*Chapter 1*

# INTRODUCTION

## 1.1 Background

### 1.1.1 Forest and Non Timber Forest Products

Forests are the important natural resources of Nepal. The coverage of the forests in the country is 39.6% of the total land area (NPC, 2002). They play a pivotal role in the economics and social lives of the rural people. People depend on forests for their livelihood because they provide a wide range of goods and services. Locally and globally, trees ameliorate climate, protect soil, regulate water and maintain biological diversity on which future benefits depends. Likewise, the existence and maintenance of forest depends on people, particularly those who live in and around the forests and directly use them for food, medicines, clothing, shelter and spiritual needs (Shrestha, 2006). The forests provide timber and non timber forest products which are important sources of livelihood for households (HHs) and communities in addition to environmental benefits. Aside from timber as the Major Forest Product; the forests also provide Minor Forest Products (MFPs) such as food, medicines, bamboos, canes, natural dyes, spices, essential oil, resins, gums, latexes, tannins, ornamental plants, wild life products, broom grasses, rattans and fibers and others. These MFPs are now popularly called Non Timber Forest Products (NTFPs).

NTFPs are all the biological materials from forests for human use. These NTFPs can be categorized as consumptive or non consumptive. Consumptive uses are those where the product is utilized at the personal or HHs level. Examples are foodstuffs, medicines and domestic necessities such as baskets, fencing, rope and cloth. They also embrace products like resins, chemical extracts, foodstuffs and construction materials as well as wild animals and manufactured goods which are usually sold in the market. Non consumptive uses of NTFPs relate to the indirect benefits of sound forest management. These involve watershed protection, maintenance of air quality, religious values, shade for agriculture, wildlife protection, buffer zones for protected areas and ecotourism (Hammett, 1993).

NTFPs in Nepal can be categorized by end use into one of the four groups:

- Subsistence, eg. medicinal uses, foodstuffs, construction materials.
- Village-based enterprises, eg. *Bombusa balcooa* (Bamboo), *Daphne bholua* (Lokta), *Girardinia diversifolia* (Allo).
- Raw material for industries, eg. *Pinus roxburghii* (Pine resin) for rosin and turpentine, *Acacia catechu* wood for katha, Sabai grass for modern paper production.
- Medicinal plants - raw materials for industries (Edwards, 1993).

NTFPs in Nepal are mostly collected from Government Managed Forests (GMFs), which are being treated as and open access resource. The collection, transportation and sale of NTFPs have been generating off-farm employment and income opportunities in rural areas. About 470,000 HHs are estimated to be involved in the annual collection of medicinal plants for commercial purposes (Olsen, 1998).

### 1.1.2 Economics and Utilities of NTFPs

A wide variety of NTFPs have been used traditionally for medicines, foods and other purposes in Nepal. With increasing marketing infrastructures, including the flow of information, many of the traditionally used products gradually entered into the commercial arena. Today, several groups of NTFPs are used for commercial or subsistence purposes such as:

- Medicinal and Aromatic Plants (including herbs, shrubs and trees)
- Bamboos, rattan and vines
- Nuts and fruits (foods, oil, medicines)
- Mushrooms (foods)
- Tubers (foods, medicines)
- Grasses and leaves (essential oil, spices, utensils)
- Resins (Pine, Shorea)
- Insects and by products (edible insects, honey, wax, lac, silk)

Earlier studies of several investigators reveal that 1,000 species of plants, comprising over 14% of the known vascular plant species of the country, are recorded for economic use (Table 1.1). Current estimates show that the number is still greater in Nepal. People estimate that many additional number of plant species that are used in

Nepal. Among these over 700 species are used for medicinal purpose, 440 species for wild food, 30 species for spices, 71 species for fiber, 50 species for fish-poisoning, and over 100 species for fodder (Malla and Shakya, 1984). In Mountains and other Himalayan areas of Nepal, forest and other natural vegetation have been used extensively for timber, fodder, firewood, leaf litter, medicines, foods, spices, fibers, tannins, gums, resins, fatty oil, dyes, incense, cosmetics, building materials, and agricultural implements.

**Table 1.1: Number of Plant Species Recorded by Economic Uses in Nepal**

| **Economic Uses** | **Number of species** |
|---|---|
| Medicine | 700 |
| Wild food | 440 |
| Essential oils | 238 |
| Fodder | 100 |
| Fiber | 71 |
| Fish-poisoning | 50 |
| Spices | 30 |
| **Sum** | **1629** |
| ***Total No. of species** | **1000** |

Source: Malla and Shakya 1984; HMGN 1982; HMGN 1984.

**Note: In the table above (Table 1.1), although the summation of the species is 1629, actual no. of species are only 1000. This is because the same species may have more than one utility and replicated in other category. For example, Myrica esculenta has two utilities; fruit as a wild food and bark as a medicine and it is numbered in both items (categories).*

Besides these economic uses, many plants have also been used for cultural purpose, such as parts of plants (leaves, flowers, fruits, roots and rhizomes) or standing trees in rituals and worships. For many of the uses, the local demand requires only a small amount, but many of the species are used for more than one purpose and are in high demand even at local level (Subedi, *et al*. 2004).

For rural communities, NTFPs are probably more important than timber due to their centuries old subsistence, economics spiritual and social attributes. They are often of

higher values unit weight or volume of timber. The importance of NTFPs has been increasingly recognized because of their commercial, socio-economic and ecological values (Kanel, 2000). NTFPs not only play a vital role to maintain the life and economy of the rural people but also are important source of food security particularly during lean seasons in marginal areas, where agricultural yields are low and uncertain. NTFPs are the major source of off-farm employment and income generation for low income HHs (Banskota and Sharma, 1994; Olsen, 1997).

NTFPs, more precisely the Medicinal and Aromatic Plants (MAPs) are not only the natural resource and income generating source of Nepal but also one of the major basis of livelihood and business of people living therein. Among the people living in the hills and plain lands, there are people who are involved in the collection and trade of NTFPs whereas the people living in the high hills and mountains have taken it as the one of the major occupation and source of income (Poudel, Subedi and Ojha, 2003). The market for NTFP, particularly MAPs, is increasing at national, regional and global levels. A 1995 survey of producers, traders and processors of NTFPs operating in the eastern border of the country to the mid-western town of Nepalgunj revealed that 100 entrepreneurs handled 42 thousand tons of over 100 different NTFP items equivalent to USD 26 million (Subedi, 1997).

One similar study was conducted in Nepal on NTFP marketing chains between Nepal and India (Edwards, 1996). The Himalayan region of Nepal is the main source of a wide variety of NTFPs which are traded to India. The main markets are the traditional medicine and essential oil industries in India which buy NTFPs such as roots, branches, leaves, bark, stems, fruits, and seeds. This trade contributes USD 8.6 million per year to Nepal's national economy, a value six times the value of Nepal's official timber exports to India. This trade supports several hundred thousand workers. In addition, these workers may depend on the trade to supply over 50% of their HH income (Edwards, 1996). Thus, the contribution to the sustenance of local people and microeconomic development by NTFPs cannot be overlooked.

### 1.1.3 Sustainable Management of NTFPs

Sustainable management of NTFPs has been the subject of increased research and technical support since 1990s. This is due to realization that the resource is being

collected in an unsustainable manner in many parts of Nepal, particularly in highlands (HMGN/MFSC, 2002).

To be sustainable, harvest levels need to be based on a sound knowledge of the ecology, distribution and abundance of the resource species. Long term availability and economic benefit from the NTFPs are directly related with the sustainable harvesting of the NTFPs. Nearly 70% of the NTFPs found in Nepal are being harvested destructively causing the depletion of the plants. Thus, scientific and systematic harvesting technologies must be adopted for the sustainability of the NTFPs. Following five points are to be considered while harvesting the NTFPs (Bhattarai and Ghimire, 2006):

- Harvesting at mature stage
- Harvesting at right time
- Regeneration
- Conservation of environment
- Harvesting at optimum quantity

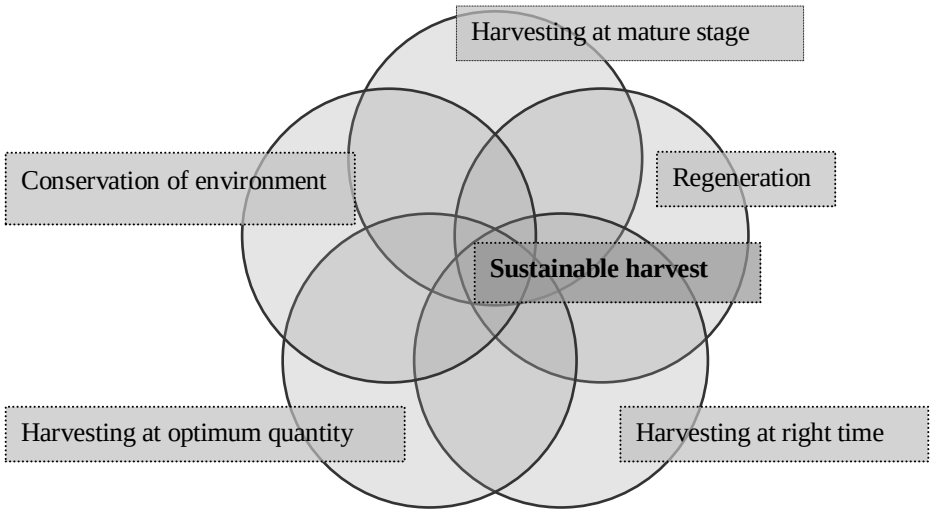



**Figure 1.1: Components for Sustainable Harvest and Management of NTFPs**

Source: Adopted from Bhattarai and Ghimire, 2006

One of the major factors that affect the sustainable management of the NTFPs is harvesting procedure. Collection of NTFPs before the maturity of the seeds, or in their younger stages of their life, and pre-season harvesting of the NTFPs may effect the natural regeneration of the species. The decrease in natural regeneration decreases the production and effects the sustainable management of the NTFPs (Hada, 2006).

Harvesting NTFPs, especially medicinal plants from which underground parts (root, rhizome, tuber) are collected, are adversely affected by uncontrolled harvesting. Thus there has been drastic depletion in plants that were once abundant. In addition, competition for collection leads to many plants being harvested before full maturity, thus hampering regeneration and affecting the quality of the product (HMGN/MFSC, 2002).

NTFPs provide raw materials for many industries for making paper, resin, soaps, paints, varnishes, and bamboos and rattans for HH and handicraft items. These resources are declining due to indiscriminate exploitation combined with habitat destruction (HMGN/MFSC, 2002).

## 1.2 Statement of Problem

A significant contribution has been made by NTFPs in the socioeconomic development of the FUG of the Chapako CF. But much of study has been done for timber species only. NTFPs have not been studied despite their high potentiality and diversity. Little attention has been given to quantifying NTFPs resources, documenting their biology and socio-economical values. Unless there is record of status of these resources, it is utterly impossible to promote them in proper manner and conserve them through appropriate management practices. Therefore, CFUG have not been able to undertake NTFPs as good income generating source.

## 1.3 Aims and objectives

The goal of this research is to study the potentiality of selected NTFPs in the Chapako CF for income generation. Associated issues include collection, use and its role in HH and community economies. These issues will be addressed by meeting four objectives of the research that are to:

i. enlist the NTFPs in the Chapako CF
ii. enumerate the density and abundance of the selected NTFPs

iii. identify the most potential NTFPs for the economic development; and
iv. describe the utilities, sustainable harvesting procedures, promotion and management of these potential NTFPs.

## 1.4 Rationale of the Study

Though NTFPs have always been important income earning potential and subsistence livelihood of people, uniform scientific data about these products or their markets are usually lacking. No inventory exists for both GMFs and Community Forests (CFs), and therefore, no sustainable management plans for NTFPs have been adopted in these forests (HMGN/MFSC, 2002).

Local, regional, national, and international trade of NTFPs can significantly contribute to community and HH economies. As a result, marketable NTFPs can provide an important means for economic growth and sustainable forest management in local communities. However, little researches have been done on NTFPs despite their great potential to positive effect to communities and HHs. This missing knowledge is critical. Increasing pressure is placed on forests to produce as communities seek ways to economically benefit from their natural resources. Basic information regarding NTFPs is necessary for communities to make optimal use of their natural resource.

## 1.5 Limitations of the Study

NTFPs cover the wide range of resources found within the forest. This study was limited to the floral non timber resources of the forest.

Information on economics of NTFPs and other related issues were gathered through questionnaire survey with user groups.

The research was confined to the specific objective of identifying the potential NTFPs for the income generation and economic development of the FUG of Chapako CF. The study may not be illustrative to other CFs within Kathmandu valley. Lack of time and economy played the major role in constraining the study to the limited NTFPs.

*Chapter 2*

# LITERATURE REVIEW

## 2.1 Concepts on NTFPs

**De Beer and Mcdermott (1989)** in their groundbreaking publication on the economic value of NTFPs in South East Asia used the term Non Timber Forest Products as an alternative to the dismissive epithet "MFPs" and proposed the following definition:
*The term 'Non Timber Forest Products' (NTFPs) encompasses all biological materials other than timber, which are extracted from forests for human use.*

The authors clearly recognized problems with the definition. They addressed them by setting out what they saw as the key point of distinction between timber and NTFPs: that timber is managed on an industrial scale for interests located outside the forest, while NTFPs 'are extracted using simple technologies by people living in or near forest.' They dismissed the alternative term 'Non-Wood Forest Products (NWFPs)' as being too exclusive. And they also offered a definition of forest:
*By 'forest' we refer to a natural ecosystem in which trees are a significant component. However, forest products are derived not only from trees, but from all plants, fungi and animals (including fish) for which the forest ecosystem provides habitat.*

**Hammett (1993)** stressed that NTFPs should never be referred to as "MFPs" from an economist's perspective, and, indeed, in recognition of this, the later term has fallen out of general use. NTFPs play a valuable role in the solution of many conservation and rural development problem. However, they are not a panacea. Market development can harmonize with and fulfill many of the objectives of forest protection, although conflicts may arise. The use and trade of NTFPs also meet many goals of rural development, but substantial investments are urgently needed, for example, in management skills training.

