DIVERSITY AND STATUS OF NON-TIMBER FOREST PRODUCTS IN SOUTHERN HILLS OF KAVREPALANCHOK DISTRICT, CENTRAL NEPAL

A THESIS SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER'S DEGREE IN BOTANY

BY

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KATHMANDU, NEPAL

August, 2023

DECLARATION

I, hereby, declare that the work enclosed here is entirely my own, except where stated otherwise by reference or acknowledgement, and has not been published or submitted elsewhere, in whole or in part, for the requirement for any other degree or professional qualification. Any literature, data, or works done by others and cited within this thesis has been given due acknowledgement and listed in the reference section.

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This is to recommend that the Master's thesis entitled "**Diversity and Status of Non-Timber Forest Products in Southern Hills of Kavreplanchok District, Central Nepal**" was carried out by Kusum Shrestha under my supervision. The entire work is based on original scientific investigations and has not been submitted for any other degree in any institutions. I, therefore, recommend this thesis work to be accepted for the partial fulfilment of M.Sc. Degree in Botany.

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ACRONYMS AND ABBREVIATIONS

DFO	Division Forest Officer
FAO	Food and agricultural organization
FL	Fidelity Level
FIC	Informant Consensus Factor
KATH	National Herbarium and Plant Laboratories
MAP	Medicinal and Aromatic Plants
Mm	Millimeter
NTFP	Non-Timber Forest Product
TUCH	Tribhuvan University Central Herbarium
UV	Use Value
HMGN	His Majesty's Government of Nepal
MoFSC	Ministry of Forests and Soil Conservation
MoFE	Ministry of Forests and Environment
GoN	Government of Nepal
DPR	Department of plant and resources
OECD	The Organization for Economic Cooperation and Development
CBD	Convention on Biological Diversity
NEHHPA	Nepal Herbs and Herbal Products Association
FUGs	Department of Forest and Forest User Groups
GDP	Gross Domestic Product
TEPC	Trade and Export Promotion Centre
Etc	Et cetera
EIA	Environmental Impact Assessment
N	North
E	East
km^2	square kilometer
m	Meter
ºC	Degree Celsius
GPS	Global Positioning System
RRA	Rapid rural appraisal
IVI	Importance Value Index
ENT	Ear Nose Throat

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ABSTRACT

This study was carried out in Kalanti Bhumidada and Dada gaun of Kavrepalanchok district to explore and document the knowledge and practices on the use of Non-timber forest products (NTFPs) plants for different purposes by the local community. Three field visits were made during the study period from 2022-2023. During every visit, plant specimens were collected, and information was gathered through interview using a semi-structured questionnaire. The total count of plants utilized by the local community as NTFPs from the study site was documented by directly interviewing 60 participants. Rapid rural appraisal (RRA) was used to gather, confirm, and validate information during the field visit. It was found that the older generation possessed more knowledge about NTFPs compared to the younger generation. Overall, 122 species were found to be NTFPs belonging to 62 families and 105 genera. The highest number of species was recorded in families Asteraceae followed by Rosaceae. The highest numbers of NTFPs are known to be harvested from different plant parts such as leaves, followed by fruits, root and shoot. Largest numbers of species are reported with medicinal use value followed by food and vegetables, fodder and animal medicine, religious and social use, fuel, handicraft and construction. Some of the highly useful NTFP species based on use value index are *Achyranthes bidentata*, *Myrica esculenta*, *Morus alba* and *Rhododendron arboreum.* Among medicinal plants, the highest informant consensus factor (FIC) value was obtained for Ureo-genital (0.913), Jundice (0.869) and Respiratory problems (0.867) repectively. Fidelity level shows high use of *Argentina lineata* and *Astilbe rivularis* to treat menstrual and pregnancy problems. The study highlighted the ecological significance of various NTFP species based on Density, Frequency, Abundance, and IVI analysis. The species with the highest IVI were *Tsuga dumosa* (38.31), *Berberis aristata* (29.1) and *Trifolium repens* (15.06), indicating their dominance among trees, shrubs, and herbs respectively. The high Simpson and Shannon-Wiener index values indicated a diverse and evenly distributed NTFP community in the study area. This research provides information on the importance of NTFPs for the sustenance of local communities and emphasizes the need for their conservation and sustainable management to preserve biodiversity and ecological balance.

Keywords: Biodiversity; Traditional knowledge; Local community; Menstrual and Pregnancy problems; Sustainable management.

1. INTRODUCTION

1.1. Background

Non-Timber Forest Products (NTFPs) are a diverse range of resources that are extracted from forests for various purposes. These resources are used for medicines, food, fodder, spices, fibers, leaf litter, resins, manure, incenses, dye stuffs, oils, aromatic herbs and construction materials (Shrestha, 1999). NTFPs are harvested from different parts of plants, such as leaves, roots, bark, flower, seeds, fruits, tubers, twigs, branches, nuts, gums, resins and latexes. The use of these plant parts serves multiple purposes, and the significance of their applications plays a crucial role in their classification. The utilization of botanical resources varies based on the types of vegetation, climate conditions, and local traditions found in specific regions (Bhattarai and Acharya, 2015).

A significant portion of rural populations worldwide relies on NTFPs for their daily sustenance (Shrestha *et al*., 2020). In fact, Chao (2012) estimated that approximately 1.6 billion people in rural areas rely on forests to varying degrees for their livelihoods. NTFPs make up a significant portion of household incomes in developing countries, accounting for 22.2% (Angelsen *et al*., 2014). Typically, those with lower incomes rely more heavily on forest resources for food, medicine, fodder, and fuel wood than those with higher incomes (Rijal *et al*., 2011).

The state and condition of natural resources heavily impacts rural communities' livelihood and economic stability. However, NTFPs alone do not guarantee a consistent or high income for forest dwellers (Saxena, 2003). According to the Food and Agriculture Organization (FAO), more than 80% of the population in developing nations depends on NTFPs to meet their nutritional and health requirements, with over 1.2 billion rural inhabitants relying on these resources to fulfil their essential needs (Adhakari *et al*., 2004). Medicinal plants, especially, have a crucial function in maintaining the well-being of rural populations in many nations globally (Uprety *et al*., 2010a). Approximately 70-80% of the global population depends on traditional herbal medicine, not only to address healthcare requirements but also for income generation and enhancing their livelihoods (Larsen and Olsen, 2007).

The rural economy of developing countries relies heavily on primary products derived from agriculture, forest, and natural resources, contributing significantly to subsistence livelihoods (Arun, 2004). Farmers depend on animals for draft power and use dung as fertilizer for soil

productivity. They feed these animals from forest and range areas, which establishes a relationship between rural food systems and forests. Forests are a regular source of various traditional agricultural inputs such as leaf litter, grass, fodder, small tools, and fuel woods, which are regularly harvested. NTFPs not only have the potential to generate income but also contribute to food security for low-income households and their livestock, particularly during droughts or famines (Arun, 2004).

NTFPs play a vital role in Nepal's economy, as highlighted by Uprety *et al.* (2010). These products are deeply intertwined with the cultural and socio-economic aspects of forest-dependent communities, as noted in studies by Rijal *et al.* (2019) and Rai *et al*. (2019). The mountain regions of Nepal serve as important habitats for a wide variety of NTFP species, which hold significant value in both local and global trade (Ghimire, 2008). In Nepal, up to 90% of cash income of the rural poor people comes from NTFPs (Bista and Webb, 2006). Identifying NTFPs and understanding their diverse applications can be beneficial for their commercialization (Malla *et al*., 1997). The potential for improving the well-being of rural communities through the sustainable expansion of NTFPs is hampered by issues such as overharvesting due to population growth and poverty, as well as the absence of local resource management, which collectively impose a substantial burden on the environment (Shrestha *et al.,* 1998). The species that possess high economic value and are of traditional importance face the threat of exploitation and potential extinction due to unsustainable harvesting practices and habitat degradation resulting from changes in land use, deforestation, and excessive grazing (Uprety *et al*., 2010a). Certain NTFPs, specifically medicinal plants, are facing issues of overharvesting, while the conservation efforts for these plants are being neglected or overlooked. More than 90% of NTFPs are medicinal and aromatic having high monetary value and some of them are endemic plants unique to Himalaya, mostly harvested and are now under threat (Acharya, 2000).

In biodiversity-rich areas, sustainable extraction of NTFPs is widely regarded as the most feasible strategy for forest conservation (Saha and Sundriyal, 2012). In the last decade, interest has been on the rise within conservation and development organizations (Neumann and Hirsch, 2000). The expanding commercial trade of natural products, especially plant medicines and crafts, has led to a rise in the harvesting of wild resources, resulting in the overexploitation of numerous species (Adhikari *et al.*, 2004). Specific species are identified as economically feasible and hold the potential to enhance the well-being of communities residing in remote areas (Joshi *et al.,* 2018).

Over the past five decades, the sustainable management of hill forest resources in Nepal has emerged as a significant concern. Non-timber focused forest management has surfaced as a viable choice for the sustainable exploitation of forest resources, offering an economically competitive approach for merging forest utilization and preservation (Peters *et al*., 1989). The collection of scientific documentation and information regarding the diversity, distribution, usage trends, and economic importance of plant species plays a vital role in conserving and sustainably utilizing such resources within a defined state or region. This data collection also involves gathering basic information on specific NTFPs, assessing their potential market value, and their contribution to people's livelihoods (Masoodi and Sundriyal, 2020).

The significance of NTFPs has gained global recognition and is considered a potential alternative to deforestation and the conversion of non-forest land (Plotkin and Famolare, 1992) and sustainable extraction of these resources can surpass the immediate profits acquired from timber and agricultural advantages. The government of Nepal has implemented multiple measures to oversee the gathering, commerce, processing, marketing, and preservation of NTFPs, as stipulated in policies, plans, and legislative actions (HMGN, 1995, 1997, 2002, 2004). To promote effective management, protection, regulation, and utilization of forest resources, including NTFPs, the government has transferred national forests to local communities (Gauli and Baral, 2008). This approach has resulted in successful forest conservation outcomes. Additionally, the establishment of small and medium-sized industries and the promotion of commercial farming are seen as potential to achieve sustainability (Uprety *et al.,* 2016). The Division Forest Office (DFO) is responsible for issuing permits for the collection and trade of NTFPs from national forests. The promotion of commercialization of NTFPs has been promoted by researchers, conservation and development organizations, and governments to enhance rural livelihoods while ensuring environmental sustainability (Belcher *et al.,* 2005).

The aim of the study was to identify and document the traditional knowledge of NTFPs among local people in Kavrepalanchok district. While many studies have mostly focused on medicinal plants, it is important to recognize that other categories of NTFPs do exist. Preserving this knowledge is essential before it is lost with the passing generation. The study uses ethnobotanical approach and ecological sampling methods to study the NTFPs.

1.2. Justification

In rural areas of Nepal, people collect NTFPs for their livelihood, but these biological resources are facing threats due to unsustainable harvesting, lack of marketing and overuse. Studies have established the importance of NTFPs in rural livelihood improvement, but little is known about their collection and marketing process (Bista and Webb, 2006). While many studies focus on socioeconomic issues, an inventory study of NTFP species in the southern hills of Kavrepalanchok is needed to assess the status of these resources, their uses, harvested parts, and potential economic benefits. This study can also help examine local people's dependency on these resources.

1.3. Research questions

The following are the research questions that the present study aims to answer:

1. What are the different species of NTFPs found in the study area?
2. How do the local people utilize these NTFPs?
3. Do these products play a significant role in enhancing the livelihood of rural population?
4. What is the ecological condition of the potential NTFP species within this study area?

1.4. Objective

The overall aim of this study was to have an inventory study on NTFPs at the Southern hills of Kavrepalanchok which comprises the following specific objectives:

1. To enumerate the plant from the study area along with the local and scientific names.
2. To assess the use of plants by local people at the study sites.
3. To determine the ecological status of potential NTFP species in the study area.

2. LITERATURE REVIEW

2.1. Diversity of NTFPs in Nepal

Rural communities in Nepal have long relied on a wide range of plant resources for essential purposes like food, medicine, materials, and cultural significance. Similarly, many Nepalese individuals depend on the natural resources found in forests, wetlands, and community lands to meet their daily needs (Rokaya, 2002). Nepal, despite covering just around 0.1% of the world's land area, boasts an incredible richness in floral diversity, hosting approximately 3.2% of the global total (MoFSC, 2014). In terms of biodiversity richness, it holds the 25th position worldwide and ranks 11th among Asian countries (MoFE, 2018). The country is home to over 11,971 flora species, with some 300 flowering plants endemic to Nepal (MoFSC, 2014; Rajbhandari *et al*., 2021). Multiple sources report varying numbers, such as 5,833 species recorded by Koba *et al.* (1994), 6,973 by MoFSC (2014), and 5,309 species under 1,515 genera and 193 families reported by Rajbhandari *et al*. (2017). Overall, Nepal boasts approximately 7,000 species of vascular plants, with over 2,000 species considered NTFPs, and an estimated 1,624 species are believed to possess medicinal properties (MoFSC, 2012). Malla and Shakya (1984) have reported 700 species of medicinal and aromatic plants (MAPs), while Chaudhary (1998) documented about 1000 wild MAPs, DPR (2007) report has mentioned 701 species of medicinal plants, Ghimire (2005) has enumerated 25 endemic plants as medicinal plants recorded from different forests of Nepal. More than 2000 plant species were estimated to be potentially useful including 1600-1900 species used for medicinal purposes (Baral and Kurmi, 2006; Ghimire, 2008). Nearly 600 species were reported to be used for food and food additives (Rajbhandari, 2001; Manandhar, 2002).

2.2. NTFPs studies conducted in Nepal

Malla and Chhetri (2009) collected 68 plant species, belonging to 59 genera under 37 families from Kavrepalanchok district which are used in the daily routines of the local tribal communities. Out of 68 plants species, 57 species are used for various medicinal purposes, 38 for edible, 26 for fodder, 18 for fuel and wood, 7 for religious beliefs, 5 for ornamental, 16 species have miscellaneous uses such as construction, furniture, mat, fiber, dye, manure and other household purposes. Shah and Lamichhane (2017) collected 55 plant species belonging to 38 families and 51 genera used by Tamang community of Kavrepalanchok. The majority of these plants served as sources of food and medicine, with miscellaneous uses, fodder, firewood, religious ceremonies, and others. Ambu *et al*. (2020) collected 116 plant species

from Kavrepalanchok district among these species 101 was reported for medicinal purpose, 20 for food, 11 for religious purpose and 6 for domestic, handicrafts purpose. Luitel *et al*. (2014) identified 161 plant species from 86 families and 144 genera, employed by the Tamang people in the Makawanpur district to remedy 89 human ailments with herbs being the primary medicinal source (45%), followed by trees (33%), and shrubs (23%). Uprety *et al*. (2016) reported 363 species of NTFPs used by locals from Kanchenjunga landscape in Nepal, medicinal and edible was the major purpose of use of the NTFPs. Pandey *et al*. (2020) reported 139 plant species belonging to 74 families from Khandadevi and Gokulganga Rural Municipality of Ramechhap District. Out of 139 plant species reported, 136 were of medicinal importance and other uses included religious, traditional rituals, making pickles, essential oil extraction, washing and dyeing, edible, timber, fodder, pesticides, and veterinary. Karki *et al*. (2023) collected 111 plant species from Dolakha district which belong to 103 genera and 70 families, which were employed for the treatment of 11 different health disorders.

2.3. Utilization and Importance of NTFPs in Rural Communities

The utilization of NTFPs plays a crucial role in sustaining well-being of rural communities around the world (Bennet, 2002). NTFPs provide food security, welfare, medicinal needs, and cultural practices to the poorest peoples around the world (Angelsen *et al*., 2014), such that over 90% of people living in condition of extreme poverty depend partially or wholly on it to sustain their life (OECD, 2009). According to Chao (2012) about 1.6 billion people in rural areas worldwide depend entirely on forests for their way of life. In developing countries such as Nepal, India, and Pakistan forest make up 22.2% of household wages and about 80% of individuals in those nations depend exclusively on traditional remedies (Angelsen *et al.*, 2014). More than 50 million Indians rely on NTFPs for their livelihoods and income (Shaanker *et al*., 2004). Mulenga *et al.* (2011) found that NTFPs have a substantial effect on improving the income and food security of rural households in Zambia, exerting a significant influence on the country's economy. In developing countries such as Nigeria, forest-based activities, particularly in areas abundant with NTFPs, contribute significantly to people's livelihoods by generating income equivalent to approximately 17 million full-time formal jobs and 30 million informal employments (Duong, 2008). According to Dani (1986), approximately 85% of the rural people in Nepal depends on indigenous healing methods for their health requirements. In mountainous regions, it has been observed that 10-100% of households engage in the commercial collection of NTFPs, which has the potential to make

up as much as 50% of their household income (Olsen and Larsen, 2003). The increasing focus on NTFPs, such as medicinal and aromatic plants, in commercial ventures is driven by their ability to improve rural livelihoods and create income from exports (Edwards and Bowen, 1993). Bista and Webb (2006) had mentioned that about 90% of the overall household income in rural Nepal is derived from trade associated with NTFPs. Around 80% of families in rural hilly regions of Nepal are documented to engage in the commercial gathering of NTFPs and MAPs (Rai *et al*., 2019).

2.4. Economic Significance of NTFPs

According to Wilkinson and Elevitoh (2003), the total estimated worth of the most economically important NTFPs in the global market is around $11 billion annually. Bista and Webb (2006) reported that approximately 90% of the total household income in rural Nepal is derived from NTFP-related trade and around 100 NTFPs being traded, which collectively generate over $30 million annually (Poudel, 2009). Nepal has a long history of trade of these valuable species to India as well as to other international markets. It is estimated that Nepal exports approximately 10,000 to 15,000 tons of plant products, involving over 100 different species, to India and other international markets every year (Edwards, 1996). Among the products, 20 NTFPs species are highly demanded, economically valuable products that are exported (Bhattarai and Olsen, 2000). The Department of Forest and Forest User Groups (FUGs) collect revenue of NPR 25 million per annum from the trading of NTFPs (MoFSC, 2012). The NTFP sub-sector in Nepal contributes approximately 5% to the country's Gross Domestic Product (GDP), while the entire forestry sector contributes around 15% to the GDP (MoFSC, 2009). More than 160 different species of NTFPs are harvested from the wild and traded in the international market, with a majority of them being exported to India. Approximately 95% of NTFPs are harvested directly from natural sources, and roughly 90% of these are shipped to India in their unprocessed state (MoFSC, 2012). According to Ghimire *et al*. (2016), exported MAPs from Nepal account for 40.89% and 69.87% of the total export volume and value respectively of NTFPs, constituting more than 10,000 tons of raw products valued at approximately USD 60 million; however, the high demand and unsustainable collection practices has led to the excessive exploitation of MAPs across various regions in Nepal as highlighted by Pyakurel *et al.* (2018).

2.5. Challenges and Threats to NTFPs

NTFPs are upgrading towards more vulnerable, endangered and even extinct categories (Acharya, 2000). As the population continues to grow and the natural resource base

diminishes, the sustainable management of NTFPs has become a challenging task (Uprety *et al.*, 2016). The rising demand for NTFPs has resulted in their over-exploitation, leading to a decline in biodiversity and negative impacts on the ecology. This situation highlights the need for effective conservation and management strategies to ensure the long-term sustainability of NTFPs and their associated ecosystems. NTFPs in the Himalayan region are under threat of exploitation and extinction due to high economic and traditional value, unsustainable extraction and habitat degradation due to alterations in land use, forest clearing, and excessive grazing (Uprety *et al*., 2010). According to TEPC (2014), approximately 50-60% of NTFPs are illegally traded without following any government channels which shows lack of strict programs and their implication on real life. According to Uprety *et al*. (2011) identified a range of challenges for local collectors and organizations involved in the sustainable management and commercialization of medicinal plants, including issues such as limited market information, inadequate input supply and cultivation support, plant depletion, infrastructure gaps for traders, resource decline due to overexploitation, and unclear policies. A significant gap exists between roadhead traders and harvesters, with harvesters receiving minimal profits, and the unsustainable harvesting practices are attributed to their lack of awareness and market information (Heinen and ShresthaAcharya, 2011; Uprety *et al.*, 2016).

2.6. Sustainable Management and Conservation of NTFPs

Researchers and government agencies from various fields are interested in NTFPs because they have the potential to support rural livelihoods, increase incomes, and promote environmentally friendly practices and NTFP market is growing, presenting both an opportunity and a challenge for more sustainable, efficient, and equitable NTFP resource management (Shackleton *et al.*, 2018). Ghimire *et al.* (2008) state that indigenous knowledge and management systems play an important role in promoting the sustainable use of NTFPs and have been successful in obtaining legal rights for their management.

