MAPs a very difficult and uncertain proposition. Even basic grading and cleaning operations tend to be centralized in major Indian cities (Edwards, 1993).

The interpretation of regulations, both national as well as international, for collection and trade of MAPs is controlled by government officials. Even products from community forests and private forests are treated in the same way as wild resources. Thus the prospects of alleviating poverty of people in remote districts of Nepal through best use of their MAPs are overshadowed in the secretive and lucrative trade controlled by transborder buyers and distant companies. Collection permits, bans, and lack of knowledge of law are contributing to increased rent seeking. Royalty payment, taxes and transport permit are not effectively implemented (Subedi, 1999).

Though government has formulated the NTFP policy, rules and regulations to manage and conserve the MAPs, the aims of MAPs management, i.e. income generation, job opportunities, poverty reduction and revenue for nation, have not been achieved yet due to varieties of problems. They are in short policy problems, management problems and implementation level problems of MAPs (Dahal, 2007).

Chapter III

METHODOLOGY

Research method followed the primary sources of data for community scale investigations. Literatures and secondary information are used to address a general scenario of country. Scope of MAPs sub sector is assessed largely based on the literatures and secondary information and stakeholder's consultation. Both the qualitative and quantitative techniques will be applied for data analysis. The methodology used for the study is described below.

3.1 Site selection

Study site was selected in consultations with institutions, DFO staffs and key stakeholders in Community forest user groups of Kavre district, Household survey was selected from the selected community forests user groups.

3.2 Units of study and sampling techniques

Simple random sampling technique was used to collect data. Sampling units were made randomly from selected forest user groups. Respondents were selected from seven forest user groups; so as to include all the categories of people involving in collecting and farming which are economically benefiting, using of traditional medicinal system or those who use in little amount for their home use or those who don't know the importance of medicinal plants or are not interested to be involved in. All together fifty five (55) households were selected for the study.

3.3Primary data

3.3.1 Field survey:

A reconnaissance survey was carried out at different predetermined sites. The most ideal site was selected for the field study, keeping in view that the area is a pocket area for medicinal plants as determined by the DFO.

3.3.2 Household survey and interview

During the field visit household survey was carried out and questionnaire was filled. The household survey was conducted on the basis of random survey and interview was made

through administering questionnaire. Formal and informal interview was made with the key informants like agencies, personnel and traders. (Questionnaires see Annex I)

3.3.3 Focus group discussion

For the purpose of gathering information on medicinal use, status of plant resources discussion was made in participation and cooperation with local people. People of different age groups participated in the discussion

3.3.4 Market appraisal (MA)

Market was appraised to understand trade pattern of medicinal plants marketing practices and flow of medicinal plants through different channels and market centers.

3.3.5 Resource Mapping

Resource mapping was very important part of the study. It was carried out during the group discussion among the local people of study sites. During resource mapping they highlighted the potential area for medicinal plants that was collected for domestic use and for trade. They also highlighted the potential medicinal plant of their area.

3.3.6 Subjective assessment

Observation is useful method to understand local management practices and pattern of these practices. It is used to verify information that is gathered by means of other methodologies. Informal interactions were made with local people during the stay at village and with FUGs.

3.3.7 Consultation with stakeholders

Different key players, institutions and actors were consulted during the study. Stakeholders of the subsector were institutions, collectors, harvesters, processing companies, NGOs and INGOs. The information were used for analyzing the contribution of medicinal plants on economic and market aspects and relevant issues at national level. Stakeholders are consulted for cost and benefit from medicinal plants from a hectare of land.

3.4 Secondary data

3.4.1 Literature review

The study is initiated by reviewing existing literature on medicinal and aromatic plants. Supplementation of the study is made from secondary information whenever required.

Studies of other researchers published and unpublished articles of different people on the subject matter are reviewed. Market information and price spreadsheet of main markets is obtained through publications.

3.5 Data analysis

The data collected from primary and secondary sources were analyzed using both qualitative and quantitative methods. The descriptive statistics such as simple means including the frequencies and percentage are used for analysis of quantitative data but problems, challenges and opportunity of community forests are analyzed and reviewed qualitatively i.e. the information collected from observation, formal and informal discussion in the group and individuals, key informant survey and data obtained from survey were used. Microsoft excels and SPSS are used for data processing. Quantitative analysis is done by descriptive and analytical statistics.

Descriptive statistical tools like frequency, percentage, mean are used to analyze the primary data. Pie chart, graph and tables are used to present data.

To assess the availability or abundance status of medicinal plants either planted or naturally occurred in the farmland, respondents were asked about medicinal plants found in their farmland and place them in order by their abundance first to see which species are most abundant. First prioritized herb is given weight 1 and then 0.8, 0.6, 0.4 and 0.2 to the following prioritization (2nd, 3^{rd}, 4^{th}, 5^{th}) respectively.

Weighted Average Index (WAI) = 1×P1+0.8×P2+0.6×P3+0.4×P4+0.2×P5/ No of respondents

A ladder of scale is used to assess the status of medicinal plants in last 20 years and present status in study area. The ladder comprises of scale varying with numerical from 1 to 10. Ten indicated the possible best condition and similarly 1 indicates the possible worst condition of the resources. Respondent's perception is used to judge this. The main objective is to identify the status of medicinal plants in the last 20 years in the study area.

3.5.1 Preference Ranking of the top four medicinal plants

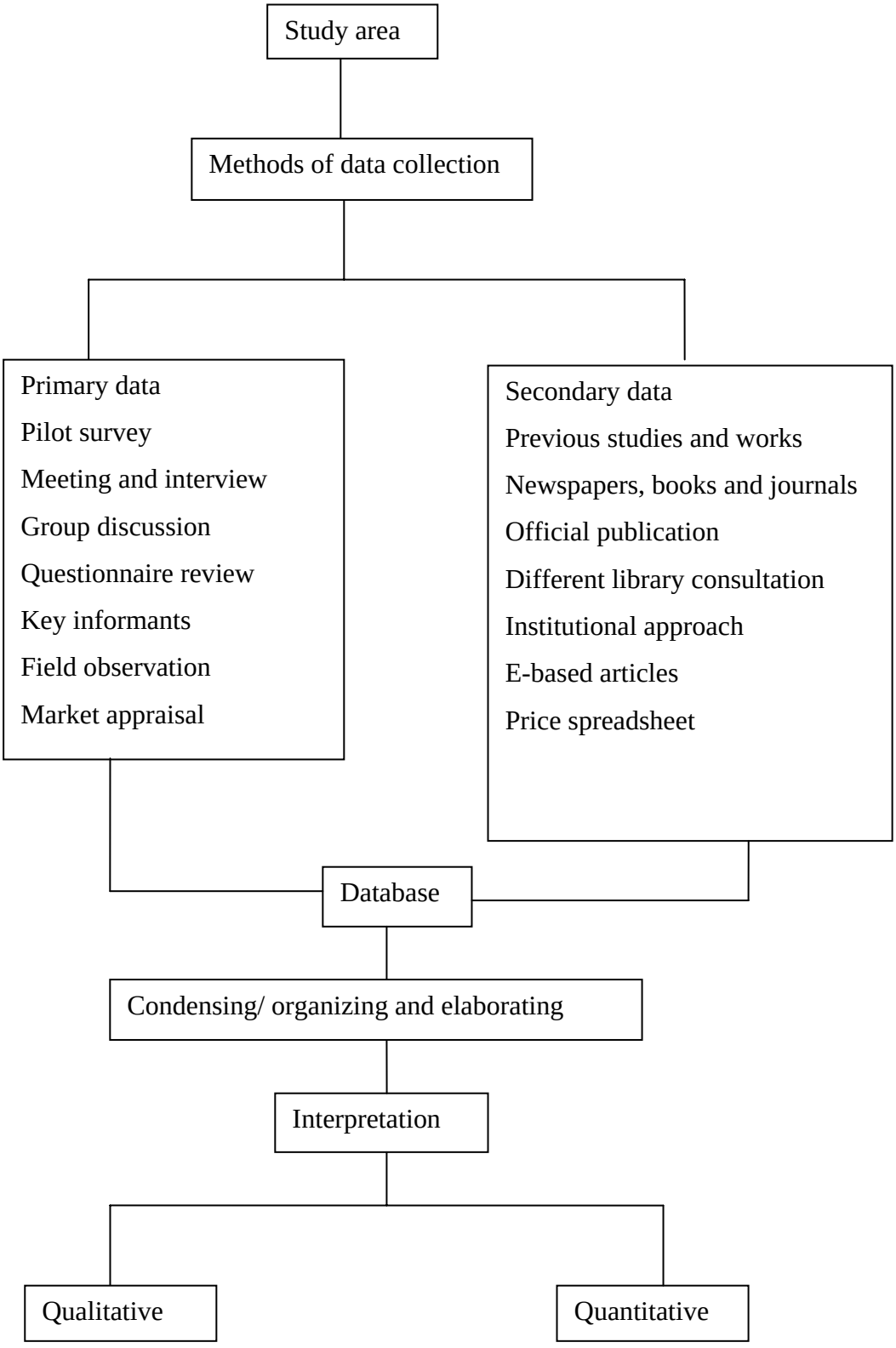
Finding top-four preferred MAPs, 27% of the total respondents HHs were selected randomly on the basis of locally developed criteria such as having been cultivated, acquainted with the commercial value of most of cultivated MAPs.

The species are ranked by developing following criteria. (i) Highly demanded commercial spps (ii) species having high market price (iii) having potential for domestic value addition (iv) species available over wide geographical range (v) species harvestable in short rotation period (vi) Soil fertility requirement for species (vii) species importance in local ethnobotany and (viii) species conservation status. These criteria are set by HNCC (Herbs and NTFPs Coordination Committee) which is common to that of NMPB (National Medicinal Plants Board)

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 MPs was obtained, that was analyzed to find out top four preferred species, which get in overall highest ranks. For this data were put into the SPSS (Version 15) and tested (using Friedman two way analysis of variance) for validation of the ordered lists. To test whether all four medicinal plants are equally important or not, the tabulated and calculated value of test was compared and find out.

3.6 Research design

Figure 3.1: Research design



Chapter IV

RESULTS

Socioeconomic status and status of medicinal plants

4.1 Socioeconomic characteristics

Demographic & Social Aspects

4.1.1 Age group of respondents

The age of the respondents ranges from 22 to 73 years. The average age of respondent was 38 years. Actively involved age group in the MP activities was ranged from 24 to 62 years. About 18% were in the age group 21-30, 51% belonged to 31-40 and 24% were belonged to 41-60 years. The oldest people i.e >60 years were 7% of the total population (table 4.2). Most actively involved age group for economic activities (16-60) years was 50 % in the study area (table 4.2).

Table 4.1 Age group of respondents and population

Respondents		Total population	
Age group	%	Age group	%
21-30	18.18	<10	23
31-40	50.9	11-15	21.50
41-60	23.63	16-60	50.2
>60	7.27	>60	5.30
Average age of respondent 38 years			

Source: field survey 2008

4.1.2 Gender

Percentage of interviewed male respondents during field survey was greater than female i.e. (61.81%). However, percentage of female was higher in the respondent's houses as comparing to total population (table 4.3).

Table 4.2 Distribution of respondents and population by gender

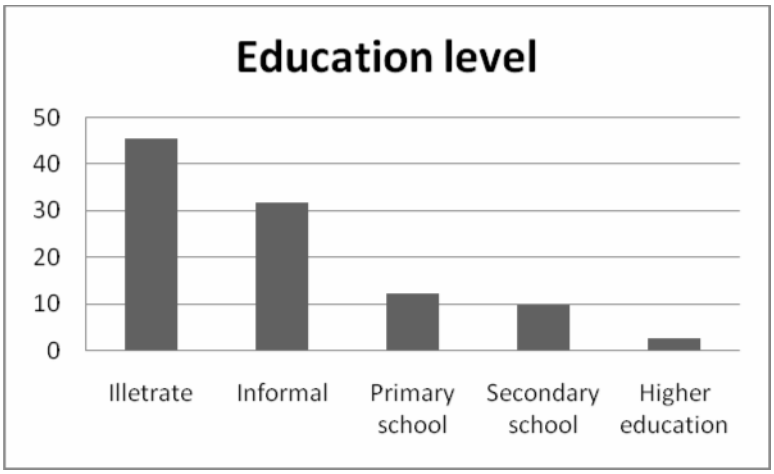
Gender	Respondents No	%	Total population of HHs	%
Male	34	61.81	155	46.96
Female	21	38.19	175	53.04
Total	55	100	330	100

Source: field survey 2008

4.1.3 Educational status

It was found that highest percentage 45.45% was of illiterate having no education. Similarly 31.8%, 12.12%, 9.69%, 2.42% had informal, primary, secondary and higher education respectively.