**FAO (1992)** gave a clear and consistent definition for NTFPs. They elected to use the term 'NWFPs'. In a 1992 document prepared by Chandresekharan, the following definition was proposed:
*NWFPs include all goods of biological origin, as well as services, derived from forest or any land under similar use, and exclude wood in all its forms.*

In the same paper, Chandrasekharan offered a detail breakdown of the term NWFPs and related terminology. The definition was revised in 1995 (FAO 1999), based on a series of regional and global consultations:
*NWFPs consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests*

**Subedi (1997)** defined NTFPs as 'all goods of biological origin other than timber, fuelwood and fodder'. The examples of NTFPs includes MAPs, bamboos and rattans, nuts, fruits, tubers, berries, grasses and leaves, resins, insects and insect providers, wild animals and birds.

**Sharma (2000)** defined NTFPs as 'MFPs in any of their acts or coordinates relating to forest'. He further noted that NTFPs are the products other than timber, which could be harvested without hampering or destructing forest environment. His definition gave more emphasis on environmental considerations.

**Poudel, Subedi and Ojha (2003)** defined that all the grasses, leaves, medicinal plants and bamboos, rattans, vines and so on which are collected from the forest for HH purposes as well as industrial purposes, are NTFPs. In addition to this, all those fruits, tubers, nuts, vegetables, as well as the products extracted from wild animals are NTFPs.

**Lawrence (2003)** explained that despite different terminologies, NTFPs at least have the following in common: they interact with a different, and larger, set of stakeholders than does timber; they often embody cultural values, through representing 'traditional' uses; they have shorter production cycles, and their yields and ecological roles are less well known than those of the main timber species.

Use and conservation of the forest are often seen as opposing forces, but NTFPs offered hope that their presence in the forest would act as an incentive to conserve that forest.

This is clearly a delicate balance and depends on economic and cultural factors as well as the more obvious biological ones.

## 2.2 NTFPs in Nepal

Nepal's Himalayas, a globally significant and biologically diverse ecosystem produces a wide range of unique and valuable Jaributi. Nepal is remarkably rich in Himalayan Jaributi. More than 700 species (comprising about 10 % of the total vascular plant species) of MAPs exist in Nepal (Malla and Shakya, 1984).

**Sharma (2002)** revealed that Nepal covers only 0.03% of the world's total land area and 0.3% of Asia, but it lies in the 25$^{th}$ position in the world and 11$^{th}$ position in Asia in terms of its biological diversity. Due to such richness in biological diversity, Nepal is considered as the natural storage of NTFPs. On the basis of the previous databases, he concluded that out of 1,000 identified species more than 750 species are NTFPs with wide ranges of medicinal uses. These medicinal plants are more popular within the rural inhabitants than the urban people. The people residing in the mountain regions are traditionally using them as the medicines for different purposes.

**Bhattarai and Ghimire (2006)** explained that NTFPs are distributed in different life form spectrum according to their habits. In Nepal, they are found in all the life forms of plants as trees, shrubs, climbers and herbaceous life form as well. Among the economically important NTFPs in Nepal, 49% are herbs, 29% are trees, 14% are shrubs and 8% are climbers. In addition to these, there are some NTFPs which fall under algae and fungi category such as yarshagumba, mushrooms etc.

**GoN/MFSC (2006)** stated that 80% of the NTFPs of Nepal traded in the local and international markets were collected from GMF, CF and leasehold forests. Only 20% of those NTFPs were from the private lands. In the fiscal year 2061/62 B.S., the NTFPs exported from the country was 3,325,670.6 kg generating the revenue of NRs.16,987,046.20 to the government through their royalties.

**Subedi (2000)** explained that NTFPs were an important part of the Nepalese economy. These products were previously an understudied and neglected resource in Nepal, despite their multi-million-dollar export earnings potential, importance to poor populations, and significance to biodiversity conservation. Every year 10,000 - 15,000

MT of NTFPs were harvested in the Middle Hills and High Mountains of Nepal. The value of these NTFPs, which were almost all sold in India, is USD 8.6 million per year. Of this amount, roughly 15-20% was believed to be from Karnali.

**Bhattarai and Ghimire (2006)** explained that there were about 1500 wild plant species in Nepal which were used traditionally as medicines, spices, dyes and foodstuffs. Among them about 150 plant species even had the economic importance. Such species were collected by the rural community and sell them to the local traders, local sellers or NTFPs collection centers. These NTFPs were finally reached in the processing centers and industries from where they were exported to the other countries providing valuable inputs to the national economy.

**Bhattarai (1992)** studied the medical ethnobotany in Karnali Zone and reported information on 80 empirically accepted prescription involving 62 plant species.

**Hada (2006)** explained that NTFPs of Nepal had high economic importance. The NTFPs has been the important source of livelihood to the people living in the ills and rural areas. The sustainable management of the NTFPs would provide medicine, employment and economic benefits to the larger group of people.

**Greiler (2002)** revealed that NTFPs in Nepal provided income to the rural people since ancient time. NTFPs have high importance especially in the high hills and mountain region of Nepal. The main commercial values of NTFPs in Nepal are with MAPs.

**Bhattarai and Ghimire (2006)** estimated that nearly 99% traded NTFPs in Nepal were derived from the natural forest. The increasing population and urbanization narrowed down these resources and some of them reached the level of local extinction. These NTFPs were the renewable natural resources and therefore conservation and scientific management of these resources seemed quite necessary.

**Sharma (2002)** defined NTFPs as the renewable natural resources and therefore sustainable management and development of these resources through multi-dimensional approach was necessary for the development of the country. NTFPs, a long term income generating natural resources, should not only be concentrated within forestry

sector. The promotion of these resources in private as well as community forestry sector is important. Thousands of people are getting the employment opportunities in relation to resources. Hence, as directed by the Forestry Development Policy (1989), the related departments, companies, organizations, NGOs and INGOs should step forward for the promotion, cultivation and development of these NTFPs.

**Edwards (1993)** mentioned that in some rural areas of Nepal, the cash from the annual harvest of NTFPs was the only income obtained from the forest land and may contributed more than a half the average annual HH income which showed the dependency of rural people, mostly the poor, in NTFPs for their survival. However, their share of income from NTFP relative to other participants was usually limited.

### 2.3 Social and Religious value of NTFPs in Nepal:

**Kunwar *et al.* (2006)** stated that most of the people in the Himalayas follow Buddhism and Bon religion having strong belief and faith on traditional herbal medicinal practice for treatment and therefore, the conservation of medicinal plants is not only vital to their livelihood but also has immense cultural significance to them. Ethnoecological knowledge, plant life forms and growth patterns are imperative to consider for management of Himalayan medicinal herbs.

**Malla and Shakya (1984)** reported that the use of plants and plant products as medicine can be traced as far back as the beginning of human civilization. The earliest record of medicinal plant use in the Himalayas was found in the Rigveda. This was written in between 4500 BC and 1600 BC, and was supposed to be the oldest repository of human knowledge and it contained the description of 67 plants. After the Rigveda, Ayurveda (the foundation of science of life and the art of healing of Hindu culture) described the medicinal importance of 1200 plants. The knowledge of using these systems was accessed by Nepali Vaidhyas and Kabirajs as early as about 879 AD. Therefore, the Ayurvedic physicians were incorporating medicinal plants in traditional Ayurvedic formulations from early on and the Ayurvedic system was reputed all over the Indian sub-continent since time immemorial.

**Gurung (1999)** stated that people of eastern Nepal uses different plants extracts for medicines. Forty-one types of fruits, vegetables, condiments and tuber crops are collected seasonally from the forest. Besides these, religious rituals conducted by the

shaman or priest in Eastern Nepal requires such plants as bans, jhaankri kaat, kaulo, musure katus, phaledo, ghungring, titepate, chabro, pangra, amliso, dubho, sawami, and puelijhaar.

### 2.4 Policies on NTFPs in Nepal

Government of Nepal (GoN) had not regulated separate policy and legal framework relating the development, conservation and management of NTFPs. However, several policies and legal provisions had been included within the Forest Act (1993) and Forest Regulation (1995) for this sector on behalf of which, their use and conservation are undertaken (GoN/MFSC, 2007).

Various policies and legal provisions related to NTFPs in Nepal are summarized as below (Adopted from GoN/MFSC, 2007; Ojha, 2000; CECI, 2005 and ANSAB, 2005).

**Master Plan for the Forestry Sector (HMGN/ MPFS, 1988)** identified 'MAPs and other MFPs' as one of the six programs of forestry sector, and prescribed some activities for development of few products of industrial importance. But the implementation has not been increasing.

**The Forest Act (1993)** imposed a ban on certain NTFPs to aid the conservation efforts on biodiversity and environment. It had imposed a ban on removal/collection, use, sale, transportation and export of three species: *Dactylozhiza hatagirea* (Panchaunle), bark of *Juglans regia* (Okhar) and *Neopicrorhiza scrophulariifolia* (Kutki). Similarly, it has imposed a ban on seven species for export in the unprocessed form: *Nardostchys grandiflora* (Jatamansi), *Cinnamomum glaucescens* (Sugandhakokila), Lichens (Jhyau), *Taxus wallichiana* (Lautha Salla), *Rauvolfia serpentine* (Sarpagandha), *Valeriana jatamansi* (Sugandhawal), *Abies spectabilis* (Talispatra).

**The Forest Regulation (1995)** included the provisions for the collection, sell, trade and ban of NTFPs. Some noteworthy provisions in relation to NTFPs are as follows:

- If any individual is willing to collect NTFPs, other than those which are banned, should summit an application to DFO revealing the type of NTFPs to be collected, area of collection, amount and purpose of collection. The DFO must check such applications and issue permission.
- The GoN can impose a ban on the collection, use, sell, transportation and export of any specific type of NTFPs.

- FUG can collect and sell any NTFPs within their CF as per provisions included in their operational plan. Prior to the transportation of such sold NTFPs written notice should be made to respective DFO.

**The Tenth Five-Year Plan (2059-2064)** further emphasized on the production, processing and marketing of NTFPs in the private-public partnership basis, by establishing a national level "Herbs and NTFP Co-ordination Committee (HNCC)" under the chairmanship of MFSC to help formulating appropriate national policy.

**The NTFPs Alliance Project (2005)** along with Nepal NTFP Network (NNN) and Himali Jaributi Sarokar Samuha (HJSS) provided support to organize policy review workshops. Organizing a national policy workshop on NTFPs and consolidating feedback and suggestions of the key stakeholders, the alliance provided the policy recommendations to HNCC/MFSC and contributed to draft a new NTFP policy of MFSC/HMG, which was the first NTFP policy in Nepal and approved by the government as Herbs and NTFPs Development Policy- 2004. This policy was the first government document, which intended to promote forest management, NTFP certification and enterprise promotion in Nepal. The Public Private Alliance (PPA) also supported the royalty fixation committee in fixing the royalty of different herbs and NTFPs. With a strong recommendation from PPA and NNN members, HMG/N-MFSC has changed the royalty rates of 188 NTFPs.

**Herbs and Non Timber Forests Products Development Policy (2004)** included different prospects of NTFPs for its promotion, development and management. It included some long term visions, amended some policies and working policies to support the principles of sustainable development for the conservation and utilization of NTFPs. Some noteworthy points of this policy are as follows:

- It planned to develop a country into a renowned natural storage of NTFPs through the conservation and promotion of highly valued NTFPs by 2020. To support it, sustainable harvesting techniques and management will be adopted so as not to effect regeneration and reproduction of the species. Ex-situ conservation and commercial production will be promoted.
- Resources inventory on NTFPs will be carried out to manage them through good harvesting practices. In-situ and ex-situ conservation of species under threat of extinction will be carried out.

- Certain area will be tagged as "NTFPs area" after the study where conservation, development and management programs will be initiated under local participation.
- For the commercialization of this sector, cultivation and promotion of NTFPs in the CFs, leasehold forests and private forests will be encouraged. Priority will be given to women under poverty line for this purpose. People living in mid hills, conservation area and farmers will be involved in the activity.
- The processing and packing of the NTFPs will be carried out within the country as far as possible involving local people so as to provide job opportunity and economic benefit to the people. To increase the value at local level, the government, private and other related institutions will be encouraged to establish processing centers.
- Forests certification, organic farming, characterization and biotechnology related to NTFPs will be developed. GoN will act like a facilitator, catalyst, regulator for such purpose.
- It encouraged the private investors by simplifying the taxation systems (including royalty rate), sale and distribution; support the investors to participate in establishing small to medium scale industries.

*Chapter 3*

# STUDY AREA

## 3.1 Introduction of the Study Area

The Chapako CF of Ramkot Village Development Committee (VDC) is situated in the middle hill of the Central Development Region of Nepal. The Chapako CF is located in Dahachowk, Ward No. 1 of Ramkot VDC towards the North-West region of the Kathmandu Valley. This area lies between $85^0$15'00" and $85^0$17'30" East Longitude and $27^0$42'30" to $27^0$45'00" North Latitude. It is located nearly 3km North-West to Kathmandu Metropolitan City. The VDC comprises moderate steep to very steep hills, the ridges and the valleys created by rivers flowing from north to south. Most of the areas are sloppy. The altitude ranges from 1300m to 1860m from mean sea level.

There are few rivulets in the VDC. The Lupan Khola originates from Lupan, Ward No. 8 in the North and flows to the South and meets Balkhu Khola near Balkhu Bridge. Lupan Khola has two tributaries: Singaripati Khola and Kalchaude Khola. Singripati Khola and Lupan Khola when meet together is called the Kalchaude Khola. Kalchaude Khola meets the Balkhu Khola.

The Chapako CF has the total of 183 HHs as CFUG. The Chapako CF has the total area of 60.55 ha. The Ramkot VDC consists of trails and seasonal roads. The total length of the road including foot trails in the VDC is 32km. Most of the trails are connected to the small villages. The total length of the seasonal road is 8km. It is motorable and is connected with the Ringroad of the Kathmandu Valley.

## 3.2 Climate and Hydrology

The Ramkot VDC, located within the Kathmandu valley, is characterized by typical monsoon climate and dry winter. Pre-monsoon season during March to May is mostly dry and warm. This period is characterized by hazy atmosphere with dusty winds. Later parts of this season brings down some precipitation with thunderstorms and is frequently associated with hailstorms. Over 80% of the total rainfall is encountered during monsoon period starting from early June and ending by late September. Post monsoon, starting from September to November is sunny and is mostly dry with

gradually decrease in rainfall and temperature. Few spells of the rain are, however, brought down during winter from January to February.

