STUDY OF ETHNOECOLOGY AND PHYTOSOCIOLOGY OF VEGETATION WITH ITS USE VALUE AND CONSERVATION STATUS OF BHANU MUNICIPALITY, CENTRAL NEPAL.

SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENT OF

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IV SEMESTER

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I, Dinesh Acharya, hereby declare that the work enclosed here is entirely my own, except where states 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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RECOMMENDATION

This is to recommend that the Master's thesis entitled **"Study of Ethnoecology and Phytosociology of Vegetation with its Use Value and Conservation Status of Bhanu Municipality, Central Nepal."** is carried out by Dinesh Acharya under our supervision. The entire work is based on original scientific investigations and has not been submitted for any other degree in any institutions. We therefore, recommend this thesis work to be accepted for the partial fulfillment of Master's Degree in Botany.

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ACRONYMS AND ABBREVIATION

ANOVA	Analysis of Variations
IVI	Important Value Index
UV	Use Value
MUV	Medicinal Use Value
TUV	Total Use Value
RUV	Religious Use Value
OUV	Other Use Value
GPS	Global Positioning System
MAPs	Medicinal and Aromatic Plants
NTFPs	Non -Timber Forests Products
RFC	Relative Frequency Curve
TBK	Traditional Botanical Knowledge
RBA	Relative Basal Area
RC	Relative Coverage
RD	Relative Density
F	Frequency
RF	Relative Frequency
VDC	Village Development Committee
WWF	World Wildlife Fund
IUCN	International Union for Conservation of Nature

ABSTRACT

Plants have always played a significant role in Nepalese culture and way of life as Nepalese folk life and beliefs are connected to flora from past to present. Numerous plant species have been known for a very long time to generate life-saving compounds and utilizing different ethno-ecological knowledge for survival and existence. The Central Nepal region is rich in biodiversity, and the Lamjung and Tanahau districts have a variety of medicinal plant species that grow along an altitude gradient. The study was conducted in Bhanu municipality, Central Nepal to study ethnoecological status, richness and species distribution of medicinal plant and non-medicinal plants and their use values through direct interviewing, semi-structured questionnaire surveys, and vegetation sampling, and their ethnobotanical uses were documented. There were 100 local respondents, representing various occupations, ages, and genders. A total of 116 plant species were documented from the study area. Among all of the total species, 23 species were trees with Euphorbiaceae as a dominant family followed by Anacardiaceae and Theaceae, 37 species were shrubs with Lamiaceae and Euphorbaceae as a dominant family followed by Fabaceae and Urticaceae and 56 species were herbs with Asteraceae as dominant family followed by Poaceae and Lamiaceae In terms of species richness, the diversity index of herb was found maximum with followed by shrubs and trees. The higher medicinal use value (MUV) among the species in vegetation layers tree, shrub and herbs were *Terminalia chebula*, *Colebrookea oppositifolia* and *Elephantopus scaber* respectively. Correlation between UV and IVI were also found weakly related. Statistical analysis with ANOVA test showed that the IVI of all herb, were statistically insignificant to UV (p>0.05) whereas shrub and tree were statistically significant. Species like *Shorea robusta* (UV=0.93), *Terminalia chebula* (0.84) were highly preferred over all the species, such species should be prioritized for cultivation and sustainable management in order to ensure their long-term availability. Thus, the present work would help to preserve ethnobotanical knowledge of local community as communication between indigenous community with scientific community, help to preserve traditional knowledge through documentation and dissemination. Many species used as medicine were threatened due to more extensive use, overgrazing, habitat destruction, high preference or rare existence.

Key words: *Medicinal Plants, Ethnobotany, Euphorbiaceae, Asteraceae, Lamiaceae, Sustainable Management, Plant Diversity, Medicinal Use Value*

CHAPTER 1

INTRODUCTION

1.1 Background

Nepal offers a wide variety of medicinal plants as large area of Nepal is home to a wide variety of biological species (Poudel *et al.*, 2011). Nepal has a suitable environmental condition like altitude and climate that is responsible for diverse biodiversity. Adding to these facts, the elevations of Nepal from tropical to alpine zones have experienced an abundance of numerous plants and distribution of flora with various life forms (Shakya *et al.*, 2007). The Himalayas contain a variety of plant groups (Banerji, 1963) and (Stainton, 1972), some of which are harvested from human use as medicines and other useful plants-based products (Mir *et al.*, 2021).