Fig 4.1 Educational status of the study area

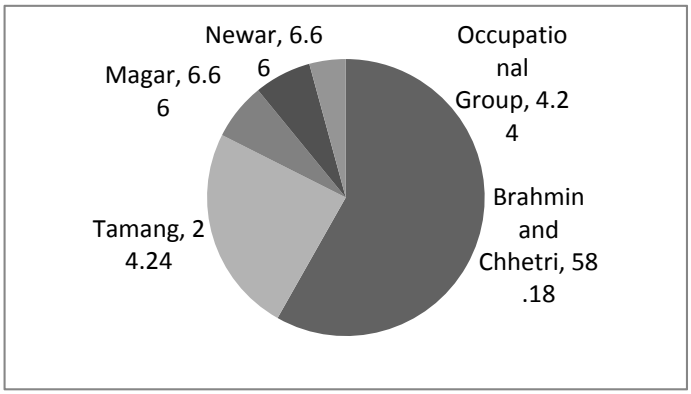


Source: field survey 2008

4.1.4 Ethnic composition

Brahmin and Chhetri were the main users of forest resources in the study area with 58.18%. Other ethnic groups constituted Tamang (24.24 %/), Magar and Newar both 6.66% and Occupational groups (Kami, Damai, Sarki) were 4.24%.

Fig. 4.2 Distribution of Population by ethnic group

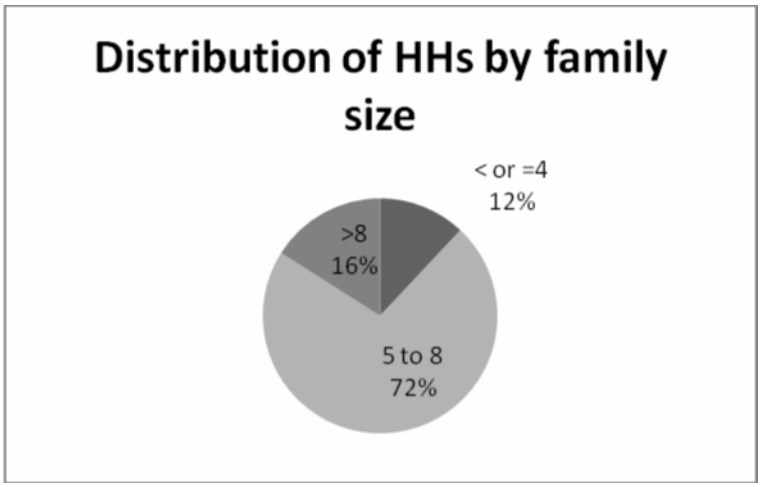


Source: field survey 2008

4.1.5 Household size

The studied area comprises 12% of family size having < or =4 members .Altogether, 72% and 16% of family size having 4-8 and >8 members respectively were found.

Fig 4.3 Distributions of households by family size



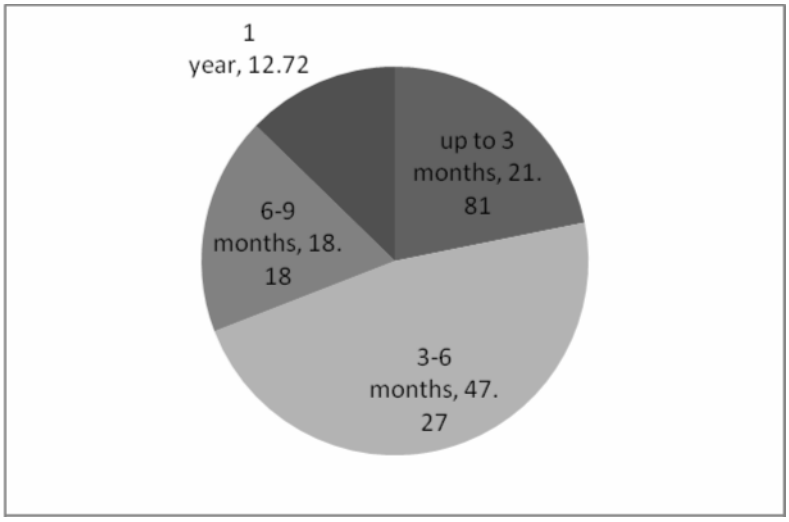
Source: field survey 2008

Economic aspects

4.1.6 Food sufficiency

The total household had been categorized into four groups based on the food sufficiency from their farmland. In total, 21.81 households had sufficient food for 3 months, 47.27% HHs had up to 6 months, 18.18% households for 9 months and 12.72% HHs had secure food for whole year from their farmland.

Fig: 4.4 Households food sufficiency from agriculture in the study area



Source: field survey 2008

4.1.7 Occupation

Among the total population 45.45% were involved in economic activities. Among economically active population 92% were engaged in agriculture and livestock related activities, 4% were involved in business and 13.33% were involved in MPs related activities. About 50% of the people were involved in wage and 10% of the people were involved in other activities like teaching & other private works. Person engaged in agriculture was also found involved in wage related activities. Table 4.4 shows the occupational distribution in study area.

Table 4.3 Occupational distribution in the study area

	Male	%	Female	%	Total	%
HH activities	68	45.33	82	54.66	150	
Activities						
Agriculture and livestock	62	44.92	76	55.07	138	92
Business	4	66.66	2	33.33	6	4
MPs related	10	50	10	50	20	13.33
Wage	40	52.63	36	47.36	76	50
Others	7	46.66	8	53.33	15	10

Source: field survey 2008

4.1.8 Gender involvement in medicinal plants related activities

In total, 13% of active population of the study area was involved in medicinal plant related activities. Women were found involved in collecting MPs for household use. Among economically active male 15% were found involved in MPs activities. Among economically active females 12% were involved in medicinal plant related activities. Those people who were actively involved in MP activities able to provide some economic support to their household economy. Women were working in group for conservation and cultivation of medicinal plants. People were found involved in medicinal plant related activities as a time actions. Table 4.5 shows the gender involvement in medicinal plants related activities.

Table 4.4 Gender involvement in medicinal plants related activities

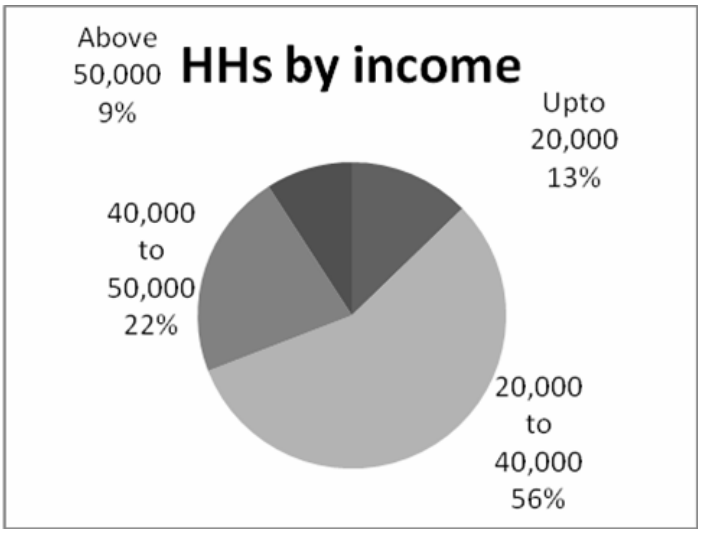
Gender	Involvement in economic activities	Involved in MPs activities %
Male	68	14.7
Female	82	12.19
Total	150	13.33

Source: field survey 2008

4.1.9 Household income

The average gross annual income of the HHs was found NRs 35,330 (US$ 441). In total, 69.08% people had annual earning less than NRs 40,000 (US$500), 12.72% had annual income below NRs 20,000 (US$250). Most of the people (56.36%) had annual income between NRs 20,000-40,000, some 21.81% had between NRs 40,000-50,000 and 9.09% had annual income greater than NRs 50,000. The lowest income recorded for the last year was NRs 19,000 and highest income recorded was NRs 110,000. In general livestock and agriculture largely contributes the household economy added by wage, other services and little from medicinal plants related activities. Fig 4.7 shows the distribution of household income.

Fig 4.5 Distribution of household by income

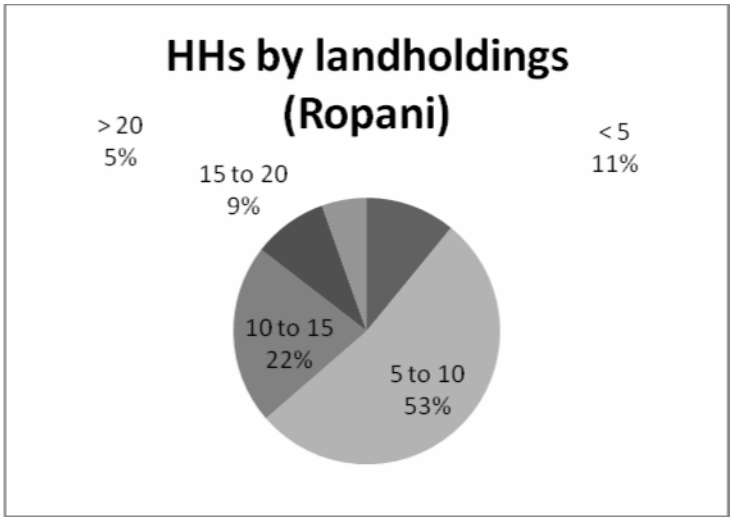


Source: field survey 2008

4.3.10 Land holding

The average land holding size in the study area was 9.37 ropani (1 ropani= 0.05 ha). It ranged from a minimum of 3 ropani to maximum of 26 ropani per household. In the study area, most of the population had 'Pakho bari' (Unirrigated upland). Some 10.9% of the HHs had landholding less than 5 ropani, 52.72% had 5-10 ropani, 21.81 % had 10-15 ropani, 9.09% had 15 to 20 ropani and 5.45% had more than 20 ropani lands. People were also using unregistered marginal land. Landholdings provided the idea of land resource available for domestication of MAPs. Fig 4.8 shows the distribution of landholding size.

Fig 4.6 Distribution of households by landholding size



Source: field survey 2008

4.2 Preferred medicinal plants

4.2.1 Preference Ranking of MAPs in Study Area

Fifteen respondents (27%) selected randomly for face to face questionnaire survey to choose most preferred medicinal and aromatic plants perceived in their choice order as first, second, third and fourth choice were interviewed. Although there were no specific criteria developed, the species were selected as per the locally developed criteria i.e. financial return, easy in cultivation and harvesting and market demand. The following given table will be analyzed to find out the top-four preferred medicinal and aromatic plants among others in the area.

Table 4.5 Preference Ranking of MPs

Respondent serial No.	**Choice order**			
	First	**Second**	**Third**	**Fourth**
1	Pakhanved	Sugandhawal	Thulo okhati	Chiraito
2	Chiraito	Pakhanved	Thulo okhati	Kurilo
3	Sugandhawal	Kurilo	Pakhanved	Thulo okhati
4	Pakhanved	Alaichi	Sugandhawal	Dhasingare
5	Timur	Bojho	Chiraito	Sugandhawal
6	Timur	Chiraito	Sugandhawal	Pakhanved
7	Sugandhawal	Chiraito	Bojho	Pakhanved
8	Bojho	Kurilo	Timur	Sugandhawal
9	Dhasingare	Pakhanved	Alaichi	Sugandhawal
10	Chiraito	Bojho	Kurilo	Timur
11	Thulo okhati	Sugandhawal	Pakhanved	Alaichi
12	Pakhanved	Kurilo	Sugandhawal	Bojho
13	Sugandhawal	Chiraito	Pakhanved	Bojho
14	Pakhanved	Sugandhawal	Kurilo	Chiraito
15	Kurilo	Alaichi	Sugandhawal	Chiraito

The above table has been developed after calculating the marks obtained by pair-wise ranking which was taken with individual respondents. In pair-wise ranking matrix of 9 by 9 was taken for interviewing with individual respondent shown in designed schedule in Annex I.

Table 4.6 Ranking of most preferred medicinal and aromatic plants

Respondent No.	Species								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
1	2	4	-	1	-	3	-	-	-
2	-	1	3	2	-	4	-	-	-
3	1	-	4	3	-	2	-	-	-
4	3	-	-	1	-	-	2	-	4
5	4	3	-	-	1	-	-	2	-
6	3	2	-	4	1	-	-	-	-
7	1	2	-	4	-	-	-	3	-
8	4	-	-	-	3	2	-	1	
9	4	-	-	2	-	-	3	-	1
10	-	1	-	-	4	3	-	2	-
11	2	-	1	3	-	-	4	-	-
12	3	-	-	1	-	2	-	4	-
13	1	2	-	3	-	-	-	4	-
14	2	4	-	1	-	3	-	-	-
15	3	4	-	-	-	1	2	-	-
Total	33	23	8	25	9	20	11	16	5

Table 4.7 Final Ranking of Medicinal and aromatic Plants

Symbol	MAPs	Mean Rank	Final ranking	Test statistics	Remarks
S1	Sugandhawal	6.93	I	N = 15 Chi-square = 24.299 d.f. = 8 Asymp. Sign. = 0.002	Calculated by Friedman Test of Non-parametric test using SPSS version 15
S2	Chiraito	5.73	III		
S3	Thulo okhati	3.93	VIII		
S4	Pakhanved	6.13	II		
S5	Timur	4.13	VII		
S6	Kurilo	5.40	IV		
S7	Alaichi	4.27	VI		
S8	Bojho	4.87	V		
S9	Dhasingare	3.60	IX		

4.2.2 Friedman Test for Preference Ranking

H0: All the medicinal and aromatic plants are equally preferred

H1: All the medicinal and aromatic plants are not equally preferred (There is preference ranking prevalent in the cultivation of medicinal and aromatic plants).