At Kathmandu, the highest maximum average temperature was recorded during August ($24.55^0$C). The minimum average temperature was recorded during January ($11.12^0$C). The average precipitation was highest during July (1192.9mm) and lowest precipitation was recorded during December (9.3mm)

### 3.3 Historical Background of the Forest

The Chapako Ban was dense before 2010 B.S., later became shrub land within 2024 B.S. as a matter of increase urbanization, illegal harvesting, export of FPs, forest fires and soil erosion due to overexploitation of the natural greenery. So, in the fiscal year 2042/43 B.S. forest conservation committee was formed and forest protection work was started. The government in addition, tried to conserve the forest by introducing forest watchers. Later in 2047 B.S., local people formed a FUG and they tried to conserve the forest with their own effort. As a result, different species regenerated naturally and developed into a mixed forest, and by to-date the condition of the forest is improving. A decade ago in 2052 B.S., 60.55 hectare (ha) of forest was handed over to the FUG in the name of Chapako CF. The forest is surrounded by Lupang Khola in the East, gully of Jaisi Dhara in the West, settlement of Ramkot VDC Ward No. 8, in the North and Khanal and Shahi Villages to the South.

### 3.4 Vegetation

The Chapako CF is composed of broadleaved species. Among the species, majority of the vegetations are regenerated along with some planted species. The Chapako CF is divided into 6 blocks. The division of the blocks has been made on the basis of roads/trials and streams. Boundaries, area and major species of vegetation in each blocks of the forest are as follows:

**Block I**

Block I is bounded in the East with Dhunge Dhare (stone spout) of Gairi Gaun, West with the way to Tapke Chaur, North with the Panidhalko Sukeko Pokhari from nursery mode, and South with the way to the school. It has an area of 11.25ha. The forest type in this block is mixed broadleaved. The major species of this block are *Myrica esculenta, Schima wallichii, Castanopsis tribuloides,* and *Rhododendron arboreum.*

**Block II**

Block II is bounded in the East with the way to Tapke Chaur, West with the Ghati Devisthan of Bhyade Chaur, North with the way Nursery Bhanjyang, and South with the way from Baraj basne Dhik to Bhyade Chaur. It has an area of 6.25ha. It has mixed broadleaved forest with *Engelhardtia spicata, Schima wallichii, Pinus wallichiana,* and *Castonopsis sp.* as the major species.

**Block III**

Block III is bounded in the East with the Ghatki Devisthan of Bhyade Chaur, West with the hill of Dhurkot, North with the way to Kol Dhunga, and South with the hills of Thapa and Panchakanya Devisthan. It has an area of 17.50ha. It has mixed broadleaved forest with *Alnus nepalensis, Maesa chisia, Rubus ellipticus* and *Berberis asiatica* as the major species.

**Block IV**

Block IV is bounded in the East with the landslide from Bakhre kholsi to Yeklo Garha, West with the way to Saleni Kholsi, North with the way from Dhunge Dhare to Saleni Kholsi, and South with the way from Chuche Dhunga to Pani Dhallo. It has an area of 4.5ha. It has mixed broadleaved forest with *Myrica esculenta, Castonopsis indica, Quercus glauca,* and *Rhodendron arboreum* as the major species.

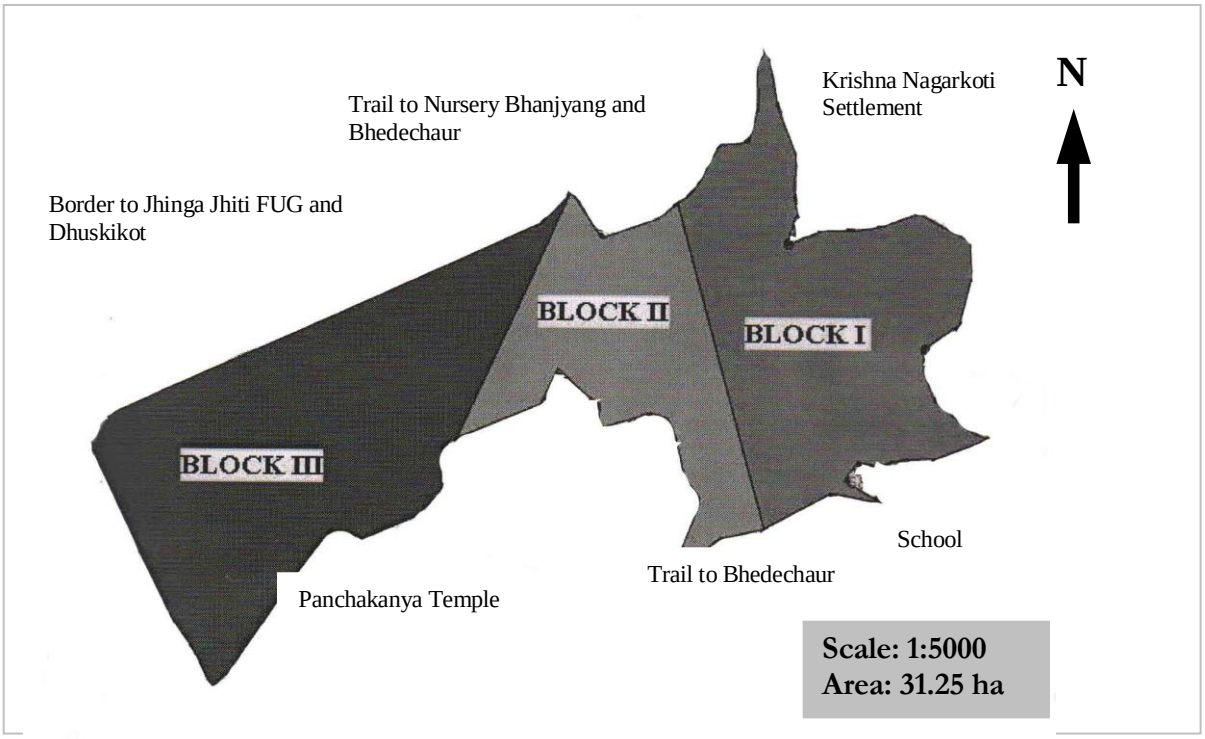
**Block V**

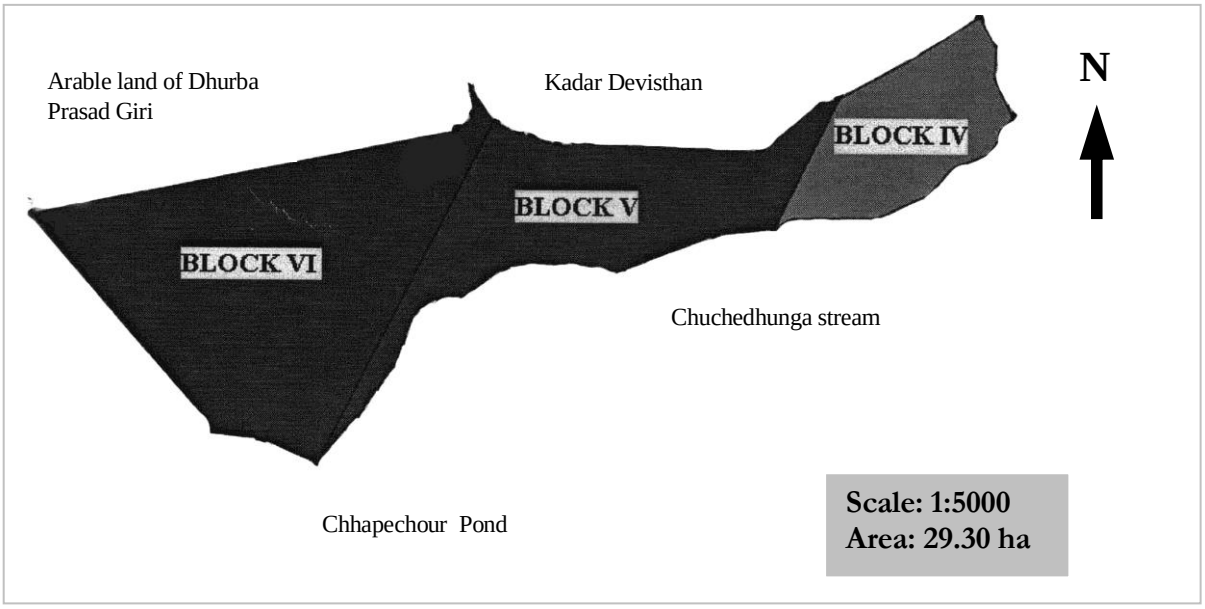
Block V is bounded in the East with the way from Saleni Kholsi to Lapsi Gairi, West from the way to Lama Ghar to Thali under the tree of Sallo, North from Dhungini Devisthan to Kedarsthan, and South with the way to Chhape Chaur. It has an area of 8.75ha. It has a mixed broadleaved forest with *Castonopsis tribuloides, Castonopsis indica, Schima wallichii,* and *Acer oblongum* as the major species.

**Block VI**

Block VI is bounded in the East with the way from Lama Ghar to Thali under the tree of Sallo, West with the Kwake Chaur and arable land of Dhurba Prasad Giri, North with the Kholsi of Jhayapane Chaur, and South with the way to Chhape Chaur. It has an area of 16.05ha. It has a mixed broad leaved forest with *Castonopsis tribuloides, Schima wallichii, Myrica esculenta, Castonopsis indica,* and *Rhododendron arboreum* as the major species.

**Figure 3.1: Map of the Chapako CF**



*Chapter 4*

# MATERIALS AND METHODS

## 4.1 Reconnaissance survey

In consultation with the DFO, Hatisar, Kathmandu and through the reconnaissance survey, the site for the study was ascertained. Visit to the site and discussion with the FUG of the CF was made to know the general status and condition of the forest. The survey of the study area was carried out prior to the in depth field study in order to gain general information about the research site by consulting with DFO, and CFUG so as to match the research objectives of the proposed field.

## 4.2 Data collection procedure

Both primary and secondary data were collected. Primary data were collected from the study area while secondary data were collected from published and unpublished documents regarding this research.

### 4.2.1 Primary data collection

Primary data collection were done by following ways-

#### 4.2.1.1 Questionnaire survey

The semi structured questionnaire, mostly with open-ended questions, was developed for questionnaire survey. The pre- testing of the questionnaire was carried out in 5 HHs and necessary modifications and improvement were done in the questionnaire.

The total uniform random sampling was done for HHs survey with the intensity of 27% (i.e. 51 HHs). The questionnaire was applied to collect the basic information of the forest, forest area, forest type, different uses of the FPs, management activities, socio-economic condition of the FUGs, their attitude and perception about NTFPs, NTFPs collection and their harvesting practices, local consumption, sources of income, NTFPs potential market etc.

#### 4.2.1.2 Key informant survey

The key informant survey was basically carried out to collect more information on their perception, attitude and practices regarding NTFPs as well as to find out the scale and values of selected NTFPs for potentiality analysis. It was carried out with elderly persons, local NGOs and INGOs, local leasers, teachers, local healers, NTFPs traders and product purchasers. The information about NTFPs resources and their existing conditions, market demand and market potential of the NTFPs was obtained from key informants.

#### 4.2.1.3 Transect walk and Personal observation

The transect survey was carried out to observe forest composition, forest type, forest block identification, cultivation plots and nursery inside CF, regeneration structure, and types of NTFPs were closely observed.

#### 4.2.1.4 Inventory of NTFPs

NTFPs were listed in the group discussion and from key informant survey. Only 10 Non Timber species were selected, based on what was expected to be a marketable item which economically benefits the FUG, for matrix ranking to identify the potential NTFPs for income generation. The inventory was carried out to assess the status of selected/potential NTFPs for enterprise development as well as recording NTFPs resources.

For the NTFPs inventory, the method adopted was stratified systematic sampling method with the sampling intensity of 0.5%. Every sampling plot of dimension 20m ×25m was taken and within the plot the whole quadrat (20m × 25m) was taken for trees, 5m × 5m was taken for shrubs and 1m × 1m was taken for herbs. The number of sampling plots assessed were 3, 2, 4, 2, 2, 4 and the horizontal distance between the sampling plots taken was 168m, 145m, 189m, 123m, 130m, 180m respectively for Block I, Block II, Block III, Block IV, Block V and Block VI (HMGN/MFSC, 2004).

### 4.2.2 Secondary data collection

Secondary data were collected from various published and unpublished documents related to the study. To generate the secondary data, the maps, official records, research reports, forest management plan, annual reports and other published and unpublished

materials from DFO, Department of Hydrology and Meteorology, internet were consulted and collected.

## 4.3 Data processing and analysis

Both quantitative and qualitative methods were used to analyze the data. For qualitative analysis, the information collected from observation, formal and informal discussion in the group and the individuals, key informant survey and data obtained from the survey were used. The quantitative analysis was done adopting following methods and formula:

### 4.3.1 Vegetation analysis

#### 4.3.1.1 Measurement of Density

The number of Non Timber species was counted within each plot and the density was calculated to express it in terms of number per ha. It was calculated by using the following formula (Zobel *et al.*, 1987).

$$\text{Density (D) pl/ha} = \frac{\text{No. of individuals of a species in all the sampling units}}{\text{Total no. of sampling units studied} \times \text{area of sampling unit}} \times 10{,}000$$

$$\text{Relative Density} = \frac{\text{Density of a species}}{\text{Total density of all the species}} \times 100$$

#### 4.3.1.2 Measurement of Abundance

The abundance of the species was calculated as the species were distributed in patches. Abundance was calculated separately for each species.

$$\text{Abundance (A) pl/ha} = \frac{\text{No. of individuals of a species in all the quadrats}}{\text{No. of quadrats in which the species occurred} \times \text{area of quadrats}} \times 10{,}000$$

$$\text{Relative Abundance} = \frac{\text{Abundance of a species}}{\text{Total abundance of all the species}} \times 100$$

### 4.3.2 Matrix preference ranking of the potential NTFPs

The selected NTFPs were tested against a set of criteria of potential NTFPs values for the economic development. The basis of selection was the more economic potential and higher ecological availability. The ranking of NTFPs for economic development of the CFUG was done with group discussion and key informant survey. The set of criteria used for matrix preference ranking were given in the table below.