The government of Nepal has implemented policies, strategies, and legal actions to control the sustainable harvesting, trade, processing, marketing, and conservation of NTFPs. The Division Forest Office (DFO) has been given the authority to issue permits for the harvesting and marketing of NTFPs obtained from national forests. In accordance with the Forest Act of 1993, there are restrictions on the export of 19 plant species and 15 species of plants listed under the Convention on International Trade in Endangered Species (CITES) (HMGN 2002). According to Chaudhary (2000), the forestry sector in Nepal is governed by several important policies and legislations which include the Plant Protection Act of 1972, the National Parks

and Wildlife Conservation Act of 1973, the Master Plan for the Forestry Sector of 1989, the Forest Act of 1993, the Forest Regulations of 2051 (HMGN, 1995), the Community Forest Directives of 1995, the Environmental Impact Assessment (EIA) Guidelines for the Forestry Sector of 1995, the Environment Protection Act of 1996, the Environmental Protection Regulation of 2054 (HMGN, 1997), the Local Self-Governance Act of 1998, the Nepal Biodiversity Strategies of 2002 (HMGN, 2002), and the Herbs and Non-Timber Forest Product Development Policy of 2004 (HMGN, 2004). These policies and regulations cover a wide range of areas, including issuing permits for the gathering, sale, transport, and export of both raw and processed products, as well as placing limitations on the collection, sale, and transport of specific NTFPs in Nepal.

3. MATERIALS AND METHODS

3.1. Study site

Kavrepalanchok is located in the Bagmati province of Nepal, and it spans a land area of 140,486 hectares. Kavrepalanchok district is positioned at coordinates 85º20'11" E and 27º42'59" N. It shares borders with Ramechhap and Dolakha to the east, Kathmandu, Lalitpur, and Bhaktapur to the west, Sindhupalchok to the north, and Makwanpur and Sindhuli to the south (Figure1).

The study was carried out in Kalanti Bhumidada and Dada gaun Kavre which lies at the southern part of Kavrepalanchok. Kalanti Bhumidada is located in Panauti municipality. It lies at latitude of 27.55º N and longitude of 85.45ºE, with an elevation ranging from 1500 m to 2200 m. Dada gaun is located in the Bethanchok Rural Municipality at coordinates 27.55ºN latitude and 85.50ºE longitude, with an altitude range of 2000 m to 2,825 m.

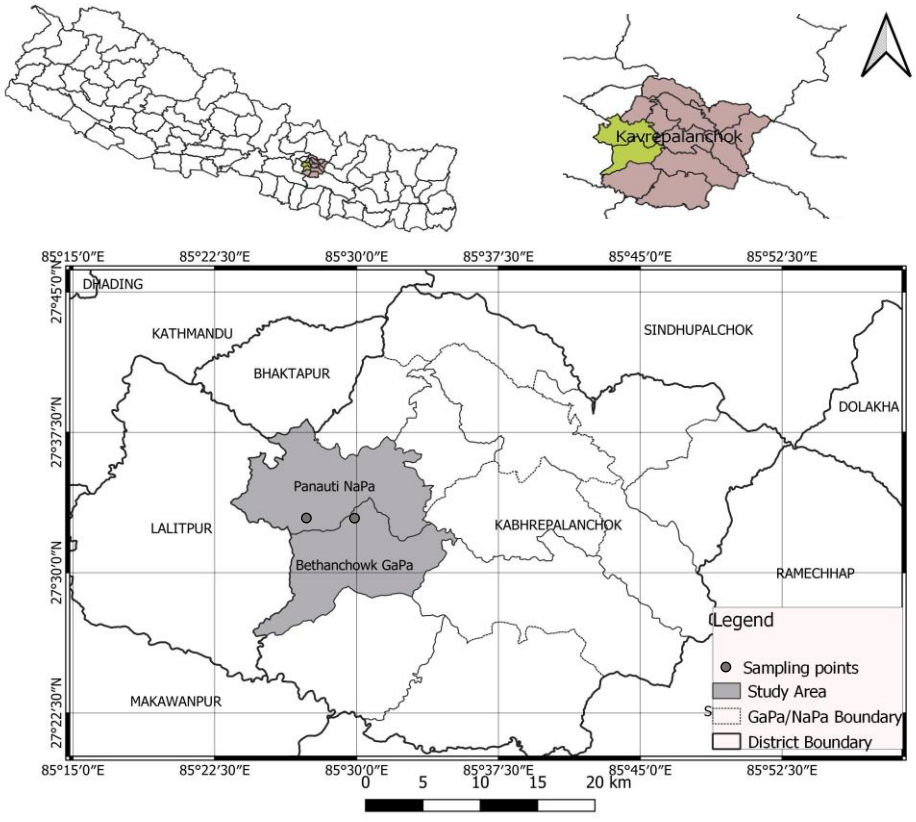

Figure 1: Map of the study area

3.2. Vegetation

Various forms of vegetation were observed within the study region, where research was conducted in subtropical and temperate zones. The subtropical zone (1000-2000m) in the study area was characterized by the dominance of *Alnus nepalensis*, *Pinus roxburghii*, and *Rhododendron arboreum* and associated species such as *Castanopsis indica*, *Maesa chisia*, *Myrica esculenta*, *Prunus cerasoides*, *Pyrus pashia*, *Quercus semecarpifolia*, *Schima wallichii*, *Pinus wallichiana* and others were also found in this zone. Among the shrubs found in the area, the most common species include *Berberis aristata*, *Phyllanthus parvifolius*, *Pyracantha crenulata*, *Rubus ellipticus*, *Strobilanthes pentastemonoides*, *Luculia gratissima* and others. The most common herbs, including *Drymaria cordata*, *Galium asperifolium*, *Cuscuta reflexa*, *Acorus calamus*, *Rubia manjith*, *Ageratum conyzoides*, *Trifolium repens*, *Centella asiatica*, *Cirsium wallichii* and others.

Within the temperate zone (2000-3000m), the area common tree species includes *Pinus wallichiana*, *Tsuga dumosa*, *Taxus baccata*, *Lyonia ovalifolia*, *Quercus lanata*, *Quercus semecarpifolia*, *Cinnamomum tamala* and *Rhododendron arboreum*. Common shrubs found in the area include *Berberis aristata*, *Gaultheria fragrantissima*, *Daphne bholua*, *Achyranthes bidentata*, *Buddleja asiatica*, *Berberis napaulensis*, *Rubus ellipticus*, *Rubus pentagonus* and others. Among the common herbaceous plants, *Bergenia ciliata*, *Gentiana capitata*, *Hydrocotyle nepalensis*, *Argentina lineata*, *Oxalis corniculata*, *Fragaria vesca*, *Cirsium wallichii*, *Valeriana hardwickii* and *Hemiphragma heterophyllum* were frequently found in temperate zone.

3.3. Climate

The meteorological station data of Kavrepalanchok district was shown in graph (Figure 2). Data for precipitation and temperature were taken from 2012 AD to 2022 AD. The highest amount of rainfall occurred in the year 2019 AD, while the lowest occurred in the year 2012 AD. The maximum temperature reached up to 24ºC in 2022 AD and minimum temperature fell to 10ºC in 2013 AD.

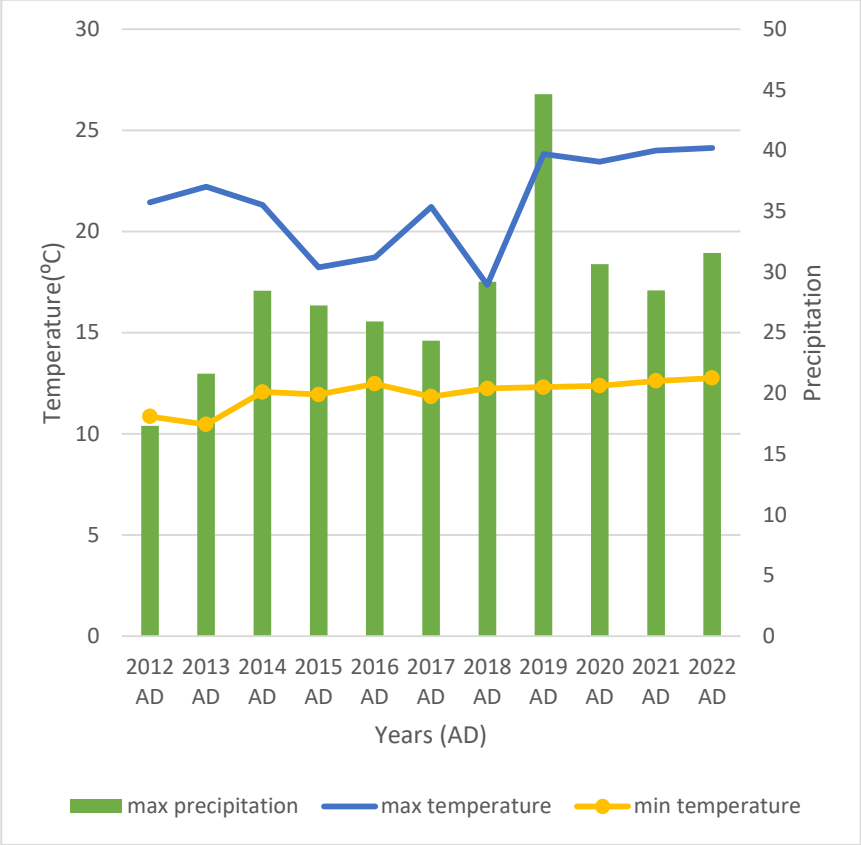

Figure 2: Temperature and Rainfall in the study area from 2012 AD - 2022 AD
(Source: Department of Hydrology and Meteorology, Babarmahal, Kathmandu)

3.4. Ethnic groups

The Tamang, Brahmin, Newar, Magar, and Pariyar were the dominant ethnic communities in Kalanti Bhumidada and Dada Gaun, located in the Kavrepalanchok district. Interviews were conducted with individuals from the Tamang, Brahmin, and Newar ethnic groups. It was found that various traditional knowledge systems had been practiced and followed for a long time by the inhabitants of different areas of Kavrepalanchok district. Even though this rural area was relatively close to urban centers, people face significant deprivation of basic

infrastructure and services. The majority of the population was engaged in agriculture, while others participate in the tourism industry, driving, wage labor, and selling handicrafts.

3.5. Taxonomy

For the systematic collection of specimens, herbarium preparation and management, Bridson and Forman method was used (Bridson and Forman, 1998).

3.5.1. Interview

The total number of plants used as NTFPs by the local community from the study site was recorded through direct interviews with 60 respondents using an ethnobotanical approach. Three field visits were made during the study period from April 2022 to March 2023, with the first occurring on 4th April, the second on 15th October, and the third on 28th February. In the selected study area, the process of obtaining prior informed consent involved discussing the study's objectives with the leaders of the respective village (Collins *et al.*, 2006). The Rapid Rural Appraisal (RRA) was employed during the field visit to collect, verify, and authenticate information. During RRA, data was gathered through semi-structured interviews with both small groups of people and individuals, as well as with key informants including local healers, family heads, elders, village authorities, and leaders of the community forest (Huntington, 2000). A checklist of various categories of plant usage was created, which was utilized to identify the specific species use and the purposes they served. Additionally, information about plants and their utilization was gathered through interviews where specimens and photographs were also shown. Local people were asked to walk along the botanical inventory routes, actively engaging in discussions and interviews to share their knowledge about different vegetation and useful plants. These walks confirmed RRA findings and gathered local names of many plant species. Participants were also questioned about threats to local biodiversity, and these responses were verified through discussions with people in various locations (Uprety *et al.*, 2011).

3.5.2. Herbarium preparation

Plants were collected from the study area, specifically focusing on plants that were in the flowering and fruiting stage. Accurate photographs of the plants were taken during the collection process. In the field, the field notes for all the species were recorded, and tagging and numbering were done. During the preparation of field notes, important details such as the collection date, collection number, locality, phenology, vegetation, and flower color were noted. In the field, all the essential tools and equipment were brought along to facilitate the

collection process, including a plant press, field notebook, digger, pruner, collection bags, hand lens, camera, altimeter, newspaper, GPS device, and tags. For the preparation of the herbarium specimens herbarium sheets, labels, needle, glue and seed envelopes were used. The plant species that were collected in the field were pressed using a herbarium press and newspaper.

3.5.3. Identification

The prepared herbarium specimens were identified with the help of relevant literatures (Polunin and Stainton, 1984; Manandhar, 2002). Furthermore, the identified species were compared with specimens deposited at KATH and TUCH, as well as with the digital herbarium deposited at KEW and KATH.

3.5.4. Quantitative ethnobotanical parameters

In the quantitative study of ethnic knowledge, data were collected from 60 informants, and the following methods were employed.

Use Value (UV)

The Use-value index (UV) quantifies the significance of each species for each informant. Use values were high when there were many useful reports for a plant representing its importance. UV was calculated using the following formula (Phillips *et al*., 1994):

$$\mathrm{UVs} = \frac{\sum \mathrm{Ui}}{\mathrm{N}}$$

Where, Ui = the number of different uses of plant species mentioned by each informant i

N = the total number of informants interviewed.

Informant consensus factor (FIC)

The informant consensus factor (FIC) was used to determine the homogeneity of information regarding the use of particular plant species for treating a specific ailment. FIC values ranged from 0 to 1, with high values indicating consensus among informants, typically when a few plant species were widely reported for treating a specific ailment, while low FIC values suggested disagreement among informants regarding which plants to use. FIC was calculated using the following formula (Canales *et al.*, 2005):

$$\mathrm{FIC} = \frac{\mathrm{Nur} - \mathrm{Nt}}{\mathrm{Nur} - 1}$$

Where, Nur = the number of individual plant use reports for a particular illness category

Nt = the total number of species used by all informants for this illness category.

Fidelity level (FL):

The fidelity level (FL) represented the percentage of informants who reported using a specific plant for the same primary purpose. A high FL indicated extensive utilization of the plant for a specific ailment, while a low FL suggested a broad range of medicinal applications but with limited frequency for each ailment, and was calculated according to the following formula (Friedman *et al.,* 1986),

$$FL = \frac{Ip}{Iu} \times 100$$

Where, Ip = the number of informants that claim the use of a plant species to treat a particular disease

Iu = the total number of informants that use the same plant as a medicine to treat any disease.

3.6. Ecology

3.6.1. Sampling

An ecological study was conducted in April and May 2022. Data were collected from 40 plots and used for ecological analysis. Vegetation was sampled, covering an elevation range from 1600 m to 2800 m. The entire range was divided into four elevation bands, each at a 300 m elevation interval. Circular sampling plots, measuring a 10m radius for trees, a 3m radius for shrubs/saplings, and a 1m radius for herbaceous species, with two subplots, were used for data collection (Zobel *et al*., 1987). The diversity of plant species obtained from the plots was analyzed to identify NTFPs. Longitude, latitude and elevation of each plot was recorded by GPS. Slope and aspect of each plot was recorded by a clinometer compass.

3.6.2. Ecological parameters

Density

Density is the total number of individuals of species counted in all the plots of specified size. It is usually expressed in the number of individuals per hectare (for larger species) or number of individuals per square meter (for smaller species). It was calculated by using following equations (Yadav *et al*., 1987);

$$\text{Density} = \frac{\text{Total no.of individual of that species}}{\text{Total no.of plot}} \times \text{Area of plot}$$

$$\text{And, Relative Density (RD)} = \frac{\text{Density of one species}}{\text{Total density of all species}} \times 100\%$$

Frequency

Frequency gives how frequently species occurs in the plot. It is given by;

$$\text{Frequency}=\frac{\text{No. of plots where species occured}}{\text{Total no. of plot}}\times 100$$

$$\text{And, Relative Frequency (RF)}=\frac{\text{Frequency of one species}}{\text{Total frequency of all species}}\times 100\%$$

Abundance

Abundance shows how abundant is species in the area. It is given by;

$$\text{Abundance}=\frac{\text{Total no. of individual species}}{\text{No. of plot where species occur}}$$

$$\text{And, Relative abundance (RA)}=\frac{\text{Abundance of one particular species}}{\text{Total abundance of all species}}\times 100\%$$

Importance Value Index (IVI)

Importance Value Index for each plant determines the plant importance in the community and was calculated using following formula:

$$IVI=RD+RF+RA$$

Where RD, RF and RA refer to the acronym of parameters as mentioned above.

3.6.3. Diversity indices

For the diversity calculation, Simpson and Shannon index were calculated. The former tells about dominancy and later denotes diversity having more species and more nearly even distribution of them.

Simpson index proposed by Simpson in 1949 can be calculated by using its modified reciprocal form (Peet, 1974) as:

$$\text{Simpson's Index (D)}=1-\left(\frac{\sum n(n-1)}{N(N-1)}\right)$$

Where, n = total number of a particular species and N is total number of all species.

Similarly, Shannon-Wiener index is given by,

$$\text{Shannon-Wiener Index (H)}=-\sum Pi(\ln Pi)$$

Where P_i = Percentage importance, and it gives information content per individual within an infinite population (Shannon and Weaver, 1949).

4. RESULTS

4.1. Enumeration of plants species

A total of 205 plant species were recorded from the study area belonging to 79 families and 153 genera (Annex I). The highest number of species was found under angiosperms (190) followed by pteriodophytes (10) and gymnosperm (5) (Table 1).

Table 1: Number of species in different Taxa

Taxa	**No. of Family**	**No. of Genera**	**No. of Species**
Pteridophytes	6	6	10
Gymnosperms	3	4	5
Angiosperms	70	143	190
Total	**79**	**153**	**205**

4.2. Enumeration of NTFPs plant species

From the present work, of the total 205 plant species 122 species were reported to have been used as NTFPs belonging to 62 families and 105 genera (Annex II). The highest number of species was found under angiosperms (114) followed by gymnosperms (5) and pteridophytes (3) and similar pattern was seen in case of families and genera as well (Table 2).

Table 2: Number of NTFPs species in different Taxa

Taxa	**No. of Family**	**No. of Genera**	**No. of Species**
Pteridophytes	3	3	3
Gymnosperm	3	4	5
Angiosperm	56	98	114
Total	**62**	**105**	**122**

The distribution of NTFPs species among different families and genera showed its diversity. The highest number of species was recorded in families Asteraceae (14 species), Rosaceae

(11 species), Fagaceae (5 species), Ericaceae (4 species), Moraceae (4 species), Poaceae (4 species) and Urticaceae (4 species) (Figure 3). Where, the largest families in term of genera were Asteraceae (13), Rosaceae (8), Utriceae (4), Poaceae (4) and Ericaceae (3). Similarly, the largest genus in terms of species were *Rubus* (4 species), *Quercus* (4 species), Berberies (3 species), *Ficus* (3 species) and *Solanum* (3 species).

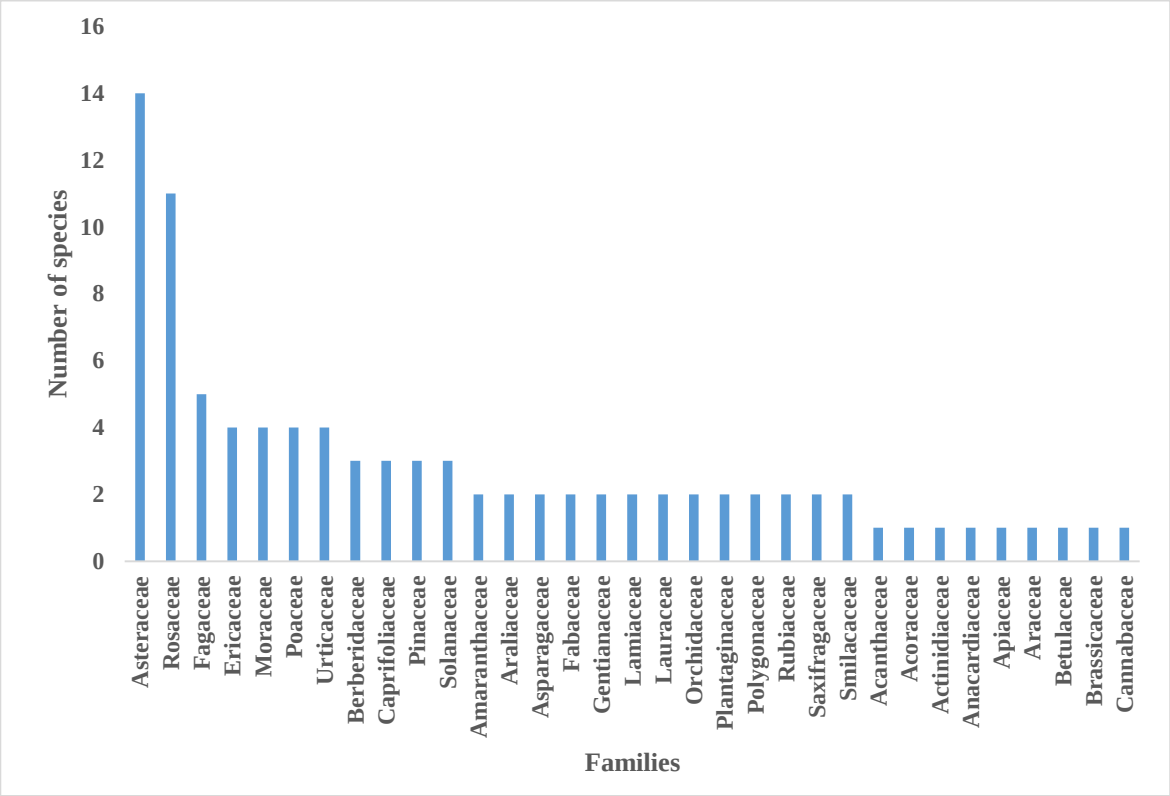

Figure 3: Number of species in Families

NTFP species were found in all types of life forms; herbs, shrubs, trees and climbers (Figure: 4). The highest number of species was recorded with herbaceous habit (61 species) followed by trees (30 species), shrubs (25 species) and climbers (6 species). *Achyranthes bidentata, Acorus calamus, Bergenia ciliate, Valeriana hardwickii, Urtica dioica* and *Cirsium wallichii* were some useful NTFP herbs species. Similarly, *Buddleja asiatica, Daphne bholua, Gaultheria fragrantissima, Prinsepia utilis, Berberis aristata* and *Rubus ellipticus* were some useful shrub species; *Tsuga dumosa, Rhododendron arboreum, Quercus semecarpifolia, Castanopsis indica, Ficus racemosa* and *Pinus wallichiana* were some tree species and *Smilax aspera*, *Clematis buchananiana*, *Cuscuta reflexa* and *Rubia manjith* were some climber species recorded from study area.