Calculated value of Chi-square = 24.299

The tabulated value of Chi-square at alpha 0.05 and d.f 8 equals to 15.507

Therefore, the calculated value exceeds the tabulated value and the value of Asymp. Significance is also less than 0.05. So the null hypothesis is rejected i.e. all the medicinal and aromatic plants are not equally preferred. Thus, new ranking of table 4.7 is valid which shows, Sugandhawal (*Valeriana jatamansii*), Pakhanved (*Bergenia ciliata*), Chiraito (*Swertia chirayita*) and Kurilo (*Asparagus racemosus*) are preferred as first, second, third and fourth respectively. Those preferred top-four species are further studied for their marketing trend with respect to average price per unit, quantity traded and total income obtained by cultivators and revenue collected by government.

4.3 Status of Medicinal Plants

4.3.1 Status of medicinal plants in Kavrepalanchowk district

In this district, a lot of medicinal plants are found in the mahabharat range and in adjacent areas of midhills. The major medicinal plants found are, Lauth salla (*Taxus wallichiana*),

Sugandhawal (*Valeriana jatamansii*), Chiraito (*Swertia chirayita*), Jatamashi (*Nardostachys grandiflora*), Dashingare (*Gaultheria fragrantissima*), Pakhanved (*Bergenia ciliata*), Kurilo (*Asparagus racemosus*), Jhyau(*Lichen spps*), Padamchal (*Rheum australe*) etc. There are traditional 'vaidays' in different part of district who are using different medicinal herbs as medicine.

4.3.2 Abundance of medicinal plants species in the community forests

Sugandhawal (*Valeriana jatamansii*) had highest weighted average with first rank. Pakhanved (*Bergenia ciliata*), Chiraito (*Swertia chirayita*) and Kurilo (*Asparagus racemosus*) had weighted average index of 0.65, 0.56, and 0.47 respectively with rank as second, third and fourth. Sugandhawal is the most abundant in CFs among five medicinal plants. Bojho (*Acorus calamus*) was in 5th rank with Weighted Average Index (WAI) value 0.23. Table 4.6 shows the WAI.

Table 4.8 Weighted average index of major medicinal plants

MP species	Scientific name	WAI	Rank
Sugandhawal	*Valerina jatamansi*	O.71	I
Pakhanved	*Bergenia ciliata*	0.65	II
Chiraito	*Swertia chiraita*	0.56	III
Kurilo	*Asparagus racemosus*	0.47	IV
Bojho	*Acorus calamus*	0.23	V

Rank 1= most frequent *Rank 5= Least frequent*

4.3.3 Status of medicinal plants in the study area

A trend of resource change over 20 years period was analyzed to come up with an overall scenario of the resource base whether depleted or increased with time. The major MPs found in the study area were Sugandhawal (*Valeriana jatamansii*), Pakhanved (*Bergenia ciliata*), Chiraito (*Swertia chirayita*) and Kurilo (*Asparagus racemosus*). Score 1 was assigned for the worst situation and 10 was assigned for the best situation of the medicinal plants. Status of four species was found some what depleting as compared to 20 yrs situation but it was found improving while comparing with 10 yrs situation. Sugandhawal had the highest score of 7.4 twenty years ago and ten years ago it had 5.3 and present situation was found to be 7.0. Similarly Pakhanved had score of 7.2 twenty years ago, 6.0 ten years ago and 6.13 at present.

Chiraito had score of 6.91 twenty years ago, 5.25 ten years ago and 6.08 at present. Kurilo had score of 6.72 twenty years ago, 4.66 ten years ago and 6.33 at present situation. Overall mean score was 6.92 twenty years ago, 5.30 ten years ago and 6.38 at present.

Table 4.9 Status of medicinal plants in the study area

MPs	Scientific name	Time periods		
		20 years ago	10 years ago	Now
Sugandhawal	*Valerina jatamansi*	7.4	5.3	7.0
Pakhanved	*Bergenia ciliata*	7.2	6.0	6.13
Chiraito	*Swertia chiraita*	6.91	5.25	6.08
Kurilo	*Asparagus racemosus*	6.72	4.66	6.33
Mean score		6.92	5.30	6.38

4.3.4 Reasons of medicinal plants resource fluctuation

Forest area was declined due to deforestation for agriculture land in the past. People in the study area were found to be aware of resource depletion. MPs with high market value such as Chiraito and Kurilo were perceived as the most depleting ones among the MPs species.now due to the conservation of forest area through forest user groups, the status was found to be improving. The status of Kurilo had improved due to its cultivation on the private land. The average condition of the MPs now was in better condition as compare to ten yrs situation. The forest users had many views towards the resource status. The reasons were mostly related to the management, ignorance, environment, economic condition and growing population.

4.3.5 Trend of natural occurrence of MAPs in the cultivated sites

People had noticed the natural occurrence and plantation of some MPs in their farmland. In total, occurrence was observed on 70% of the cultivated sites. Naturally grown species in the sites were Sugandhawal, Pakhanved, Kurilo and Chiraito. They were available mostly in the marginal land and places where agricultural works were seldom.

Table 4.10 Medicinal plants species occurred in the cultivated sites

MPs	Scientific name	Rank
Sugandhawal	*Valerina jatamansi*	II
Pakhanved	*Bergenia ciliata*	III
Chiraito	*Swertia chiraita*	IV
Kurilo	*Asparagus racemosus*	I

Note: Rank I= most frequent, Rank IV= least frequent

Availability of the medicinal plants in the cultivated sites was also found depleting. Some 70 % people told the occurrence of MP in their land was decreased and the rest 30% informed the resource in their private land was as before.

4.3.6 Frequently used medicinal plants in the study area

Forest user groups were found to use MPs for their household purpose. All forest users had no good idea about their use but old aged people had better knowledge of it.

Table 4.11 Currrent use of medicinal plants in the study area

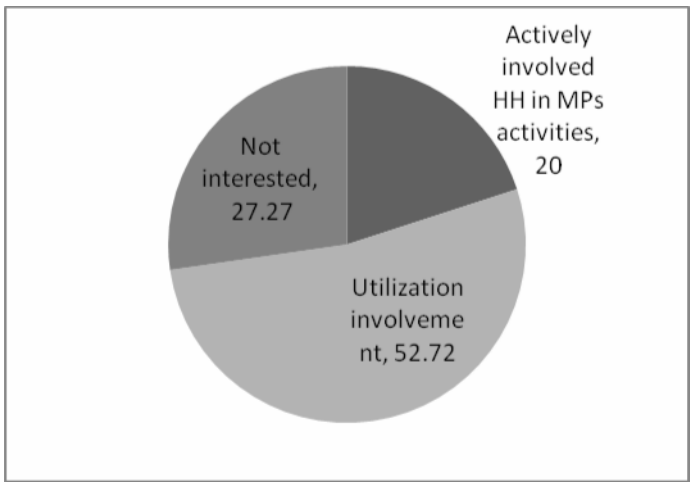
S.No.	Local name	Scientific name	Parts used	Use
1	Sugandhawal	*Valerina jatamansi*	Rhizome	Oil, stomach pain, Diarrhoea
2	Pakhanved	*Bergenia ciliata*	Root	Fever, pulmonary diseases, Burn
3	Chiraito	*Swertia chiraita*	Whole plant	Fever, stomach pain, Body ache, antihelminthes
4	Kurilo	*Asparagus racemosus*	Tuber	Tonic, cooling agent
5	Bojho	*Acorus calamus*	Root stocks	Cough, Sore throat
6	Alaichi	*Amomum subulatum*	Fruit	Spices, Stomach pain
7	Timur	*Zanthoxylum armatum*	Fruit	Toothache, spices
8	Thulo okhati	*Astilbe rivularis*	Root	Pregnancy, diarrhoea
9	Dhasingare	*Gaultheria fragrantissima*	Leaves	Stomach pain, Gastric, fever, ointment

4.3.7 Collection of major medicinal plants

Classification of respondents

Actively involved Households in the medicinal plants related activities were found to be 20%. Households using medicinal plants only for household use were found to be 43.63%. Some of the respondents did not have idea about medicinal plants and did not involved in any medicinal plants activities were found to be 36.36%. Households' involvement in medicinal plants activities is shown in fig 4.2

Fig: 4.7 Distribution of respondents by their involvement in medicinal plants activities



(Source: Field survey 2008)

Collection for HH purpose

Some 72% of the respondents' populations were involved in the collection of either of the major medicinal plants for house hold purpose. Some 53.84% are involved in the collection of Pakhanved for HH purpose, 46.15% collect Sugandhawal, 38.46% collect Chiraito and 17.94% collect kurilo. The collections are not exclusive of nature.

Table 4.12 Medicinal plant collection for household purpose

MPs	Scientific name	Yes%	No%
MP collection		72	28
Sugandhawal	*Valerina jatamansi*	46.15	53.85
Pakhanved	*Bergenia ciliata*	53.84	46.16
Chiraito	*Swertia chiraita*	38.46	61.54
Kurilo	*Asparagus racemosus*	17.94	82.06

Collection source:

All were found to collect medicinal plants from community forest, of them some collected from private land too. About 28% of the active respondents collected Sugandhawal from private lands also. Some 27.58% of the active respondent had also collected Pakhanved from their land. Similarly about 19.04% of the active respondent had collected Chiraito and 20% of the active respondent had collected Kurilo from private land.

Table 4.13 Source of collection of medicinal plants

MPs	Scientific name	CF only	Private land only	Both	% of both
Sugandhawal	*Valerina jatamansi*	29	-	8	27.58
Pakhanved	*Bergenia ciliata*	25	-	7	28
Chiraito	*Swertia chiraita*	21	-	4	19.04
Kurilo	*Asparagus racemosus*	10	-	2	20

4.3.8 Amount of collection of the medicinal plants

Most of the people of the CFs were found to collect the medicinal plants in little amount. Some 39.13% of the Pakhanved collectors collected in trace amount. About 43.47% collected in little amount and remaining 17.39% collected in significant amount. Some 36% of the Sugandhawal collectors collected it in trace amount. About 48% collected in little amount and remaining 16% collected in significant amount. Some 33.33% of the Chiraito collectors collected it in trace amount. About 54.16% collected in little amount and 12.5% collected in significant amount. Similarly 80% collectors of the Kurilo collected it in little amount and remaining 20% collected it in significant amount.

Table 4.14 Quantity of medicinal plants collected in year 2007/08

MPs	Scientific name	Trace%	Little %	Significant%
Sugandhawal	*Valerina jatamansi*	36	48	16
Pakhanved	*Bergenia ciliata*	39.13	43.47	17.39
Chiraito	*Swertia chiraita*	33.33	54.16	12.5
Kurilo	*Asparagus racemosus*	-	80	20

Note: Trace: up to 1 kg, little: up to 10 kg, Significant: more than 10 kg

Season of collection

From the questionnaire survey, the seasons of collection for the MPs species were found to be same for all forest user groups. Collecting season of the MPs is presented in the table below.

Table 4.15 Collecting season of medicinal plants

MPs	Scientific name	Collecting season
Sugandhawal	*Valerina jatamansi*	Oct-Jan
Pakhanved	*Bergenia ciliata*	Oct-Nov
Chiraito	*Swertia chiraita*	Oct-Apr
Kurilo	*Asparagus racemosus*	Dec-Feb

Purpose of collection

MPs were collected mostly for the domestic use, marketing was not well practiced, some practiced in barter system i.e. exchange with crops rather than selling them. Few were involved in the marketing of MPs.

Table 4.16 Purpose of collection of Medicinal plants

MPs	Scientific name	Purpose	
		Domestic (HH)	Domestic and Marketing
Sugandhawal	*Valerina jatamansi*	20	3
Pakhanved	*Bergenia ciliata*	18	7
Chiraito	*Swertia chiraita*	15	9
Kurilo	*Asparagus racemosus*	9	2

4.3.9 Knowledge on propagation, collection and processing

About 95% of the respondents don't know about producing seeds of MPs themselves. However about 58.18% of the respondents have little idea how the MPs propagate. Only 36.36% know propagation from the forest, of them 19% know of propagation from nursery.

Forest user groups know the stage of collection of the MPs but some people were found to collect them before the maturity. Only 20% of the respondents were involved in trading either

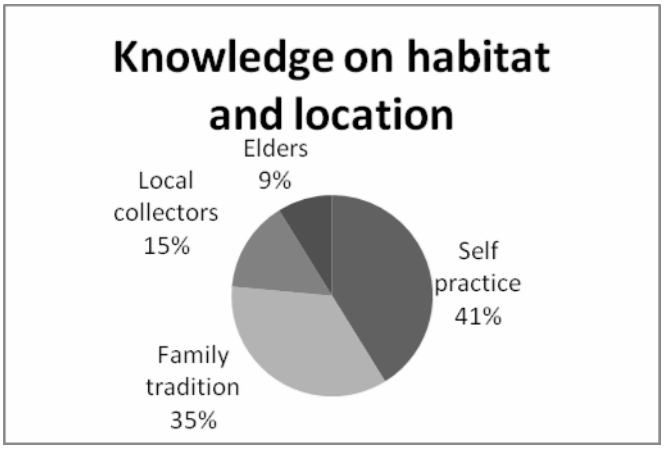
in small or bulk quantity. They processed MPs before marketing. They are dried and reduced in volume. For the kurilo, it was cleaned, boiled and dried before trading. The middleman does not take unprocessed MPs so they need to do it.