**Table 4.1: Matrix preference ranking, their potentiality criteria, scale and values of NTFPs to be potential for economic development:**

| S.N. | Criteria | Scale and scores | | |
|---|---|---|---|---|
| | | 3 | 2 | 1 |
| 1. | Market potential | Large | Moderate | Limited |
| 2. | Market demand | High | Moderate | Low |
| 3. | Regenerative potential | High | Moderate | Low |
| 4. | Availability | Almost always | Seasonally | Rarely |
| 5. | Impact on environment | Positive | Neutral | Negative |
| 6. | Contribution to the income | High | Moderate | Low |
| 7. | FUG interest | High | Moderate | Low |
| 8. | Processing technology | High | Moderate | Low |
| 9. | Habits | Herb/grasses | Shrub | Tree |
| 10. | Parts used | Leaf & bark | Flower & fruit | Roots, rhizomes, bulbs |
| 11. | Abundance | High | Moderate | Low |

*Chapter 5*

# DATA ANALYSIS AND FINDINGS

## 5.1 Inventory of NTFPs

The NTFPs were distributed all around the Chapako CF in different space and aspects. Thirty four species of NTFPs were observed in the forest during the study. The NTFPs observed in the forest were given in Annex II. Among them, 10 NTFPs were selected for the detail study. The basis of selection was the marketable species with higher ecological availability and good economic potential as per CFUG. The inventories of these NTFPs were carried out in the different blocks separately. Data obtained from the sampling plots were analyzed and tabulated separately for different blocks of the forest.

**Block I:**

Among 10 selected NTFPs, 7 species were present in Block I. *Castonopsis tribuloides* and *Myrica esculenta* had the highest densities with 693.34 pl/ha and 606.67 pl/ha respectively. The relative densities of *Castonopsis tribuloides*, *Myrica esculenta* and *Rhododendron arboreum* were 32.60, 28.53 and 26.33 respectively. The abundance was highest for *Myrica esculenta* (910 pl/ha) and relative abundance of 22.58. The densities, relative densities, abundance and relative abundance were given in the Table 5.1.

**Table 5.1: Density (D), Relative Density (RD), Abundance (A) and Relative Abundance (RA) of the species of NTFPs in Block I**

| S.N. | Name of species | D | RD | A | RA |
|---|---|---|---|---|---|
| 1. | *Amomum subulatum* | 35.56 | 1.67 | 800 | 19.85 |
| 2. | *Castonopsis tribuloides* | 693.34 | 32.60 | 693.33 | 17.20 |
| 3. | *Choerospondias axillaris* | 106.67 | 5.02 | 160 | 3.97 |
| 4. | *Cinnamomum tamala* | - | - | - | - |
| 5. | *Gaultheria fragrantissima* | - | - | - | - |
| 6. | *Lyonia ovalifolia* | 106.67 | 5.02 | 106.67 | 2.65 |
| 7. | *Myrica esculenta* | 606.67 | 28.53 | 910 | 22.58 |
| 8. | *Pinus wallichiana* | - | - | - | - |
| 9. | *Piper longum* | 17.78 | 0.84 | 800 | 19.85 |
| 10. | *Rhododendron arboreum* | 560 | 26.33 | 560 | 13.90 |

**Block II:**

Eight among from the selected NTFPs were present in Block II. *Cinnamomum tamala* and *Gaultheria fragrantissima* were absent. The highest density was of *Lyonia ovalifolia* (960 pl/ha) with relatively high relative density (33.24). *Castonopsis tribuloides*, *Pinus wallichiana*, *Myrica esculenta* and *Choerospondias axillaris* had the densities as 520 pl/ha, 400 pl/ha, 360 pl/ha and 320 pl/ha respectively. The abundance were highest for *Lyonia ovalifolia* and *Amomum subulatum* with abundance 960 pl/ha and 900 pl/ha respectively. Their relative abundances were 21.33 and 20 respectively. The densities and abundances of all the available species were tabulated below (Table 5.2).

**Table 5.2: Density (D), Relative Density (RD), Abundance (A) and Relative Abundance (RA) of the species of NTFPs in Block II**

| S.N. | Name of species | D | RD | A | RA |
|---|---|---|---|---|---|
| 1. | *Amomum subulatum* | 144 | 4.99 | 900 | 20 |
| 2. | *Castonopsis tribuloides* | 520 | 18.01 | 520 | 11.56 |
| 3. | *Choerospondias axillaris* | 320 | 11.08 | 320 | 7.11 |
| 4. | *Cinnamomum tamala* | - | - | - | - |
| 5. | *Gaultheria fragrantissima* | - | - | - | - |
| 6. | *Lyonia ovalifolia* | 960 | 33.24 | 960 | 21.33 |
| 7. | *Myrica esculenta* | 360 | 12.47 | 360 | 8 |
| 8. | *Pinus wallichiana* | 400 | 13.85 | 800 | 17.78 |
| 9. | *Piper longum* | 64 | 2.22 | 400 | 8.89 |
| 10. | *Rhododendron arboreum* | 120 | 4.16 | 240 | 5.33 |

**Block III:**

Least among from the selected NTFPs were found in Block III. The species found were *Lyonia ovalifolia*, *Pinus wallichiana* and *Piper longum*, *Gaultheria fragrantissima*. The densities of these species were 320 pl/ha, 85 pl/ha, 17.14 pl/ha and 11.43 pl/ha respectively. Their relative densities were 73.81, 19.96, 3.95 and 2.64 respectively. The abundance were highest for *Lyonia ovalifolia* with abundance 640 pl/ha and relative abundance 41.20. The densities, relative densities, abundance and relative abundance of other species were given in the Table 5.3.

**Table 5.3: Density (D), Relative Density (RD), Abundance (A) and Relative Abundance (RA) of the species of NTFPs in Block III**

| S.N. | Name of species | D | RD | A | RA |
|---|---|---|---|---|---|
| 1. | *Amomum subulatum* | - | - | - | - |
| 2. | *Castonopsis tribuloides* | - | - | - | - |
| 3. | *Choerospondias axillaris* | - | - | - | - |
| 4. | *Cinnamomum tamala* | - | - | - | - |
| 5. | *Gaultheria fragrantissima* | 11.43 | 2.64 | 400 | 25.75 |
| 6. | *Lyonia ovalifolia* | 320 | 73.81 | 640 | 41.20 |
| 7. | *Myrica esculenta* | - | - | - | - |
| 8. | *Pinus wallichiana* | 85 | 19.60 | 113.33 | 7.30 |
| 9. | *Piper longum* | 17.14 | 3.95 | 400 | 25.75 |
| 10. | *Rhododendron arboreum* | - | - | - | - |

**Block IV:**

Only two among from the selected NTFPs were missing in Block IV. Among the eight available NTFPs, *Lyonia ovalifolia* had the highest density with 640 pl/ha. Its relative density was found to be 30.06. The densities of *Castonopsis tribuloides*, *Myrica esculenta*, *Gaultheria fragrantissima* and *Rhododendron arboreum* were 410 pl/ha, 360 pl/ha, 244.45 pl/ha and 240 pl/ha respectively. *Choerospondias axillaris*, *Cinnamomum tamala* and *Piper longum* had comparatively less densities ie; 110 pl/ha, 80 pl/ha and 44.45 pl/ha respectively. The abundance were highest for *Lyonia ovalifolia* and *Gaultheria fragrantissima* with abundance 640 pl/ha and 550 pl/ha respectively. Their relative abundances were found to be 22.30 and 19.16 respectively (Table 5.4).

**Table 5.4: Density (D), Relative Density (RD), Abundance (A) and Relative Abundance (RA) of the species of NTFPs in Block IV**

| S.N. | Name of species | D | RD | A | RA |
|---|---|---|---|---|---|
| 1. | *Amomum subulatum* | - | - | - | - |
| 2. | *Castonopsis tribuloides* | 410 | 19.26 | 410 | 14.29 |
| 3. | *Choerospondias axillaris* | 110 | 5.17 | 110 | 3.83 |
| 4. | *Cinnamomum tamala* | 80 | 3.76 | 160 | 5.57 |
| 5. | *Gaultheria fragrantissima* | 244.45 | 11.48 | 550 | 19.16 |
| 6. | *Lyonia ovalifolia* | 640 | 30.06 | 640 | 22.30 |
| 7. | *Myrica esculenta* | 360 | 16.91 | 360 | 12.54 |
| 8. | *Pinus wallichiana* | - | - | - | - |
| 9. | *Piper longum* | 44.45 | 2.09 | 400 | 13.19 |
| 10. | *Rhododendron arboreum* | 240 | 11.27 | 240 | 8.36 |

**Block V:**

All together eight among from the selected NTFPs were found in Block V. Among them, *Castonopsis tribuloides* had the highest density with 510 pl/ha and relatively high relative density (37.78). The densities of *Rhododendron arboreum*, *Myrica esculenta* and *Cinnamomum tamala* were 200 pl/ha, 200 pl/ha and 170 pl/ha respectively. The abundance were highest for *Gaultheria fragrantissima* and *Castonopsis tribuloides* with abundance 600 pl/ha and 510 pl/ha respectively. Their relative abundances were 25.64 and 21.76 respectively. The densities, relative densities, abundance and relative abundance of other species were given in the Table 5.5.

**Table 5.5: Density (D), Relative Density (RD), Abundance (A) and Relative Abundance (RA) of the species of NTFPs in Block V**

| S.N. | Name of species | D | RD | A | RA |
|---|---|---|---|---|---|
| 1. | *Amomum subulatum* | - | - | - | - |
| 2. | *Castonopsis tribuloides* | 510 | 37.78 | 510 | 21.76 |
| 3. | *Choerospondias axillaris* | 90 | 6.67 | 180 | 7.69 |
| 4. | *Cinnamomum tamala* | 170 | 12.59 | 170 | 7.26 |
| 5. | *Gaultheria fragrantissima* | 60 | 4.44 | 600 | 25.64 |
| 6. | *Lyonia ovalifolia* | 40 | 2.96 | 80 | 3.42 |
| 7. | *Myrica esculenta* | 200 | 14.81 | 200 | 8.55 |
| 8. | *Pinus wallichiana* | - | - | - | - |
| 9. | *Piper longum* | 80 | 5.93 | 400 | 17.09 |
| 10. | *Rhododendron arboreum* | 200 | 14.81 | 200 | 8.55 |

**Block VI:**

Only five among from the selected NTFPs were found in Block VI. The *Castonopsis tribuloides* had remarkably high density than other species. The density and relative density of *Castonopsis tribuloides* was 1300 pl/ha and 53.86 respectively. The abundance was also remarkably high for *Castonopsis tribuloides* with abundance 1300 pl/ha and relative abundance 46.51. The densities, relative densities, abundance and relative abundance of other species were given in the Table 5.6.

**Table 5.6: Density (D), Relative Density (RD), Abundance (A) and Relative Abundance (RA) of the species of NTFPs in Block VI**

| S.N. | Name of species | D | RD | A | RA |
|---|---|---|---|---|---|
| 1. | *Amomum subulatum* | - | - | - | - |
| 2. | *Castonopsis tribuloides* | 1300 | 53.86 | 1300 | 46.51 |
| 3. | *Choerospondias axillaris* | - | - | - | - |
| 4. | *Cinnamomum tamala* | - | - | - | - |
| 5. | *Gaultheria fragrantissima* | 18.46 | 0.76 | 400 | 14.31 |
| 6. | *Lyonia ovalifolia* | 240 | 9.94 | 240 | 8.59 |
| 7. | *Myrica esculenta* | 575 | 23.82 | 575 | 20.57 |
| 8. | *Pinus wallichiana* | - | - | - | - |
| 9. | *Piper longum* | - | - | - | - |
| 10. | *Rhododendron arboreum* | 280 | 11.60 | 280 | 10.02 |

## 5.2 Matrix preference ranking, their potentiality criteria, scale and values of NTFPs to be potential for economic development

The matrix preference ranking for the selected NTFPs has been performed with their potentiality criteria and their scale and values to determine the potential NTFPs. The selected NTFPs were *Amomum subulatum, Castonopsis tribuloides, Choerospondias axillaris, Cinnamomum tamala, Gaultheria fragrantissima, Lyonia ovalifolia*, *Myrica esculenta, Pinus wallichiana, Piper longum* and *Rhododendron arboreum.*

*Gaultheria fragrantissima* had the highest score with the total score of 28. Similarly, *Amomum subulatum* and *Piper longum* also had relatively high scores (25 and 26 respectively). So, these three species were taken as first order potential NTFPs for economic development. *Cinnamomum tamala, Choerospondias axillaris* and *Lyonia ovalifolia* also had the respective scores whereas scores were least for *Castonopsis tribuloides, Rhododendron arboreum* and *Myrica esculenta*. The tabulated form of the matrix preference ranking for these species is given below in Table 5.7.

**Table 5.7: Matrix preference ranking for the selected NTFPs**

| Ranking Criteria / Name of species | Market potential | Market demand | Regenerative potential | Availability | Impact on environment | Contribution to income | FUG interest | Processing technology | Habits | Parts used | Abundance | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Amomum subulatum* | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 25 |
| *Castonopsis tribuloides* | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 3 | 17 |
| *Choerospondias axillaris* | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 22 |
| *Cinnamomum tamala* | 3 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 1 | 3 | 1 | 23 |
| *Gaultheria fragrantissima* | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 28 |
| *Lyonia ovalifolia* | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 21 |
| *Myrica esculenta* | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 15 |
| *Pinus wallichiana* | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 19 |
| *Piper longum* | 3 | 3 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 26 |
| *Rhododendron arboreum* | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 15 |

## 5.3 NTFPs in the Chapako CF

The Chapako CF was composed of broad leaved species. The majorities of the tree species were naturally regenerated in addition to some planted tree species. The major tree species found in the Chapako CF are *Schima wallichii, Rhododendron arboreum, Myrica esculenta* and *Castonopsis* sp.

The NTFPs available in different blocks and their status was overviewed through different primary data collection procedures. All together 34 NTFPs were found in the forest. Among them, 13 were herbs/grasses, 7 were shrubs and 14 were trees. The NTFPs available in the study area were classified according to their habits in the Table 5.8 below.