Ethnoecology includes studies describing how local people interact with the natural environment, including subfields such as ethnobiology, ethnobotany, ethno-entomology and ethnozoology (Rokaya *et, al* 2012). The outcomes of ethnoecology have a positive impact on rural development, poverty reduction, health care and conservation (Rokaya *et al.*, 2012). Over the last century, ethnobotany has evolved into a scientific field that examines the relationship between humans and plants from a multidisciplinary point of view, including not only the collection and documentation of indigenous uses, but also aspects of ecology, economics, pharmacology, public health and other areas. Ethnobotany is increasingly important in developing global initiatives on conservation and natural health care system.

The term "phytosociology" is used for the study of plant communities' composition, distribution and organization. Phytosociology is a subset of vegetation science which defines the vegetation types on the basis of floristic composition of stands (Dengler, 2017). Phytosociological status provided by plant diversity helps to evaluate the various uses of different types of plants (Begossi, 1996). Use Value (UV) is identified as relative significance of commonly used local plants. It is quantitative indicator of plant usage, aims to assess the relative usefulness of a plant species to people based on the variety and distribution of plants. The species and habitats of species which were exploited in ethnobotanical research were the most widely and readily accessible, according to the hypothesis of environmental appropriateness (Phillips et al., 1994). The plants with higher abundance are more likely to have the higher use values (Giday et al., 2003). It is important to understand the role of environmental patterns in determining and regulating plant use by human

beings (Salick, 1995). The heterogeneous use of plants is found in environments with diverse plant populations while a low diversity environment has the same number of uses (Begossi, 1996), The main basis for facilitating information on the availability and accessibility of plants is plant use value (UV) and phytosociological indicators.

Most rural residents of Nepal use their traditional knowledge of medicinal plants in order to treat a variety of illnesses. Along with medicinal uses, plants provide a number of other services like regulation of different air gases, water recycling and management of various soil erosive processes. Apart from the provision of foodstuffs, shelters, fodder, drugs, lumber and fuel wood. Phyto diversity therefore plays an important role in meeting the various daily needs of humans. Many goods made from wild plants are a common source of income for millions of people in developing countries (Maroyi, 2007). For the treatment of a vast range of diseases, ethnomedicinal plants have long been applied in classical medicinal practices. The origin of this connection is from Neanderthal man, who used plants to treat illnesses. Many indigenous communities are still dependent on biological sources to produce various herbal products (Akerele, 1993). In order to enhance and sustain the quality of life almost 80% of people living in developing countries depends on herbal medicines (Reproductive Health WHO, 2003). While developing herbal and pharmaceuticals products, traditional indigenous knowledge and bioactive components extracted from plants are used as precursors to a large extent. This criterion can be best applied for the development of novel drug formulations (Fabricant, 2001). In addition, the conservation and maintenance of biological diversity can be helped by the use of traditional knowledge. Traditional knowledge, especially the herbal medical system, has been decreased in larger communities and among younger generations due to a changing attitude and increasing social change. (Kala, 2005). The study of factors that contribute to plant decline and protective measures are referred to as "preservation of rare and endangered plants." In contrast to the conservation of individual species, plant conservation is a relatively new area that focuses on the conservation of biodiversity and ecosystems as a whole. The area under investigation is also subject to a great amount of anthropogenic pressure. The woody plants, cut down for miscellaneous purposes, are facing conservational problems. The significant investment is being made in the establishment of tree plantations across Asia's degraded areas. (Sayer *et al.,* 2004)

According to a very conservative estimate, the Earth is losing at least one significant drug candidate

every two years and that the current pace of plant extinction is between 100 to 1000 times greater than what is expected from natural extinction (Pimm, 1995). Approximately 50,000 to 80,000 flowering plants are used globally as medicines according to estimates by the World Wildlife Fund (WWF) and the International Union for Conservation of Nature (IUCN). One-fifth of them, or 15,000 species, is in danger of going extinct due to habitat loss and overharvesting, and 20% of their wild resources have already practically run out due to rising human populations and plant consumption. Even though these threats have been known for decades, the risk of medicinal plant extinction in Nepal is increased by an accelerated loss of species and habitat worldwide (Hamilton, 2008).