4.4 Roles, access to and control over MP resources and associated traditional knowledge of men and women

4.4.1 Knowledge of its habitat and location

About 41.17% of the respondents have knowledge from self practice. Some 35.29% have knowledge from family tradition. Similarly, 14.70% have known from local collectors and rest 8.82% have known about its habitat and location from their elders.

Fig 4.8 Knowledge on habitat and location

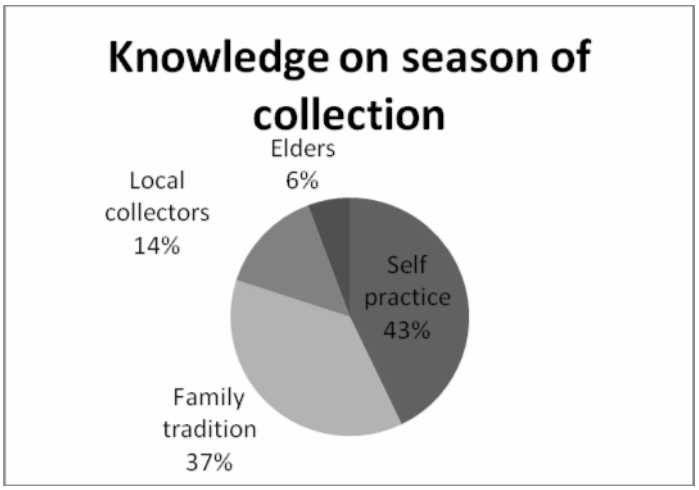


Source: field survey 2008

4.4.2 Knowledge on season of collection

Different people have known about season of collection from different sources. Some 42.85% (both men and women) have known from self practice. About 37.14% have known from family tradition. Similarly, 14.28% have known from local collectors and 5.71% have known from their elders.

Fig 4.9 Knowledge on season of collection

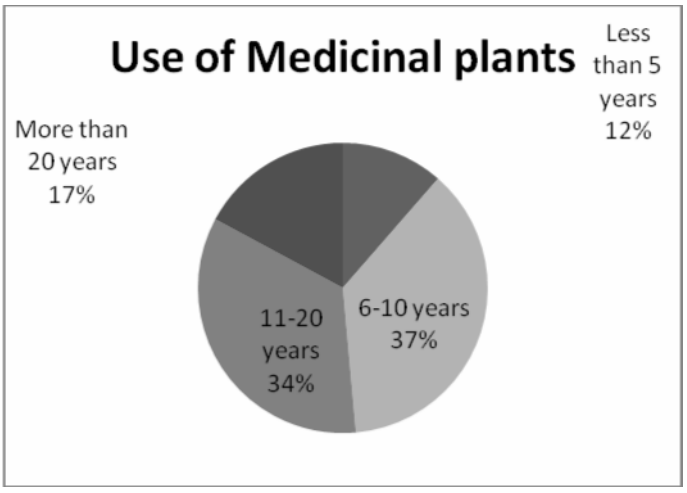


Source: field survey 2008

4.4.3 Use of Medicinal plants

From the field survey, about use of MPs 11.42% respondent were using for less than five years. Some 37.14% were using between 6-10 years. About 34.28% were using for 11-20 years and 17.14% were using for more than 20 years.

Fig 4.10 Use of medicinal plants

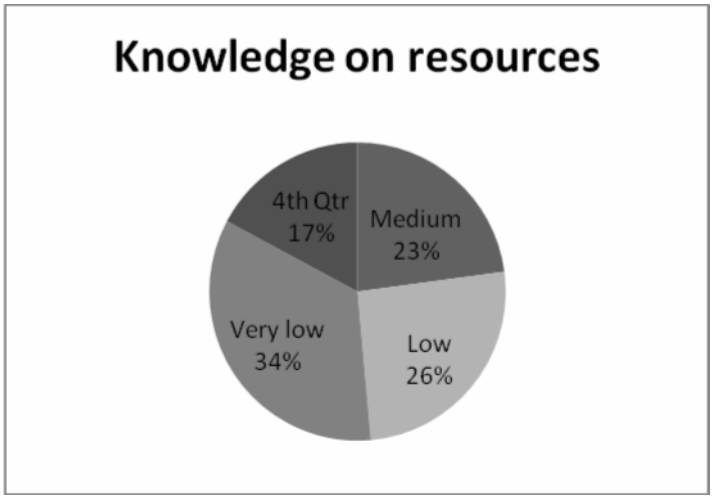


Source: field survey 2008

4.4.4 Knowledge on the MPs resource

The respondents have different knowledge on these resources. Twenty three percent of the respondents have Medium knowledge. About 25.71% have medium level of knowledge, 34.28% have very low knowledge and 17.14% have no knowledge about the resources.

Fig 4.11 Knowledge on resources



Source: field survey 2008

About the knowledge on MPs resource verses respondents age, some 51.42% were older men and women, about 37.14% were middle aged men and women and 11.42% were young male and female.

Regarding the resource at community level at present, in the study area, community makes decision. The people have noticed certain change due to these resources on their livelihood like economic benefit and medicines. About the use of its parts, processing and final medicinal plants; they have different knowledge. Some have known from self practice, some from elders. Since only few are known of this, percentage on individual can't be shown. About 20% respondent said that woman have more exercise in terms of labor contribution, its final use over this resource.

4.5 Household economy and market system of medicinal plants

4.5.1 Income from medicinal plants

Only 20% of the respondents were able to generate income by selling medicinal plants. The highest income from Sugandhawal (*Valeriana jatamansii*) was found to be Rs 4000 by selling 50 kg and lowest income was Rs 800 by selling 10 kg. The lowest income from

Pakhanved (*Bergenia ciliata*) was found to be NRs 300 by selling 10 kg and the highest price was found to be 2450 by selling 90 kg. Some of the respondent were found selling Chiraito (*Swertia chirayita*). The lowest income from chiraito was found to be Rs 500 by selling 3 kg and highest was found to be 9100 by selling 70 kg. Single respondent was found trading Kurilo (*Asparagus racemosus*), he sold 30 kg at Rs 4000. Average income of the person involved in medicinal activities from major medicinal plants is presented in table.

Table 4.17 Average income of the person involved in medicinal plants activities

Species	Scientific name	Avg. income/person
Sugandhawal	*Valerina jatamansi*	3000
Pakhanved	*Bergenia ciliata*	1855
Chiraito	*Swertia chiraita*	4000
Kurilo	*Asparagus racemosus*	2500
Total		11355

Most of the people were not involved in the cultivation and trade of medicinal plants. The experience of the collector showed that if people were actively involved in the collection of MPs then they might earn Rs 11355 per year. This would be 32% of the average household income (Rs 35330). However this is an assumption; this amount might be reduced if there is competition in the collection of MPs or might be increased if cultivated on private land.

Table 4.18 Distribution of income from medicinal plants with respect to overall income of the economically active households in medicinal plants activities

Species	Scientific name	%
Sugandhawal	*Valerina jatamansi*	15
Pakhanved	*Bergenia ciliata*	3.3
Chiraito	*Swertia chiraita*	8.6
Kurilo	*Asparagus racemosus*	5.4
Average		6.4

On an average, of the respondent involved in the collection and trade of medicinal plants, of their total income only 6.4% was contributed by Medicinal plants. People in the study area were not actively involved in the medicinal plants activity.

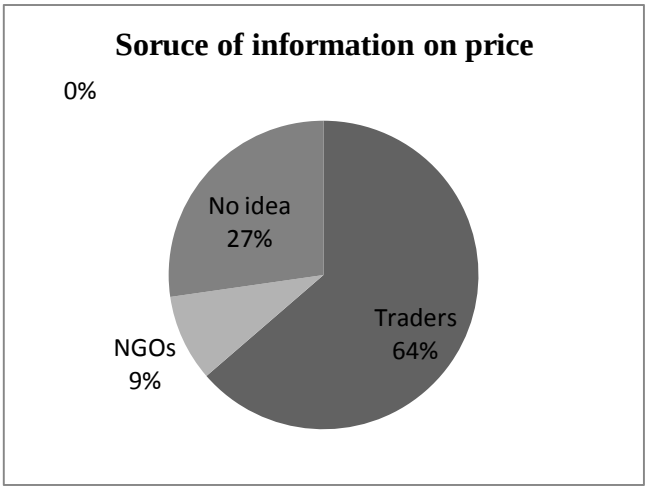
4.5.2 Knowledge on marketing

Trade on these species was found to be occurred in the past. Ambiguous market, price and lack of technical knowledge on propagation of MPs have discouraged the economic activity of these herbs. All of the respondents do not know the final price of medicinal plants they sold. Only few respondents knew where the MPs finally reach, otherwise respondents do not know the destination of their product. Respondents also do not know the final consumer of the product. These factors might be the reasons of being economically passive towards the medicinal plant activities.

Source of information

Some 63.63% knew the current market price from the traders, 9.09% knew current price from NGOs and 27.27% didn't respond to the question.

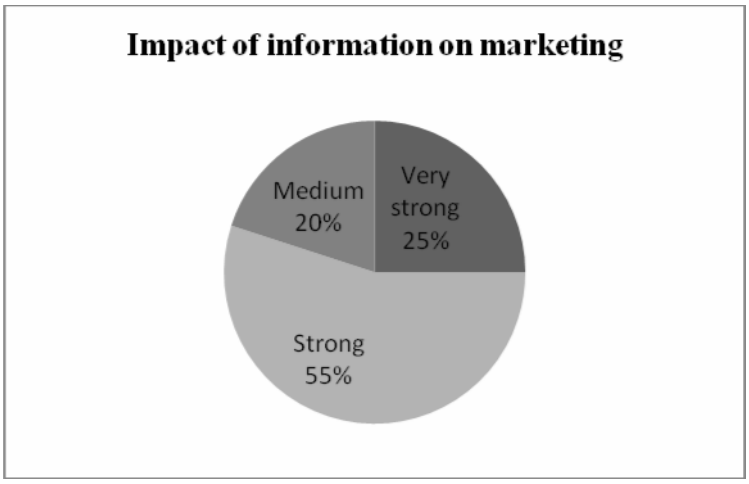
Fig 4.12 Source of information on price



Impact of information on marketing

Only 25% of the respondents believed information on marketing have very influence on marketing margin, 55% believed strong influence on marketing margin and rest 20% believed medium influence on marketing margin.

Fig: 4.13 Impact of information on marketing



On the multiple choice question for the domestication of medicinal plants in the farmland, 41.6% chose domestication was possible through the community forest user group. Some 25% believed cooperatives could motivate for domestication and 8.33% believed from local level enterprise and 25% give different opinions such as improved marketing and technical knowledge would help in domestication.

4.5.3 Marketing system of the medicinal plants

According to DFO staffs, for the collection of the MPs collector needed to get prior approval from district forest office. These collectors were allowed to trade these herbs after the legal procedure. However, DFO staffs accepted the unclear channel of the medicinal plants. During the field survey, collectors were identified as the local villagers paid by middleman residing the same district or nearby area. Local traders were the small businessman residing village and national trader were the businessman in Banepa, Kathmandu and herbal processing companies.