**Table 5.8: Classification of NTFPs of the Chapako CF according to their habits**

| **Herbs/ Grasses** | **Shurbs** | **Trees** |
|---|---|---|
| *Amomum subulatum,*<br>*Acorus calamus,*<br>*Ageratina adenephora,*<br>*Artemesia sp.,*<br>*Arundinaria intermedia,*<br>*Astilbe rivularis,*<br>*Cymbopogon flexousus,*<br>*Daphne bholua,*<br>*Dioscorea bulbifera,*<br>*Parmelia sp.,*<br>*Piper longum,*<br>*Smilax menispermoides,*<br>*Thysanolaena maxima* | *Berberis asiatica,*<br>*Dichroa febrifuga,*<br>*Gaultheria fragrantissima,*<br>*Phyllanthus parvifolius,*<br>*Rhus javanica,*<br>*Rubus ellipticus,*<br>*Zanthoxylum armatum* | *Betula alnoides,*<br>*Castonopsis indica,*<br>*Castonopsis tribuloides,*<br>*Choerospondias axillaris,*<br>*Cinammomum tamala,*<br>*Lyonia ovalifolia,*<br>*Myrica esculenta,*<br>*Phyllanthus emblica,*<br>*Pinus wallichiana,*<br>*Prunus cerasoides,*<br>*Pyrus pashia,*<br>*Rhododendron arboreum,*<br>*Schima wallichii,*<br>*Zizyphus incurva* |
| **Total:** 13 species | 7 species | 14 species |

Source: Field Survey, 2006

The overall status of NTFPs in the CF is quite promising. The NTFPs were in good condition as 58.82% responded that NTFPs are increased in the last 5 years. Only 5.90% of the respondent replied that the NTFPs were decreasing in the last 5 years. 13.72% responded that the status of NTFPs had not changed in the last 5 years. 21.56% of the respondents were not clear on the status of NTFPs in their CF as they responded that they didn't know the changes in NTFPs in five years time.

**Table 5.9: Status of NTFPs in the last 5 year**

| **Status** | **% of Respondent** |
|---|---|
| Increasing | 58.82 |
| Decreasing | 5.90 |
| Same (No change) | 13.72 |
| Don't know | 21.56 |

The FUG members were involved in the plantation of NTFPs in the CF. The NTFPs together with the number of saplings planted in the respective block and year of plantation were given in the Table 5.10. Recently, the FUGs were involved in the plantation of *Acorus calamus, Amomum subulatum, Choerospondias axillaris* and *Daphne bholua*.

**Table 5.10: NTFPs planted in the CF**

| **NTFPs** | **Planted number in block** | | | | | | **Planted year (A.D.)** |
|---|---|---|---|---|---|---|---|
| | **I** | **II** | **III** | **IV** | **V** | **VI** | |
| *Acorus calamus* | 60 | | | | | | 2005 |
| *Daphne bholua* | 1000 | | | | | | 2004 |
| *Choerospondias axillaris* | | | | 45 | | | 2004 |
| *Amomum subulatum* | 500 | 1000 | | | | | 2000 |
| *Cymbopogon flexousus* | 70 | | | | | | 2000 |
| *Pinus wallichiana* | | NA | NA | | | | 1988 |

In addition, the CFUG were willing to plant some other NTFPs in the forest. Those NTFPs were given in the Table 5.11 in the order of their priorities.

**Table 5.11: Prioritized NTFPs by the FUG for cultivation**

| S.N. | Name of the species |
|---|---|
| 1. | *Arundinaria intermedia* |
| 2. | *Choerospondias axillaris* |
| 3. | *Cinnamomum tamala* |
| 4. | *Gaultheria fragrantissima* |
| 5. | *Piper longum* |
| 6. | *Zanthoxylum armatum* |

Status of the planted NTFPs was quite satisfactory as 56.86% of the respondent stated that their conditions were good, 35.30% responded fair and a few (7.84%) responded that those NTFPs were in the poor condition.

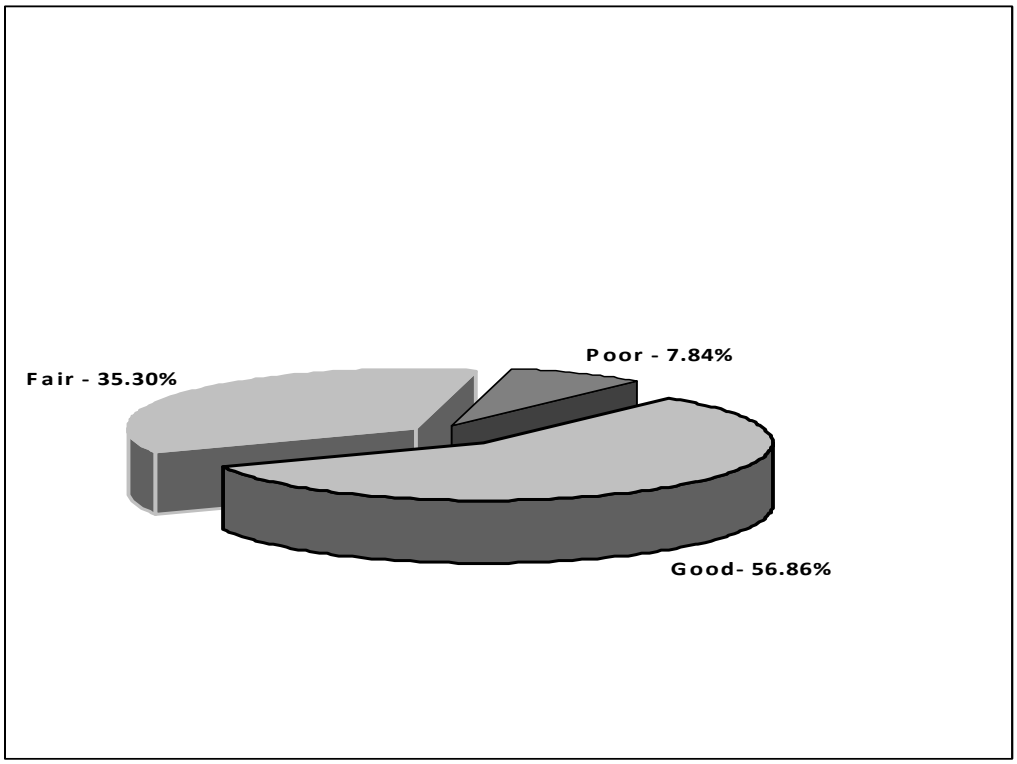



**Figure 5.1: Status of planted NTFPs**

## 5.4 Declining NTFPs

Some of NTFPs had declined from the Chapako CF and some upto the point of local extinction. The respondents reported that 7 species were found to be declined (Table 5.12). Among them, 62.75% responded that *Gaultheria fragrantissima* was the most declining species. Similarly, *Berberis asiatica* and *Cinnamomum tamala* were enlisted by the respondents as the declining species by 54.10% and 45.10% respectively. Others which were thought to be the declined species were *Zanthoxylum amartum, Rubus ellipticus, Rhus javanica* and *Phyllanthus emblica.*

**Table 5.12: NTFPs treated to be the threatened**

| S.No. | NTFPs | % of Respondent |
|---|---|---|
| 1. | *Berberis asiatica* | 54.10 |
| 2. | *Cinnamomum tamala* | 45.10 |
| 3. | *Gaultheria fragrantissima* | 62.75 |
| 4. | *Phyllanthus emblica* | 9.80 |
| 5. | *Rhus javanica* | 9.80 |
| 6. | *Rubus ellipticus* | 27.45 |
| 7. | *Zanthoxylum armatum* | 27.45 |

## 5.5 Cultivation of NTFPs in the farmland

Majority of the FUG members cultivated some NTFPs in their farmlands (Table 5.13). Only few of them (19.60%) did not like to cultivate the NTFPs in the farmland. Among the cultivated NTFPs, there were mostly high valued plants like *Amomum subulatum* and *Asparagus racemosus.* Like wise many of the FUG members cultivated *Choerospondias axillaris* (57.14%), *Amomum subulatum* (50.12%) and *Malus pumila* (21.42%).

The NTFPs thus cultivated were used for both personal and selling purposes. In this category came the *Prunus persica* and *Asparagus racemosus.* But *Cinnamomum tamala* and *Thysanolaena maxima* were found to be cultivated basically for personal HH uses. Like wise *Amomum subulatum*, *Choerospondias axillaris* and *Malnus pumila* were found to be cultivated only for personal use by 38.46%, 37.93% and 63.63% HHs respectively. At the same time, only 23.08%, 13.80% and 36.37% HHs respectively responded that those 3 species were cultivated for selling.

**Table 5.13: NTFPs cultivated by FUG members in their farmland**

| NTFPs | % of Respondent | Use of NTFPs (%) | | |
|---|---|---|---|---|
| | | HHs use | Sell | Both |
| *Amomum subulatum* | 50.10 | 38.46 | 23.08 | 38.46 |
| *Asparagus racemosus* | 7.84 | - | - | 100 |
| *Choerospondias axillaris* | 56.87 | 37.93 | 13.80 | 48.27 |
| *Cinnamomum tamala* | 7.84 | 100 | - | - |
| *Malus pumila* | 21.57 | 63.63 | 36.37 | - |
| *Prunus persica* | 7.84 | - | - | 100 |
| *Thysanolaena maxima* | 15.69 | 100 | - | - |
| Don't cultivate | 19.60 | - | - | - |

## 5.6 Collection, use and management of NTFPs

However, the provision of cultivation and promotion of NTFPs was included the operation plan, separate provision on its collection, use and managements were not included in the operation plan of the CF.

The FUG members had made a nursery in block II where they cultivated some NTFPs as *Acorus calamus* and *Cymbopogon flexousus.* They also grafted *Pyrus pashia* (Mayal) and *Malus pumila* (Naspati). They tried to graft in 25 species and succeeded in 10 of them.

The FUG members were involved in the collection of NTFPs. The collected NTFPs and their collected months were presented in the Table 5.14. They were mostly interested in the collection of *Amomum subulatum* (64.71%) followed by other species like *Choerospondias axillaris, Gaultheria fragrantissima, Myrica esculenta* and so on. Only a few (13.73%) were involved in the collection of *Cinnamomum tamala*. Collection of some species like *Gaultheria fragrantissima* and *Artemesia* sp. did not have specific months. They were collected whenever required.

**Table 5.14: NTFPs collected from CF**

| NTFPs | % of Respondent | Collected month |
|---|---|---|
| *Amomum subulatum* | 64.71 | November |
| *Artemesia* sp. | 37.25 | ** |
| *Castonopsis* sp. | 41.18 | September |
| *Choerospondias axillaris* | 50.98 | November-December |
| *Cinnamomum tamala* | 13.73 | August-October |
| *Dioscorea bulbifera* | 21.57 | December-January |
| *Gaultheria fragrantissima* | 45.10 | ** |
| *Myrica esculenta* | 43.14 | April |
| *Rhododendron arboreum* | 37.25 | March |
| *Rubus ellipticus* | 19.61 | April - May |

*Note: ** collected when required*

The collected NTFPs were mostly used in the HH uses rather than selling them. 68.62% of FUG members responded that the collected NTFPs were used for personal HH purposes. 9.81% responded that they sold where as 11.76% responded that collected NTFPs were sold as well as used for HH purposes. 9.81% of the interviewees did not respond to the question.

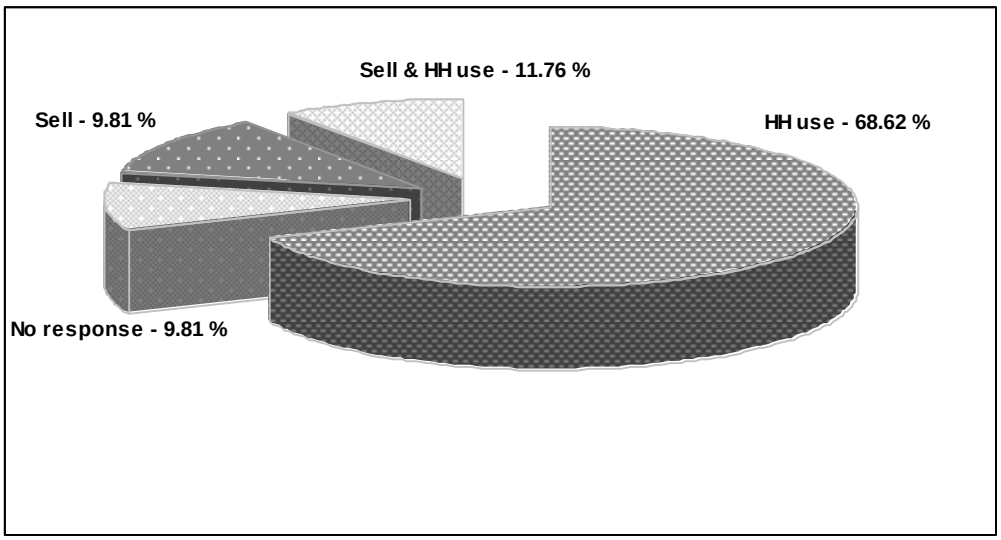



**Figure 5.2: Use of collected NTFPs**

**Collectors of the NTFPs:**

Adult males were found to be the usual collectors of the NTFPs. 39.21% responded that adult males were the collector of NTFPs, while 11.77% responded that it was adult females and 27.45% responded that children were the collectors. Appreciable number (21.57%) responded that there was no fixed demarcation for the collectors as far as their HHs were concerned.

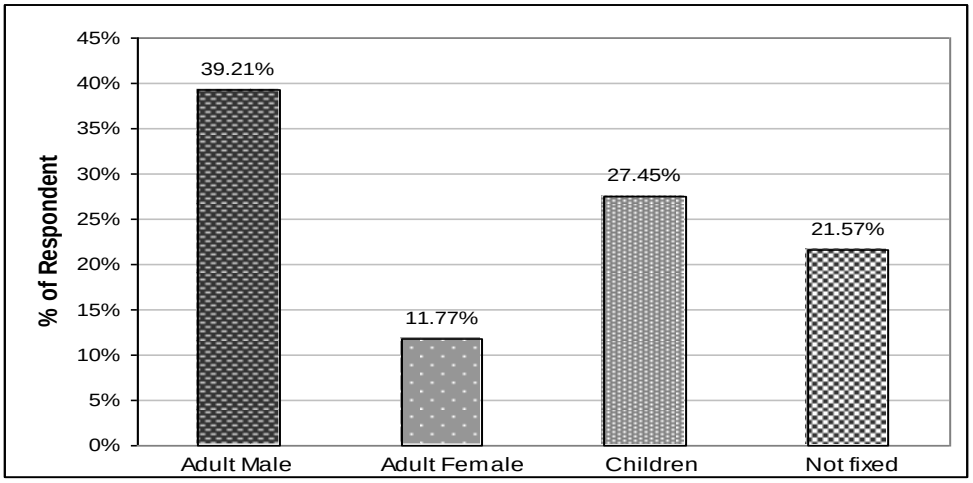



**Figure 5.3: Collectors of NTFPs**

## 5.7 Contribution of NTFPs on the Economic Development

The contribution of the NTFPs on the economic development of the CFUG was assessed. There was a considerable contribution of NTFPs on the economic development of the FUG members (Table 5.15). Majority of the FUG members (72.55%) responded that they were economically benefited from NTFPs of their farmland and only a few of them (9.80%) responded they were not. Similarly, 50.10% of the FUG members responded that they were economically benefited from NTFPs of their CF and 35.29% responded they were not economically benefited. They (35.29%) responded so simply because they were not benefited at personal level as the income generated thus was used in the developmental activities of the community.