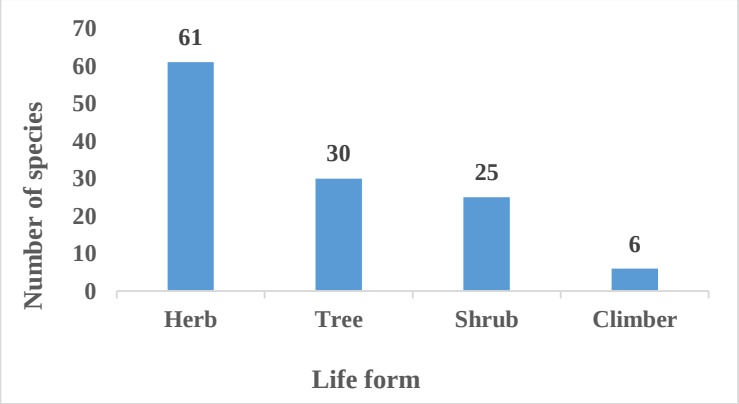

Figure 4: Species of plants based upon their life form

In total 122 plants were enumerated with their uses and species were categorized based on their use, parts use and number of uses reported from interviews. A total of 60 informants (23 male and 37 female) aged between 16 and 82 years were interviewed (Table 3).

Table 3: Distribution of informant's gender and age

Gender	**Number of informants by Age**						
	16-25	**26-35**	**36-45**	**46-55**	**56-65**	**66-75**	**76-85**
Men	2	0	4	2	9	5	1
Women	5	4	6	11	5	3	3
Total	**7**	**4**	**10**	**13**	**14**	**8**	**4**

Out of 60 informants, 12 informants were illiterate, 29 had schooling below the school leaving certificate (S. L. C.) and 19 had an education level higher than S. L. C. Among the total informants 55% were involved in agriculture, while the remaining 23.33% were involved in daily wage labor, 11.67% in official work and 10% in business (Figure: 5).

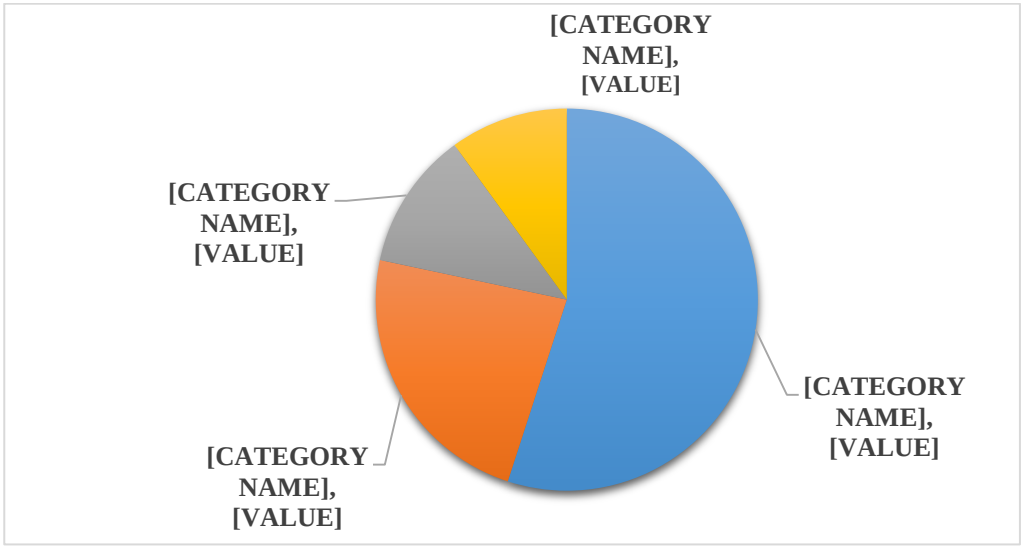

Figure 5: Percentage of informants by occupation

4.3. Use of NTFPs

4.3.1. Parts used

Ten different useful parts of the plants were recognized among which highest numbers of NTFPs were known to be harvested from leaves (58 species), followed by fruits (30 species), root (28 species), shoot (23 species), entire (18 species), stem (16 species), flower (12 species), bark (11 species), seed (5 species) and resin (2 species) in the study area (Figure 6). There were 67 NTFP species that were utilized for multiple parts, while 55 species are utilized for single parts (Figure 7).

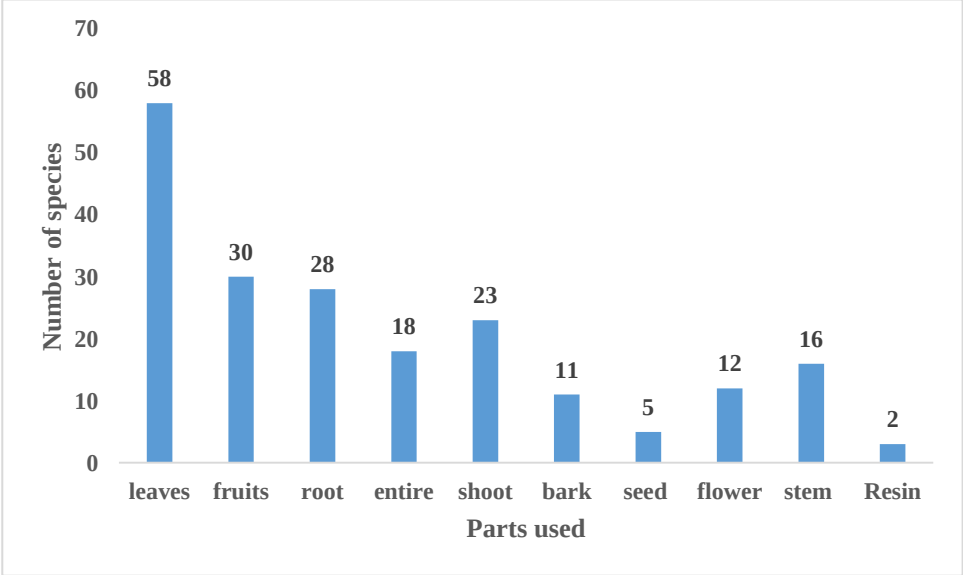

Figure 6: Number of NTFP species by parts used

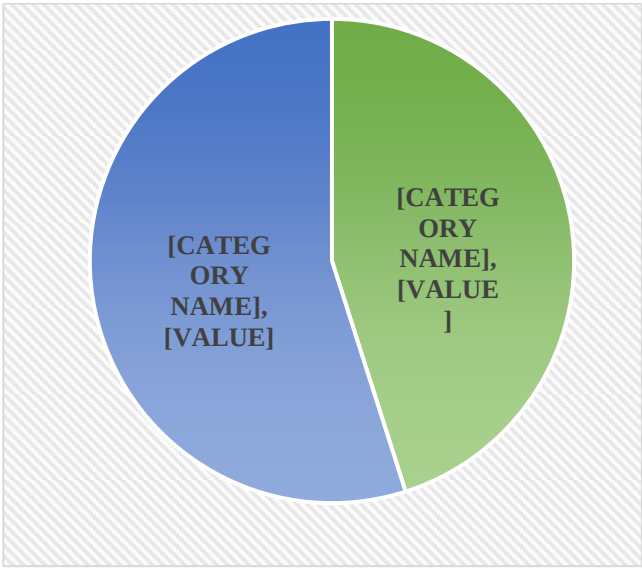

Figure 7: NTFP species number with their parts used

4.3.2. Use category

A detail study on 122 NTFPs species revealed their 212 uses were recorded in 6 broad categories for simplification in present study (Annex III). The highest numbers of species was reported with medicinal use value (66 species) followed by food and vegetables (53 species), fodder and animal medicine (40 species), religious and social use (20 species), fuel (18 species) and handicraft/ construction (15 species) (Figure 8).

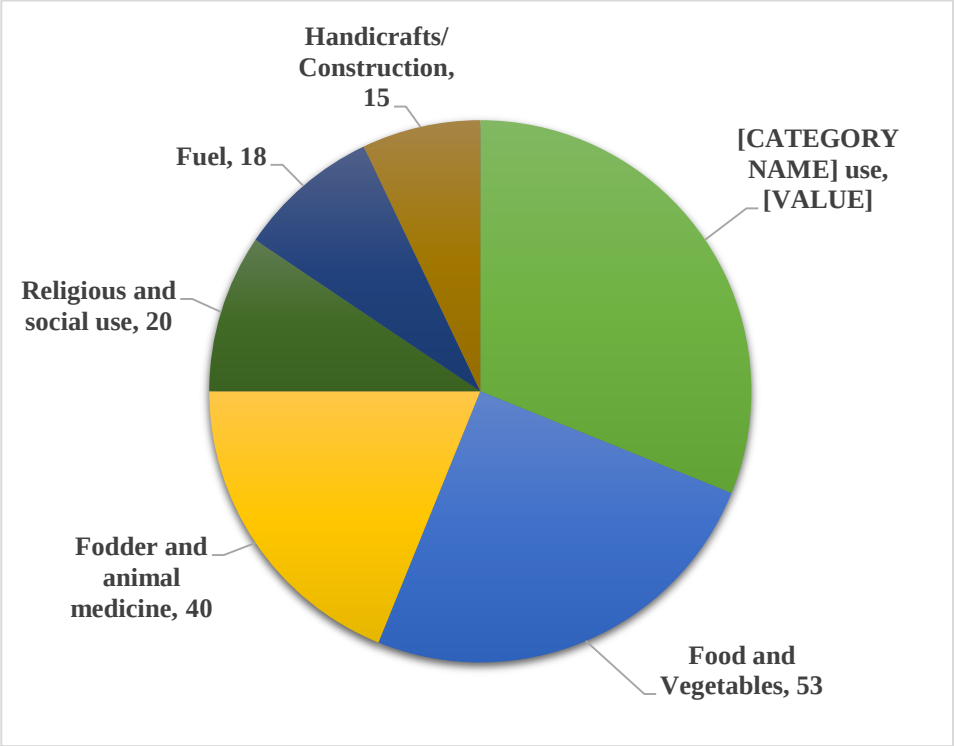

Figure 8: Species proportion by their use category

4.3.2.1. Medicinal Use

A total of 66 plant species, distributed into 48 families, were used for medicinal purposes. In the category of medicinal plants, the Asteraceae family was the most dominant with 7 species, followed by the Rosaceae family with 4 species. The families Ericaceae, Urticaceae, and Solanaceae had 2 species each that were utilized for their medicinal properties. Most of them were herbs (40 species) followed by shrubs (14 species) and trees (12 species). Leaves, roots, and fruits were the most frequently used plant parts (Annex II). Medicinal plants were used to treat 14 different ailments (Annex IV). *Acorus calamus, Achyranthes bidentata, Valeriana hardwickii, Cuscuta reflexa, Swertia chirayita,* and *Bergenia ciliata* were plant species highly valued for their medicinal properties.

4.3.2.2. Food and vegetables

A total of 53 different species from 33 families were identified as food sources. The Rosaceae family, with 9 species, was the most prominent, followed by the Berberidaceae and Solanaceae family with 3 species each. The most consumed edible parts were fruits and shoots. Among these species, the majority were herbs (22 species), followed by shrubs (16 species) and trees (10 species) (Annex II). Some of the commonly consumed fruits include *Choerospondias axillaris, Berberis aristata, Morus alba*, *Myrica esculenta,* and *Rubus ellipticus*. Several species were also used as vegetables, such as *Urtica dioica, Smilax aspera, Plantago major,* and *Nasturtium officinale.* Additionally, plants serve as spices, which include *Cinnamomum tamala, Zanthoxylum armatum, Amomum subulatum,* and *Mentha spicata*. These plants add flavor to various dishes.

4.3.2.3. Fodder and animal medicine

Local people preferred 40 species from 23 families as fodder and animal medicine, with trees being the most abundant (22 species), followed by herbs (11 species) and shrubs (6 species). *Saurauia napaulensis, Brassaiopsis hainla, Castanopsis indica, Quercus lanata, Quercus glauca, Eurya acuminata* and *Ficus neriifolia* were highly preferred fodder species (Annex II). According to the local people, *Achyranthes bidentata* was very nutritive and enhances milk production. Decoction of *Boehmeria platyphylla* was given to livestock to treat diarrhea and dysentery. To treat intestinal disorder and parasite root juice *Daphne bholua* was used and bark juice of *Schima wallichii* was used.

4.3.2.4. Religious and social use

Local people used 20 species from 12 families for religious and social purposes, with the majority being herbs (14 species), followed by trees (4 species) and shrubs (2 species) (Annex II). Flowers from *Rosa multiflora*, *Anaphalis contorta, Nyctanthes arbor-tristis, Rhododendron arboreum,* and *Tagetes erecta* were used in worship practices. Incense made from the roots of *Valeriana jatamansi* and *Valeriana hardwickii* holds religious significance and was used for ceremonial purposes.

4.3.2.5. Fuel

Locals used 18 species from 12 families as fuel, with 16 tree species along with one herb and one shrub species. The Fagaceae family had the most representation with 5 species, while Pinaceae and Rosaceae had 2 species each (Annex II). Among the commonly used plants for firewood were *Quercus lamellosa, Quercus lanata, Quercus semecarpifolia, Alnus nepalensis*

and *Castanopsis indica*. These species were preferred by the community for their reliable source of fuel.

4.3.2.6. Handicraft/ Construction

Local people utilized 15 species from 10 families for household and construction purposes, with 7 of them being herbs, 6 shrubs, and 2 trees (Annex II). For making walking sticks, *Piptanthus nepalensis* and *Pyracantha crenulata* were used. *Berberis aristata* and *Prinsepia utilis* were used for fencing purposes. *Drepanostachyum intermedium* and *Dendrocalamus hamiltonii* were utilized in the construction of baskets, mats, fencing, and walking sticks. *Agave cantala*, *Daphne bholua*, *Boehmeria platyphylla* and *Girardinia diversifolia* fiber were used.

4.4. Quantitative analysis of the use reports of NTFPs

One hundred and twenty two species of NTFPs were reported from a total of 60 informants. Informant's utilized plants with medicinal properties to address various illnesses (Annex IV). The highest number of plant species was used for gastrointestinal-related diseases followed by fever and headaches and skin disease (Figure 9).

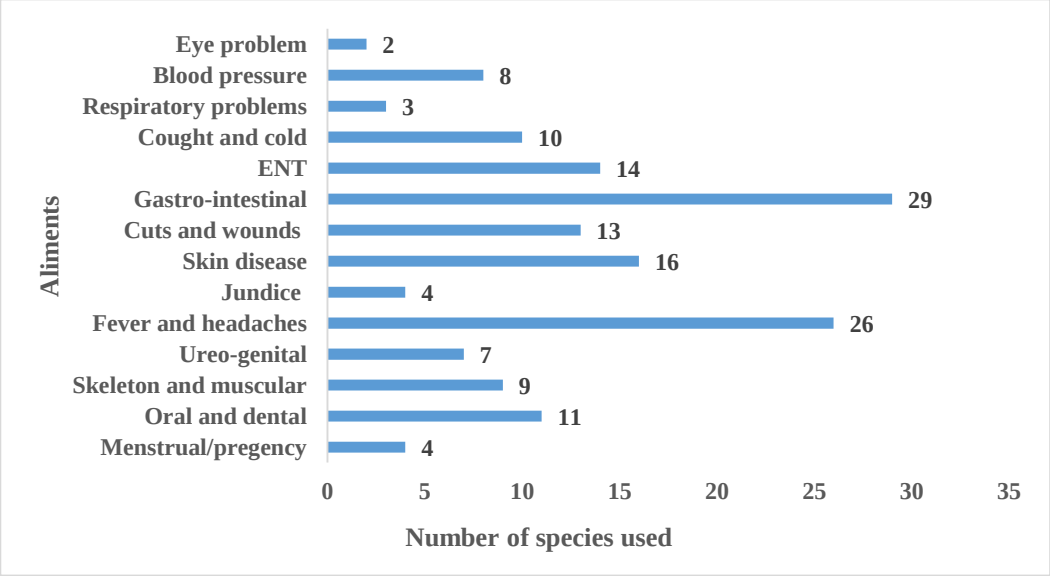

Figure 9: Number of species used to treat different ailments

4.4.1. Use Value

The use value of the 122 NTFP species was calculated by interviewing 60 respondents (Table 4). Use value was found to be highest for *Achyranthes bidentata* (2.033), *Myrica esculenta* (1.583), *Morus alba* (1.533), *Rhododendron arboreum* (1.483), *Drymaria cordata* (1.417) and Berberis *wallichiana* (1.4). Similarly, least use value was found for *Smilax elegans*,

Elephantopus scaber, Solanum betaceum, Satyrium nepalense, Euphorbia hirta and *Synotis cappa.*

Table 4: Use value of NTFPs species

Name of plant	**∑Ui**	**N**	**UVs=∑Ui/N**
Acer pectinatum Wall.	6	60	0.1
Achyranthes bidentata Blume	122	60	2.033
Acorus calamus L.	25	60	0.417
Agave cantala Roxb.	61	60	1.017
Ageratina adenophora (Spreng.) R. M. King & H. Rob.	19	60	0.317
Ageratum conyzoides L.	6	60	0.1
Alnus nepalensis D.Don	34	60	0.567
Amomum subulatum Roxb.	14	60	0.233
Anaphalis contorta (D. Don) Hook. fil.	16	60	0.267
Anaphalis triplinervis (Sims) C. B. Clarke	20	60	0.333
Argentina lineata (Trevir.) Soják	13	60	0.217
Arisaema tortuosum (Wall.) Schott	10	60	0.167
Artemisia indica Willd.	55	60	0.917
Asparagus racemosus Willd.	12	60	0.2
Astilbe rivularis Buch.-Ham. ex D. Don	12	60	0.2
Berberis aristata DC.	84	60	1.4
Berberis napaulensis (DC.) Spreng.	11	60	0.183
Berberis wallichiana DC.	10	60	0.167
Bergenia ciliata (Haw.) Sternb.	45	60	0.75
Bidens pilosa L.	19	60	0.317
Boehmeria platyphylla D. Don	22	60	0.367
Brassaiopsis hainla (Buch.-Ham.) Seem.	22	60	0.367
Buddleja asiatica Lour.	65	60	1.083
Cannabis sativa L.	19	60	0.317
Castanopsis indica (Roxb. ex Lindl.) A.DC.	20	60	0.333
Centella asiatica (L.) Urb.	14	60	0.233
Choerospondias axillaris (Roxb.) B. L. Burtt & A. W. Hill	6	60	0.1
Cinnamomum tamala (Buch.-Ham.) T. Nees & Eberm.	38	60	0.633
Cirsium wallichii DC.	8	60	0.133
Clematis buchananiana DC.	8	60	0.133
Coriaria napalensis Wall.	13	60	0.217