Fig 4.14 Flow chart of existing market channel of medicinal plants in Kavrepalanchowk district

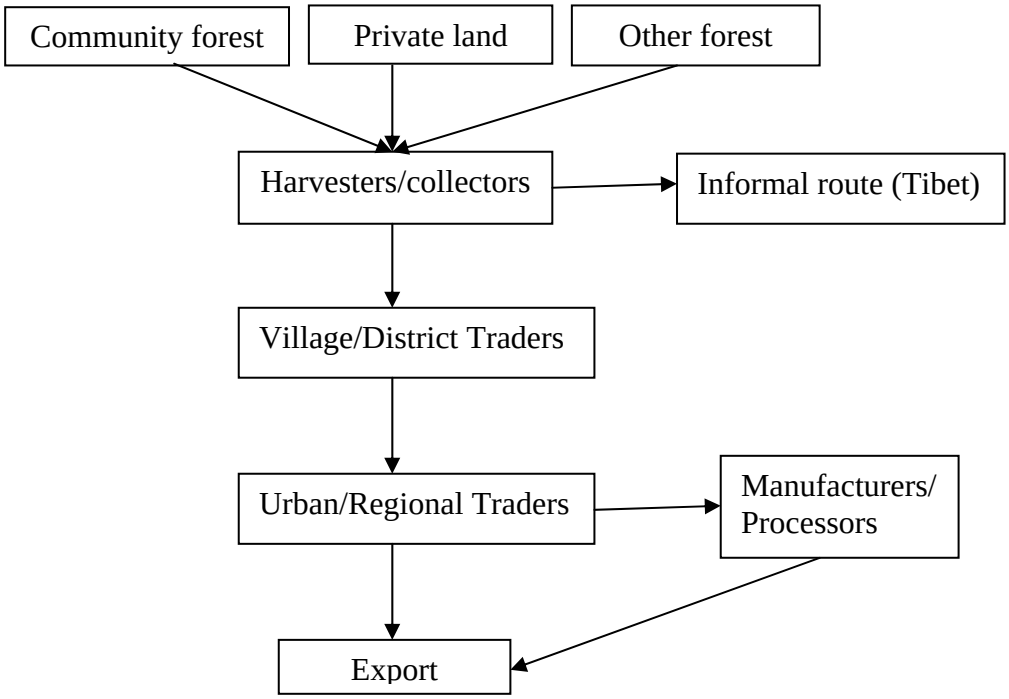


Fig 4.15 Flow chart of existing market channel of medicinal plants based on CFs

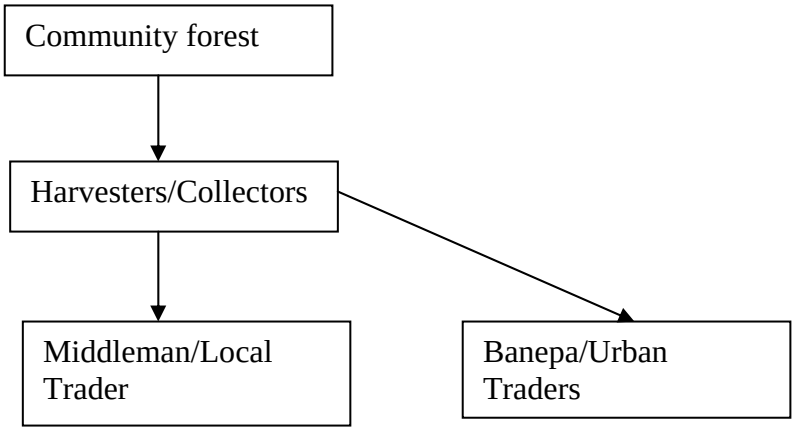


Table 4.19 Price of medicinal plants at different level of trade (Costs/Kg NRs)

MPs	Trade level Collector	Village traders	Urban traders
Pakhanved	15-25	25-30	30-40
Chiraito	70-100	125-150	200-225
Kurilo	50-80	150-175	300-340
Sugandhawal	70-90	150-175	200-220

4.6 Problems and prospects

In the community forest of the study area, people were unaware on the importance of MPs. Lack of education and marketing infrastructures might be the reasons behind it. People had very little institutional support. People did not know how much resource they got for harvesting. They do not have sound knowledge on harvesting techniques causing the resource depletion. Domestication of MAPs had not been widely practiced due to lack of knowledge and technology. Benefit sharing among the stakeholders was not well established, middleman and big businessman were found to manipulate the harvesters. Well established marketing system was lacking thus farmers were not motivated towards the medicinal plants related activities. People were not able to get any motivating source for doing any activities in medicinal plants. There was a gap between the FUGs and line agencies.

There were definitely some problems, but there would be a lot of beneficial prospects from MPs related activities. An overcome on the problems and challenges faced by the community would help in biodiversity conservation. Poor degraded and wasteland can be utilized for the cultivation of medicinal plants as medicinal products. Enterprise oriented activities on medicinal plants would support medicinal system and also increase the household economy of the people.

4.7 Strength, weakness, opportunity and threats (SWOT) analysis

On the basis of field survey, observation and group discussion; strength, weakness, opportunities and threats of medicinal plants sub sector was assessed and presented below.

Strengths

- Availability of resources in CFs and natural forests
- Local NGOs and INGOs are initiating for market linkage
- Availability of labor force at low cost
- Some species like Chiraito and Sugandhawal are domesticated
- Waste land can be improved through medicinal plant plantation.
- Global acceptance of Ayurveda system of medicine

Weakness

- Lack of knowledge on MAPs
- Lack of reliable market

- Poor resource identification
- Absence of enterprise oriented activities
- Most people uneducated
- Small landholding size
- No specific legal support to deal with offences related to MPs
- Lack of financial support, lack of transparency in collection and trade
- Trade is unorganized, controlled by informal sector, custodian has no material stake

Opportunities

- Employment
- Helps in household income
- Middleman helping in trade
- Market is easier i.e. Banepa and Kathmandu

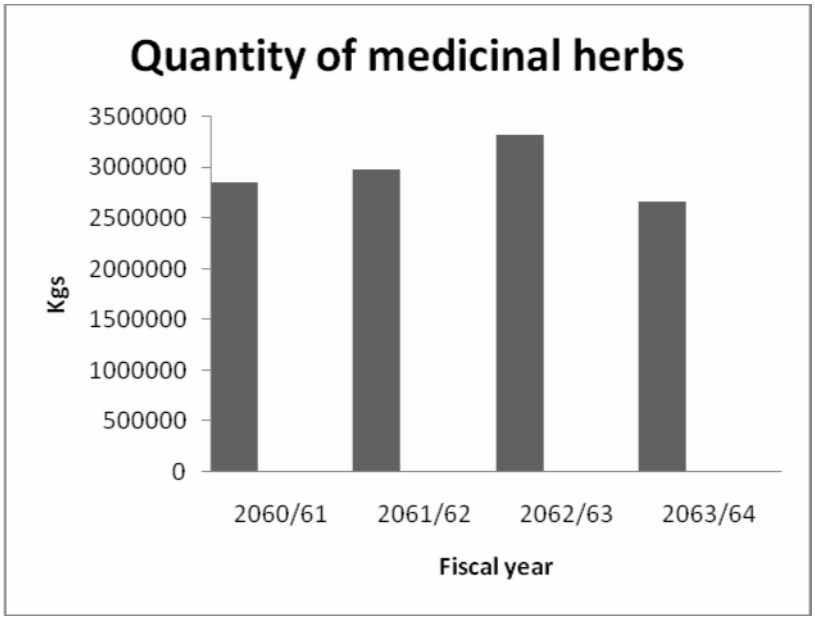
Threats

- Resource degradation
- Competition leads to threat to habitat
- Loss of traditional knowledge and bio- piracy
- Local people will be manipulated
- No specific measures for rehabilitation

4.8 Contribution to national economy from focused herbs

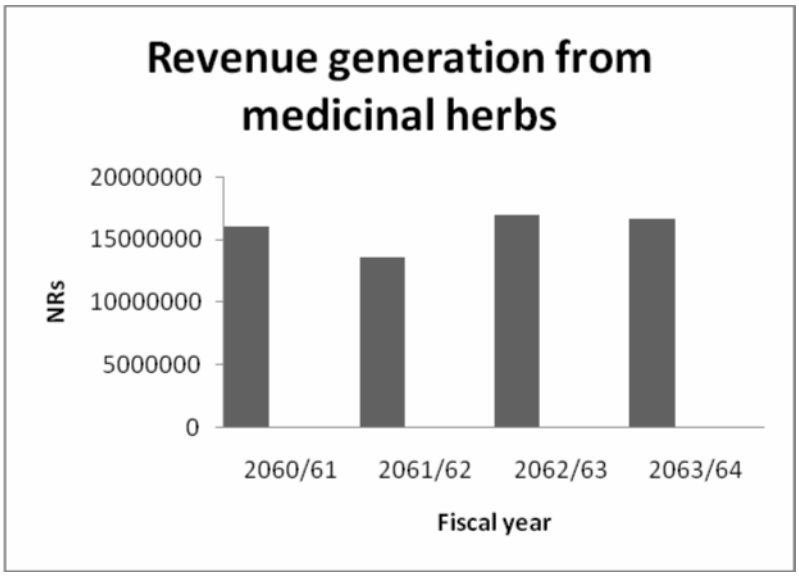
Nepal had been receiving economic benefit from the focused herbs and medicinal plants. Country was found to receive income from royalty. Although the country is not able to get full economic benefit, the amount is going to different level of market actors in different proportion. Another benefit to the country found was the rural, uneducated, unskilled and semi-skilled people are involved in economic activity.

Fig. 4.16 Distribution by quantity



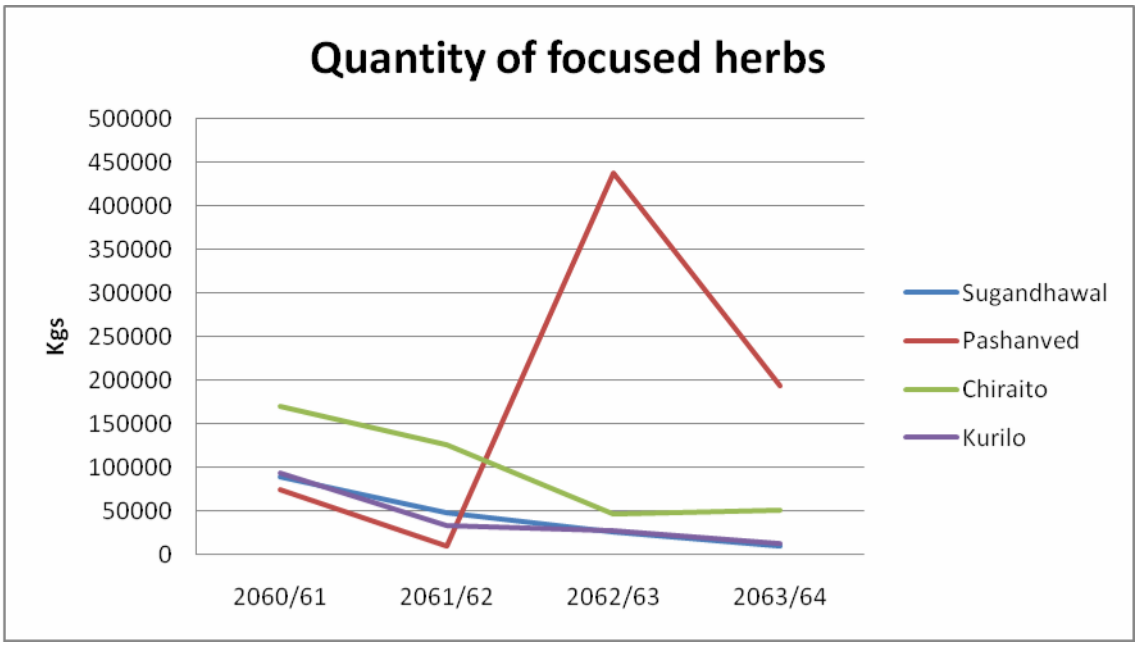
The quantity of medicinal herbs was found to be highest in the fiscal year 2062/63 while comparing four years data with 3325670.5 kgs and lowest in the year 2063/64 with 2663907.1 kgs . The detail of data is presented in table in annex II.

Fig. 4.17 Distribution by revenue



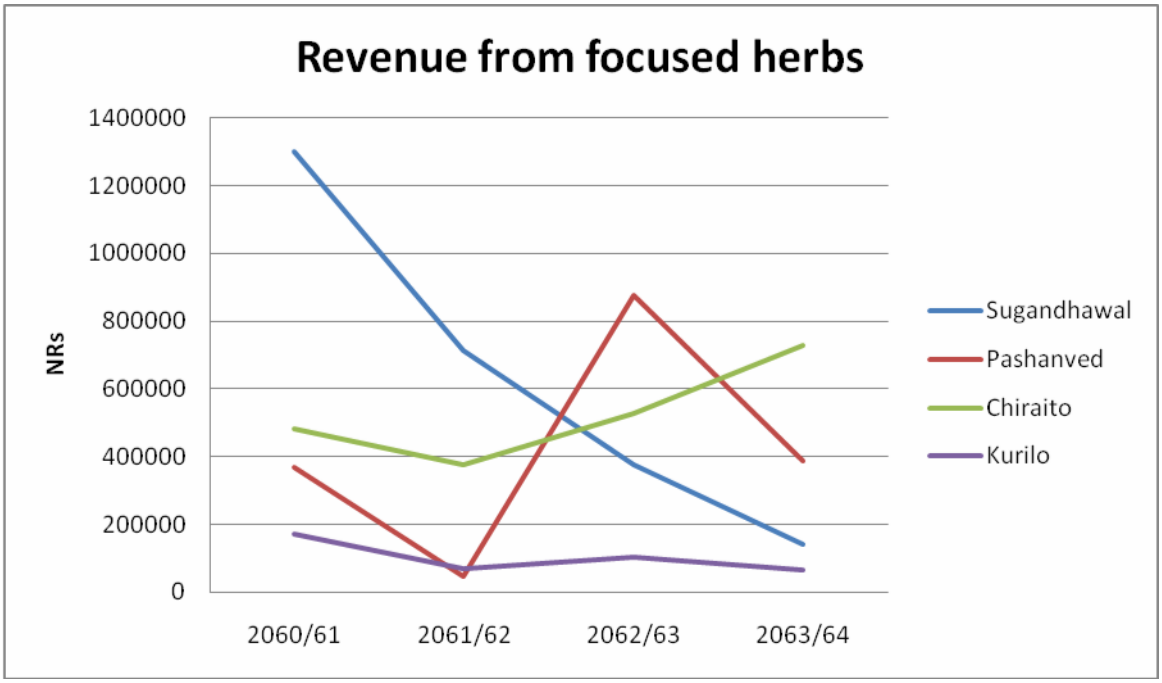
The revenue generated from the medicinal herbs was found to be highest in the fiscal year 2062/63 with NRs 16987046 and lowest in the year 2061/62 with NRs13551200. The detail of the revenue is presented in annex II.