It is necessary to determine how rare each species is and in which ways rare species differ from one another. The harvest pressure does not have the same effect on all medicinal plants. Despite the significant impact on species rarity, a sufficiently detailed description does not exist of how each species responds to harvesting pressure due to overexploitation, broadscale collection, uncontrolled deforestation and habitat degradation. The risk of extinction is associated with a number of biological characteristics, including habitat specialization, distribution range, population size, species diversity, growth rates and reproductive systems.

This research aims to analyze the interactions of plant UVs and phytosociological patterns (frequency, density, abundance, diversity and distribution). Specifically, whether there is an association between the UV of plants and their richness, diversity, density, frequency, abundance. Importance Value Index (IVI), patterns of association of UV across different plant forms (herbs, shrubs and trees) will be analyzed. A better understanding of interactions of plant use values and phytosociological patterns can enhance the knowledge and support the sustainable conservation of medicinal plants.

1.2 Justification

The folk knowledge of medicinal plants species of ethnic group residing in Tanahau district has been possibly unexplored. In addition, overuse and high demand for medicinal herbs has caused threats to the natural population (Bhattarai, 2005). Due to a variety of anthropogenic activities, natural forests are disappearing, which has resulted in a decrease in the diversity of medicinal plant species (Bhattarai & Ghimire, 2006). Therefore, it has been crucial to document the uses of medicinal plants and analyze the Use value of medicinal plants to research the degradation patterns and the causes behind them (Rokaya *et al.*, 2012). The majority of medicinal plant research in Nepal has, to yet, concentrated on systematic cataloging of helpful plants (Acharya *et al.*, 2010). Similarly, comparable research on plant diversity with correlation to ethnobotany has been lacking in Bhanu municipalities. So present research has been conducted for quantitative study in this area to document medicinal plants uses, to preserve traditional knowledge, and also to motivate the local residents against the vanishing wealth of traditional knowledge of medicinal flora. Additionally, this research is also directed towards the correlation of use value of plants species with phyto-diversity index. Thus, the indigenous and traditional uses of plants need conservational strategies and further investigation for better utilization of natural resources in such a diverse community of forest.

1.3 Research Questions

1) How does ethnobotany relate with the phytosociological and diversity indices of plant species?
2) Is there any relationship of plant use value in terms of availability?
3) Does the distribution of plants matter in the plant use value?

1.4 Research Objectives

General objective

To analyze the vegetation status and use value of both medicinal and non-medicinal plants with respect to phytosociological parameters including frequency, density, abundance and their relative values (IVI) following Mueller-Dombois and Ellenberg (1974) and management approaches of vegetation in Tanahun district (Bhanu Municipality).

Specific objectives

1) To document the medicinal and non-medicinal uses of plant species.
2) To analyze and compare use value of plant species.
3) To know the availability of plant species along with its ethnoecological values.
4) To assess phytodiverstiy of Tanahun district (Bhanu Municipality).
5) To correlate vegetation parameters with Use value (UV) of both medicinal and non-medicinal plants.

CHAPTER 2

LITERATURE REVIEW

Plants have always played a significant role in Nepalese culture and way of life (Shrestha *et al*. 2004). From ancient times to today, all aspects of Nepalese folk life and beliefs are connected with the flora (Manandhar, 2002). A medicinal plant is any plant or plant derived product that can be used to treat or cure diseases in humans or animals (Oladeji, 2016). A number of plant species have been known to produce life-saving compounds for a very long time, and researchers are still studying them for the development of modern medicinal products (Cox and Ballick, 1994). The factors such as forest abundance and the size and diversity of individual species have a strong influence on traditional plant use (Philips and Gentry 1993, Johns *et al.*, 1990 and De Lucena *et al.*, 2007).