Cuscuta reflexa Roxb.	48	60	0.8
Cynodon dactylon (L.) Pers.	49	60	0.817
Daphne bholua Buch.-Ham. ex D. Don	66	60	1.1
Dendrobium sp	9	60	0.15
Dendrocalamus hamiltonii Nees & Arn. ex Munro	73	60	1.217
Dioscorea bulbifera L.	15	60	0.25
Dipsacus inermis Wall.	9	60	0.15
Drepanostachyum intermedium (Munro) Keng f.	41	60	0.683
Drymaria cordata (L.) Willd. ex Schult.	85	60	1.417
Dryopteris cochleata (Don) C.Chr.	8	60	0.133
Elephantopus scaber L.	4	60	0.067
Erigeron karvinskianus DC.	6	60	0.1
Euphorbia hirta L.	3	60	0.05
Eurya acuminata DC.	12	60	0.2
Ficus auriculata Lour.	11	60	0.183
Ficus neriifolia Sm.	24	60	0.4
Ficus racemosa L.	9	60	0.15
Fragaria vesca L.	14	60	0.233
Galinsoga parviflora Cav.	14	60	0.233
Galium hirtiflorum Req. ex DC.	9	60	0.15
Gaultheria fragrantissima Wall.	24	60	0.4
Gaultheria nummularioides D. Don	11	60	0.183
Gentiana capitata Buch.-Ham. ex D. Don	7	60	0.117
Geranium wallichianum D. Don ex Sweet	13	60	0.217
Girardinia diversifolia (Link) Friis	8	60	0.133
Gomphrena globosa L.	5	60	0.083
Hedera nepalensis K. Koch	16	60	0.267
Hemiphragma heterophyllum Wall.	22	60	0.367
Inula cappa (Buch.-Ham. ex D. Don) DC.	6	60	0.1
Juglans regia L.	15	60	0.25
Juniperus indica Bertol.	9	60	0.15
Lecanthus peduncularis (Wall. ex Royle) Wedd.	7	60	0.117
Litsea cubeba (Lour.) Pers.	15	60	0.25
Lycopodium clavatum L.	13	60	0.217
Lyonia ovalifolia (Wall.) Drude	9	60	0.15
Maesa chisia Buch.-Ham. ex D. Don	12	60	0.2

Mentha spicata L.	19	60	0.317
Morus alba L.	92	60	1.533
Myrica esculenta Buch.-Ham. ex D. Don	95	60	1.583
Nasturtium officinale R.Br.	6	60	0.1
Nephrolepis cordifolia (L.) C.Presl	7	60	0.117
Nyctanthes arbor-tristis L.	9	60	0.15
Ocimum tenuiflorum L.	16	60	0.267
Osbeckia nepalensis Hook.	6	60	0.1
Osyris lanceolata Steud. & Hochst. ex A. DC.	8	60	0.133
Oxalis corniculata L.	13	60	0.217
Paris polyphylla Sm.	6	60	0.1
Persicaria capitata (Buch.-Ham. ex D. Don) H. Gross	18	60	0.3
Picrasma quassioides (D. Don) Benn.	6	60	0.1
Pinus roxburghii Sarg.	6	60	0.1
Pinus wallichiana A.B. Jacks.	6	60	0.1
Piptanthus nepalensis (Hook.) Sweet	15	60	0.25
Plantago major L.	13	60	0.217
Prinsepia utilis Royle	6	60	0.1
Prunus cerasoides Buch.-Ham. ex D. Don	25	60	0.417
Pyracantha crenulata (D. Don) M. Roem.	12	60	0.2
Pyrus pashia Buch.-Ham. ex D. Don	13	60	0.217
Quercus glauca Thunb.	65	60	1.083
Quercus lamellosa Sm.	8	60	0.133
Quercus lanata Sm.	40	60	0.667
Quercus semecarpifolia Sm.	31	60	0.517
Rhododendron arboreum Sm.	89	60	1.483
Rosa multiflora Thunb.	7	60	0.117
Rubia manjith Roxb.	20	60	0.333
Rubus ellipticus Sm.	75	60	1.25
Rubus nepalensis (Hook. fil.) Kuntze	6	60	0.1
Rubus paniculatus Sm.	9	60	0.15
Rubus pentagonus Wall.	6	60	0.1
Rumex nepalensis Spreng.	11	60	0.183
Satyrium nepalense D.Don	4	60	0.0667
Saurauia napaulensis DC.	31	60	0.517
Schima wallichii (DC.) Korth.	13	60	0.217

Senecio scandens Buch.-Ham. ex D. Don	8	60	0.133
Smilax aspera L.	7	60	0.117
Smilax elegans Wall. ex Kunth	5	60	0.083
Solanum aculeatissimum Jacq.	8	60	0.133
Solanum betaceum Cav.	4	60	0.067
Solanum nigrum L.	12	60	0.2
Strobilanthes pentastemonoides (Wall. ex Nees) T. Anderson	6	60	0.1
Swertia chirayita (Roxb.) H. Karst.	55	60	0.917
Synotis cappa (Buch.-Ham. ex D. Don) C. Jeffrey & Y. L. Chen	3	60	0.05
Tagetes erecta L.	7	60	0.117
Taxus baccata L.	13	60	0.217
Thysanolaena latifolia (Roxb. ex Hornem.) Honda	74	60	1.233
Trifolium repens L.	6	60	0.1
Tsuga dumosa (D. Don) Eichler	9	60	0.15
Urtica dioica L.	55	60	0.917
Valeriana hardwickii Thwaites	82	60	1.367
Valeriana jatamansi Jones	6	60	0.1
Viscum articulatum Burm. fil.	6	60	0.1
Zanthoxylum armatum DC.	18	60	0.3

4.4.2. Informant Consensus Factor (FIC)

Informant Consensus Factor (FIC) shown their knowledge agreement among the locals (Table 5). Highest FIC value was obtained for Ureo-genital (0.913), followed by Jundice (0.869), Respiratory problems (0.867) and Menstrual/pregnancy (0.857) and least FIC value was obtained for Skeleton and muscular (0.714), Blood pressure (0.731) and ENT (0.74).

Table 5: Informant Consensus Factor (FIC) for different ailment:

Aliments	**Number of use reports (Nur)**	**Number of taxa (Nt)**	**Nur-Nt**	**Nur-1**	**Informant consensus factor (FIC)**
Menstrual/pregnancy	22	4	18	21	0.857
Oral and dental	48	11	37	47	0.787
Skeleton and muscular	29	9	20	28	0.714
Ureo-genital	70	7	63	69	0.913

Fever and headaches	105	27	78	104	0.75
Jundice	24	4	20	23	0.869
Skin disease	74	16	58	73	0.795
Cuts and wounds	54	13	41	53	0.774
Gastro-intestinal	138	29	109	137	0.796
ENT	51	14	37	50	0.74
Cought and cold	45	10	35	44	0.795
Respiratory problems	16	3	13	15	0.867
Blood pressure	27	8	19	26	0.731
Eye problem	6	2	4	5	0.8

4.4.3. Fidelity level (FL %)

Fidelity level showed high use of *Argentina lineata* and *Astilbe rivularis* to treat menstrual and pregnancy problems; *Achyranthes bidentata* and *Zanthoxylum armatum* to treat oral and dental problems; *Gaultheria fragrantissima* and *Osyris lanceolata* to treat skeleton and muscular problems and other species with low FL value had a wide range of uses for different ailment (Table 6).

Table 6: Fidelity level for ailment to different species:

Ailment	**Name of plants used**	**Ip**	**Iu**	**Fidelity level (%)**
Menstrual/pregnancy	*Argentina lineata* (Trevir.) Soják	7	15	46.667
	Astilbe rivularis Buch.-Ham. ex D. Don	9	16	56.25
Oral and dental	*Achyranthes bidentata* Blume	17	42	40.476
	Zanthoxylum armatum DC.	6	10	60
Skeleton and muscular	*Gaultheria fragrantissima* Wall.	8	11	72.727
	Osyris lanceolata Steud. & Hochst. ex A. DC.	7	11	63.636
Ureo-genital	*Bergenia ciliata* (Haw.) Sternb.	24	37	64.865
	Cirsium wallichii DC.	17	21	80.952

Fever and headaches	*Swertia chirayita (Roxb.) H. Karst.*	18	20	90
	Cuscuta reflexa Roxb.	16	33	48.485
Jundice	*Cuscuta reflexa* Roxb.	13	33	39.394
	Berberis napaulensis (DC.) Spreng.	5	22	22.727
Skin disease	*Hemiphragma heterophyllum* Wall.	14	14	100
	Achyranthes bidentata Blume	10	42	23.81
Cuts and wounds	*Ageratina adenophora* (Spreng.) R. M. King & H. Rob.	14	14	100
	Ageratum conyzoides L.	6	6	100
Gastro-intestinal	*Oxalis corniculata* L.	13	18	72.222
	Valeriana hardwickii Thwaites	19	19	100
ENT	*Rhododendron arboreum* Sm.	12	22	54.545
	Acorus calamus L.	11	23	47.826
Cought and cold	*Acorus calamus* L.	12	23	52.174
	Ocimum tenuiflorum L.	8	8	100
Respiratory problems	*Bergenia ciliata* (Haw.) Sternb.	6	42	14.286
	Taxus baccata L.	8	13	61.538
Blood pressure	*Cynodon dactylon* (L.) Pers.	7	10	70
	Artemisia indica Willd.	6	32	18.75
Eye problem	*Berberis napaulensis* (DC.) Spreng.	4	22	18.182
	Berberis aristata DC.	2	14	14.286

4.5. Ecology

4.5.1. Density, Frequency, Abundance and Importance Value Index

Density, Frequency, Abundance and IVI of the NTFP species from the plot were calculated and presented based on their habit as Trees, shrubs and herbs. Among the tree species highest density, frequency, abundance and consequently IVI was found for *Tsuga dumosa* (IVI= 38.31) followed by *Pinus wallichiana* (IVI= 27.44), *Rhododendron arboreum* (IVI= 25.64) and its least value for *Juglans regia* and *Nyctanthes arbor-tristis* (IVI= 1.75) (Annex V). Similarly, shrubs species values were known to be highest for *Berberies aristata* (IVI= 29.1) followed by *Rubus ellipticus* (IVI= 24.43), *Gaultheria nummularioides* (IVI= 17.11) and least for *Viscum articulatum* (IVI=2.627) and *Picrasma quassioides* (IVI= 2.002) (Annex VI). Moreover, within the herbs species highest value for *Trifolium repens* (IVI=15.06) followed by *Galium hirtiflorum* (IVI= 14.77), *Hemiphragma heterophyllum* (IVI= 14.25) and least for *Acorus calamus* (IVI= 0.75) (Annex VII).

4.5.2. Diversity Indices

NTFPs species diversity in the study area was presented using two indices: the Simpson index and the Shannon-Wiener index (Table 7). The Simpson index had a value of 0.937, indicating a high level of diversity in the community. This meant that there were a large number of different species present, and they were relatively evenly distributed in terms of their abundance.

Similarly, the value of the Shannon-Wiener index was 3.099, indicating a relatively high diversity and evenness of species in the community. This meant that there was a variety of species present, and they were distributed evenly in terms of their abundance. Finally, based on these values, the results indicated higher NTFPs diversity in the study area.

Table 7: Diversity index of NTFPs:

S. No.	Indices	Value
1	Simpson Index (1-D)	0.937
2	Shannon-Wiener Index (H)	3.099

5. DISCUSSION

5.1. Taxonomic status

The research site boasts a diverse flora, encompassing a wide array of valuable NTFP species. Out of the 205 plant species recorded in the study area, 122 were identified as NTFPs. These NTFPs belong to 62 families and 105 genera, indicating that a significant amount of the plant diversity in the area is valuable for the sustenance of local communities. Some families have a higher number of NTFP species, such as Asteraceae with 14 species, Rosaceae with 11 species, Fagaceae with 5 species and Ericaceae, Moraceae, and Poaceae with 4 species each. Similarly, the largest genera in terms of NTFP species were Rubus, Quercus, Berberis, Ficus, and Solanum. The family Asteraceae, being the largest family in the plant kingdom, shows the highest number of species in the study area. It might be due to abundance of herbs in this family and their diverse uses, which shows their ecological importance and potential in meeting various human needs. Similar findings support the result (Ambu *et al.,* 2020; Masoodi and Sundriyal, 2020; Uprety *et al*., 2016). The herbaceous habit had the highest number of NTFP species, with 61 recorded, followed by trees with 30 species, shrubs with 25 species, and climbers with 6 species. A similar pattern was documented in different regions of Nepal (Bhattarai *et al.*, 2010; Ghimire *et al*., 2018; Rokaya *et al.,* 2010; Uprety *et al*., 2010). The higher abundance of herbaceous NTFPs can be due to their greater diversity, small size, and wide distribution. The lower number of trees NTFPs is likely due to the absence of a timber use category, and fewer climber species result from their limited overall diversity. These herbaceous species are mostly medicinal, and they are extensively used because they are commonly found in the forest. The preference for herbs may be due to the ease of collecting, storing, and transporting plants, as well as the simple extraction of bioactive compounds from them. Similar result was found in study (Bhattarai and Tamang, 2017; Uprety *et al*., 2016; Ghimire, 2008; Shrestha and Dhillion, 2003).

5.2. Use status

The use of NTFPs was explored in the study area, with a specific emphasis on the informants' demographics, occupations, and the categorization of NTFPs based on their uses and the plant parts they utilize. The study involved a total of 60 informants, with 23 being male and 37 female. The age range of the informants, spanning from 16 to 82 years, ensures the collection of information from both younger and older generations. The older ethnic individuals have knowledge about various plant species and their common uses for treating

ailments. However, the majority of the younger generation lacks knowledge about many plants and their medicinal properties. Only a few younger individuals continue to follow the medicinal practices and traditional knowledge passed down by the elders and traditional healers, which is a pattern observed in other region of Nepal as well (Shrestha and Dhillion, 2003). The local people's main occupations are agriculture and animal husbandry, making them highly dependent on plant resources, which they use in various ways. This reliance might be due to limited basic facilities (transportation, health facilities) and poverty, but it is also influenced by culturally acceptable traditional practices (Chaudhary, 1998).

The study identified ten different useful plants parts that are collected for their value as NTFP. The highest number of NTFPs were known to be harvested from leaves (58 species), followed by fruits (30 species), roots (28 species), and shoots (23 species) (Figure 6). The most frequently use part of the plant is the leaf, which holds significant medicinal value due to its abundance of rich and bioactive chemical compounds (Bhattarai *et al*., 2010; Uprety *et al*., 2016). After leaves, the fruit is the next commonly used part of the plant. Many wild plants are harvested for food and vegetables, with wild edible fruits being especially familiar and well-known (Bhattarai *et al*., 2009). These findings share a similar conclusion with the study conducted by Masoodi and Sundriyal, 2020; Pradhan *et al.*, 2020; Bano *et al*., 2014 and Malla *et al.*, 2015. In some research, fruits were frequently identified as commonly used parts (Uprety *et al*., 2012; Luitel *et al*., 2014) while in other cases, roots were observed as the predominant plant parts in use (Uprety *et al.*, 2010; Shrestha and Dhillion, 2003; Bhattrai *et al.*, 2010).

The detailed study examined 122 common NTFP species and identified 212 recorded uses categorized into six main groups (Annex III). Medicinal use had the highest number of species (66), followed by food and vegetables (53), fodder and animal medicine (40), religious and social use (20), fuel (18), and handicraft/construction (15) (Figure: 8). Similar to findings in other parts of Nepal (Gautam, 2012; Uprety *et al.*, 2012) and in different regions worldwide (Rossato *et al.*, 1999), the majority of wild plant species in the study area were utilized for medicinal and food purposes. In the study area, wild plants were important for food. People ate fruits and used whole plants as vegetables, some are used as spices which provide diverse diets and ensuring enough food for households (Balemie and Kebebew, 2006). In the region, where people's lives depend on farming, certain tree species used as animal feed are significant. By improving the production of livestock, there is a chance to have more food and better lives for the local community (Gemedo-Dalle *et al*., 2005). In the

study area, people use root juice of *Daphne bholua* and bark juice of *Schima wallichii* to treat intestinal parasites, while the root juice of *Achyranthes bidentata* stimulates lactation in cows and buffalos and to treat livestock suffering from diarrhea and dysentery, a decoction of *Boehmeria platyphylla* is employed. Additionally, *Cissampelos pareira* is used for intestinal parasites, and *Asparagus racemosus* and *Coriandrum sativum* are used to enhance milk production in animals. Furthermore, *Cannabis sativa* and *Lindera neesiana* serve as specific remedies for treating diarrhea in animals, as reported in the studies by Luitel *et al.* in 2014 and Ambu *et al*. in 2020. These diverse uses highlight the importance of these plant extracts in traditional medicine and livestock management within the local community (Uprety *et al*., 2022). Commonly used plants for firewood include *Quercus lamellosa, Quercus lanata, Quercus semecarpifolia, Alnus nepalensis*, and *Castanopsis indica,* favored for their reliable fuel source. A similar study was conducted by Manandhar, 2002; Budha-Magar *et al.,* 2020 and Panthi, 2013. *Drepanostachyum intermedium* and *Dendrocalamus hamiltonii* are used for making baskets, mats, fencing, and walking sticks. *Agave cantala, Daphne bholua, Boehmeria platyphylla,* and *Girardinia diversifolia* fibers are also utilized. Similar findings were reported in the studies by Manandhar, 2002 and Pradhan *et al*., 2020.

In the study area, *Achyranthes bidentata* had the highest use value, being used for various purposes such as decoction for urinary problems, root juice for indigestion, toothaches, and fever, stem as a toothbrush, leaves for skin problems, and root juice for stimulating lactation in buffalos and religious practices (Manandhar, 2002; Ambu *et al*., 2020). Following *Achyranthes bidentata*, other high-value NTFPs included *Myrica esculenta, Morus alba, Rhododendron arboreum, Drymaria cordata,* and *Berberis wallichiana.* In this study, ailments related to the urogenital system, jaundice, respiratory problems, and menstrual/pregnancy issues showed the highest FIC values. This suggests there might be a higher level of agreement among informants regarding the use of certain plants for these health conditions. The FIC values for Skeleton and muscular, Blood pressure, and ENT were relatively low, indicating that there might be less agreement among the local community regarding the use of plant-based treatments for these specific health issues. Therefore, plant species with high FIC consensus values hold socio-economic significance and are crucial for pharmacological research to understand the chemical compounds responsible for their antibacterial activity (Canales *et al.,* 2005). The FL data (Table 6) shows that certain ailments, like Menstrual/Pregnancy (treated with *Argentina lineata* and *Astilbe rivularis*), Oral and Dental (treated with *Achyranthes bidentata* and *Zanthoxylum armatum*), and Skeleton and Muscular (treated with *Gaultheria fragrantissima* and *Osyris lanceolata*), have

high FL values. A higher FL value for a particular plant species indicates that the local community places a high level of trust and preference in using that plant to treat the specific health issue. In a study conducted by Malla *et al.* (2015), specific plant species were found to be highly significant based on their FL values. For instance, *Centella asiatica* was valued for musculoskeletal and nervous system issues, *Dactylorhiza hatagirea* for urinogenital problems, *Swertia chirayita* for cardiovascular diseases, and *Juglans regia* for musculoskeletal and nervous system ailments.

5.3. Population of NTFPs

The study analyzed the Density, Frequency, Abundance, and IVI of NTFP species categorized as Trees, Shrubs, and Herbs within the plot. These results offerd valuable understanding of the ecological significance and importance of various NTFP species within the area, helped in conservation and sustainable management for maintaining biodiversity and ecological balance. Various elements, such as elevation, soil composition, dominant and related species, and human interventions, had an impact on frequency, density, and abundance (Shrestha *et al*., 1998). The variability in species richness was often attributed to factors like climatic conditions, environmental stability, land usage, area, and diversity of habitats (Spies and Turner, 1999).

Certain plants, including *Bergenia ciliata, Achyranthes bidentata, Swertia chirayita, Agave cantala, Acorus calamus,* and *Osyris lanceolata*, exhibited high use value and fidelity value, while their IVI values were comparatively lower. This plant species are heavily utilized by the local community due to their cultural, medicinal or economic value. However, their relatively low IVI suggests they may not be ecologically dominant. This could be due to habitat changes, overharvesting, fragmentation, multiple uses, and trade (Ghimire, 2008).

The study assessed the species diversity of NTFPs in the study area using two indices, the Simpson index and the Shannon-Wiener index. The calculated Simpson index value of 0.937 suggests a high level of diversity within the community. This shows that there is a presence of various NTFP species, and they are relatively evenly distributed in terms of their abundance. Likewise, the Shannon-Wiener index value of 3.099 indicates a relatively high diversity and evenness of NTFP species within the community, signifying a wide range of species and an equitable distribution of their abundance. Overall, these indices point to a higher NTFP diversity in the study area, highlighting the importance of the region as a habitat for a rich variety of NTFPs.

6. CONCLUSIONS

Based on the above findings and discussion, it can be indicated that the residents of the study area possess knowledge regarding the utilization of plant resources for diverse purposes. The findings reveal a total of 205 plant species, among them 122 species are identified as NTFPs belonging to 62 families and 105 genera. Certain families, such as Asteraceae, Rosaceae, Fagaceae, Ericaceae, Moraceae and Poaceae exhibit higher numbers of NTFP species, reflecting their ecological importance and diverse human uses. The study also shows the significance of the herbaceous habit, which represents the highest number of NTFP species, followed by trees, shrubs, and climbers. The herbaceous habit shows the highest number of NTFP species, due to their greater diversity, small size, wide distribution, and easy collection. Medicinal use stands out as the most common category for NTFPs, followed by food and vegetables, fodder and animal medicine, religious and social use, fuel, and handicraft/construction.