Fig. 4.18 Quantity of focused herbs in different fiscal year



The quantity of Pakhanved traded was highest in the year 2062/63 and lowest in the year 2061/62, quantity of Sugandhawal and Kurilo was highest in the year 2060/61 and lowest in the year 2063/64, quantity of Chiraito was highest in the year 2060/61 and lowest in the year 2062/63. The detail of data is presented in the annex II.

Fig. 4.19 Revenue of focused herbs in different fiscal year



The revenue collected from the trade of sugandhawal was found to be highest in the year 2060/61 and lowest in the year 2063/64, from trade of Pakhanved was highest in the year 2062/63 and lowest in the year 2061/62, from trade of Chiraito was highest in the year 2063/64 and lowest in the year 2061/62 and from trade of Kurilo was highest in the year2060/61 and lowest in the year 2063/64. The detail of data is shown in annex II.

4.9 Cost and benefit on farming

Cost and benefit Analysis is an important aspect for assessing the potentiality of any MAPs for cultivation in private land. Chiraito (*Swertia Chirayita*), Kurilo (*Asparagus racemosus*), Timur (*Zanthoxylum armatum)* were presently cultivated in FUGs and herbal farms in Nepal. Cultivation on MPs seemed to be beneficial. Benefit varied according to the type of land and labor price available. These cost and benefit was analyzed assuming the land to be suitable for the focused herbs and the labor price to be fixed as average price seen in the community level. The price obtained was based on the field observation and information obtained from market actors and technical personals and NGOs and INGOs. Cost and benefit of planting of focused herb is presented in the annex II.

4.10 Opportunities for competitiveness of MAPs sub-sector

MAPs sub-sector was not able to enjoy full economic benefit. Producers were not able to generate a good benefit from their products that moves through an economic channel to final consumers. This situation was due to lack of information and less competition in the market place. In order to increase income, a fair competition was realized to be encouraged. Some of the opportunities to boost the competitiveness are as below:

- Value added processing and sale of MAPs
- Cost and benefit analysis, knowledge on processing, productivity and information are easily obtained.
- Different traders are involved in the system. The system is gradually shifting towards modern and scientific rather than traditional trading and monopoly market.
- Growth of media and information technology can be a good means to increase awareness and competitiveness of the products.
- Various actors are involved in the product flow chain thus ensuring income generating activities to the unskilled and semi-skilled people.

- Accession to international market through WTO, a new opportunity to compete with international market.
- Opportunity to patent the product, further safeguarding the quality and place in international market.
- Foreign investment policy opens the door to invest in herbal sector to ensure international standard herbal products, medicines and cosmetics.

4.11 Constraints of MAPs sub-sector

MAPs sub-sector has many constraints. Although this subsector has potential for improvement some constraints however pose problems to achieve this. These constraints are briefly outlined below.

Table: 4.20 Constraints of MAPs sub-sector and its economic implication

Constraints	Implication
-Unscientific royalty rates	-Trading cost is high
-Procedural time to obtain leaving note (15-21 days)	-Legal channel of trade is scarce
-No property right	-Access to resource is random
-Intellectual property rights (IPR) on innovation herbs is not fully realized due to lack of appropriate law.	-Competition with global market is difficult
-Banned on collection and or export without processing	-Legal route is difficult
-Collection permit required	-Big traders manipulate harvesters
-Lack of technology and market information	-Resource degradation and no good price to collectors
-Hidden and secret nature of business	-Decrease in royalty, discourage for collectors
-Various check post, 38 check post from Kakadbhitta to Nepalgunj, 6 in Nepalgunj itself.	-Informal amount needed to be expanded; consumer has to pay high for final product

Chapter V
DISCUSSION

5.1 Status of Medicinal Plants in Kavrepalanchowk district

Due to conservation of forests through the efforts of user groups' i.e CFUGs, the status of forests in the district has been improved. The topographical and climatic variation has made a good niche on the distribution pattern of availability of MAPs in the area. So the area has opportunity for economic gains from MAPs. Since the area is adjacent to Kathmandu, it has greater opportunity to improve the status and market value.

During the study, conversation with the local community members and subjective assessment was made to identify the area of the distribution of MAPs, through the tool of resource mapping; map showing distribution of MAPs in Kavre district. At the same time field survey was also carried out for the confirmation of the data obtained.

The major medicinal plants found in the kavre district are, *Taxus wallichiana* (Lauth salla), *Valeriana jatamansi* (Sugandhawal), *Swertia chirayita* (Chiraito), *Nardostachys grandiflora* (Jatamansi), *Gaultheria fragrantissima* (Dhasingare), *Bergenia cilliata* (Pakhanved), *Asparagus racemosus* (Kurilo, Satawari), *Lichen spp.* (Jhyau), *Rheum australe* (Padamchal) etc. The study shows that, Sugandhawal, Pakhanved, Chiraito and Kurilo are the top four abundant MPs in the area. These plants have played some role in the economy of local people. The status of these plants is found to be decreasing as compared to 20 years before. When comparing the 10 years before the present situation, increasing trend are evident. Similar study on MAPs but in Community forest of Dhading district carried out by Poudel (2007) who found the resource of MPs is decreasing. Naturally grown species in the sites were *Valeriana jatamansi, Bergenia cilliata, Asparagus racemouss, Swertia chirayita, Zanthoxylum armatum, Phyllanthus emblica* etc. They were available mostly in the marginal land and places where agricultural works were seldom.

While dealing with medicinal plants it is important to refer the use of MAPs in health care system of Nepal. The Ayurvedic system under the Department of Ayurveda, under Ministry of Health is spread all over the country. The World Health Organization (WHO) has recognized the importance of traditional medicines in primary health care (Malla, 2000). Forest user groups were found to use MPs for their household purpose. All forest users had

not got good idea about their use but older people had better knowledge of it. The local people are using different herbs for different purpose as medicine.

5.2 Collection and Trade

Medicinal plants provide accessible and culturally relevant sources of primary health care to a majority of the population in Asia. Marginalized people who are unable to finance and logistically access formal health systems are especially dependent on herbal medicines (Karki and Williams, 1999). Large distribution of herbs, shrubs along with NTFPs i.e. the main source of Kavrepalanchowk district have made the rural people to be partially or wholly dependent on it.

Medicinal plant that are regarded as a free commodity to be collected from nature are the major source of traditional medicines and also include all goods of biological origin (Subedi, 1997). These NTFPs, especially the medicinal and aromatic plants have been deeply associated with the Nepalese. Socio-economic conditions, particularly in rural areas (population). The harvesters usually are less concerned about conservation and future production. They only think about the present context and income. They are always in hurry to collect the plants in maximum amount to get maximum price. This has resulted pressure on the resources. The collection of plant at immature stage and the whole part means there will be little left to continue reproducing for next season. During the survey it was found that the collection was not planned and synchronized with the season. The time of harvest, the quantity of harvest was not the concerned of the collectors. Therefore there is a threat for the decline in the medicinal plants resources. The MAPs are being randomly collected due to lack of local control over the resources, rural poverty, and social and cultural traditions. The result of over exploitation and premature harvesting which is due to lack of awareness and knowledge of sustainability has led to decline of both quality and quantity of natural resources (Kunwar and Duwadee, 2003).

Mostly herders, local healers cover the main collection. Ethnicity also plays an important role in the collection of MAPs and ethnic communities derive a large portion of their annual per capita income from the collection of MAPs. All the family members including the children are engaged in the collection due to the lack of proper knowledge on collection, harvest and marketing of these resources, they get low price by the middlemen.

The scarcity of good agriculture land is the the reason to force people for the collections of Medicinal plants. Areas having good agricultural land people seldom go for the collection of medicinal plants. Instead they are engaged in agricultural operation.

The larger the distribution pattern of MAPs the more will be the collection for trade to uplift the economic status. The highly traded species from the study area are *Swertia chirayita*, *Valeriana jatamansi* and *Bergenia cilliata*. According to the secondary data *Cordyceps sinensis* was the most valuable one but it is found only in the higher altitude areas. Sugandhawal is found abundantly in the Study area.

5.3 Preferred Medicinal plants for economic benefits

National Medicinal Plants Board (NMPB) of India, functioning similar to the HNCC of Nepal, has launched promotional and commercial schemes for all kinds of stakeholders. These schemes include production of quality planting material, conservation, inventorisation, R&D, extension, value addition, semi-processing, marketing, etc. The NMPB has also prioritized 32 medicinal plants at the national level with a view to develop and promote them more intensively. The criteria for the prioritization and selection of species are grouped into five broad categories based on high value in local uses, suitable to local agro-ecology and farming system, processing technology known to capture part of the value addition, wide distribution and ease in availability of genetic materials, and importance in genetic resources/biodiversity conservation.

The HNCC has compiled a list of 30 species of MAPs and other NTFPs for research and development. The species are prioritized based on 8 principal criteria viz. (i) highly demanded commercial sps (ii) species having high market price (iii) having potential for domestic value addition (iv) species available over wide geographical range (v) species harvestable in short rotation period (vi) land fertility requirement for species (vii) species importance in local ethnobotany and (viii) species conservation status. Most of the criteria set by HNCC are common to that of NMPB. The common species in both prioritizations are Amala (*Phyllanthus emblica*), Atis (*Aconitum heterophyllum*), Chiraito (*Swertia chirayita*), Jatamansi (*Nardostachys grandiflora*), Kutki (*Neopicrorhiza scrophulariflora*), Pipla (*Piper longum*), Sarpagandha (*Rauvolfia sarpentina*) and Gurjo (*Tinospora sinensis*) thus indicating the importance of these species for overall promotion in social, economic and ecological context of both the countries.

From the study, though all characters are not concerned, the top four ranked medicinal plants found in the study area are; Sugandhawal, Pakhanved, Chiraito and Kurilo in the ranking order. Similar study carried out by Poudel (2005) Considering the 8 criteria of HNCC and the 5 criteria of NMPB; altogether 17 practically applicable criteria (both qualitative and quantitative in nature for scoring and ranking; the study has found Amala (*Phyllanthus emblica*), Pipla (*Piper longum*), Mentha (*Mentha arvenses*) and Chamomile to be the priority species for Terai and Siwalik regions; Chiraito (*Swertia chirayita*), Tejpat (*Cinnamomum tamala*), Ritha (*Sapindus mukorossi*), Timur (*Zanthoxylum armatum*) for Mid-hills; Sugandhawal (*Valeriana jatamansii*), Padamchal (*Rheum australe*), Jatamansi (*Nardostachys grandiflora*), and Bisjara for High-mountain for commercial promotion by involving private investors. The study carried out by Yadav 2008 in Sarlahi district shows that Chamomile, Sarpagandha, Tulsi and Asparagus wild are the first, second, third and fourth preferred MAPs respectively.

5.4 Social and economic values of MAPs

There is good opportunity to promote marketing of available MAPs because of huge demand from national and international markets. Not only this will create job opportunities in but also it generates funds for social development as well. As far as MAPs is concerned it is worth to mention about the forest user groups (FUGs) engaging in collection of medicinal plants from the forest. At present more than 14337 of FUGs have formed and accordingly more than 1.65 million HHs are managing 1.22 million ha of community forests (DOF, 2007). About 80% of rural people including forest users in the remote areas still use medicinal and herbal plants for the treatment of various ailments. Thus medicinal plants have become more important socially and economically. Poor forest users in the rural areas are mainly the collector of medicinal plants from which they can have financial benefits which can improve their livelihood. This is off farm job for these people and they need not to travel far for to collect medicinal plants. It is observed that community forests are rich in MAPs. A study carried out in 31 community forests indicated that out of 371 plant species indentified, 227 species have got medicinal values (Shrestha, 2003).

MAPs are perennial and tangible commodity that can be cultivated on open spaces of community forests. Moreover, such plants can be harvested in short duration thereby generating income of the poor people. Therefore cultivation of MAPs in community forest would support poverty alleviation program. In addition cultivation of MAPs needs not big

investment. Despite having a little risk of price fluctuation, users can earn good profit because of demand of the MAPs in the internal and international market. According to one study, FUG of Darchula district especially poor is earning Rs 40000 per year by collecting and selling MAPs. Similarly, in Dolpa district, it is said that one individual can easily make more than Rs 50000 net profit per year by collecting and selling Yarshagumba. In Dandeldhura district community forests has not only provided economic and social benefits to the local users but has become a model unit to manage MAPs. In this way poor family is earning double the income compared to rich families. On an average a poor family is earning Rs 40000 per year just from collecting and selling the herbs from community forests (Shrestha, 2003). In this study the average earning of people from MAPs is found to be Rs 11355 which is low as compared with above. But the income can be increased through increasing activity on MAPs.

No doubt community forestry program endures good opportunity for the promotion of MAPs to reduce poverty of rural people, but there are some constraints as well. Usually information regarding MAPs in the community forests includes guideline only about woody species. As a result most of the users do not know about valuable MAPs and their management. Thus most of the MAPs are still collected from wild exclusively from government controlled forest. So it is obvious that the FUGs are not able to reap the benefit from MAPs from community forestry. Secondly, FUGs are simply local collectors; they sell MAPs to local traders without having knowledge about the price and value of MAPs. In such situation local traders are earning more and have monopoly in fixing price by the traders in their own way. Over and un-time harvesting has become another constraint due to poor administration of FUGs in the remote areas. This has threatened the survival of some of the valuable species (Shrestha, 2003).