More than 20% of Nepal's various plant species are known to have therapeutic properties (Kunwar *et al.,* 2006). The most widespread distribution of plants in Nepal's temperate and subtropical range can be found in the intermediate altitudinal region (Bhattarai and Vetaas, 2003; Baniya *et al.,* 2010). It is because of many different ethnic groups in Nepal, each one has its own traditional knowledge of the use of medicinal herbs (Manandhar, 1990). There is a rich biodiversity in the Central Nepal region, with a variety of medicinal plants growing in the altitude gradient of the Lamjung and Tanahau districts (Luitel *et al.,* 2014). The inhabitants of these areas have a special knowledge of how to use certain plants and, in particular, depend on the nearby forests for medicinal plant resources that are at risk from depletion due to environmental degradation (Luitel *et al.,* 2014). High species richness and a variety of habitats are supported by the numerous physiographic and environmental variables found in central Nepal (Bhattrai and Ghimire, 2006). The diversity and spread of endemic, threatened or medicinal plants is greatly influenced by the differing environmental conditions and climate created by these elevation changes in combination with their resulting soil differentiation (Brown, 2001). There are a variety of floristic components in this varied environment, and there are a variety of plant communities in the Himalayas (Rokaya *et al.*, 2012).

The community forests of the Tanahu district were explored that results non-timber forest product (NTFP) resources and the potential medical applications of 73 NTFP species (Sedai, 2010). In order to use the wide variety of plants and their advantages for a range of purposes, villagers from Nepal

are extremely aware about herbal medicine. (Joshi and Joshi, 2000).

The ethnobotanical study at Dolakha in Central Nepal showed 58 species of plant used for medicinal purposes with 113 medical treatments (Shrestha and Dhillon, 2003). A case study carried out in Daman Village Development Committee of Makawanpur district, 76 different kinds of medicinal plants were identified and used by the locals in the study area to cure a variety of physical illnesses (Bhattrai and Ghimire, 2006). There were 76 plant species reported having medicinal values and properties in Baitadi and Darchula district. Among them 47 were indigenously used as ethno-medicine. Among the ethno-medicinal plants, 29 species were only from Darchula district, 19 were only from Baitadi district and 19 species were common to both districts. They provide information and management practices of these plants in Darchula and Baitadi (Kunwar *et al*., 2008).

There were 60 species of herbal medicinal plants known in Rasuwa district, with a description of their family, uses and habits (Humagain and Shrestha, 2009). The study conducted in Humla district of western Nepal discovered 161 plant species from 61 families and 106 genera that were used to treat 73 human and 7 veterinary diseases. *Rumex hastatus* and *Mentha spicata* were both utilized for gastrointestinal problems, ranking first and second in terms of their use value respectively (Rokaya *et al.,* 2010). Likewise, the ethnobotanical survey of medicinal plants uses in terai region of western Nepal, research documented 66 medicinal plant species belonging to 37 families and 60 genera grouped under 11 different disease categories bearing herbs (53%) as the primary source of medicine, followed by trees (23%). In this area, the most commonly used medicinal plants were *Curcuma longa* (84%) and *Azadirachta indica* (76%) (Singh *et al.,* 2012) Similarly, from Rasuwa district Central Nepal, 60 medicinal plant species were reported and also identified that Tamang community possess rich ethno-pharmacological knowledge (Uprety *et al.,* 2010).

Twelve medicinal plants with short descriptions of their use, parts use and identification have been reported in a study conducted in the Kathmandu Valley (Poudel *et al.,* 2018). In a study carried out in Sikles region, 42 plant species were identified as having been used by local people to treat 43 different diseases. With 24 species, herbs predominated among these plant species, followed by 7 shrubs species and 7 tree species (Rana *et al.,* 2015).

The research conducted on the Palas Valley's ethnobotanically significant plants and reported 139 species from 72 families. The elements of the plant that have been commonly applied are fruit, wood, bark, roots and leaves. The majority of the plants (83 species) were used as remedies by the locals, while 3 species were used as veterinary medications, 68 species were used as food, 29 species

as fuel, and 10 species as timber (Saqib and Sultan, 2004). According to a comparable study carried out in Ethiopia, the indigenous population utilized between 49 and 76 percent of the flora (Gemedo-Dalle *et al.,* 2005). The use of woody plants by a rural community in an area of dry land Caatinga vegetation in northeastern Brazil and correlation analysis found a weak correlation between relative frequency and use values for species found in the area farthest from the community. However, no correlation could be found which would have supported the conclusion that apperancy was related to the value of species as it relates to its use within the neighbouring area (Lucena *et al.,* 2007). As food and medicinal products 169 species were used in the Poonch Valley of Azad Kashmir. It is crucial to preserve and sustainably use certain plants that have been used for food, fuel, medicine or other purposes (Khan *et al.,* 2010).