The study explores the usage of NTFPs in the study area, with a particular focus on informant demographics, occupations, and the classification of NTFPs according to their uses and plant parts. The main occupations of the local peoples in the study area are agriculture and animal husbandry, which shows their dependence on NTFPs to meet various needs. This study shows that older individuals have more knowledge about NTFPs, while the younger generation is less familiar with these valuable plant resources. Leaves are the most harvested part, followed by fruits, roots, and shoots, because leaves are especially valued for their medicinal properties. Many wild plants are harvested for food and vegetables, fodder, firewood, handicraft, and religious purpose.

Through quantitative analysis of use value, informant consensus value, and fidelity level, the study has provided an information of NTFPs used in the study area, including use preferences and level of agreement among the local community regarding their uses. The study identifies *Achyranthes bidentata* as having the highest Use value, showing its various use in the community for medicinal and religious purposes. The FIC and FL values reveal a higher level of agreement among informants for certain plant species used for specific health conditions.

The analysis of Density, Frequency, Abundance, and IVI for NTFP species shows the dominance and significance of certain species in the study area. These results provide valuable insights into the ecological significance of various NTFP species, help in

conservation and sustainable management to maintain biodiversity and ecological balance. Certain plant species, valued for cultural, medicinal, and economic reasons, exhibit high use and fidelity values but have comparatively IVI values, potentially due to habitat changes, overharvesting, fragmentation, multiple uses, and trade. The high values of the Simpson and Shannon-Wiener indices indicate a rich diversity and even distribution of NTFP species across the study area, providing further information about the presence of various species throughout the study area.

7. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made to ensure the sustainable use and management of plant resources while conserving the traditional knowledge of local people in utilizing these resources:

1. Implement conservation measures to protect the diverse plant species and their habitats in the study area, considering the ecological significance and importance of NTFPs for the local communities.
2. It is needed to promote and engage the local population in growing and cultivating beneficial and valuable NTFPs.
3. Raise awareness among younger generations about the importance of NTFPs and their traditional uses to prevent the loss of valuable knowledge and practices.
4. Promote sustainable harvesting practices of NTFPs to ensure their availability for future generations and maintain ecological balance.
5. Encourage research on the chemical compounds and medicinal properties of NTFPs, which have high Fidelity Level and Informant Consensus Value, to support their potential pharmacological applications.
6. Local laws should be developed for the systematic and legal collection, processing and marketing of NTFPs.

8. REFERENCES

Acharya, T. P. (2000). Conservation of non-timber forest products (NTFPs) in Humla, Nepal: A case study of Rudikot (Margor) region for Biodiversity conservation. In Proceedings of the Third Regional Workshop of Community Based NTFP Management, Kathmandu, Nepal. South and East Asian Countries NTFP Network (SEANN) (pp. 264-271).

Adhikari, B., Di Falco, S., & Lovett, J. C. (2004). Household characteristics and forest dependency: evidence from common property forest management in Nepal. Ecological economics, 48(2), 245-257.

Ambu, G., Chaudhary, R. P., Mariotti, M., & Cornara, L. (2020). Traditional uses of medicinal plants by ethnic people in the Kavrepalanchok district, Central Nepal. *Plants*, *9*(6), 759.

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N. J., Bauch, S. & Wunder, S. (2014). Environmental income and rural livelihoods: a global-comparative analysis. World development, 64, S12-S28.

Arun, K. C. (2004). Extraction of NTFPs from the community forest: Analysis of benefit distribution pattern in household level. Journal of forest and Livelihood, 4(1), 38-43.

Aryal, K. P., Poudel, S., Chaudhary, R. P., Chettri, N., Chaudhary, P., Ning, W., & Kotru, R. (2018). Diversity and use of wild and non-cultivated edible plants in the Western Himalaya. *Journal of Ethnobiology and Ethnomedicine*, *14*, 1-18.

Balemie, K., & Kebebew, F. (2006). Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, *2*, 1-9.

Bano, A., Ahmad, M., Hadda, T. B., Saboor, A., Sultana, S., Zafar, M. & Ashraf, M. A. (2014). Quantitative ethnomedicinal study of plants used in the skardu valley at high altitude of Karakoram-Himalayan range, Pakistan. *Journal of ethnobiology and ethnomedicine*, *10*(1), 1-18.

Baral, S. R., & Kurmi, P. P. (2006). Compendium of medicinal plants in Nepal. Rachana Sharma.

Belcher, B., Ruiz-Pérez, M., & Achdiawan, R. (2005). Global patterns and trends in the use and management of commercial NTFPs: implications for livelihoods and conservation. World development, 33(9), 1435-1452.

Bennett, B. C. (2002, November). Forest products and traditional peoples: Economic, biological, and cultural considerations. In Natural Resources Forum (Vol. 26, No. 4, pp. 293-301).

Bhattarai, K. R. (2018). Ethnobotanical study of plants used by Thami community in Ilam District, eastern Nepal. *Our Nature*, *16*(1).

Bhattarai, K. R., & Acharya, S. K. (2015). Documentation of ethnobotanical knowledge of Tharu people on the utilization of plant resources in Gadariya and Phulwari VDCs of Kailali District, West Nepal. Bulletin of Department of Plant Resources, 37, 41-50.

Bhattarai, N. K., & Olsen, C. S. (2000). Towards a generic framework for investigating national importance of medicinal plant trade. In Proceedings of the third regional workshop on community based NTFP management, South and East Asian Countries NTFP Network (SEANN). Pokhara, Nepal: Institute of Forestry (pp. 336-346).

Bhattarai, S. B. S., & Tamang, R. T. R. (2017). Medicinal and aromatic plants: A synopsis of Makawanpur district, central Nepal. *International Journal of Indigenous Herbs and Drugs*, 6-15.

Bhattarai, S., Chaudhary, R. P., & Taylor, R. S. (2009). Wild edible plants used by the people of Manang district, central Nepal. *Ecology of Food and Nutrition*, *48*(1), 1-20.

Bhattarai, S., Chaudhary, R. P., Quave, C. L., & Taylor, R. S. (2010). The use of medicinal plants in the trans-himalayan arid zone of Mustang district, Nepal. *Journal of Ethnobiology and Ethnomedicine*, *6*(1), 1-11.

Bista, S., & Webb, E. L. (2006). Collection and marketing of non-timber forest products in the far western hills of Nepal. Environmental Conservation, 33(3), 244-255.

Bridson, D., & Forman, L. 1998. The Herbarium Handbook. Royal Botanic Garden Kew, UK

Budha-Magar, S., Bhandari, P., & Ghimire, S. K. (2020). Ethno-medicinal survey of plants used by Magar (Kham) community, Rolpa district, Western Nepal. *Ethnobotany Research and Applications*, *19*, 1-29.

Canales, M., Hernández, T., Caballero, J., De Vivar, A. R., Avila, G., Duran, A., & Lira, R. (2005). Informant consensus factor and antibacterial activity of the medicinal plants used by the people of San Rafael Coxcatlán, Puebla, México. *Journal of Ethnopharmacology*, *97*(3), 429-439.

Chao, S. (2012). Forest peoples: numbers across the world (Vol. 10, p. 2017). Moreton-in-Marsh, UK: Forest Peoples Programme.

Chaudhary, R. P. (1998). Biodiversity in Nepal: status and conservation. S. Devi, Saharanpur.

Chaudhary, R. P. (2000). Forest conservation and environmental management in Nepal: a review. Biodiversity & Conservation, 9, 1235-1260.

Collins, S., Martins, X., Mitchell, A., Teshome, A., & Arnason, J. T. (2006). Quantitative ethnobotany of two East Timorese cultures. *Economic Botany*, *60*(4), 347-361.

Dani, D.D. (1986). Nepal Himalaya geological Perspective. Himalayan Research Group, Nainital, India, 163-173.

DPR, (2007). Medicinal plants of Nepal. Department of Plant Resources, Ministry of Forest and Soil Conservation, Government of Nepal. Thapathali, Kathmandu, Nepal

Duong, N. H. (2008). The role of non timber forest products in livelihood strategies and household economics in a remote upland village in the upper ca river basin, nghe the Phuong. Journal of science and development, 1, 88-98.

Edward, D. M. (1996). Non–Timber Forest Products from Nepal: Aspects of the trade in medicinal and aromatic plants. FORESC occasional paper 2/93. Ministry of Forest and Soil conservation. Forest Research and Survey center. Kathmandu, Nepal.

Edwards, D.M. & Bowen, M.R., Eds (1993) Focus on Jaributi. Proceedings ofthe Non Timber Forest Products Seminar. Kathmandu, Nepal: Forest Research and Survey Center.

Friedman, J., Yaniv, Z., Dafni, A., & Palewitch, D. (1986). A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. Journal of ethnopharmacology, 16(2-3), 275-287.

Gauli, K., & Baral, S. (2008, May). Community Forestry in Nepal: conserving resources with economic incentive. In International Conference on Preservation of Bio-cultural Diversity-A Global Issue, May (pp. 6-8).

Gautam, R.K. (2012). Diversity of useful plant species in Humla Karnali Basin, Northwest Nepal. M. Sc. thesis in Plant Systematics and Biodiversity, Central Department of Botany Tribhuvan University.

Gemedo-Dalle, T., Maass, B. L., & Isselstein, J. (2005). Plant biodiversity and ethnobotany of Borana pastoralists in southern Oromia, Ethiopia. *Economic botany*, *59*(1), 43-65.

Ghimire, K., Adhikari, M., Uprety, Y., & Chaudhary, R. (2018). Ethnomedicinal use of plants by the highland communities of Kailash Sacred Landscape, Far-west Nepal. *Acad J Med Plants*, *6*(11), 365-378.

Ghimire, S. K. (2005). The endemic flora in Dolpo, north-west Nepal: distribution patterns, life forms, habitat specificity and conservation status. Botanica Orientalis, 5, 30-39.

Ghimire, S. K. (2008). Sustainable harvesting and management of medicinal plants in the Nepal Himalaya: current issues, knowledge gaps and research priorities. *Medicinal Plants in Nepal: an Anthology of Contemporary Research*, 25-44.

Ghimire, S. K., Sapkota, I. B., Oli, B. R., & Parajuli, R. R. (2008). Non-timber forest products of Nepal Himalaya: database of some important species found in the mountain protected areas and surrounding regions. WWF Nepal, Kathmandu, Nepal.

Ghimire, S. K., Awasthi, B., Rana, S., Rana, H. K., Bhattarai, R., & Pyakurel, D. (2016). Export of medicinal and aromatic plant materials from Nepal. *Botanica Orientalis: Journal of Plant Science*, *10*, 24-32.

Heinen, J. T., & Shrestha-Acharya, R. (2011). The non-timber forest products sector in Nepal: Emerging policy issues in plant conservation and utilization for sustainable development. Journal of sustainable forestry, 30(6), 543-563.

HMGN (His Majesty's Governent of Nepal, Ministry of Forest and Soil Conservation). (1995). Forest Regulations, 2051, as amended. Nepal gazette, Khanda 44 Atiriktanka 54, 2051/12/20.

HMGN (His Majesty's Governent of Nepal, Ministry of Forest and Soil Conservation). (1997). Environmental Protection Regulations, 2054, as amended. Nepal gazette, Khanda 47, Atiriktanka 15, 2054/3/12.

HMGN. (2002). Nepal Biodiversity Strategy. Ministry of Forest and Soil Conservation, HMG, Nepal.

HMGN (His Majesty's Governent of Nepal, Ministry of Forest and Soil Conservation). (2004). Herbs and Non-timber Forest Products Development Policy. Singha Durbar, Kathmandu, Nepal.

Huntington, H. P. (2000). Using traditional ecological knowledge in science: methods and applications. *Ecological applications*, *10*(5), 1270-1274.

Joshi, S. K., Ballabh, B., Negi, P. S., & Dwivedi, S. K. (2018). Diversity, distribution, use pattern and evaluation of wild edible plants of Uttarakhand, India. Defence Life Science Journal, 3(2), 126-135.

Joshi, A. R., & Joshi, K. (2003). Fodder plants of hilly areas of Bagmati and Langtang watershed of Nepal: ethnobotany and future conservation strategy. *Ethnobotany*, *15*, 107-114.

Karki, S., Dhital, A. P., Uprety, Y., & Ghimire, S. K. (2023). Medicinal plants and their use by an ethnic minority Jirel in Dolakha district, Central Nepal. Ethnobotany Research and Applications, 25, 1-29.

Koba, H., Akiyama, S., Endo, Y. and Ohba, H. (1994). Name List of the Flowering Plants and Gymnosperms of Nepal. University Museum Material Reports No. 32, University of Tokyo, Tokyo, Japan.

Larsen, H. O., & Olsen, C. S. (2007). Unsustainable collection and unfair trade? Uncovering and assessing assumptions regarding Central Himalayan medicinal plant conservation. Biodiversity and Conservation, 16, 1679-1697.

Luitel, D. R., Rokaya, M. B., Timsina, B., & Münzbergová, Z. (2014). Medicinal plants used by the Tamang community in the Makawanpur district of central Nepal. *Journal of Ethnobiology and ethnomedicine*, *10*(1), 1-11.

Malla, B., & Chhetri, R. B. (2009). Indigenous knowledge on ethnobotanical plants of Kavrepalanchowk district. Kathmandu University Journal of Science, Engineering and Technology, 5(2), 96-109.

Malla, B., Gauchan, D. P., & Chhetri, R. B. (2015). An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of western Nepal. *Journal of ethnopharmacology*, *165*, 103-117.

Malla, S.B., & Shakya, P.R. (1984). Medicinal Plants. In: Nepal Nature Paradise, Majpuria, T.C. (eds.), White Lotus Co. Ltd., Bangkok, Thailand, 261-297.

Malla, S.B., Shakya, P.R., Rajbhandari, K.R., Subedi, M.N. and Shrestha, B.L. (1997). Identification manual for some non-timber forestry products of Nepal. FRIS Project paper no. 9. Ministry of Forests and Soil Conservation. pp. 280.

Manandhar N.P., (2002). *Plants and People of Nepal*. Timber Press, Oregon, USA.

Masoodi, H. U. R., & Sundriyal, R. C. (2020). Richness of non-timber forest products in Himalayan communities—diversity, distribution, use pattern and conservation status. *Journal of ethnobiology and ethnomedicine*, *16*(1), 1-15.

MoFE (2018). Nepal's Sixth National Report to the Convention on Biological Diversity. Ministry of Forest and Environment, Nepal. Available online: https://www.mofe.gov.np/downloadfile/6th%20NR_Bio_Diver_1576649610.pdf [Accessed on 23 November 2020].

MoFSC (2012). Non-Timber Forest Product Resource Inventory Guideline. Ministry of Forests and Soil Conservation (MoFSC), Department of Forest, Kathmandu.

MoFSC (2014). Nepal Biodiversity Strategy and Action Plan: 2014-2020. Government of Nepal, Ministry of Forests and Soil Conservation, Singhdurbar, Kathmandu. Available online: https://www.cbd.int/doc/world/np/np-nbsap-v2-en.pdf [Accessed on 3 October 2020].

MoFSC (Ministry of Forest and Soil Conservation). (2009). Nepal fourth national report to the convention on biological diversity.

Mulenga, B. P., Richardson, R. B., Mapemba, L. D., & Tembo, G. (2011). The contribution of non-timber forest products to rural household income in Zambia.

Neumann, R. P., & Hirsch, E. (2000). Commercialisation of non-timber forest products: review and analysis of research.

OECD. (2009). DAC Guidelines and Reference Series: Natural Resources and ProPoor Growth.

Olsen, C.S., & Larsen, H.O., (2003). Alpine medicinal plant trade and Himalayan mountain livelihood strategies. The Geographical Journal, 169 (3), 243- 254.

Pandey, B. P., Chaudhary, R. P., Sigdel, S., & Pradhan, S. P. (2020). Ethnobotanical Knowledge of Khandadevi and Gokulganga Rural Municipality of Ramechhap District of Nepal. Ethnobotany Research and Applications, 20, 1-32.

Panthi, M. P. (2013). Indigenous knowledge on use of local fodder trees in mid hills of west Nepal. Tribhuvan University Journal, 28(1-2), 171-180.

Peet, R. K. (1974). The measurement of species diversity. Annual review of ecology and systematics, 5(1), 285-307.

Peters, C. M., Gentry, A. H., & Mendelsohn, R. O. (1989). Valuation of an Amazonian rainforest. Nature, 339(6227), 655-656.

Phillips, O., Gentry, A. H., Reynel, C., Wilkin, P., & Gálvez-Durand B, C. (1994). Quantitative ethnobotany and Amazonian conservation. Conservation biology, 8(1), 225-248.

Plotkin, M., & Famolare, L. (Eds.). (1992). Sustainable harvest and marketing of rain forest products. Island Press.

Polunin, O., & Stainton, J.D.A. (1984). Flowers of the Himalaya. Oxford University Press, New Delhi, India.

Poudel, K. L. (2009). Trade potentiality and ecological analysis of non-timber forest products in Himalayan kingdom of Nepal.

Pradhan, S. P., Chaudhary, R. P., Sigdel, S., & Pandey, B. P. (2020). Ethnobotanical knowledge of Khandadevi and Gokulganga rural municipality of Ramechhap district of Nepal. *Ethnobotany Research and Applications*, *20*, 1-32.

Pyakurel, D., Sharma, I. B., & Smith-Hall, C. (2018). Patterns of change: The dynamics of medicinal plant trade in far-western Nepal. *Journal of Ethnopharmacology*, *224*, 323-334.

Rai, R.K., Neupane, B.K. and Sapkota, K. (2019). Non-timber Forest Product and its Impacts on Livelihood in the Middle Hill: A Case of Lamjung district, Nepal. Journal of Geography and Geology, 11(4): 29-37.

Rajbhandari, K. R. (2001). Ethnobotany of Nepal. Ethnobotanical society of Nepal.

Rajbhandari, K.R., Rai, S.K., Bhatt, G.D., Chhetri, R. and Khatri, S. (2017). Flowering Plants of Nepal: An Introduction. Department of Plant Resources, Kathmandu, Nepal, p.432. Available online: https://www.exoticindiaart.com/book/details/flowering-plants-of-nepal-introduction-NAP808/

Rajbhandari, K. R., Rai, S. K., Joshi, M. D., Khatri, S., Bhatt, G. D., & Chhetri, R. (2021). Endemic flowering plants of Nepal: Status and distribution. *Integrating Biological Resources for Prosperity*.

Rijal, A., Smith-Hall, C., & Helles, F. (2011). Non-timber forest product dependency in the Central Himalayan foot hills. Environment, Development and Sustainability, 13, 121-140.

Rijal, S., Adhikari, S., & Pant, R. R. (2019). Non-timber forest products and livelihood linkages: A case of Lamabagar, Nepal. International Journal of Social and Business Sciences, 13(3), 338-343.

Rokaya, M. B. (2002). Ethnoecology of Medicinal Plants in Dho-Tarap Area in Buffer Zone of Shey-Phoksundo National Park, Dolpa, Nepal. Unpublished Master's Dissertation. Central Department of Botany, Tribhuvan University, Nepal.

Rokaya, M. B., Münzbergová, Z., & Timsina, B. (2010). Ethnobotanical study of medicinal plants from the Humla district of western Nepal. *Journal of Ethnopharmacology*, *130*(3), 485-504.

Rossato, S. C., Leitão-Filho, H. D. F., & Begossi, A. (1999). Ethnobotany of caiçaras of the Atlantic Forest coast (Brazil). *Economic botany*, 387-395.

Saha, D., & Sundriyal, R. C. (2012). Utilization of non-timber forest products in humid tropics: Implications for management and livelihood. Forest Policy and Economics, 14(1), 28-40.

Saxena, N. C. (2003). Livelihood Diversification and Non-Timber Forest Products in Orissa: Wider Lessons on the Scope for Policy Change?. London: Overseas Development Institute.

Shaanker, R. U., Ganeshaiah, K. N., Krishnan, S., Ramya, R., Meera, C., Aravind, N. A., & Reddy, B. C. (2004). Livelihood gains and ecological costs of non-timber forest product dependence: assessing the roles of dependence, ecological knowledge and market structure in three contrasting human and ecological settings in south India. Environmental Conservation, 31(3), 242-253.

Shackleton, C. M., Ticktin, T., & Cunningham, A. B. (2018). Nontimber forest products as ecological and biocultural keystone species. Ecology and Society, 23(4).