5.5 Management Practices

There are several factors threatening the survival of ecologically and economically important species and reducing the quantity and quality of MAPs such as unsustainable harvesting, population pressure an increasing and expanding market, held for cash, lack of an appropriate and practical regulatory mechanism (Jayaswal, 2000).

Number of natural resources is reducing each year due to over exploitation. MAP has been extensively extracted from the study area and their role in rural and forest economies is

immense. From the study it is clear that the people in study area are somewhat engaged in collection of MAPs. Specially, large quantity of *Swertia chirayita* plant is harvested from study area without any sustainable harvesting plan. It is great threat for the population of *Swertia chirayita* in the study area. Instead of sustainable harvesting, everybody is in rush to collect those items, which have high market value, before maturing and flowering.

Every year large quantity of *Rheum australe* (Padamchal), *Neopicrorhiza scrophulariiflora* (Kutki), *Nardostachys grandiflora* (Jatamansi), *Valeriana jatamansi* (Sugandhawal), *Swertia chirayita* (Chiraito), *Cordyceps sinensis* (Yarshagumba), are collected and traded. Local people by collecting this can earn money but the problem is that they are not well paid by the traders. There are no specific methods, time and proper management for sustainable harvesting and collection and thus every day the highly priced MAPs are at the alarming rate. The people should be engaged in other practices such as cultivation of MAPs which has great demand in pharmaceutical industry.

The cultivation practices are not so rapidly adapted by the people of these sites. This might be due to lack of knowledge of cultivation .Only few household are engaged in the cultivation of *Swertia chirayita*.

Chapter VI
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

MAPs sub sector plays an important role in national economy. People are involved in this sub sector as different actors in different level. Rural people far from the urban centre are involved in collection and trade of MAPs. However country is not able to generate full benefit from sub-sector. The local collectors are not able to get actual price of the product. Most of the profit goes to middleman and big businessman. The government is losing its revenue due to lack of appropriate policy regulation and collection Chiraito, Jatamansi, Sugandhawal, Timur are traded in large amounts from the country.

In the community forests of the study area, medicinal plants are found. Common medicinal plants include Sugandhawal, Pakhanved, Chiraito and Kurilo. From the test of preference ranking, top four preferred medicinal plants in the study area were found to be Sugandhawal as first, Pakhanved as second, Chiraito as third and Kurilo as fourth rank. From the hypothesis testing it is clear that all the medicinal and aromatic plants are not equally preferred (There is preference ranking prevalent in the cultivation of medicinal and aromatic plants) for cultivation.

When comparaing the data of 20 years, status of these resources is somewhat decreasing due to the lack of knowledge on these resources however due to the effort of community forestry user groups for the last decade the status is found to be increasing. These resources are being used by local healers, Baidhyas for treating different ailments. The commercial practice of these herbs in the study area is yet to be developed. Only few people are generating income from trade of these plants. Medicinal plants related activities are profitable but they do not give immediate return and sufficient insurance. Improved value addition to their products is lacking. Presence of resources, low labor costs and social institutions show the potentiality of enterprises. With the introduction of modern technology and funds at the community level, improvement on MAP could be made.

Only 13% of the economically active people are involved in income generating activity of medicinal plants related occupation; however this percents also engaged in Agriculture. None of the population was found to solely dependent on MP related occupation. People are deprived of getting actual price of their products as the MPs market is trader dominated. They

largely depend on village level traders and district level traders for acquiring information on market price of the products.

6.2 Recommendations

Based on the conclusions derived from the findings of the study, some recommendations are made to promote sustainable utilization of medicinal plants and to further uplift national as well as household economy. They are as follows;

- The local people should be encouraged for the cultivation of preferred top four MAPs Sugandhawal, Pakhanved, Chiraito and Kurilo in the research area. Cultivation should be done not only for the use of resources for industries and for export but also for conservation of specified and endangered species as well.
- The CFUGs must know the availability of the resources they have and in what amount and stage. So resource inventory and its awareness program should be launched.
- DFOs and supporting organizations should give trainings on the available MPs in the study area. They should attract FUGs by sharing success story of other sites. Tours to different demo-plots, processing units are good to them.
- MPs based enterprise development could be an effective approach to enhance domestication at local level by provision of micro-loan to the FUGs. This could help them in increasing the price of their product.
- MAPs related NGOs/INGOs should be involved through participating as stakeholders of the MAPs related activities.
- District level action plan for MAPs should be separately prepared.
- Directory, circulars, rules and regulations of government should be communicated to the grass root level/ farmers.
- Information through communication media on MAPs should be given to local cultivators or regular program should be arranged through Radio/Television.
- Public and private sector processing units should be established.
- Access to poor people on government land should be allowed so as to promote livelihood of them.
- While formulating the policies all legitimate stakeholders especially the grass-root level community, poor women and other disadvantaged collector and domestications should be included in policy development and the revision process could help to

minimize gaps between the policy level and implementation level, contradictions, inconstancies as well increases the effectiveness of implementation.

- The government must determine the practical royalty rates for different herbs so that the collectors or traders may not evade the royalty. For this loyal DFOs are needed. The practice of making DFOs involved in MAPs trade should be discouraged as this enhances corruption.
- The FUGs should continue using traditional system added by modern values of MAPs.
- Collectors should collect the MPs in a sustainable way, leaving some plants to regenerate.

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Annex I

Field questionnaires

Date……

Name of the data collector: ……...
Respondent Name : ……
Cast\ethnic group : ……
Sex :……..
Age (yrs) : ……
Education : ……
Occupation : …….
Current address (ward) : …….

Socio-economic survey

1. Household information

S.N.	Relation to Respondent	Sex	Age(years)	Marital status(M/U) *	Occupation**			Education ***
					1	2	3	

2. Please describe in detail on Medicinal Plants related occupation.

Occupation	Male	Female	Total
MP Collection			

3. Please give your income during one year.

Income source	Rs/Month	Total	Men	Women
Livestock				
Agriculture				
NTFPs/MPs				
Business				
Salary				
Wages				
Remittances				
Others				

4. Please give detail on earnings from selected MPs.

Medicinal plants	Quantity sold	Earnings

5. For how long the field crop production can meet your household food requirement.
a) 3 months b) 6 months c) 9 months d) whole year

6. Landholding size and tenure rights

Land type		Owner operated	Rented in	Rented out
Khet	Tari Khet			
	Phant Khet			
Bari	Gharbari			
	Pakhobari			
Marginal land	Rukhobari			
	Kharbari			

7. Can you make some more products at home from focused Medicinal Plants?
Yes…… No……

8. If yes, what are these?

9. If no, why?

---

*Marital Status
1. Unmarried **2.** Married **3.** Separated **4**. Divorced **5**. Widowed

**Occupation
Paternal Ancestors occupation ……
Maternal Ancestors occupation ----------
Paternal parent's occupation ----------
Maternal parent's occupation ----------
Your present occupation ----------

***Education
1. Cannot read and write (Illiterate) 2.Can read and write (Informal but no school)
3. Primary level 4. Secondary level 5. Higher Secondary level 6. Graduate
7. Above graduate

To assess the status of focused MPs and management aspect of selected MPs

1. What are the major medicinal plants found in your area?

- -
- -
- -

2. Can you figure out the resource base situation of these species over 20 years?

Worst situation Best situation

0 1 2 3 4 5 6 7 8 9 10

Time/ Mps					
20 yrs ago					
10 yrs ago					
Now					

3. Have you ever noticed the natural occurrence of these MPs in your land?

Yes…… No…….

4. If yes, mention the following

MPs	Place of occurrence								
	Khet Land			Bari Land			Marginal Land		
	Area	Distance from forest(m)	No.	Area	Distance from forest(m)	No.	Area	Distance from forest(m)	No.

5. What do you think about the trend of occurrence of these medicinal plants in your land in comparison to last 20 years?

a) Very highly decreasing b) Highly decreasing c) Same as before
d) Highly increasing e) Very highly increasing

6. In which land type do you notice the occurrence is very highly decreasing and very highly increasing? And what are the reasons why it is happening?

MPs	Place of occurrence								
	Khet			Bari			Marginal		
	VHI	VHD	Why	VHI	VHD	Why	VHI	VHD	Why

VHI= Very Highly Increasing VHD= Very Highly Decreasing

6. Mention the parts of selected MPs that can be used for different uses?

MPs	Different parts used for different purposes							
	Leaf	Fruit	Flowers	Root	Shoot	Tuber	Bark	Whole plant

7. Medicinal and other uses of different parts of selected species.

MPs	Used for	Parts used	Form used	Used for(days)	Others

8. Do you collect the focused MPs for your household? If yes, from where?

MPs	Community forest	Government forest	Private forest	Leasehold forest

9. Mention your collection pattern.

MPs	Amount	Seasons of collection	Purpose of collection			Remarks
			Domestic use	Selling		
				Oneself	Middleman	

10. Are seedlings produced by you for cultivation?
Yes…….. No……..

11. If no, why? Mention reason for selected MPs.
a)
b)
c)
d)
e)

12. If yes, how do you propagate?
a) Nursery b) From the forest c) Conserving the naturally grown seed
d) Others

13. Do you know which method is easier and gives good result? Please mention for each species.
a)
b)
c)
d)
e)

14. How did you know about propagation of these MPs?

15. Are you aware of destructive and non-destructive methods of harvesting?
Yes…….. No…….

16. Please mention the stage of collection of selected MPs?

Period/MPs				
Before maturity				
After maturity				
Before flowering				

17. Please mention the whole process of harvesting method that you have followed for each species.

18. Do you process the MPs after harvesting and before marketing? If yes, what type of processing you are doing currently?
a) Drying
b) Cleaning
c) Grinding
d) Storing
e) Others

19. Do these processing methods make any differences in selling price? Please mention which alternative is more profitable?

20. Please mention the whole process of different post harvesting techniques you have followed.

21. Labor involvement in propagation, harvesting, post harvesting and marketing species……

Activities	100% M	100% F	50% M, 50% F	75% M, 25% F	25% M, 75% F	Estimated cost
1) Propagation						
-collection of planting materials						
-arrangement of nursery materials						
-preparation of seedbeds						
-planting seeds, tuber etc. in the prepared seedbed						
-management of seedbed						
-plantation of seedlings						
2) Harvesting practices						
3) Post harvesting practices						
-drying						
-cleaning						
-grinding						
-packaging						
-storing						
4) Marketing						

To assess the contribution of Medicinal Plants to household economy and analyze market system of focused MPs.

1. How much MPs did you sell last year?

MPs	From cultivated land			Wild collection		
	Qty. in Kg.	Labor(Hr)	Price	Qty. in Kg.	Labor(Hr)	Price

2. Where did you sell and at what price?

MPs	Farm land/ Wild collection					
	Fellow neighbors		Middleman		Road head trader	
	Quantity	Price (Rs)	Quantity	Price (Rs)	Quantity	Price (Rs)

3. Do you process MPs before marketing?
Yes……. No……..

4. Farmers knowledge based on marketing.

Statement	Yes	No
Do you know the final price of the MPs you sold		
Do you know where these MPs finally reach		
Do you know who is the final consumer of your products		

5. What is your source of information regarding the current market price?
a) Local level and district level traders
b) INGOs/ Projects/ NGOs
c) GOs
d) Others

6. To what extent up to date information on marketing influence the marketing margin of the farmers?
a) Very Strong Influence
b) Strong Influence
c) Medium Influence
d) Low Influence
e) Very Low Influence

7. If you want to sell your products at the road head center, what is the price you get and time you need for that product sale?

MPs	Season of marketing	Time required(Hr)	Price(Kg)

8. Do you face problems with marketing of your products? If yes, please mention in priority order.

9. How can it be solved in your opinion?

10. Which option do you think is the best to promote domestication in the farmland?
a) Existing marketing system
b) Through CFUG
c) Through co-operatives
d) Through local level enterprise
e) Others

Table: Preference ranking for selection of top-four among the other medicinal plants

Name of Jadibuties/Ranking	1	2	3	4	5	6	7	8	9
1									
2									
3									
4									
5									
6									
7									
8									
9									

Roles, Access to and Control over medicinal plant resources and associated Traditional Knowledge of men and women

1. How did you come to know about this knowledge of its location and habitat?

Options/MPs					
Elders					
Neighbors					
Self practice					
Family tradition					
Community knowledge					
Traditional knowledge holders					
Others (specify).....					

2. How did you come to know about its season of collection?

Options/MPs					
Elders					
Neighbors					
Self practice					
Family tradition					
Community knowledge					
Traditional knowledge holders					
Others (specify).....					