**Table 5.15: Contribution of NTFPs on the Economic Development**

| **Responses** | **% of Respondent** | |
|---|---|---|
| | **Farmland** | **CF** |
| Supported to the economic development | 72.55 | 50.10 |
| Not supported to the economic development | 9.80 | 35.29 |
| Don't know | 17.65 | 13.71 |

With this, the CFUG was benefited both in cash and kind (i.e. directly by the sell of NTFPs and indirectly by the use and consumption of these products for different purposes). A few amounts had been generated through the selling of some species like *Choersopondias axillaris, Amomum subulatum, Dhaphe bholou* etc (Table 5.16). They were in the initial phase of the cultivation and promotion of the NTFPs in the CF. The benefit in terms of cash by the sell of these products was prominent to rise in the future.

**Table 5.16: NTFPs sold by the CFUG from the CF**

| NTFPs | Sold Amount (Kg) | Rate (NRs./Kg) | Sold at |
|---|---|---|---|
| *Amomum subulatum* | 25 | 68 | Local market |
| *Choerospondias axillaris* | 250 | 20 | Local market |
| *Daphne bholua* | 300 (plants) | 2/plant | Local farmers |

Likewise, the NTFPs had also indirectly benefited the CFUG through their utilities. NTFPs having religious importance like *Castonopsis* sp., *Dioscorea bulbifera* etc were widely used for the respective religious purposes. Similarly, the species with medicinal values were used as per the requirement and ethonobotanical uses. The species *Ageratina adenephora, Artemesia* sp., *Betula alnoides, Gaultheria fragrantissima, Piper longum* and *Rubus ellipticus* were used for such purposes. Edible NTFPs were also consumed.

In addition, the CFUG also sold the NTFPs produced from their farmlands. The quantities sold per HH per year with its rate were given in the table below (Table 5.17).

**Table 5.17: NTFPs sold by the CFUG from farmland**

| NTFPs | Maximum Quantity sold (Kg) | Average Quantity Sold (Kg) | Rate (NRs./Kg) | Sold at |
|---|---|---|---|---|
| *Amomum subulatum* | 14 | 2.03 | 68 | Local market |
| *Asparagus racemosus* | 19 | 3.29 | 15 | Local market |
| *Choerospondias axillaris* | 28 | 6.02 | 20 | Local market |
| *Cinnamomum tamala* | 4 | 0.47 | 16 | Local market |
| *Malus pumila* | 11 | 3.92 | 12 | Local market |

As the majority of FUG members had cultivated NTFPs in the farmlands, their average monthly income was analyzed. It was found that the FUG members who had cultivated NTFPs had an average monthly income of NRs. 5,815 and there was appreciable contribution of NTFPs in their monthly income. The average monthly income (NRs. 5,815) of the CFUG for the rural community was fairly good. Those FUG members who had taken NTFPs as one of the major source of income had even better monthly income averaging more than NRs. 8,000. The contribution of NTFPs in their income was 25% or more.

### 5.8 Prioritized NTFPs for Economic Development

The GoN has enlisted 30 various species under NTFPs as the prioritized species for the economic development (Table 5.18). Among the prioritized species *Acorus calamus, Cinnamomum tamala, Gaultheria fragrantissima, Lichen, Phyllanthus emblica, Piper longum* and *Zanthoxylum armatum* were found in the Chapako CF (Table 5.19).

**Table 5.18: Prioritized NTFPs for Economic Development in Nepal:**

| S.N. | Scientific Name | Nepali Name | Family |
|---|---|---|---|
| 1. | *Aconitum heterophyllum* | Atish | Ranunculaceae |
| 2. | *Aconitum spicatum* | Bikha | Ranunculaceae |
| 3. | *Acorus calamus* | Bojho | Araceae |
| 4. | *Asparagus racemosus* | Kurilo | Liliaaceae |
| 5. | *Azadirachta indica* | Neem | Meliaceae |
| 6. | *Bergenia cialita* | Pakhanvet | Saxifragaceae |
| 7. | *Cinnamomum glaucescens* | Sugandhakokila | Lauraceae |
| 8. | *Cinnamomum tamala* | Tejpat | Lauraceae |
| 9. | *Cordyceps sinensis* | Yarshagumba | Clavicipitaceae |
| 10. | *Dactlorhiza hatagirea* | Panchaunle | Orchidaceae |
| 11. | *Dioscorea deltiodea/pentaphylla* | Bhyakur | Dioscoreaceae |
| 12. | *Gaultheria fragrantissima* | Dhasingre | Ericaceae |
| 13. | *Juglans regia* | Okhar | Juglandaceae |
| 14. | *Lichen* | Jhau | |
| 15. | *Morchella sp.* | Guchhichyau | Pezizaxeae |
| 16. | *Nardostachys grandiflora* | Jatamasi | Valerianaceae |

| | | | |
|---|---|---|---|
| 17. | *Neopicrorhiza scrophlariifolia* | Kutki | Scrophulariaceae |
| 18. | *Phyllanthus emblica* | Amala | Euphaorbiaceae |
| 19. | *Piper longum* | Pipla | Piperaceae |
| 20. | *Podophyllum hexandrum* | Laghupatra | Berberidaceae |
| 21. | *Rauvolfia serpentine* | Sarpagandha | Apocynaceae |
| 22. | *Rheum australe* | Padamchal | Polyganaceae |
| 23. | *Rubia manjith* | Manjitho | Rubiaceae |
| 24. | *Sapindus mukorossi* | Ritha | Sapinaceae |
| 25. | *Swerita chirayita* | Chiraito | Gentianaceae |
| 26. | *Tagetes minuta* | Jungali saypatri | Compositae |
| 27. | *Taxus wallichiana/baccata* | Lauthsalla | Taxaceae |
| 28. | *Tinospora sinensis* | Gurjo | Manispernaceae |
| 29. | *Valeriana jatamansi* | Sugandhawal | Valerianaceae |
| 30. | *Zanthoxylum armatum* | Timur | Rutaceae |

Source: MFSC, 2002 (as cited in Jaributi Kheti Prasar Pustika, GoN/MFSC, 2007)

**Table 5.19: Prioritized NTFPs found in the Chapako CF**

| S.N. | Scientific Name | Nepali Name |
|---|---|---|
| 1. | *Acorus calamus* | Bojho |
| 2. | *Cinnamomum tamala* | Tejpat |
| 3. | *Gaultheria fragrantissima* | Dhasingre |
| 4. | *Lichen* | Jhau |
| 5. | *Phyllanthus emblica* | Amala |
| 6. | *Piper longum* | Pipla |
| 7. | *Zanthoxylum armatum* | Timur |

*Chapter 6*

# DISCUSSION

## 6.1 NTFPs in the Chapako CF

The availability of the NTFPs in the Chapako CF seemed to be satisfactory. All together 34 species (Annex II) under NTFPs were enlisted from the forest, including those which were naturally available as well as those planted by the CFUG. Block wise distribution of the NTFPs had made them more promising to be undertaken for economic development of the FUG members.

The species *Castonopsis tribuloides* and *Myrica esculenta* had the highest densities in Block I with the densities 693.34 pl/ha and 606.67 pl/ha respectively. The abundance was highest for *Myrica esculenta* (910 pl/ha). Similarly, the species *Lyonia ovalifolia* had the remarkably high density than other non timber species in Block II and Block III with the densities of 960 pl/ha and 320 pl/ha respectively. The abundance were highest for *Lyonia ovalifolia* and *Amomum subulatum* with abundance 960 pl/ha and 900 pl/ha respectively. The species with highest densities in Block IV were *Lyonia ovalifolia* (640 pl/ha), *Castonopsis tribuloides* (410 pl/ha) and *Myrica esculenta* (360 pl/ha). The abundance were highest for *Lyonia ovalifolia* and *Gaultheria fragrantissima* with abundance 640 pl/ha and 550 pl/ha respectively. Their relative abundances were found to be 22.30 and 19.16 respectively. The species with highest densities in Block V were *Castonopsis tribuloides* (510 pl/ha), *Myrica esculenta* (200 pl/ha) and *Rhododendron arboreum* (200 pl/ha). Similarly, in Block VI the species with highest densities were *Castonopsis* tribuloides (1300 pl/ha) and *Myrica esculenta* (575 pl/ha).

The GoN had enlisted 30 NTFPs as the prioritized species for the economic development. The presence of high value non timber species in the forest was more encouraging to carry out income generating activities through NTFPs for the CFUG. Altogether 7 species out of 30 prioritized NTFPs were found in the CF. Those were *Cinnamomum tamala, Phyllanthus emblica, Piper longum, Acorus calamus, Zanthoxylum armatum, Lichen* and *Gaultheria fragrantissima*. Also the interest of the FUG members in NTFPs and their involvement in the plantation of NTFPs like *Amomum subulatum, Cymbopogon flexousus, Choerospondias axillaris, Acorus*

*calamus* and *Daphne bholua* into the forest indicated that the FUG realized the economic benefits of NTFPs and so were their conservation efforts more focused on it.

It was understood through the study that the availability of valuable NTFPs were decreasing in number. The species that were decreasing according to FUG members were *Gaultheria fragrantissima, Berberis asiatica, Cinnamomum tamala, Zanthoxylum armatum, Rhus javanica* and *Rubus ellipticus.* Forest degradation in the past before the establishment of CFs had caused remarkable decrease in NTFPs.

Nowadays, the CFUGs are focusing on conservation of timber as well as NTFPs through guarding system to save what is left off. The CFUG had also cultivated some NTFPs into the forest. The species they cultivated were *Amomum subulatum, Choerospondias axillaris, Pinus wallichiana, Cymbopogon flexousus, Acorus calamus* and *Daphne bholua*. The DFO and FECOFUN have assisted the FUG with information and trainings related to NTFPs. In addition, they also provided the saplings to cultivate in the forest.

Since the CFUG were heavily lacking of the theoretical and practical knowledge and skills on NTFPs, they were given the training related to cultivation and promotion of NTFPs for better development of NTFPs. The FUG members were keenly interested in the cultivation and promotion of *Piper longum, Gaultheria fragrantissima* and *Zanthoxylum armatum* in the forest.

### 6.2 Potentiality of NTFPs for the economic development of CFUG

Considering the actual market situation, there is a concrete possibility of expanding the management of NTFPs within the CFs as income generation activity either through cultivation or through intensive protection and sustainable use. Generally, the FUG members showed a serious interest in finding opportunity through NTFPs.

The main goal of finding potential NTFPs was to address the opportunities of economic development to the FUG through promotion and management of NTFPs within the CF. And in doing so; priority should be given to potential species of NTFPs so that there is more possibility of economic development in the long run through economic and ecological prospect.

According to the matrix preference ranking (Table 5.7), the potential NTFPs for economic development of the FUG of the Chapako CF were *Amomum subulatum, Gaultheria fragrantissima* and *Piper longum*. Second priority should be given to *Choersopondias axillaris, Cinnamomum tamala*, *Lyonia ovalifolia* and *Pinus wallichiana* taking with due respect of their ecological abundance and economic values. The available high value NTFPs with high market potential like *Acorus calamus, Cinnamomum tamala, Daphne bholua, Gaultheria fragrantissima* and *Rhus javanica* should be conserved, protected and promoted so that these species can be taken into account for the future economic benefits. The better understanding of the sustainable harvesting and uses are a topic of concern. The availability of high value as well as prioritized NTFPs by the GoN in the CF had made more promising opportunities for CFUG to undertake NTFPs as income generating prospect.

For the last five years, the CFUG were involved in the selling of some NTFPs. They also cultivated NTFPs in the CF. Those NTFPs had helped them to uplift their economic status at some extent. The income generated from the sell of NTFPs together income generated from other sources related to CF was used in community development such development of roads, foot trails, drinking water access and school. Nowadays, they were interested to develop the area into a tourism destination and planning to make a park in the adjoining area of CF. More inclination was however towards the cultivation of NTFPs into the farmland than in the forest. The inclination was obviously because of more economic benefit at personal level.

To undertake the NTFPs to uplift the economic stature of FUG members requires a fundamental shift in the way they think about NTFPs. More consideration should be to the fact that there is a great prospect of economic advantages through NTFPs. The government and related private organizations / NGOs should provide a helpful framework for the CF sector in relation to NTFPs which lacks the knowledge and understanding on NTFPs (Subedi & Binayee, 2000).

The knowledge on the collection parts of the NTFPs and MAPs is very important as one may be collecting the non useful parts. The collection of non useful parts not only declines the production and quality of the NTFPs but may also destroy the plants as a

whole. Sustainable harvesting procedures and proper management should be considered to gain the long term benefit from NTFPs. The proper harvesting procedures related with the techniques and harvesting time were not found to be adopted by the FUG members. Also the considerable numbers of HHs used to send children for the collection of NTFPs that might negatively effect the NTFPs population because children might not have applied the proper collection techniques.

As NTFPs include all the plant products except the timber, they cover all habits of plants in different habitats. Therefore, collection method, time and post collection treatments, etc. vary from plant to plant and part to part. However, these aspects can be generalized at some extent. Some practical considerations on collection of the NTFPs should be made which are as follows (Malla and Shakya *et al.*, 1997):

- Collection in the wet conditions should be avoided.
- Composite collection or mixing of different species or even different parts of the same species must be avoided.
- Materials should be collected in clean and dry sacks or baskets.
- Collected materials should be kept clean and free from foreign bodies.

The harvestable parts, harvesting time and processes for NTFPs are quite different from each other. However, the following simple rules should be taken into the consideration while collecting NTFPs (Rawal, 2002; Poudel *et al.*, 2003).