Shah, S., & Lamichhane, D. (2017). Documentation of indigenous knowledge on plants used by Tamang community of Kavrepalanchok district, Central Nepal. J Plant Res, 15, 45-51.

Shannon, C.E., & Weaver, W. (1949). The Mathematical Theory of Communication. University of Illinois Press, Urbana.

Shrestha, K. K., Ghimire, S. K., Gurung, T. N., Lama, Y. C. and Thomas, Y. A. (1998). Conservation of Plant Resources, Community Development and Training in Applied Ethnobotany at Shey-Phoksundo National Park and it's Bufferzone, Dolpa. World Wildlife Fund, WWF Nepal Program, Report Series No. 33, WWF Nepal.

Shrestha, P. M., & Dhillion, S. S. (2003). Medicinal plant diversity and use in the highlands of Dolakha district, Nepal. *Journal of ethnopharmacology*, *86*(1), 81-96.

Shrestha, N., Shrestha, S., Koju, L., Shrestha, K. K., & Wang, Z. (2016). Medicinal plant diversity and traditional healing practices in eastern Nepal. *Journal of Ethnopharmacology*, *192*, 292-301.

Shrestha, S., Shrestha, J., & Shah, K. K. (2020). Non-timber forest products and their role in the livelihoods of people of Nepal: A critical review. Grassroots Journal of Natural Resources, 3(2), 42-56.

Shrestha, T. B. (1999). Nepal Country Report on Biological Diversity, IUCN, Nepal. pp.37.

Spies, T.A. and M.G. Turner. (1999). Dynamic forest mosaics. In maintaining biodiversity in forest ecosystems, ed. M.L. Hunter Jr., 95–160. Cambridge, UK: Cambridge University Press.

TEPC. (2014). Trade Statistics. Trade and Export Promotion Centre, MoCS, Government of Nepal. Retrieved from http://www.tepc.gov.np/tradestatistics/

Uprety, Y., Asselin, H., Boon, E. K., Yadav, S., & Shrestha, K. K. (2010a). Indigenous use and bio-efficacy of medicinal plants in the Rasuwa District, Central Nepal. *Journal of ethnobiology and ethnomedicine*, *6*, 1-10.

Uprety, Y., Boon, E. K., Poudel, R. C., Shrestha, K. K., Rajbhandary, S., Ahenkan, A., & Tiwari, N. N. (2010). Non-timber forest products in Bardiya district of Nepal: Indigenous use, trade and conservation. Journal of Human Ecology, 30(3), 143-158.

Uprety, Y., Poudel, R. C., Asselin, H., Boon, E. K., & Shrestha, K. K. (2011). Stakeholder perspectives on use, trade, and conservation of medicinal plants in the Rasuwa District of Central Nepal. Journal of Mountain Science, 8, 75-86.Uprety, Y., Poudel, R. C., Shrestha, K. K., Rajbhandary, S., Tiwari, N. N., Shrestha, U. B., & Asselin, H. (2012). Diversity of use and local knowledge of wild edible plant resources in Nepal. *Journal of Ethnobiology and Ethnomedicine*, *8*, 1-15.

Uprety, Y., Poudel, R. C., Gurung, J., Chettri, N., & Chaudhary, R. P. (2016). Traditional use and management of NTFPs in Kangchenjunga Landscape: implications for conservation and livelihoods. *Journal of Ethnobiology and Ethnomedicine*, 1-59.

Uprety, Y., Karki, S., Poudel, R. C., & Kunwar, R. M. (2022). Ethnoveterinary use of plants and its implication for sustainable livestock management in Nepal. *Frontiers in Veterinary Science*, *9*, 930533.

Wilkinson, K., & Elevitoh, C. (2003). Non-timber forest products: an introduction via the internet. The Overstory, 53.

Yadav, U.K.R., Jha, P.K., Behan, M.J., & Zobel, D.B. (1987). A Practical Manual for Ecology. Kathmandu Ratna Book Distributors, Nepal.

Zobel, D. B., Jha, P. K., Behan, M. J., & Yadav, U. K. R. (1987). A practical manual for ecology. *Ratna Book Distributors, Kathmandu, Nepal*, *149*(7), 75-83.

9. ANNEXS

Annex I: List of all enumerated plant

S.N.	Scientific name	Family	Local name	life form	Voucher specimens
1	*Acer pectinatum* Wall.	Sapindaceae	Thusi pangree	Tree	K068
2	*Achyranthes bidentata* Blume	Amaranthaceae	Datiwan	Herb	K109
3	*Acorus calamus* L.	Acoraceae	Bojho	Herb	K019
4	*Adenostemma lavenia* (L.) Kuntze	Asteraceae	Daanthe ghas	Herb	
5	*Adiantum capillus-veneris* L.	Pteridaceae	Susko jhar	Herb	
6	*Agave cantala* Roxb.	Asparagaceae	Ketuki	Herb	K145
7	*Ageratina adenophora* (Spreng.) R. M. King & H. Rob.	Asteraceae	Banmara	Herb	K127
8	*Ageratum conyzoides* L.	Asteraceae	Gande jhar	Herb	K129
9	*Agrostis micrantha* Steud.	Poaceae	Sano ghas	Herb	K108
10	*Ainsliaea latifolia* (D. Don) Sch. Bip.	Asteraceae	Tito butee	Herb	
11	*Alnus nepalensis* D.Don	Betulaceae	Uttis	Tree	
12	*Amomum subulatum* Roxb.	Zingiberaceae	Alanchi	Herb	K006
13	*Anaphalis contorta* (D. Don) Hook. fil.	Asteraceae	Bukiphul	Herb	K053
14	*Anaphalis margaritacea* (L.) Benth.	Asteraceae	Bukiphul	Herb	K124
15	*Anaphalis triplinervis* (Sims) C. B. Clarke	Asteraceae	Bukiphul	Herb	K089
16	*Argentina lineata* (Trevir.) Soják	Rosaceae	Bajradanti	Herb	K030
17	*Arisaema tortuosum* (Wall.) Schott	Araceae	Sarpa makai	Herb	K130
18	*Artemisia indica* Willd.	Asteraceae	Titepati	Herb	K131
19	*Asparagus racemosus* Willd.	Asparagaceae	Kurilo	Herb	K126
20	*Aster trinervius* Roxb. ex D. Don	Asteraceae	Tare phool	Herb	K097
21	Astilbe rivularis Buch.-Ham. ex D. Don	Saxifragaceae	Thulo okhati	Herb	K074
22	*Berberis aristata* DC.	Berberidaceae	Chutro	Shrub	K001
23	*Berberis napaulensis* (DC.) Spreng.	Berberidaceae	Jamanemandro	Shrub	K132
24	*Berberis wallichiana* DC.	Berberidaceae	Chutro	Shrub	K072
25	*Bergenia ciliata* (Haw.) Sternb.	Saxifragaceae	Pakhanbed	Herb	K022
26	*Bidens pilosa* L.	Asteraceae	Kalo kuro	Herb	K129
27	*Boehmeria platyphylla* D. Don	Urticaceae	Chalesisnu	Shrub	K102
28	*Brassaiopsis hainla* (Buch.-Ham.) Seem.	Araliaceae	Hattipaile	Tree	K005
29	*Buddleja asiatica* Lour.	Scrophulariaceae	Bhimsenpati	Shrub	K050
30	*Calanthe herbacea* Lindl.	Orchidaceae		Herb	K163
31	*Calanthe tricarinata* Lindl.	Orchidaceae		Herb	K164
32	*Cannabis sativa* L.	Cannabaceae	Ganja	Shrub	K136
33	*Castanopsis indica* (Roxb. ex Lindl.) A.DC.	Fagaceae	Dhalne katus	Tree	
34	*Centella asiatica* (L.) Urb.	Apiaceae	Ghodtapre	Herb	K125
35	*Choerospondias axillaris* (Roxb.) B. L. Burtt & A. W. Hill	Anacardiaceae	Lapsi	Tree	K121

36	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.	Lauraceae	Tejpat	Tree	K020
37	*Cirsium wallichii* DC.	Asteraceae	Thakal	Herb	K140
38	*Clematis buchananiana* DC.	Ranunculaceae	Junge lahara	Climber	K047
39	*Clematis connata* DC.	Ranunculaceae	Bhaise lahara	Climber	K094
40	*Clematis grewiiflora* DC.	Ranunculaceae	Bhede kuro	Climber	K076
41	*Coriaria napalensis* Wall.	Coriariaceae	Hakupaku	Shrub	K067
42	*Cotoneaster adpressus* Bois	Rosaceae		Shrub	K099
43	*Crassocephalum crepidioides* (Benth.) S. Moore	Asteraceae	Anikale jhar	Herb	
44	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akashbeli	Climber	K010
45	*Cynodon dactylon* (L.) Pers.	Poaceae	Dubo	Herb	K003
46	*Daphne bholua* Buch.-Ham. ex D. Don	Thymelaeaceae	Lokta	Shrub	K160
47	*Daphniphyllum himalense* (Benth.) Müll. Arg.	Daphniphyllaceae	Rakta chandan	Tree	K085
48	*Dendrobium* sp	Orchidaceae	Ban kera	Herb	K036
49	*Dendrocalamus hamiltonii* Nees & Arn. ex Munro	Poaceae	Choyabas	Herb	
50	*Deutzia staminea* R. Br. ex Wall.	Hydrangeaceae	Sun taule	Shrub	
51	*Dichroa febrifuga* Lour.	Hydrangeaceae	Bhasak	Shrub	K096
52	*Dioscorea bulbifera* L.	Dioscoreaceae	Bantarul	Herb	
53	*Dipsacus inermis* Wall.	Caprifoliaceae	Ban karyaal	Herb	K137
54	*Dobinea vulgaris* Buch.-Ham. ex D. Don	Anacardiaceae	Ban soup	Shrub	K080
55	*Drepanostachyum intermedium* (Munro) Keng f.	Poaceae	Nigalobas	Herb	
56	*Drymaria cordata* (L.) Willd. ex Schult.	Caryophyllaceae	Abijalo	Herb	K138
57	*Dryopteris chrysocoma* (Christ) C.Chr.	Dryopteridaceae	Kuthurke	Herb	K034
58	*Dryopteris cochleata* (Don) C.Chr.	Dryopteridaceae	Neuro	Herb	K141
59	*Dryopteris wallichiana* (Spreng.) Hyl.	Dryopteridaceae	Dakle uneu	Herb	K035
60	*Elephantopus scaber* L.	Asteraceae	Sahasra buti	Herb	K128
61	*Elsholtzia pilosa* (Benth.) Benth.	Lamiaceae	Tulsi ghas	Herb	K119
62	*Equisetum diffusum* D.Don	Equisetaceae	Kurkure jhar	Herb	
63	*Eragrostis nigra* Nees ex Steud.	Poaceae	Phurke khar	Herb	K107
64	*Erigeron bonariensis* L.	Asteraceae		Herb	K114
65	*Erigeron canadensis* L.	Asteraceae		Herb	K063
66	*Erigeron karvinskianus* DC.	Asteraceae		Herb	K077
67	*Erigeron multiradiatus* (Lindl. ex DC.) Benth.	Asteraceae		Herb	K090
68	*Euphorbia hirta* L.	Euphorbiaceae	Dudhe jhar	Herb	
69	*Eurya acuminata* DC.	Pentaphylacaceae	Sano jhingane	Shrub	K060
70	*Ficus auriculata* Lour.	Moraceae	Timilo	Tree	
71	*Ficus neriifolia* Sm.	Moraceae	Dudhilo	Tree	
72	*Ficus racemosa* L.	Moraceae	Dhumri	Tree	
73	*Fragaria nubicola* Lindl.	Rosaceae	Bhui ainselu	Herb	

74	*Fragaria vesca* L.	Rosaceae	Bhui kafal	Herb	K028
75	*Galinsoga parviflora* Cav.	Asteraceae	Bhuitimur	Herb	K134
76	*Galium asperifolium* Wall.	Rubiaceae	Khasro jhar	Herb	K013
77	*Galium hirtiflorum* Req. ex DC.	Rubiaceae	Lute jhar	Herb	K002
78	*Gaultheria fragrantissima* Wall.	Ericaceae	Dhasingre	Shrub	K021
79	*Gaultheria nummularioides* D. Don	Ericaceae	Kaligedi	Shrub	K069
80	*Gentiana capitata* Buch.-Ham. ex D. Don	Gentianaceae	Hansphul	Herb	K146
81	*Geranium wallichianum* D. Don ex Sweet	Geraniaceae	Rakalamul	Herb	K150
82	*Gerbera maxima* (D. Don) Beauverd	Asteraceae	Pangparpa	Herb	K086
83	*Girardinia diversifolia* (Link) Friis	Urticaceae	Allo	Herb	K159
84	*Gomphrena globosa* L.	Amaranthaceae	Makhamali phul	Herb	K112
85	*Hedera nepalensis* K. Koch	Araliaceae	Dudelaa	Climber	K073
86	*Hemiphragma heterophyllum* Wall.	Plantaginaceae	Nash jhar	Herb	K062
87	*Hypericum perforatum* L.	Hypericaceae		Herb	K117
88	*Hypericum podocarpoides* N. Robson	Hypericaceae	Chali mhendro	Shrub	K104
89	*Ilex dipyrena* Wall.	Aquifoliaceae	Liso	Shrub	K015
90	*Impatiens scabrida* DC.	Balsaminaceae	Tiuri jhar	Herb	K078
91	*Inula cappa* (Buch.-Ham. ex D. Don) DC.	Asteraceae	Gaaitihaare	Shrub	K054
92	*Isodon phulchokiensis* (Murata) H.Hara	Lamiaceae		Herb	K116
93	*Juglans regia* L.	Juglandaceae	Okhar	Tree	
94	*Juniperus indica* Bertol.	Cupressaceae	Dhupi	Tree	K139
95	*Lecanthus peduncularis* (Wall. ex Royle) Wedd.	Urticaceae	Khole jhar	Herb	K161
96	*Lindenbergia muraria* (Roxb. ex D. Don) Brühl	Orobanchaceae		Herb	
97	*Lindera pulcherrima* (Nees) Benth.	Lauraceae		Tree	K120
98	*Litsea cubeba* (Lour.) Pers.	Lauraceae	Siltimur	Tree	K044
99	*Lobelia pyramidalis* Wall.	Campanulaceae	Eklebir	Herb	
100	*Lonicera glabrata* Wall.	Caprifoliaceae		Shrub	K095
101	*Luculia gratissima* (Wall.) Sweet	Rubiaceae		Shrub	K081
102	*Lycopodium clavatum* L.	Lycopodiaceae	Nagbeli	Herb	K149
103	*Lycopodium japonicum* Thunb.	Lycopodiaceae		Herb	K061
104	*Lyonia ovalifolia* (Wall.) Drude	Ericaceae	Angeri	Tree	K018
105	*Maesa chisia* Buch.-Ham. ex D. Don	Primulaceae	Bilauni	Tree	K066
106	*Mentha spicata* L.	Lamiaceae	Pudina	Herb	K147
107	*Morus alba* L.	Moraceae	Kimbu	Tree	K008
108	*Mussaenda macrophylla* Wall.	Rubiaceae	Dhobini	Shrub	K079
109	*Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	Kafal	Tree	K056
110	*Myrsine semiserrata* Wall.	Primulaceae	Kali kath	Shrub	K014
111	*Nasturtium officinale* R.Br.	Brassicaceae	Sim sag	Herb	
112	*Nephrolepis cordifolia* (L.) C.Presl	Nephrolepidaceae	Bhiuamala	Herb	K075

113	*Nyctanthes arbor-tristis* L.	Oleaceae	Parijat	Tree	
114	*Ocimum tenuiflorum* L.	Lamiaceae	Tulsi	Herb	K148
115	*Ophiopogon intermedius* D.Don	Asparagaceae		Herb	K105
116	*Oplismenus baronii* A.Camus	Poaceae		Herb	
117	*Oplismenus compositus* (L.) P.Beauv.	Poaceae		Herb	
118	*Osbeckia nepalensis* Hook.	Melastomataceae	Chulsi	Shrub	K058
119	*Osyris lanceolata* Steud. & Hochst. ex A. DC.	Santalaceae	Nundhiki	Shrub	K064
120	*Oxalis corniculata* L.	Oxalidaceae	Chari amilo	Herb	K151
121	*Paris polyphylla* Sm.	Melanthiaceae	Sadhuwa	Herb	
122	*Persicaria capitata* (Buch.-Ham. ex D. Don) H. Gross	Polygonaceae	Ratnyaule jhar	Herb	
123	*Persicaria nepalensis* (Meisn.) H. Gross	Polygonaceae	Pire jhar	Herb	
124	*Persicaria pubescens* (Blume) H. Hara	Polygonaceae		Herb	K045
125	*Persicaria runcinata* (Buch.-Ham. ex D. Don) Masam.	Polygonaceae		Herb	K041
126	*Photinia integrifolia* Lindl.	Rosaceae		Tree	K091
127	*Phyllanthus parvifolius* Steud.	Phyllanthaceae	Khareto	Shrub	K092
128	*Phyllanthus urinaria* L.	Phyllanthaceae	Kanthad	Herb	K009
129	*Phytolacca acinosa* Roxb.	Phytolaccaceae		Herb	K118
130	*Picrasma quassioides* (D. Don) Benn.	Simaroubaceae	Nim kath	Shrub	
131	*Pieris formosa* (Wall.) D. Don	Ericaceae	Chimilo	Shrub	K093
132	*Pinus roxburghii* Sarg.	Pinaceae	Salla	Tree	
133	*Pinus wallichiana* A.B. Jacks.	Pinaceae	Salla	Tree	
134	*Piptanthus nepalensis* (Hook.) Sweet	Fabaceae	Sugaphul	Shrub	K142
135	*Plantago major* L.	Plantaginaceae	Thulo chiraite	Herb	K048
136	*Pogostemon glaber* Benth.	Lamiaceae	Rudhilo	Herb	
137	*Prinsepia utilis* Royle	Rosaceae	Dhatelo	Shrub	K065
138	*Prunus cerasoides* Buch.-Ham. ex D. Don	Rosaceae	Painyo	Tree	K155
139	*Pseudognaphalium affine* (D. Don) Anderb.	Asteraceae	Jhyapu ghas	Herb	K083
140	*Pseudognaphalium luteoalbum* (L.) Hilliard & B. L. Burtt	Asteraceae		Herb	K084
141	*Pteridium aquilinum* (L.) Kuhn	Dennstaedtiaceae	Uneu	Herb	K032
142	*Pteridium revolutum* (Blume) Nakai	Dennstaedtiaceae	Uneu	Herb	K033
143	*Pyracantha crenulata* (D. Don) M. Roem.	Rosaceae	Ghangaru	Shrub	K153
144	*Pyrus pashia* Buch.-Ham. ex D. Don	Rosaceae	Mayal	Tree	K154
145	*Quercus glauca* Thunb.	Fagaceae	Phalat	Tree	K025
146	*Quercus lamellosa* Sm.	Fagaceae	Bansi	Tree	K026
147	*Quercus lanata* Sm.	Fagaceae	Banjh	Tree	K017
148	*Quercus semecarpifolia* Sm.	Fagaceae	Khasru	Tree	K016
149	*Ranunculus diffusus* DC.	Ranunculaceae	Nakkore jhar	Herb	K088
150	*Rhododendron arboreum* Sm.	Ericaceae	Laliguras	Tree	K023