3. Parts and products used
(Roots, barks, fruits, seed, branch, stem, leaves, flowers)

Options/ MPs				
Roots				
Barks				
Fruits				
Seeds				
Stem				
Leaves				
Flowers				
Whole Plant				
In combination				
Others (specify)				

4. Whose does what from collection to final consumption
Please rate the most applicable from the following:
1. Male 2. Female 3. Both 1 & 2 4. Children 5. Others

1. Collection/Harvest
2. Cleaning
3. Drying
4. Processing
5. Medicine preparation

5. Since how many years your family is using it?

i. Less than 5 years ii. 6-10 years iii. 11-20 years iv.More than 20 years

6. Do you think that women have more say or exercise more control (in terms of labor contribution, its final use and consumption) over this resource?

1. No **2.**Yes **3.**Can't say

7. What is the resource availability now? It is

1. Abundant 2. Medium 3.Scarce

8. What is the level of knowledge of this resource among? Please rate the most applicable from the following:

1. Very high 2.High 3.Medium 4.Low 5.Very low 6.Nil

1. Older men (>60)
2. Older women (>60)
3. Middle aged male (30-59)
4. Middle aged female (30-59)
5. Young male (18-29)
6. Young female (18-29)
7. Youths (14-17)
8. Children (<14)
9. Ethnic groups (specify)…….

9. Who makes decisions regarding this resource at community level at present?

1. Traditional Village Leader 2.CBO's 3.Community 4.Government institution NGO's

10. What benefits, do you think that you have gained from this resources and your knowledge associated with it? Explain.

11. Who has benefited from this resource? Explain.

12.

How did you come to know about the use of parts?
How did you come to know of its use?
How did you come to know of its processing?
How did you come to know of final medicine preparation?

Options/MPs					
Elders					
Neighbors					
Self practice					
Family tradition					
Community knowledge					
Traditional knowledge holders					
Others (specify).....					

Questionnaire for line agencies
DFO staff, line agencies personnel etc.

Name of respondent……. Position…….
Organization…… Place…….
District…… Phone No……..

1. Who do you think are the key players in sub-sector?

2. What is the status of harvesting MPs species?

3. Do you believe the MPs can contribute to uplift local economy?

4. What might be constraints for the sustainable utilization of these MPs?

5. Can you provide product flow of Herbal sub-sector?

6. What is existing market problem?

7. What strategy could be made to overcome these problems?

8. Can you suggest any model for sustainable utilization and harvesting of these MPs?

9. What roles and supports your organization can play to uplift these MPs?

10. Anything you would like to suggest regarding potentiality of MPs?

11. What must be done for their sustainable use?

12. Would you please provide relevant data regarding trade of these MPs?

Questionnaire for FGD

Place of discussion……..

1**.** What are MPs available in your CFs?

2. Major herbs, MPs like …….available or not?

3. Which of the above MPs are traded in bulk amount?

4. Which MPs locally available has the highest demand in market and why?

5. Do you believe in the traditional medicinal practices?

MPs	Yes	No	Traditional medicinal practices

6. Are you interested in entrepreneurship based on the above MPs?

7. Are you getting proper market for focused MPs?

8. Are you satisfied with the price obtained from trade?

9. What are social/ economic/ natural constraints for utilization of MPs?

10. Are you interested to invest your own effort, money and land for the farming of these MPs, if proper marketing and price is provided?

11. Would you like to make any suggestions for sustainable utilization?

12. Any suggestion for harvesting of these MPs.

Checklist for traders

Name of trader (local/ regional/ road head):……..
Name of district:…….. Place:……

1. What are MPs that you trade? Do you trade these every time?

MPs	Yes	No	Occasionally

2. Where do you get these MPs?

MPs	Collect	Buy	Buying price	Selling price

Annex II

Quantity and Revenue for selected herbs (Jadibuti) found in Nepal

SN	Name of Jadibuti	Fiscal year 2060/2061		Fiscal year 2061/2062		Fiscal year 2062/2063		Fiscal year 2063/2064	
		Quantity Collected (Kg)	Collected Revenue (Rs)	Quantity Collected (Kg)	Collected Revenue (Rs)	Quantity Collected (Kg)	Collected Revenue (Rs)	Quantity Collected (Kg)	Collected Revenue (Rs)
1.	*Cordyceps sinensis* Yarsagumba	76.05	1372000	12.6	252060	214.6	3397000	254.1	2540600
2.	Lichens Jhhyau	134570	1313120	102131	1000315	58027	814510	167501	2464525
3.	*Nardostachys grandiflora* Jatamansi	208464	3058045	130195	1953043	687113	1554075	16471	247065
4.	*Swertia chiraita* Chirayito	169703	481628	125244	375693	45949	527890	50155	729045
5.	*Taxus wallichiana* Lauthsalla	78472	1923750	160197	4004935	7535	188625	19382	208562
6.	*Xanthoxylum armatum* Timur	365475	1162527	429140	1286620	279855	2265711	460710	3670040
7.	*Valeriana jatamansi* Sugandhawal	88589	1300696	47549	713235	25140	377106	9340	140110
8.	*Bergenia ciliata* Pashanved	74503	367344	9075	45375	437685	874570	193310	386660
9.	*Asparagus racemosus* Kurilo	93444	171948	34168	69664	27213	101755	13260	64300
	Total	1213296.05	11151058	1037711.6	9700940	1568731.6	10101242	930383.1	10450907
	Total medicinal plants	2856438	15985203	2985024	13551200	4575579	16987046	2663907	16642015

Quantity and Revenue for (Jadibuti) found in Nepal by regionwise

Region	Fiscal year 2060/2061		Fiscal year 2061/2062		Fiscal year 2062/2063		Fiscal year 2063/2064	
	Quantity Collected (Kg)	Collected Revenue (Rs)	Quantity Collected (Kg)	Collected Revenue (Rs)	Quantity Collected (Kg)	Collected Revenue (Rs)	Quantity Collected (Kg)	Collected Revenue (Rs)
Eastern	272517	486555.3	254578	942919	101510	659564	174484	955332
Central	717897.6	2735360.2	627628	2334117.5	209464.5	1710083	118988	764805
Western	50371.5	309843.3	45881	254590.3	78162	291973.5	44823	332366
Mid-western	1430266.8	10465328.6	1390165.1	7648950	2170416	12118433.2	1301308.4	10310916.2
Far-western	385721.1	1989120.3	666772	2370624	766118	2206992.5	1024303.7	4278596
Total	2856774	15986207.7	2985024.1	13551200.8	3325670.5	16987046.2	2663907.1	16642015.2

Annex III

Medicinal plants prioritized for research and development:

1. *Aconitum heterophyllum* Wall.	Aatish
2. *Aconitum spicatum* (Bruth) Stapf	Bish
3. *Acorus calamus* Linn.	Bojho
4. *Asparagus racemosus* Willd.	Satawari
5. *Azadirachta indica* A.Juss.	Neem
6. *Bergenia ciliata* (Haw.) Sternb.	Pashanbed
7. *Cinnamomum glaucescens* (Nees) Hand.-Mazz.	Sugandhakokila
8. *Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm.	Tejpat
9. *Cordyceps sinensis* (Berk.) Sacc	Yarshagumba
10. *Dactylorhiza hatagirea* (D.Don) Soo	Panchaunle
11. *Dioscorea deltoidea* Wall.	Vyakur
12. *Gaultheria fragrantissima* Wall.	Dasingare
13. *Juglans regia* Linn.	Okhar
14. Lichens	Jhyau
15. *Morchella* spp.	Khoya chyau/ Guchchichyau
16. *Nardostachys grandiflora* DC.	Jatamashi
17. *Neopicrorhiza scrophularifolia* (Pennell) Hong	Kutki
18. *Phyllanthus emblica* Linn.	Amala
19. *Piper longum* Linn.	Pipla
20. *Podophyllum hexandrum* Royle	Laghupatra
21. *Rauwolfia serpentina* (L.) Benth. Ex Kurz	Sarpagandha
22. *Rheum australe* D.Don *Rheum moorcroftianum* Royale	Padamchal
23. *Rubia manjith* Roxb. Ex Fleming	Majitho
24. *Sapindus mukorossi* Gaertn.	Riththa
25. *Swertia chirayita* (Roxb. Ex Fleming) Karstrn	Chirayito
26. *Tagetes minuta* Linn.	Jangali sayapatri
27. *Taxus bacata* Linn.	Lauth salla
28. *Tinospora sinensis* (Lour.) Merr.	Gurjo
29. *Valeriana jatamansii* Jones	Sugandhawal
30. *Zanthoxylum armatum* DC.	Timur

Medicinal plants prioritized for agro-technology development:

1. *Asparagus racemosus* Willd.	Satawari
2. *Cinnamomum glaucescens* (Nees) Hand.-Mazz.	Sugandhakokila
3. *Dactylorhiza hatagirea* (D.Don) Soo	Panchaunle
4. *Nardostachys grandiflora* DC.	Jatamashi
5. *Neopicrorhiza scrophularifolia* (Pennell) Hong	Kutki
6. *Piper longum* Linn.	Pipla
7. *Rauwolfia serpentina* (L.) Benth. Ex Kurz	Sarpagandha
8. *Swertia chirayita* (Roxb. Ex Fleming) Karstrn	Chirayito
9. *Taxus bacata* Linn.	Lauth salla
10. *Tinospora sinensis* (Lour.) Merr.	Gurjo
11. *Valeriana jatamansii* Jones	Sugandhawal
12. *Zanthoxylum armatum* DC.	Timur

Annex IV

Cost-Benefit analysis of cultivation of Chiraito per Ha

Total no of plants per hectare 1,00,000 (spacing 50cm×20cm)						
Items	1st year	2nd year	3rd year	Cost of cultivation	Gross income	Net profit
Land preparation	22000	-	-	22000	After 2 years	
Agricultural Equipments	7000	-	-	7000		
Manure	25000	25000	-	50000		
Planting Material Chiraito 100,000 @ Re 1	100000	20000	-	120000	2500 kg @ Rs 230	
Crop maintenance (fixed plantation, weeding, hoeing etc)	30000	20000	-	50000		
Insecticide/ Post harvesting	4000	4000	-	8000		
Harvesting/Post harvesting	-	3500	-	3500		
Other works (Irrigation facilities, fencing, Protection from wild animals etc.)	2000	5400	-	7400		
Total	190000	77900		267900	575000	307100

B/C ratio: 2.14

Cost-Benefit analysis of cultivation of Kurilo per Ha

Total no of plants per hectare 18,500 (spacing 60cm×90cm)						
Items	1st year	2nd year	3rd year	Cost of cultivation	Gross income	Net profit
Land preparation	25000	-	-	25000	After 2 years	
Agricultural Equipments	10000	-	-	10000		
Manure	30000	15000	-	45000		
Planting Material Kurilo 18500 @ Re 3	55500	-	-	55500	3000kg @ 210	
Crop maintenance (fixed plantation, weeding, hoeing etc)	30000	15000	-	45000		
Insecticide/ Post harvesting	5000	5000	-	10000		
Harvesting/Post harvesting	-	20000	-	20000		
Other works (Irrigation facilities, fencing, Protection from wild animals etc.)	-	5000	-	5000		
Total	155500	60000	-	215500	630000	414500

B/C ratio: 2.92

Cost-Benefit analysis of cultivation of Sugandhawal per Ha

Items	Cost of cultivation	Gross income	Net profit
Nursery preparation	5000	After 2 years	
Land preparation	6000		
Manure	6000		
Plantation	8000	2000 kg@ Rs 80	
Plant maintenance(1st year)	5000		
Plant maintenance (2nd year)	5000		
Irrigation	4000		
Harvesting	9000		
Processing and storage	2000		
Total	50000	160000	110000

B/C ratio: 3.2
(Source: Observation, stakeholder's consultation)

Annex V

Identification and use of Medicinal Plants

1. Sugandhawal

Scientific name: *Valeriana jatamansii Jones*
Family: Valerianaceae
Common name: Nakkali jatamasi, Samayo, Sugandhawal
Availability: 1500 to 3300 m altitude
Harvested part: Rhizome
Harvested season: October-January
Uses: Nervous illness, Stomach pain, Leprosy Essential oils in perfumes

2. Pakhanved

Scientific name: *Bergenia ciliata* (Haw.) Sternb.
Family: Saxifragaceae
Common name: Dhungriko jara, Pakhanved, Pakshanved, Simpate, Silpu
Availability: 1600-3200 m altitude
Harvested part: Stem attached with soil
Harvested season: October-November
Uses: Fever, pulmonary diseases, Burn,

3. Chiraito

Scientific name: *Swertia chirayita* (Roxb. ex Fleming) H. Karst.
Family: Gentianaceae
Common name: Chirayita, Chirayito, Tite, C hirauto, Tikta, Khalu
Availability: 1500-2500 m altitude
Harvested plant: Whole plant
Harvested season: October-April
Uses: Fever, stomach pain, Body ache, antihelminthes, Medicine

4. Kurilo

Scientific name: *Asparagus racemosus* Wild.
Family: Liliaceae
Common name: Kurilo, Satawari, Makuri, Pujutoro, Kobi, Kuril, Kopi
Availability: 600-2100 m altitude
Harvested part: Tuber
Harvested Season: December-February
Uses: Diarrohea, epilepsy, hypertension, nervous disorders, dysentery, stomachic, diabetes, tonic, urinary problem

Photographs

A community forest in Budhakhani VDC of Kavre

Discussion with local collector

Local expert showing MAPs in the study area

MAPs nursery in Kushadevi