- Root, Stem, Bulb, Tuber and Rhizome: If the collection parts are root, stem, bulb, tuber and rhizome then these parts should be collected within October to March. While collecting these parts, regeneration of the plants should be given greater importance and thus about 1/3$^{rd}$ of these root, stem, bulb, tuber and rhizome should be left behind for regeneration.
- Bark: If the collection part is bark of the plants, then the collection should be done before March because the barks should be harvested before new leaves starts to regenerate again which begins from the month of March.
- Leaf: The leaves of the plants should be harvested before the plant starts flowering. In case of smaller plants, the leaves are collected together with the branches. For *Cinnamomum tamala*, the leaves should be collected only after 5 years of its lifespan.

- Flower: The flowers should be collected before they fully flourish in the dry air period.
- Fruit: If the collection part is fruit, it must be harvested after it matures fully and ripens.
- Seed: The seeds should be collected after the fruit just matures or before the fruit starts rupturing.

The NTFPs collected should be properly dried to avoid fungal infection and protect from insects. Different drying methods should be adopted in accordance to the type and nature of NTFPs so that their chemical constituents are not lost. These products could be dried in the sunlight, shadow, sunlight and shadow, controlled temperature and oven (GoN/MFSC, 2007; Bhattarai and Ghimire, 2006).

If FUG members would get some technical support to cultivate and promote NTFPs in their forest, it could serve two advantages: good source of income for CFUG, and conservation of valuable plants and biological diversity. Proper support to FUGs related to NTFPs in operational plans for the management, harvest and sale, along with the establishment of enterprises that use these products, can achieve the broad objectives of community development, income generation to rural poor, and conservation of biodiversity (Subedi and Binayee, 2000).

Dynamic flow of information on NTFPs to the rural communities especially to CFUGs can not only help to uplift the economic status but also help to achieve the ultimate goal of forest conservation through sustainable use of FPs. The adaptive strategies must be adopted in response to biophysical condition of the forest, socioeconomic condition and market demand and potential. More emphasis should be given to those NTFPs with high economic potential, suited to biophysical condition of the forest and have no negative impact on environment. Increased technical support and strengthening participatory management particularly among the existing FUG members may result in more effective and sustainable management of the forest together with the economic benefits to FUG and thus reducing pressure in these resources. The category created by the term NTFPs, for all its oddities and difficulties, has given a valuable process whereby we have been forced to recognize both the need for case-specific, systemic analyses of the potential or actual impact of using and

selling a forest component; and the complex socioeconomic relationships around such forest use (Lawrence, 2003).

Though there were plentiful opportunities in the cultivation and promotion of NTFPs, there were some challenges as well. To overcome these challenges, there was a need to develop appropriate technique for the cultivation of different species of NTFPs, appropriate system to reach out the collected NTFPs to the market place, and establishment of information centre for NTFPs so that necessary infrastructures could be developed for the promotion of NTFPs (GoN/MFSC, 2006).

# *Chapter 7*

# CONCLUSION AND RECOMMENDATION

## 7.1 CONCLUSION

The study was concentrated mainly on the NTFPs and their potentiality on economically benefit to the rural community. The main goal of the study was to find out potential NTFPs to address the opportunities of economic development to the FUG through promotion and management of these NTFPs within the CF. There was considerable contribution of NTFPs in economic well being of the FUG members of the Chapako CF and had the prominence and definite advantages of promoting the sector for the economic development of the rural communities/CFUG through the proper study and management of NTFPs.

The CF was divided into six blocks and each block had considerable availability of NTFPs. The handing over of forests to CFUG and the active protection and management had turned the degraded land into the productive dense forest. The non timber species had also regenerated in the forest together with planted species. The dominant non timber species were *Castonopsis tribuloides, Myrica esculenta, Rhododendron arboreum* and *Lyonia ovaliafolia*. The selected NTFPs were tested against the set of criteria (matrix preference ranking) and *Gaultheria fragrantissima, Piper longum, Amomum subulatum* were found to be the potential NTFPs for the economic development of the FUG members of the Chapako CF. However, sustainable harvesting mechanisms and management of these species were the aspects the CFUG must look over for the promotion and long term benefits from those species.

The CFUG showed deep interest in the cultivation and promotion of NTFPs in the CF. They had taken the initiation in this sector through the cultivation of several NTFPs like *Amomum subulatum, Choerospondias axillaris, Daphne bholua, Acorus calamus* and *Cymbopogon flexousus*. They were also interested in the cultivation and promotion of *Cinnamomum tamala, Gaultheria fragrantissima, Zanthoxylum armatum* and *Piper longum*. In future, the economic benefit to CFUG through NTFPs might be evident if they worked out in the promotion and management of the NTFPs along with sustainable harvesting mechanisms. There was a great scope of expanding this sector into NTFPs

based enterprise. Nevertheless, the technical support by the related organization, institutions and NGOs would be an important asset to the CFUG for better progression in the sector.

## 7.2 RECOMMENDATION

The study was precisely concentrated on the NTFPs and its potentiality for economic development in the Chapako CF. For the betterment and development of the sector some recommendation were drawn out. The recommendations generated from the study were listed as below:

**Recommendation to the CFUG**

- The detailed inventory for NTFPs was lacking. There is a need to increase the desirability of sound assessment of NTFP populations and dynamics especially during the time of utilization of these resources. The CFUG should focus on it.
- Participation of FUG in NTFPs inventory and promotion is important in order to gain the potential benefits. The CFUG should bear this into their mind.
- The CFUG should identify the best harvesting season and method to ensure the regeneration for the species selected.
- The CFUG should focus on value addition and marketing of NTFPs through processing, semi-processing and packaging of the NTFPs with appropriate technologies.
- The CFUG should include in the FUG operational plan on NTFP selection, quantitative assessment, rules related to NTFP harvesting access, the season and methods.

**Recommendation to the related Government, Non Government organizations and policy makers**

- There were a very little scientific studies conducted and database generated to know the indepth situation of the NTFPs in Nepal. So is in the Chapako CF. Thus, the sector needs to be rigorously studied and adequate information (data) to be generated to determine future plans and programs to tap up the potential resources in a sustainable basis. So, the related institutions should conduct a quantitative assessment of the selected NTFPs in the CF.

- Sustainable harvest technology should be made available to the collectors and a scientific system to be developed for royalty collection and for ban or sale of NTFPs.
- Provide training and conduct educational activities on NTFPs for extension workers and FUGs to improve their technical skills on *in-situ* management, cultivation and harvesting.
- Efforts should be made both through policy and infrastructural development to facilitate the function like discouraging the exports of unprocessed products by promoting the processing/ packaging plants with appropriate technology and other supportive facilities like credit facility, tax exemption on the processing equipments, and export facilities etc.
- Market forces are very difficult to overcome, even with a strong mechanism. Therefore, policy has to be developed to working with market forces. Promotion for commercialization of the NTFPs by providing right incentives needs the community involvement strictly in forest development and management.

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# ANNEXES

## ANNEX I

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## ANNEX II

**List of NTFPs available in the Chapako CF with their scientific name, parts used and utilities.**

| S.N. | Nepali Name | Scientific Name | Parts used | uses |
|---|---|---|---|---|
| 1. | Aalaichi | *Amomum subulatum* | Fruit | Spices, stomachache, headache, heart and liver problem, lung tuberculosis |
| 2. | Ainselu | *Rubus ellipticus* | Whole plant and fruit | astringent, tonic, dysentery, indigestion, root decoction fever and food poisoning |
| 3. | Amala | *Phyllanthus emblica* | Fruit, seed and roots | Fruit-Laxative, diuretic. Seeds-asthma, bronchitis, biliousness and root-astringents |
| 4. | Amriso | *Thysanolaena maxima* | Flower and root | Brooms, pneumonia, root-old wounds (with mustard oil) |
| 5. | Angeri | *Lyonia ovalifolia* | Leaf | Leaf-tobacco wrapping, scabies and skin diseases. Anti-ticks |
| 6. | Banmara | *Ageratina adenephora* | Leaf | Astringent, haemostatic and antiseptic |
| 7. | Basak | *Dichroa febrifuga* | Buds, leaf and root | Fever, root juice-malaria fever |
| 8. | Ban Tarul | *Dioscorea bulbifera* | Tuber | Taken as vegetable, loss of appetite, fever |
| 9. | Bhakki amilo | *Rhus javanica* | Fruit | Colic, diarrhoea, paralysis, blood dysentery (with curd) |
| 10. | Bojho | *Acorus calamus* | Root | Emetic, stomachic, nerve tonic, dyspepsia, colic, remittent fever, bronchitis, dysentery, chronic diarrhoea |
| 11. | Chilaune | *Schima wallichii* | Root and leaf | Febrifuge |
| 12. | Chutro | *Berberis asiatica* | Fruit, root and bark | Fruit-taken fresh; Root-blood purifier. Bark-antipyretic drug |
| 13. | Dhale Katus | *Castonopsis indica* | Nut and leaf | Nut-cultural and religious value, edible. Leaf-diarrhoea, stomachache, wrapping tobacco |
| 14. | Dhasingre | *Gaultheria fragrantissima* | Leaf | Carminative, stimulants, rheumatism, antiseptic, sciatica and headache. |
| 15. | Hade bayer | *Zizyphus incurva* | Seeds | Decorative rosaries |
| 16. | Jhyau | *Parmelia sp.* | Whole plant | Scabies, throat disease, piles, leprosy, 'Dhup'; in industries for dyes and preservation of scent. |
| 17. | Kafal | *Myrica esculenta* | Bark and fruit | Bark-astringent, carminative, antiseptic, fever and asthma, cough and bronchitis. Fruit-edible and refreshing |
| 18. | Khareto | *Phyllanthus parvifolius* | Leaf | Leaves decoction and extracts are antipyretic, antidandruff |
| 19. | Kukurdaino | *Smilax menispermoides* | Whole plant | Vegetable, haemostatic |

| | | | | |
|---|---|---|---|---|
| 20. | Laligurans | *Rhododendron arboreum* | Leaf and flower | Leaf-headache. Flower-profuse diarrhoea, blood dysentery, appetizer, fish bone stuck, menstrual disorder |
| 21. | Lapsi | *Choerospondias axillaris* | Fruit | Pickle or important ingredient of pickle |
| 22. | Lemon grass | *Cymbopogon flexousus* | Leaf | Tea, scent, perfumer |
| 23. | Lokta | *Daphne bholua* | Leaf | Purgative, paper production |
| 24. | Mayal | *Pyrus pashia* | Fruit | Edible, stop over menstrual flow, dysentery |
| 25. | Musure katus | *Castonopsis tribuloides* | Nut and leaf | Nut-cultural and religious value, edible. Leaf-diarrhoea, stomachache, wrapping tobacco |
| 26. | Nigalo | *Arundinaria intermedia* | Whole plant | Handicraft-utensils. Root-Diuretic. |
| 27. | Painyu | *Prunus cerasoides* | Bark | Swelling |
| 28. | Pipla | *Piper longum* | Fruit and root | Root-stomachic, appetizer, bronchitis, antihelmintic, carminative, abdominal pains. Fruit-aphrodisiac bronchitis, diuretic, tumors, insomnia, jaundice. |
| 29. | Gobre sallo | *Pinus wallichiana* | Resin | Resin-for rosin and turpentine production; applied in labour pain |
| 30. | Saur | *Betula alnoides* | Bark | Over menstrual flow |
| 31. | Tejpat | *Cinammomum tamala* | Leaf and bark | Spices, scabies, piles, heart and liver disease, dysentery, energizer, gastric |
| 32. | Thulo okthi | *Astilbe rivularis* | Root | Post partum and post natal diarrhoea and dysentery, astringent, tonic and appetizer to women |
| 33. | Timur | *Zanthoxylum armatum* | Fruit and Seed | Spices, constipation, antihelmintic, indigestion, appetizer, mouth fresh |
| 34. | Titepate | *Artemesia sp.* | Leaf | Heating, muscular strain |

Source: Field Survey, 2006.

## ANNEX III

### Major NTFPs of the Chapako CF and their biological characteristics:

## 1. Aalaichi

**English Name:** Greater cardamom

**Scientific name:** *Amomum subulatum* (Roxb.)

**Family:** ZINGIBERACEAE

**Natural occurrence:**
Imported species and not found naturally in Nepal. Generally found cultivated between 600 - 2,000m in Tropical and Sub-tropical Zones in the sloppy moist places with no frost.

**Description:**
Perennial herbs with creeping horizontal rhizomes, rarely with fibrous roots; stems bracted and scapose or leafy and then very short or elongated; leaves basal or cauline, alternate, distichous, sheathing, sheaths split throughout very long, close, straite, quite smooth, rounded at the top, and terminating in a short rounded ligule. Flowers solitary, on very short peduncles, coming off directly from the rhizome and covered with strongly imbricated brownish bracts becoming larger upwards.

**Flowering season:** March - April

**Fruiting season:** August - October

**Parts used:** Fruits

**Collection season:** August - October

**Uses / Ethonobotanical uses:**
The fruit is used as the spices as well as for stomachache, cough and cold, lung tuberculosis, mouth disease, eyelid burns etc in Ayurvedic medicine. It is used to produce different type of cosmetic and medicines through extraction of its oil. In Yunani medicine, the fruit is used for stomachache, heart and liver problem, headache and toothache.

**Processing before storage:** Clean and sundry or drier

**Best storage:** Dry storage with no wind

**Propagation methods:** Seed and root shocker

**Market price:** NRs. 100 - 250 / kg

**Royalty rate:** No royalty since it is produced only by cultivation

## 2. Angeri

**English name:**

**Scientific name:** *Lyonia ovalifolia* (Wall.)

**Family:** ERICACEAE

**Natural occurrence:**
Generally found in the broad leaved forest of Lower Subtropical and Upper Temperate Zones between the altitudes of 900 -2500m.

**Description:**
A deciduous or semi-evergreen tree, 8 – 12m tall, occurring in Lower Subtropical and Upper temperate zones, with ovate leaves and white flowers with racemes. Poisonous to the cattle.

**Flowering season:**

**Fruiting season:**

**Parts used:** Leaves

**Collection season:**

**Uses / Ethonobotanical uses:**
Leaves are used for tobacco wrapping. Paste and infusion of leaf are applied for scabies and other skin diseases. It is also used to remove ticks. Poisonous to the cattle.

**Processing before storage:** Clean and sundry

**Royalty rate:** NRs. 5 / kg

## 3. Dhasingre

**English name:** Indian wintergreen

**Scientific name:** *Gaultheria fragrantissima* (Wall.)

**Family:** ERICACEAE

**Natural occurrence:**
Generally found in the forest of lower sub tropical and upper sub tropical region or open spaces or forest clearing and open shurbland in the Lower and Upper Sub-tropical Zones between the altitudes 1,200 - 2,600m.