151	*Rhododendron arboreum* var. roseum Lindl.	Ericaceae	Seto guras	Tree	K024
152	*Rosa multiflora* Thunb.	Rosaceae	Gulaf	Shrub	
153	*Rubia manjith* Roxb.	Rubiaceae	Majitho	Climber	
154	*Rubus acuminatus* Sm.	Rosaceae	Saano ainselu	Shrub	K111
155	*Rubus biflorus* Buch.-Ham. ex Sm.	Rosaceae	Saano gulpha	Shrub	K122
156	*Rubus calycinus* Wall. ex D. Don	Rosaceae	Lahare ainselu	Herb	K037
157	*Rubus ellipticus* Sm.	Rosaceae	Ainselu	Shrub	K012
158	*Rubus foliolosus* D. Don	Rosaceae	Kalo ainselu	Shrub	K011
159	*Rubus hexagynus* Roxb.	Rosaceae	Ainselu	Climber	K101
160	*Rubus nepalensis* (Hook. fil.) Kuntze	Rosaceae	Bhui ainselu	Herb	K004
161	*Rubus niveus* Thunb.	Rosaceae	Ainselu	Shrub	K029
162	*Rubus paniculatus* Sm.	Rosaceae	Kalo ainselu	Shrub	K059
163	*Rubus pentagonus* Wall.	Rosaceae	Rato ainselu	Shrub	
164	*Rubus rosifolius* Sm.	Rosaceae	Rato ainselu	Shrub	K027
165	*Rumex nepalensis* Spreng.	Polygonaceae	Halhale	Herb	K152
166	*Salix longiflora* Wall. ex Andersson	Salicaceae	Bainse	Shrub	K031
167	*Salvia coccinea* L.f.	Lamiaceae		Herb	K103
168	*Satyrium nepalense* D.Don	Orchidaceae	Thamni	Herb	K057
169	*Saurauia napaulensis* DC.	Actinidiaceae	Gogan	Tree	K043
170	*Schima wallichii* (DC.) Korth.	Theaceae	Chilauni	Tree	K158
171	*Senecio scandens* Buch.-Ham. ex D. Don	Asteraceae	Bakhre phul	Herb	K052
172	*Smilax aspera* L.	Smilacaceae	Kukurdaino	Climber	K071
173	*Smilax elegans* Wall. ex Kunth	Smilacaceae	Kukurdaino	Climber	K070
174	*Smilax ferox* Wall. ex Kunth	Smilacaceae	Kukurdaino	Climber	K098
175	*Smilax glaucophylla* Klotzsch	Smilacaceae		Climber	K007
176	*Solanum aculeatissimum* Jacq.	Solanaceae	Kanthakari	Herb	K156
177	*Solanum betaceum* Cav.	Solanaceae	Meter	Shrub	K157
178	*Solanum nigrum* L.	Solanaceae	Kaligeri	Herb	K042
179	*Spiraea bella* Sims	Rosaceae		Shrub	K123
180	*Spiraea micrantha* Hook. fil.	Rosaceae	kharani	Shrub	K115
181	*Spiranthes sinensis* (Pers.) Ames	Orchidaceae		Herb	K113
182	*Stauntonia angustifolia* (Wall.) R. Br. ex Wall.	Lardizabalaceae		Climber	K087
183	*Stellaria monosperma* (Will.) Kozhevn.	Caryophyllaceae	Jogiphul	Herb	
184	*Strobilanthes lachenensis* C. B. Clarke	Acanthaceae		Herb	K040
185	*Strobilanthes pentastemonoides* (Wall. ex Nees) T. Anderson	Acanthaceae	Gathe	Herb	K106
186	*Swertia chirayita* (Roxb.) H. Karst..	Gentianaceae	Chiraito	Herb	K144
187	*Symplocos paniculata* (Thunb.) Miq.	Symplocaceae	Tite seula	Tree	
188	*Synotis cappa* (Buch.-Ham. ex D. Don) C. Jeffrey & Y. L. Chen	Asteraceae	Bakhrakane	Herb	K051
189	*Tagetes erecta* L.	Asteraceae	Syapatri	Herb	K135

190	*Taraxacum officinale* Weber ex F. H. Wigg.	Asteraceae	Tuki phul	Herb	K168
191	*Taxus baccata* L.	Taxaceae	Lauth salla	Tree	K055
192	*Tetrastigma serrulatum* (Roxb.) Planch.	Vitaceae	Charchare	Climber	K100
193	*Thalictrum foliolosum* DC.	Ranunculaceae	Dampate	Herb	K167
194	*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda	Poaceae	Amreso	Herb	K049
195	*Trifolium repens* L.	Fabaceae	Peuli	Herb	K143
196	*Tripterospermum volubile* (D. Don) H. Hara	Gentianaceae		Climber	K082
197	*Tsuga dumosa* (D. Don) Eichler	Pinaceae	Thingre salla	Tree	
198	*Urena lobata* L.	Malvaceae	Nalu kuro	Shrub	K110
199	*Urtica dioica* L.	Urticaceae	Sisnu	Herb	K162
200	*Valeriana hardwickii* Thwaites	Caprifoliaceae	Jatamasi	Herb	K038
201	*Valeriana jatamansi* Jones	Caprifoliaceae	Samayo	Herb	K046
202	*Viola diffusa* Ging. ex DC.	Violaceae		Herb	K166
203	*Viscum articulatum* Burm. fil.	Viscaceae	Hadachur	Shrub	
204	*Zanthoxylum armatum* DC.	Rutaceae	Timur	Shrub	K039
205	*Zanthoxylum oxyphyllum* Edgew.	Rutaceae	Sil timur	Shrub	K165

Annex II: A checklist of useful plant species

S.N	Family	Scientific Name	Local Name	Part uses	Uses	Similar use reference	Voucher specimens
1	Acanthaceae	*Strobilanthes pentastemonoides* (Wall. ex Nees) T. Anderson	Gathe	Root	Root cut in pieces, soaked in water and drank in high fever.	Ambu *et al*., 2020	K106
2	Acoraceae	*Acorus calamus* L.	Bojho	Root	Root is used in cough, throat pain.	Shrestha and Dhillion, 2003; Manandhar, 2002	K019
3	Actinidiaceae	*Saurauia napaulensis* DC.	Gogan	Leaves, Shoot	As fodder.	Manandhar, 2002	K043
4	Amaranthaceae	*Achyranthes bidentata* Blume	Datiwan	Entire, root, stem, shoot	Decoction of plant is applied for urinary problems; root juice to cure indigestion, toothache; stem used as toothbrush; root crushed with water to cure fever; plant rubbed directly in skin to treat pimples; root juice stimules lactation in cows and buffalos; as fodder; used during festivals, religious value.	Ambu *et al*., 2020; Shah and Lamichhane, 2017; Malla and Chhetri, 2009; Joshi and Joshi, 2003	K109
		Gomphrena globosa L.	Makhamali phul	Flower	During worship, cultural ceremony.	Manandhar, 2002	K112
5	Anacardiaceae	*Choerospondias axillaris* (Roxb.) B. L. Burtt & A. W. Hill	Lapsi	Fruit	Ripen fruit eaten.	Ambu *et al*., 2020; Manandhar, 2002	K121
6	Apiaceae	*Centella asiatica* (L.) Urb.	Ghodtapre	Entire	Used in throat pain, skin irritation, high blood pressure.	Bhattarai, 2018	K125
7	Araceae	*Arisaema tortuosum* (Wall.) Schott	Sarpa makai	Corm	Corn powder used in snake bite.	Manandhar, 2002	K130
8	Araliaceae	*Brassaiopsis hainla* (Buch.-Ham.) Seem.	Hattipaile	Leaves	As fodder.	Manandhar, 2002	K005

		Hedera nepalensis K. Koch	Dudelaa	Entire, leaves	Decoction for skin disease; leaves to cure diabetes.	Manandhar, 2002	K073
9	Asparagaceae	*Agave cantala* Roxb.	Ketuki	Leaves	Leaves used in cuts and wounds, to kill worms; leaves fiber to make rope.	Ambu *et al*., 2020;	K145
		Asparagus racemosus Willd.	Kurilo	Shoot	Shoot vegetables.	Aryal *et al*. 2018	K126
10	Asteraceae	*Ageratum conyzoides* L.	Gande jhar	Shoot, flower, leaves	Leaves or shoot paste cure wounds, flowers juice in skin disease.	Manandhar, 2002; Aryal *et al*., 2018	K129
		Anaphalis busua (Buch.-Ham.) Hand.-Mazz.	Bukiphul	Entire, flower	Plant juice in cuts and wounds; flower used in worship.	Manandhar, 2002	K133
		Ageratina adenophora (Spreng.) R. M. King & H. Rob.	Banmara	Leaves	Leaves crushed and paste applied on cuts and wounds to stop bleeding.	Manandhar, 2002; Ambu *et al*., 2020; Aryal *et al*. 2018	K127
		Anaphalis contorta (D. Don) Hook. fil.	Bukiphul	Leaves, flower	Leaves paste in cuts and wounds; flowers used in worship.	Manandhar, 2002	K053
		Elephantopus scaber L.	Sahasra buti	Leaves	Plant juice in jaundice.	Ambu *et al*., 2020	K128
		Erigeron karvinskianus DC.		Flower	Used in worship.		K063
		Galinsoga parviflora Cav.	Bhuitimur	Flower	Flower for toothache.	Ambu *et al*., 2020	K134
		Inula cappa (Buch.-Ham. ex D. Don) DC.	Gaaitihaare	Root	Root juice in fever and gastric, use as fodder.	Ambu *et al*., 2020; Joshi and Joshi, 2003	K054
		Bidens pilosa L.	Kalo kuro	Entire, flower	Plant juice applied to cure cuts and wounds; flower juice to cure fever and headaches; as fodder.	Malla and Chhetri, 2009; Ambu *et al*., 2020	K129
		Senecio scandens Buch. -Ham. ex D. Don	Bakhre phul	Shoot	Used as fodder.	Manandhar, 2002	K052

		Tagetes erecta L.	Syapatri	Flower	Used to worship, to make garland.	Ambu *et al*., 2020	K135
		Synotis cappa (Buch.-Ham. ex D. Don) C. Jeffrey & Y. L. Chen	Bakhrakane	Shoot	Used as fodder.		K051
		Cirsium wallichii DC.	Thakal	Root	Root juice to cure urinary problems, fever.	Manandhar, 2002; Ambu *et al*., 2020	K140
		Artemisia indica Willd.	Titepati	Entire, shoot, leaves	Plant juice taken to treat cough, food poisoning, fever, join pain, gastric, shoots, juice in throat irritation; shoot paste in skin problems; in traditional rituals.	Manandhar, 2002; Ambu *et al*., 2020	K131
11	Berberidaceae	*Berberis wallichiana* DC.	Chutro	Stem, fruit	Branches used for fencing; fruit edible.	Manandhar, 2002	K072
		Berberis aristata DC.	Chutro	Root, stem, fruit	Root is boiled and used to treat fever, toothaches, mouth infection and diarrhea; bark juice in eye infection; branches used for fencing; fruit edible.	Manandhar, 2002; Ambu *et al*., 2020; Aryal *et al*. 2018	K001
		Berberis napaulensis (DC.) Spreng.	Jamanemandro	Bark, leaf, fruit	Decoctation of bark used as eye drop to treat inflammattions of eyes, to treat jundice, dysentry; fruit edible.	Manandhar, 2002;	K132
12	Betulaceae	*Alnus nepalensis* D.Don	Uttis	Root, leaves	Decoctation of roots is taken orally to treat diarrhoea, dysentry; leaf paste applied in cuts, wounds and burns; leaves as fodder; firewood.	Manandhar, 2002; Malla and Chhetri, 2009; Joshi and Joshi, 2003	
13	Brassicaceae	*Nasturtium officinale* R.Br.	Sim sag	Leaves	Eaten as vegetables.		
14	Cannabaceae	*Cannabis sativa* L.	Ganja	Seed	Seed a pickles.	Manandhar, 2002	K136
15	Caprifoliaceae	*Dipsacus inermis* Wall.	Ban karyaal	Leaves	Throat pain, leaves juice in cuts.	Budha- Magar *et al*., 2020	K137
		Valeriana hardwickii Thwaites	Jatamasi	Root	Root juice to treat diarrhea, gastric in children, incense is produced from dried roots.	Ambu *et al*., 2020	K038

		Valeriana jatamansi Jones	Samayo	Root	Incense is produced from dried root; root juice to cure stomach pain, low blood pressure.	Ambu *et al*., 2020	K046
16	Caryophyllaceae	*Drymaria cordata* (L.) Willd. ex Schult.	Abijalo	Entire, shoot	Plant juice to cure fever, stomach infection, urine infection, fever, food poisoning, join pain, headache; shoots as vegetables; used to make fermenting cake.	Manandhar, 2002; Ambu *et al*., 2020	K138
17	Convolvulaceae	*Cuscuta reflexa* Roxb.	Akashbeli	Entire	Used in fever, headaches, jundice, high blood pressure.	Ambu *et al*., 2020; Shrestha and Dhillion, 2003	K010
18	Coriariaceae	*Coriaria napalensis* Wall.	Hakupaku	Leaves, fruit	Leaves juice to treat indigestion; ripe fruit edible and helps in indigestion.	Ambu *et al*., 2020	K067
19	Cupressaceae	*Juniperus indica* Bertol.	Dhupee	Leaves, berries	Leaves juice to cure diarrhea, abdominal pain, urinary problems; berries for tooth pain, religious use.	Malla and Chhetri, 2009	K139
20	Dioscoreaceae	*Dioscorea bulbifera* L.	Bantarul	Root	Tubers as vegetables.	Malla and Chhetri, 2009	
21	Dryopteridaceae	*Dryopteris cochleata* (Don) C.Chr.	Neuro	Frond	Fronds as vegetables.	Manandhar, 2002	K141
22	Ericaceae	*Gaultheria fragrantissima* Wall.	Dhasingre	Leaves	Leaves is used to make essential oil which is used in join pain, relieve pain.	Baral & Kurmi 2006, Manandhar, 2002	K021
		Gaultheria nummularioides D. Don	Kaligedi	Fruit	Fruit edible.	Manandhar, 2002	K069
		Rhododendron arboreum Sm.	Laliguras	Flower	Flowers used ih diarrhoea, dysentry, fever, throat pain, menstrual disorder; flower offer to god.	Manandhar, 2002	K023
		Lyonia ovalifolia (Wall.) Drude	Angari	Leaves, stem	Mature leaves as fodder; firewood.	Joshi and Joshi, 2003	K018
23	Euphorbiaceae	*Euphorbia hirta* L.	Dudhe jhar	Shoot	Paste in skin problems.	Ambu *et al*., 2020	
24	Fabaceae	*Piptanthus nepalensis* (Hook.) Sweet	Sugaphul	Stem, leaves	Stem used to make walking sticks; leaves as fodder.	Manandhar, 2002	K142
		Trifolium repens L.	Peuli	Entire	Nutritious fodder.	Manandhar,	K143

						2002; Joshi and Joshi, 2003	
25	Fagaceae	*Quercus lanata* Sm.	Banjh	Leaves, stem	As fodder; firewood.	Manandhar, 2002; Joshi and Joshi, 2003	K017
		Quercus lamellosa Sm.	Bansi	Leaves, stem	As fodder, firewood.	Manandhar, 2002; Joshi and Joshi, 2003	K026
		Castanopsis indica (Roxb. ex Lindl.) A.DC.	Dhalne katus	Leaves, resin	Decoctation of leaves to treat stomach disorder and skin disease, plant resin to treat diarrhoea; leaves as fodder; firewood.	Malla and Chhetri, 2009; Joshi and Joshi, 2003	
		Quercus semecarpifolia Sm.	Khasru	Leaves, stem	As fodder; as firewood.	Manandhar, 2002; Joshi and Joshi, 2003	K016
		Quercus glauca Thunb.	Phalant	Leaves, stem	Very good fodder; as firewood.	Manandhar, 2002; Joshi and Joshi, 2003	K025
26	Gentianaceae	*Swertia chirayita (Roxb.) H. Karst.*	Chiraito	Root, entire	Root juice to treat fever, decoctation of plant in cough and cold.	Manandhar, 2002; Malla and Chhetri, 2009; Ambu *et al*., 2020	K144
		Gentiana capitata Buch.-Ham. ex D. Don	Hansphul	Entire	Plant juice in fever; paste applied in headaches.	Manandhar, 2002	K146
27	Geraniaceae	*Geranium wallichianum* D. Don ex Sweet	Rakalamul	Entire	Plant juice in cuts and wounds; plant as fodder.	Manandhar, 2002	K150
28	Juglandaceae	*Juglans regia* L.	Okhar	Fruit, leaves	Fruit edible; leaves a fodder.	Manandhar, 2002	
29	Lamiaceae	*Mentha spicata* L.	Pudina	Leaves	Leaves as pickle.	Manandhar, 2002	K147
		Ocimum tenuiflorum L.	Tulsi	Leaves	Leaves inn common cold; worship.	Ambu *et al*.,	K148

						2020	
30	Lauraceae	*Litsea cubeba* (Lour.) Pers.	Siltimur	Fruit, seed, leaves	Dried ripe fruits are used in stomach problems, seeds for gastric; as fodder.	Manandhar, 2002; Ambu *et al*., 2020; Rokaya *et al*., 2010	K044
		Cinnamomum tamala (Buch.-Ham.) T. Nees & Eberm.	Tejpat	Leaves, bark	Leaves as spices, making tea, bark used as spices; used as fodder.	Manandhar, 2002	K020
31	Lycopodiaceae	*Lycopodium clavatum* L.	Nagbeli	Seed	Paste of seed applied to treat wounds and cracks; Used for traditional purpose.	Manandhar, 2002; Malla and Chhetri, 2009	K149
32	Melanthiaceae	*Paris polyphylla* Sm.	Sadhuwa	Root	Root in diarrhoea, fever, cough, cold, tonsil, cuts and wounds.	Manandhar, 2002	
33	Melastomataceae	*Osbeckia nepalensis* Hook.	Chulsi	Shoot	Shoot paste applied in skin infections.	Ambu *et al*., 2020	K058
34	Moraceae	*Ficus racemosa* L.	Dhumeri	Leaves	Used as fodder.	Manandhar, 2002	
		Ficus neriifolia Sm.	Dudhilo	Leaves, shoot, stem	As fodder; firewood.	Manandhar, 2002	
		Morus alba L.	Kimbu	Bark, fruit, leaves	Bark juice in cuts and wounds; fruit are edible and remedy for throat pain; lopped as fodder.	Uprety *et al*., 2016	K008
		Ficus auriculata Lour.	Timilo	Leaves	Used as fodder.	Manandhar, 2002	
35	Myricaceae	*Myrica esculenta* Buch.-Ham. ex D. Don	Kafal	Bark, fruit, leaves	Fresh bark is chewed in throat pain, bark is dried and powdered which is used in headaches, toothaches, skin problems, brush teeth; fruit edible; as fodder; firewood.	Manandhar, 2002; Ambu *et al*., 2020	K056
36	Nephrolepidaceae	*Nephrolepis cordifolia* (L.) C.Presl	Bhiuamala	Tuber, leaves	Tuber juice to treat diarrhoea and dysentry; leaf paste in urinary problems.	Malla and Chhetri, 2009	K075
37	Oleaceae	*Nyctanthes arbor-*	Parijat	Flower	Used in cultural rituals.	Uprety *et al*.,	

		tristis L.				2016	
38	Orchidaceae	*Dendrobium* sp	Ban kera	Stem	Edible		K036
		Satyrium nepalense D.Don	Thamni	Leaves	Tender as vegetables.	Manandhar, 2002	K057
39	Oxalidaceae	*Oxalis corniculata* L.	Chari amilo	Entire	Helps in digestion, release the gas, diarrhoea, throat pain.	Manandhar, 2002	K151
40	Pentaphylacaceae	*Eurya acuminata* DC.	Sano jhingane	Leaves, stem	Leaves as fodder; as firewood.	Manandhar, 2002; Joshi and Joshi, 2003	K060
41	Pinaceae	*Pinus roxburghii* Sarg.	Khote salla	Leaves, stem	In common cold, ; firewood.	Shah and Lamichhane, 2017	
		Pinus wallichiana A.B. Jacks.	Salla	Resin, stem	Resin for commercial purpose; firewood.	Manandhar, 2002	
		Tsuga dumosa (D. Don) Eichler	Thingre salla	Leaves	Leaves used to make incense.	Manandhar, 2002	
42	Plantaginaceae	*Hemiphragma heterophyllum* Wall.	Nash jhar	Entire, fruit	Paste in skin disease, ripe fruit is edible.	Manandhar, 2002	K062
		Plantago major L.	Thulo chiraite	Entire, leaves	Plant juice for fever, paste for burns, tenders leaves as vegetables.	Manandhar, 2002	K048
43	Poaceae	*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda	Amreso	Shoot, leaves	To make brooms; as fodder.	Manandhar, 2002; Malla and Chhetri, 2009	K049
		Dendrocalamus hamiltonii Nees & Arn. ex Munro	Choyabas	Shoot, stem, leaves	Mature bamboo used for construction, make baskets, mats, fences; young shoot as vegetables; firewood; used in cultural ceremony.	Manandhar, 2002; Malla and Chhetri, 2009	
		Cynodon dactylon (L.) Pers.	Dubo	Entire	Plant juice relieve indigestion, paste applied in cuts and wounds; as fodder; in many rituals.	Manandhar, 2002; Joshi and Joshi, 2003	K003
		Drepanostachyum intermedium (Munro) Keng f.	Nigalobas	Stem, shoot, leaves	Used for construction, wearing mats, baskets and walking sticks; young shoot as vegetables; leaves are source of fodder in winter; used in cultural ceremony.	Manandhar, 2002; Malla and Chhetri, 2009	

44	Polygonaceae	*Rumex nepalensis* Spreng.	Halhale	Root	Root in skin disease, swollen gums, externally applied in headaches.	Manandhar, 2002; Shah and Lamichhane, 2017	K152
		Persicaria capitata (Buch.-Ham. ex D. Don) H. Gross	Ratnyaule jhar	Entire	Plant juice for stomach disorder; plant as fodder.	Manandhar, 2002	
45	Primulaceae	*Maesa chisia* Buch.-Ham. ex D. Don	Bilauni	Bark, leaves	Barks paste in mouth infection; as fodder; firewood.	Manandhar, 2002	K066
46	Ranunculaceae	*Clematis buchananiana* DC.	Junge lahara	Root, shoot	Root juice to cure gastric problems; used as fermenting yeast.	Manandhar, 2002; Ambu *et al*., 2020	K047
47	Rosaceae	*Rubus ellipticus* Sm.	Ainselu	Fruit, root	Root juice for treatment of gastric problems, skin infections; fruit edible.	Ambu *et al*., 2020; Shrestha and Dhillion, 2003	K012
		Rubus paniculatus Sm.	Kalo ainselu	Fruit	Fruit edible.	Manandhar, 2002	K059
		Rubus pentagonus Wall.	Rato ainselu	Fruit	Fruit edible.	Manandhar, 2002	
		Argentina lineata (Trevir.) Soják	Bajradanti	Flower, leaves, root	Used in menstrual cramp, mouth disease, toothaches.	Manandhar, 2002	K030
		Rubus nepalensis (Hook. fil.) Kuntze	Bhui ainselu	Fruit	Fruit edible.	Manandhar, 2002	K004
		Fragaria vesca L.	Bhui kaphal	Fruit	Fruit edible.	Manandhar, 2002	K028
		Pyracantha crenulata (D. Don) M. Roem.	Ghangaru	Stem, fruit	Stems as walking sticks; ripen fruit edible.	Manandhar, 2002	K153
		Pyrus pashia Buch.-Ham. ex D. Don	Mayal	Bark, leaf, fever	Bark used in throat pain, fever, gastric, fruit edible; as fodder; firewood.	Manandhar, 2002	K154
		Prunus cerasoides Buch.-Ham.	Paiyo	Bark, leaves,	Bark juice applied in dislocated bones; ripen fruit edible; as fodder; firewood.	Manandhar, 2002	K155

		ex D. Don		fruit			
		Prinsepia utilis Royle	Dhatelo	Stem, fruit	Stem as fencing; ripen fruit edible.	Manandhar, 2002	K065
		Rosa multiflora Thunb.	Gulaf	Flower	Used in worship.		
48	Rubiaceae	*Galium asperifolium* Wall.	Khasro jhar	Leaves	Leaves paste in cuts and wounds.	Manandhar, 2002	
		Rubia manjith Roxb.	Majitho	Entire, root	Used in skin disease; root for dye.	Uprety *et al*., 2016	
49	Rutaceae	*Zanthoxylum armatum* DC.	Timur	Seed	Fruit used in toothaches; fruits as spices.	Manandhar, 2002;	K039
50	Santalaceae	*Osyris wightiana* J. Graham	Nundhiki	Shoot	Body pain, skin disease, broken bone.	Shah and Lamichhane, 2017; Uprety *et al*., 2016	K064
51	Sapindaceae	*Acer pectinatum* Wall.	Thusi pangree	Leaves, stem	Used as fodder; firewood.	Manandhar, 2002	K068
52	Saxifragaceae	*Bergenia ciliata* (Haw.) Sternb.	Pakhanbed	Root, flower	Rhizome juice to cure urinary problems; powder rhizome to treat fever, diarrhoea, dysentery, asthma and cough; flowers are boiled and pickled.	Manandhar, 2002; Malla and Chhetri, 2009; Ambu *et al*., 2020; Shrestha and Dhillion, 2003	K022
		Astilbe rivularis Buch.-Ham. ex D. Don	Thulo okhati	Root	Root is used in pregnancy, diarrhoea, dysentery.	Shrestha *et al*., 2016	K074
53	Scrophulariaceae	*Buddleja asiatica* Lour.	Bhimsenpati	Shoot, leaves, flower	Shoot in treating fever, cough, throat pain, headaches, stomach pain; leaves paste in cuts and wounds; flowers boiled and drunk to cure cough and cold; as fodder; used in worship.	Manandhar, 2002; Joshi and Joshi, 2003; Shah and Lamichhane, 2017	K050
54	Simaroubaceae	*Picrasma quassioides* (D. Don)	Nim kath	Leaves	Leaves used to cure fever, food poisoining, headaches, join pain.	Ambu *et al*., 2020	

		Benn.					
55	Smilacaceae	*Smilax elegans* Wall. ex Kunth	Kukurdaino	Shoot, leaves	Tender and shoot and leaves as vegetables.	Manandhar, 2002	K070
		Smilax aspera L.	Kukurdaino	Fruit, shoot, leaves	Fruit paste used in skin irritation problems; tender shoot and leaves as vegetables.	Manandhar, 2002	K071
56	Solanaceae	*Solanum aculeatissimum* Jacq.	Kanthakari	Root, fruit, seeds	Root paste applied in gums and toothaches; fruit juice for headaches; seeds chewed for toothaches.	Manandhar, 2002	K156
		Solanum betaceum Cav.	Metar	Fruit	Fruits used to make pickles.		K157
		Solanum nigrum L.	Kaligeri	Shoot, root, leaves, fruit	Plant juice for bloody dysentry, inflammation of urinary bladder; root juice for fever; ripen berries edible; tender shoot and leaves as vegetables.	Manandhar, 2002	K042
57	Taxaceae	*Taxus baccata* L.	Lauth salla	Leaves	Juice of leaves for cough and cold.	Malla and Chhetri, 2009	K055
58	Theaceae	*Schima wallichii* (DC.) Korth.	Chilaune	Bark, leave, root, flower	Bark used in cuts and wounds; leaves and roots for fever; bark juice used for disinfecting intestinal worms in animals; flowers to make fermenting cake (Mercha); firewood.	Manandhar, 2002; Shah and Lamichhane, 2017	K158
59	Thymelaeaceae	*Daphne bholua* Buch.-Ham. ex D. Don	Lokta	Bark, roots, leaves	Decoctation of bark to relieve fever; roots juice for intestinal disorder and parasite for cattles; bark fiber is used to make nepali paper, rops and strings; as fodder	Manandhar, 2002; Malla and Chhetri, 2009	K160
60	Urticaceae	*Girardinia diversifolia* (Link) Friis	Allo	Stem	Stem bark as fiber	Manandhar, 2002	K159
		Boehmeria platyphylla D. Don	Chalesisnu	Entire, root, leaves, bark	Decoctation of plant is given to livestock for diarrhoea and dysentry; paste of root is usedto treat cattle wounds and cuts; leaves juice in cuts and wounds; barks used to make threads; leaves a fodder	Malla and Chhetri, 2009; Ambu *et al*., 2020	K102
		Lecanthus	Khole jhar	Leaves	Used as vegetables; used as fodder	Manandhar, 2002	K161

		peduncularis (Wall. ex Royle) Wedd.					
		Urtica dioica L.	Sisnu	Stem, shoot	Stripes from stem used to wrap bone fractures, young shoot as vegetables	Manandhar, 2002; Shrestha et al. 2016	K162
61	Viscaceae	*Viscum articulatum* Burm. fil.	Hadachur	Entire	Respiratory problems		
62	Zingiberaceae	*Amomum subulatum* Roxb.	Alanchi	Fruit	Fruit is used in spices, stomach pain, throat pain, burning during urination	Manandhar, 2002	K006

Annex III: Categorization of uses in broad categories

S.No.	Use Category	Use Reported
1	Medicinal	All types of medicinal uses for human.
2	Food and Vegetables	All kinds of edible plants used as vegetables, fruits, spices, pickle, fermenting yeast.
3	Fodder and animal medicine	Used to feed domestic animals, also for their medicinal property.
4	Religious and social use	Used in incense, to make toran, decoration, plants offered during worship, essential during religious functions and different types of Puja.
5	Fuel	Firewood
6	Handicrafts/ Construction	Fencing, making brooms, dyes, Nepali paper, ornamental, stick, fiber, making basket, agricultural tools, etc.

Annex IV: Aliments categories of human illness

Aliments	Illness
Menstrual/pregnancy	Difficulty in childbirth, menstrual disorders, menstrual cramp
Oral and dental	Gums problem, mouth swelling, mouth infections, swelling of the dental glands, toothache
Skeleton and muscular	Body pain, joint pain, dislocated bones, joint swelling, ankle sprains, bone fracture
Ureo-genital	Urinary problems, bladder swelling, blood in the urine, burning during urination
Fever and headaches	Fever, high fever, typhoid fever, headaches, migraine
Jundice	Jundice
Skin disease	Skin diseases, skin infections, ,pimples, itchy pustules, fissure, cracks
Cuts and wounds	Cuts, wounds, boils, burns
Gastro-intestinal	Stomach diseases, gastritis, vomiting, indigestion, loss of appetite, diarrhoea, dysentery, constipation, abdominal pain, appetizer, food poisoning
ENT	Throat irritations, throat pain, tonsil
Cought and cold	Cough, cold
Respiratory problems	Breathing problems, asthma
Blood pressure	High and low blood pressure
Eye problem	Eye diseases, inflammation of eyes

Annex V: Importance Value Index of Trees

Name of species	RD	RF	RA	IVI
Acer pectinatum Wall.	1.031	1.639	2.865	5.535
Alnus nepalensis D.Don	6.314	6.011	4.786	17.11
Brassaiopsis hainla (Buch.-Ham.) Seem.	1.031	1.639	2.865	5.535
Castanopsis indica (Roxb. ex Lindl.) A.DC.	0.773	1.639	2.149	4.561
Choerospondias axillaris (Roxb.) B. L. Burtt & A. W. Hill	1.031	2.186	2.149	5.365
Cinnamomum tamala (Buch.-Ham.) T. Nees & Eberm.	1.16	2.732	1.934	5.826
Ficus auriculata Lour.	0.258	1.093	1.074	2.425
Ficus neriifolia Sm.	0.902	1.639	2.507	5.048
Ficus racemosa L.	0.387	1.093	1.612	3.091
Juglans regia L.	0.129	0.546	1.074	1.75
Juniperus indica Bertol.	0.387	1.093	1.612	3.091
Litsea cubeba (Lour.) Pers.	1.031	2.186	2.149	5.365
Lyonia ovalifolia (Wall.) Drude	3.995	3.825	4.758	12.58
Maesa chisia Buch.-Ham. ex D. Don	0.773	2.186	1.612	4.571
Morus alba L.	0.258	1.093	1.074	2.425
Myrica esculenta Buch.-Ham. ex D. Don	5.799	3.825	6.907	16.53
Nyctanthes arbor-tristis L.	0.129	0.546	1.074	1.75
Pinus roxburghii Sarg.	9.536	6.011	7.227	22.77
Pinus wallichiana A.B. Jacks.	11.86	10.38	5.202	27.44
Prunus cerasoides Buch.-Ham. ex D. Don	1.289	2.186	2.686	6.16
Pyrus pashia Buch.-Ham. ex D. Don	1.804	3.279	2.507	7.59
Quercus glauca Thunb.	3.737	4.918	3.462	12.12
Quercus lamellosa Sm.	1.675	2.186	3.492	7.353
Quercus lanata Sm.	2.577	2.732	4.297	9.607
Quercus semecarpifolia Sm.	5.284	7.104	3.388	15.78
Rhododendron arboreum Sm.	11.21	8.197	6.231	25.64
Saurauia napaulensis DC.	2.835	2.186	5.909	10.93
Schima wallichii (DC.) Korth.	0.515	1.639	1.432	3.587
Taxus baccata L.	2.835	4.372	2.954	10.16
Tsuga dumosa (D. Don) Eichler	19.46	9.836	9.013	38.31
Total	100	100	100	300

Annex VI: Importance Value Index of Shrub

Name of plant	RD	RF	RA	IVI
Berberis aristata DC.	13.482	11.07	4.549	29.1
Berberis napaulensis (DC.) Spreng.	2.2238	5.5351	1.501	9.259
Berberis wallichiana DC.	2.8492	3.69	2.884	9.423
Boehmeria platyphylla D. Don	4.1696	2.583	6.029	12.78
Buddleja asiatica Lour.	1.8068	1.845	3.658	7.309
Cannabis sativa L.	3.2662	1.845	6.612	11.72
Clematis buchananiana DC.	0.6254	1.107	2.11	3.843
Coriaria napalensis Wall.	0.6254	1.845	1.266	3.737

Daphne bholua Buch.-Ham. ex D. Don	2.7797	3.321	3.126	9.227
Eurya acuminata DC.	1.3204	2.952	1.671	5.943
Gaultheria fragrantissima Wall.	6.1154	5.1661	4.421	15.7
Gaultheria nummularioides D. Don	6.6713	3.69	6.753	17.11
Hedera nepalensis K. Koch	5.8374	2.952	7.386	16.18
Inula cappa (Buch.-Ham. ex D. Don) DC.	0.6949	1.107	2.345	4.147
Osbeckia nepalensis Hook.	3.1272	2.214	5.275	10.62
Osyris lanceolata Steud. & Hochst. ex A. DC.	1.2509	1.476	3.165	5.892
Picrasma quassioides (D. Don) Benn.	0.2085	0.738	1.055	2.002
Piptanthus nepalensis (Hook.) Sweet	5.6289	4.428	4.748	14.8
Prinsepia utilis Royle	1.3899	2.583	2.01	5.983
Pyracantha crenulata (D. Don) M. Roem.	3.3357	4.059	3.069	10.46
Rosa multiflora Thunb.	3.0577	4.428	2.579	10.06
Rubus ellipticus Sm.	11.258	7.7491	5.426	24.43
Rubus paniculatus Sm.	5.5594	7.3801	2.814	15.75
Rubus pentagonus Wall.	2.7797	4.797	2.164	9.741
Smilax aspera L.	4.8645	4.059	4.476	13.4
Smilax elegans Wall. ex Kunth	2.9187	2.952	3.693	9.564
Solanum betaceum Cav.	0.7644	1.476	1.934	4.175
Viscum articulatum Burm. fil.	0.3475	1.107	1.172	2.627
Zanthoxylum armatum DC.	1.0424	1.845	2.11	4.998
Total	100	100	100	300

Annex VII: Importance Value Index of Herbs

Name of plant	**RD**	**RF**	**RA**	**IVI**
Achyranthes bidentata Blume	0.638	1.477	0.859	2.974
Acorus calamus L.	0.052	0.211	0.488	0.75
Agave cantala Roxb.	0.138	0.633	0.433	1.204
Ageratina adenophora (Spreng.) R. M. King & H. Rob.	5.877	4.43	2.639	12.95
Ageratum conyzoides L.	1.861	2.321	1.596	5.778
Amomum subulatum Roxb.	0.155	0.633	0.488	1.276
Anaphalis contorta (D. Don) Hook. fil.	2.74	3.586	1.52	7.847
Anaphalis triplinervis (Sims) C. B. Clarke	1.689	1.899	1.77	5.357
Argentina lineata (Trevir.) Soják	3.516	4.641	1.507	9.664
Arisaema tortuosum (Wall.) Schott	1.034	1.688	1.219	3.941
Artemisia indica Willd.	1.672	1.899	1.752	5.322
Asparagus racemosus Willd.	0	0	0	0
Astilbe rivularis Buch.-Ham. ex D. Don	0.845	2.11	0.796	3.751
Bergenia ciliata (Haw.) Sternb.	1.017	1.688	1.199	3.903
Bidens pilosa L.	4.705	4.008	2.335	11.05
Centella asiatica (L.) Urb.	4.809	4.219	2.267	11.3
Cirsium wallichii DC.	0.362	1.477	0.488	2.326
Cuscuta reflexa Roxb.	0.483	0.844	1.138	2.464
Cynodon dactylon (L.) Pers.	1.861	1.055	3.51	6.427

Dendrobium sp	0.103	0.422	0.488	1.013
Dendrocalamus hamiltonii Nees & Arn. ex Munro	0.224	0.211	2.113	2.548
Dioscorea bulbifera L.	0.103	0.633	0.325	1.061
Dipsacus inermis Wall.	0.483	1.055	0.91	2.448
Drepanostachyum intermedium (Munro) Keng f.	0.259	0.211	2.438	2.907
Drymaria cordata (L.) Willd. ex Schult.	4.361	3.165	2.741	10.27
Dryopteris cochleata (Don) C.Chr.	0.293	0.633	0.921	1.847
Elephantopus scaber L.	0.327	0.844	0.772	1.943
Erigeron karvinskianus DC.	0.982	2.11	0.926	4.019
Euphorbia hirta L.	0.896	0.844	2.113	3.853
Fragaria vesca L.	2.844	3.586	1.577	8.008
Galinsoga parviflora Cav.	0.327	0.633	1.029	1.99
Galium hirtiflorum Req. ex DC.	7.17	4.219	3.38	14.77
Gentiana capitata Buch.-Ham. ex D. Don	2.758	1.477	3.715	7.949
Geranium wallichianum D. Don ex Sweet	6.377	3.797	3.341	13.52
Girardinia diversifolia (Link) Friis	0.293	0.844	0.691	1.828
Gomphrena globosa L.	0	0	0	0
Hemiphragma heterophyllum Wall.	6.86	3.797	3.594	14.25
Lecanthus peduncularis (Wall. ex Royle) Wedd.	0.845	0.633	2.655	4.132
Lycopodium clavatum L.	0.707	0.844	1.666	3.216
Mentha spicata L.	2.603	1.266	4.09	7.959
Nasturtium officinale R.Br.	1.241	0.422	5.851	7.514
Nephrolepis cordifolia (L.) C.Presl	0.603	1.055	1.138	2.796
Ocimum tenuiflorum L.	0.793	1.688	0.935	3.415
Oxalis corniculata L.	4.878	2.743	3.538	11.16
Paris polyphylla Sm.	0.155	0.844	0.366	1.365
Persicaria capitata (Buch.-Ham. ex D. Don) H. Gross	0.707	0.633	2.221	3.561
Plantago major L.	0.655	1.899	0.686	3.24
Rubia manjith Roxb.	1.982	2.11	1.869	5.961
Rumex nepalensis Spreng.	0.655	0.844	1.544	3.043
Satyrium nepalense D.Don	0.793	1.266	1.246	3.305
Senecio scandens Buch.-Ham. ex D. Don	0.913	2.11	0.861	3.885
Solanum aculeatissimum Jacq.	0.138	0.633	0.433	1.204
Solanum nigrum L.	0.327	0.422	1.544	2.293
Strobilanthes pentastemonoides (Wall. ex Nees) T. Anderson	1.62	2.532	1.273	5.425
Swertia chirayita (Roxb.) H. Karst.	0.138	0.422	0.65	1.21
Synotis cappa (Buch.-Ham. ex D. Don) C. Jeffrey & Y. L. Chen	0.327	1.055	0.618	2
Tagetes erecta L.	0	0	0	0
Thysanolaena latifolia (Roxb. ex Hornem.) Honda	0.793	0.844	1.869	3.506
Trifolium repens L.	7.394	3.797	3.873	15.06
Urtica dioica L.	0.569	1.266	0.894	2.728
Valeriana hardwickii Thwaites	2.689	2.11	2.535	7.334
Valeriana jatamansi Jones	0.362	1.266	0.569	2.197
Total	100	100	100	300

Annex VIII: Questionnaire

Questionnaire for data collection on NTFPs use

Date:

Name of the respondent:

Address:

Gender:

Age:

Occupation:

Ethnic group:

Education level:

Questions:

1) Do you use forest products from nearby forests?
……

2) What kinds of materials do you bring from forests?
……

3) For what purpose do you use forest products?
……

4) How often do you collect forest products?
……

5) Who collect the NTFPs mostly from the forests and why?
……

6) What are the NTFPs found in your forest, that you use?
……

7) Are all the products consumed or also sold in local market?
……..……..

8) What about the importance of NTFPs in your livelihood?
……

9) Do you earn from any NTFPs? (If yes) What is the estimated value of yearly income from NTFPs?
……

10) What are the basic differences on NTFPs before 10 years and nowadays? Are they still available as before? If not, what are the reasons (what are the threats to NTFPs?)
……..

11) Do you cultivate NTFPs in your farmland? What are they and purpose of use?
……..

12) In your opinion what is the resource condition of NTFPs?
……

13) What is the marketing status of NTFPs?
…….

14) What are the most frequently used NTFP?
……
15) Which season is the major collection time for NTFPs?
……..

16) What is your concept about future security or sustainable harvesting?
……..

17) What are the criteria for their collection regarding volume/ quantity?
…….....

18) Do other flora or fauna are affected during collection?
…….

19) Why do you collect NTFPs?
……

20) Is it easy to collect and consume?
……..

21) Is it easy to sell and generate income?
…….

22) What are traditional preferences of NTFPs?
……

Photo plate 1: Interviews

Photos 1: (A-E) Local people sharing their knowledge about NTFPs

Photo plate 2: Use of NTFPs

Collection of species for firewood

Species used as walking stick

Locally made basket

Religious use of Bamboo

Photo plate 3: NTFPs found in study area

Bergenia ciliata

Valeriana hardwickii

Hemiphragma heterophyllum

Berberis napaulensis

Gaultheria fragrantissima

Saurauia napaulensis