**Description:**
A robust, bushy shrub, 2-3m tall, leaves ovate to lanceolate, 5-11cm long and 3-4.5cm broad, bristly toothed, acute, smoothabove, dotted with the bases of bristles beneath. Flowers short stalked. White, 4-6cm long, white borne on axillary, 2.5-8cm long, spike like clusters, corolla tabular, about 5mm long. Fruits globose, 2-5mm in diameter, surrounded by persistent blue calyx.

**Flowering season:** February - June

**Fruiting season:** June - August

**Parts used:** Leaves

**Collection season:** November - January

**Uses / Ethonobotanical uses:**
Oil is aromatic, stimulant and carminative and used in muscular pain, acute rheumatism, sciatica and headache. Chemical constituent 'methyl salicylate' derived from it, is industrially used in the production of various types of antiseptic creams. Fruits are edible.

**Propagation methods:** Seed and grafting

**Royalty rate:** NRs. 1 / kg

## 4. Kafal

**English name:** Box Myrtle, Bay berry, Wax Myrtle

**Scientific name:** *Myrica esculenta* (Buch. – Ham.)

**Family:** MYRICACEAE

**Natural occurrence:**
Generally found in the broad leaved forest of lower sub tropical and upper sub tropical region or in open spaces or forest clearing between the altitudes 1,000 - 2,000m.

**Description:**
A small or moderate sized evergreen tree upto 20m in height. Leaves alternate, crowded towards the end of the branchlets, narrow oblong to oblong – lanceolate, 8 – 12cm long, 2 – 4cm broad, entire, leathery, pale or rustycoloured with minute resinous glands. Flowers green, unisexual, borne separately on same spikes, male spikes drooping, reddish, in branches axillary clusters, female flowers in slender, erect spikes or occasionally at the end of male spikes. Fruits red, rounded or oval, with red flesh and a rough stone.

**Flowering season:** July - November

**Fruiting season:** March - April

**Parts used:** Bark and fruit

**Collection season:** April - May

**Uses / Ethonobotanical uses:**
Bark is astringent, carminative, anticeptic, useful in fever and asthma. Bark decoction is used in Bronchitis and paste is used externally to chest to get relief from cough and Bronchitis. Fruits are edible and refreshing.

**Royalty rate:** NRs. 100 / kg (for bark)

## 5. Laligurans

**English name:** Rhododendron

**Scientific name:** *Rhododendron arboreum* (Sm.)

**Family:** ERICACEAE

**Natural occurrence:**
Generally found in upper tropical (500 - 1,000m), collinean (2,000 - 2,500m), montane (2,500 - 3,000m) and lower sub alpine (3,000 - 3,5000m) regions in the broad leaved forest and open spaces.

**Description:**
A robust tree upto 15m tall. Leaves oblong to lanceolate, 10-20cm, with groover mid vein and lateral veins deeply impressed above, glossy - green, under surfaces with thin or thick felted hairs either white, fawn, cinnamon or rusty-brown. Flowers blood red, pink to white, 4-5cm long and wide, in compact clusters borne at the tip of the branches. The clusters are 10-13cm across and of about 20 tubular-bell-shaped flowers. National flower of Nepal.

**Flowering season:** March - June

**Fruiting season:** August - November

**Parts used:** Young leaves and flowers

**Collection season:** March - April

**Uses / Ethonobotanical uses:**
Young leaves are applied to forehead for headache. Flowers are taken in case of blood dysentery. Honey is sucked from the flowers. Nowadays, juices are prepared from flower extract and that is used to be kept for sale at community level.

**Royalty rate:** NRs. 2 / kg

## 6. Lapsi

**English name:**

**Scientific name:** *Choerospondias axillaris* (Roxb.)

**Family:** ANACARDIACEAE

**Natural occurrence:**
Important species of the broad leaved forest and found naturally in Nepal. Generally found in Lower Tropical zone and Subtropical zone between 850 - 1,900m. Grows well in fertile soil, also grows in medium and dry soils.

**Description:**
A large deciduous tree, 20m tall. Leaves crowded towards the ends of branches, impari-pinnately compound, about 30cm long, leaflets 11 – 17, oval to lanceolate, about 10cm long and 4cm broad, slightly toothed and long pointed at the apex. Flowers small greenish – white, borne in pinnacles at the ends of the branchlets. Fruits oblong, fleshy drupes, about 3cm long rounded at the ends, yellowish when ripe, with a 4 -6 eyed stone.

**Flowering season:** April - May

**Fruiting season:** September - November

**Parts used:** Fruits

**Collection season:** November – January

**Uses / Ethonobotanical uses:**
Fruits pulp is used in preparing candy and pulp and pericarp are used for preparing pickles and as one of the ingredients of variety of pickles. Stones used for internal decorative purpose.

**Propagation methods:** Seed, grafting and hardwood cutting

**Market price:** NRs. 10 – 30 / kg

**Royalty rate:** NRs. 2 / kg

## 7. Musure Katus

**Scientific name:** *Castonopsis tribuloides* (Sm.)

**Family:** FAGACEAE

**Natural occurrence:**
Important species of the broad leaved forest and found naturally in Nepal. Generally found between 1,000 - 2,000m in Lower and Upper Sub-tropical Zones. Grows well in wet rainy areas and can resist frost.

**Description:**
A moderate to large sized evergreen tree upto 20m tall with fine hairy shoots. Leaves lanceolate, variable in size, upto 25cm long, long pointed with entire, sometimes toothed on the upper half margin. Flowers unisexual, small, cream-coloured, borned on spikes, male spikes upto 20cmlong, clustered at the end of branchets. Fruiting spikes usually solitary, upto 25cm long, fruits widely spaced, 1.5 cm across, with involucre, the surface is visible between the tuffs of unequal, slender, spines. Nuts about 1cm long.

**Flowering season:** March - September

**Fruiting season:** September - October

**Parts used:** Nuts and leaves

**Collection season:** November - January

**Uses / Ethonobotanical uses:**
Leaves are used in wrapping tobacco for smoking. Nuts are eaten. The nuts have cultural bearing in Nepal. It is offered to Laxmi “The Goddess of Wealth”. Nuts are also offered to the brothers by the sisters during Bhai Puja ceremony at the time of Nepal New Year.

**Processing before storage:** Clean and sundry

**Best storage:** Dry storage with no wind

**Propagation methods:** Seed

## 8. Pipla

**English Name:** Long pepper

**Scientific name:** *Piper longum* (Linn.)

**Family:** PIPERACEAE

**Natural occurrence:**
Generally found in the Tropical and Sub-tropical area between the altitudes of 200 – 1000m. The cultivation requires well drained loamy soil but not dry soil. The cultivation in moist and shady places is preferred.

**Description:**
A slender ascending or prostrate or trailing aromatic plant. Lower leaves 6-10cm long and 3-5cm wide, ovate-cordate with rounded loibes at the base; upper ones oblong-oval, cordate at the base; all dark green and shining above and pale on lower surface. Flowers in solitary spikes; bracts of male spikes narrow and those of female circular, female spkes 1-3cm long and 4.5mm in diameter. Fruit ovoid, yellowish orange, sunk in fleshy spikes.

**Flowering season:**

**Fruiting season:** August – October

**Parts used:** Fruits and roots

**Collection season:** August – October

**Uses / Ethonobotanical uses:**
Root is pungent, heating, stomachic, laxative, antihelmintic, carminative, improves appetite, useful in bronchitis, abdominal pains, causes biliousness. Fruits are heating, stomachic, aphrodisiac, and useful in bronchitis, abdominal complaints, fever, leucoderma, urinary discharges, tumors, piles, insomnia, jaundice, tuberculosis glands.

**Processing before storage:** clean and sundry or drier

**Best storage:** dry storage with no wind

**Propagation methods:** Seed and root shocker

**Market price:** NRs. 100 - 250 / kg

**Royalty rate:** 20 / kg (root)

## 9. Khote Sallo

**English name:** Chirpine

**Scientific name:** *Pinus roxburghii* (Sarg.)

**Family:** DINACEAE

**Natural occurrence:**
Generally found in mixed broad leaved forest of Upper Tropical and Upper Sub-tropical Zones between the altitudes 500 - 2,000m.

**Description:**
A large evergreen tree, upto 40m tall. Leaves bright green, needle – like with grayish basal sheath, borne in cluster of three, 20 -30cm long. Male catkins are small oval – oblong. Female cones erect, ovoid – conical in shape, 10 -12cm long, 8 – 13cm across, borne singly or in cluster. Seeds oval with a membranous wings which are about 3 times as long as the seed itself.

**Flowering season:** February - April

**Parts used:** Resin and seeds

**Collection season:**

**Uses / Ethonobotanical uses:**
Oil is aromatic, stimulant and carminative and used in muscular pain, acute rheumatism, sciatica and headache. Chemical constituent 'methyl salicylate' derives from it is industrially used in various types of antiseptic creams. Fruits are edible.

**Propagation methods:** Seed

## 10. Tejpat

**English name:** Cinnamom tree

**Scientific name:** *Cinnamomum tamala* (Buch. - Ham.)

**Family:** LAURACEAE

**Natural occurrence:**
Generally found in broad leaved forest in Lower Tropical Zone and Subtropical Zone between the altitudes 500 – 2,000m. Generally grows well in cool and shady places.

**Description:**
A moderate sized evergreen tree upto 20m tall. Leaves lanceolate or ovate lanceolate, pointed at tip. Flowers in panicles. Fruits oval, black when ripe.

**Flowering season:** April - May

**Fruiting season:** June - July

**Parts used:** Leaves and bark

**Collection season:** September - October

**Uses / Ethonobotanical uses:**
Widely used as a spices / flavoring ingredients in different curries. Useful to treat scabies, piles, heart and liver diseases, dysentery and gastric. Bark extract is used in the treatment of intestinal disorder.

**Propagation methods:** Seed, cutting and coppice

**Market price:** NRs. 32 - 45 / kg (leaf); NRs. 125 / kg (bark)

**Royalty rate:** NRs. 2 / kg (leaves) and NRs. 10 / kg (bark)

## ANNEX V

**Questionnaire for Field Survey:**

My name is Keshab Shrestha and I am a student of Central Department of Environmental Science, Tribhuvan University, Kirtipur. I am doing my dissertation related to NTFPs in your community forest. So this questionnaire survey is related to my dissertation work and your household was selected for the study. This research may help to promote the NTFPs in your CF in the future. The interview will be completely confidential and will only be used to draw a data as a group.

Date of interview: .. .. /.. .. / 2006

Questionnaire No:

Name of the respondent:

Age/Sex:

Remarks (if any):

**Section 1: Questionnaire on NTFPs in CF**

1.1 Name the NTFPs found in your CF. What are their traditional uses and which part is used for which purpose?

| S.N. | NTFPs | Block No. | Parts used | Uses |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

1.2 Have you planted the NTFPs in your CF?

a. Yes
b. No → *Go to Question no. 1.5*
c. Don't know → *Go to Question no. 1.5*

1.3 What are the NTFPs that you have planted in your CF?

| S.N. | NTFPs | No. of NTFPs planted in Block | | | | | | Planted year |
|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

1.4 What are the conditions of the planted NTFPs presently?

a. Good
b. Fair
c. Poor
d. Don't know

1.5 Did you go to collect NTFPs from your CF?

a. Yes
b. No → *Go to Question no. 1.13*

1.6 What are the NTFPs that you have collected from CF and how much did you collected?

| S.N. | NTFPs | Collected quantity (in kg.) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

1.7 What time/month is the most favorable for the collection of these NTFPs?

| S.N. | NTFPs | Collection month |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

1.8 Who goes to collect these NTFPs from your HH member?

a. Adult male
b. Adult female
c. Children
d. Not fixed

1.9 What did you do to these collected NTFPs?

a. HH use → *Go to Question no. 1.11*
b. Sell
c. Both a and b

1.10 If you sold them then, how much did you sell, at what rate and where?

| S.N. | NTFPs | Sold quantity ( in kg.) | Rate | Place | Year |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

1.11 Do you process the NTFPs after collection?

a. Yes

b. No → *Go to Question no. 1.13*

1.12 If yes, what do you do?

| S.N. | NTFPs | Processing technique |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

1.13 Have NTFPs of your CF contributed in your economic development?

a. Yes

b. No

c. Don't know

1.14 What is the status of NTFPs in your CF in last 5 years?

a. Increasing

b. Decreasing

c. Same

d. Don't know

1.15 Are there any NTFPs that have been depleted/ destroyed in last 5 year? If yes, name the species.

a.

b.

c.

d.

e.

1.16 What are the NTFPs that you are willing to plant in your CF? Name them.

a.

b.

c.

d.

**Section 2: Questionnaire on institution and management**

2.1 What provision do you have for NTFPs in the management plan of your CF?

- 

2.2 Did any of your FUG members take training related to NTFPs? If yes, list the types of training they had.

a.
b.
c.
d.

2.3 Are there any institution that provided you support/assistance related to NTFPs? If yes, name the institution and support they provided.

| S.N. | Institutions | Supports/assistance | Year |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

2.4 Do you manage NTFPs sustainably in your CF? If yes, what are the steps taken for the sustainable management of NTFPs?

a.
b.
c.
d.

2.5 What kind of trainings is necessary for the management of NTFPs?

a.
b.
c.
d.

2.6 Do you have any suggestion regarding the better management of NTFPs in your CF?

a.
b.
c.
d.
e.

**Section 3: Questionnaire on HH information**

3.1 If you don't mind, could you suggest your HH/ family's monthly income?

a. NRs. ... … … …
b. No fixed income
c. I don't want to disclose
d. I don't know

3.2 How much farmland do you own?

a. Khet … … … … … … Ropani
b. Bari … … … … … … Ropani
c. Others … … … … … Ropani

3.3 Have you planted the NTFPs in your farmland?

a. Yes
b. No → *Go to Question no 3.8*

3.4 What are the NTFPs that are planted in you farmland?

a.
b.
c.
d.

3.5 What do you do with these NTFPs?

a. HH use
b. Sell
c. Both a and b

3.6 Have these NTFPs helped you to uplift your economic level?

a. Yes
b. No
c. Don't know

3.7 Have you participated in the trainings related to NTFPs? If yes, list the types of training you had.

a.
b.
c.
d.

**THANK YOU**