People have relied on ethnomedicine since it is accessible, affordable, acceptable, and offers benefits for biomedicine. The increase in demand is due to population growth and the generally insufficient availability of modern medicines (Marshal, 1993). Overexploitation, overgrazing, habitat loss and change, destructive harvesting techniques, unsustainable trade and deforestation are major threats to a large number of ethnomedicinal plant species in most developing countries (Hamilton, 2004). The collection of medicinal plants and other nontimber forest products is a major source of income for Nepal's economy, which is heavily dependent on them (Edwards, 1996; Bhattarai, 1997 and Olsen, 1997). People want to make their own money, given the demands of modern life.

The accessibility by using the use values of plants with reference to the site-specific explanatory variables: forest, non-forest habitat, adjacent hill, transitional area, cosmopolitan distribution, Himalayan endemics, where the distribution showed a weak association between plant use values and plant availability and accessibility. However, the plant use value was influenced by ecological (Shannon diversity, species richness) and cultural indicators (preference for specific products and recognition) and varied at the level of use category (medicinal and non-medicinal) (Kunwar *et al.*, 2020).

A study on the ecology, flora and fauna of Nepal's northern west and north eastern regions was conducted respectively. The highest factor determining the type of vegetation has been shown to be altitude (Shrestha, 1982) and (Bhattarai and Vetaas, 2003). The highest variety of plants in Nepal Himalayan has largely been driven by elevation and climate factors with different life forms explaining their rich biodiversity (Bhattarai *et al.,* 2004). The Himalayan Medicinal Plants comprises a diverse array of species varying in life-forms, reproductive modes, growth strategies

and habitat specificities distributed from 100m to 5500m and the relative diversity of species of given life form varies differently along the altitudinal gradient in Nepal (Ghimire, 2008).

Use value (UV) is a measurement of the relative significance of valuable plants that is frequently used as an index. It combines the frequency with which a species is mentioned and the number of uses described per species, so it has been frequently used as an indication of particular varieties of interest. The Relative Frequency of citation (RFC) and Use value (UV) data show a weaker relationship, especially when it comes to the value of plants for human use and the proportion of informants who mention plant usage. In order to preserve Traditional Botanical Knowledge (TBK) in the use of medicine plants, future generations are required to acquire knowledge about species and their biological properties (Rana *et al.,* 2015).

Ethnobotanical studies in the Republic of Georgia in the Caucasus and compared the two best-populated categories of use (medicinal and food uses) and the components of UV (relative frequency of citation and number of uses mentioned per species) and found the UV was higher in cultivated plants than wild plants but medicinal plants did not exhibit this trend, as medicinal wild plants had marginally higher UV than medicinal cultivated plants (Zenderland *et al.,* 2019). The results also show that the management strategy of medicinal plants works well in the research area despite problems such as illegal collection and over harvesting (Hasan *et al.,* 2013).

Ethnoecology and use value of medicinal plants may provide scientific information about the status of flora. Traditional knowledge has become known around the world, not simply as a result of its inherent value but also because it could be an important factor in science and conservation, noted by previous literature. The use of medicinal plants with species composition and conservation status is still subject to uncertainty. This work will not just be an extension of this study forest, but may also help to gain better knowledge about the biodiversity situation and use of available flora.

CHAPTER 3

MATERIALS AND METHODS

3.1 Study Area:

3.1.1 Location

The Tanahu district's Bhanu Municipality is located there at 28.0113° N and 84.4278° E. The altitude ranges from 300 to 1500 meters above mean sea level. According to the 2011 census, it has a total area of 184 km^2 and a population of 46,179. The Chundi and Marsyangdi rivers are this municipality's two main sources of water. The municipality can be physically separated into two areas. One of them is the flat area near the banks of the Chudi River and the right bank of Marsyangdi. This flat land makes over 60% of the municipality's total land, making it ideally suited for cultivation. Hills make up about 40% of the municipality's land area, with the majority of them located in the municipality's western, central, and northern regions. The majority of the settlements are located on lowlands, ridges, and gentle slopes.

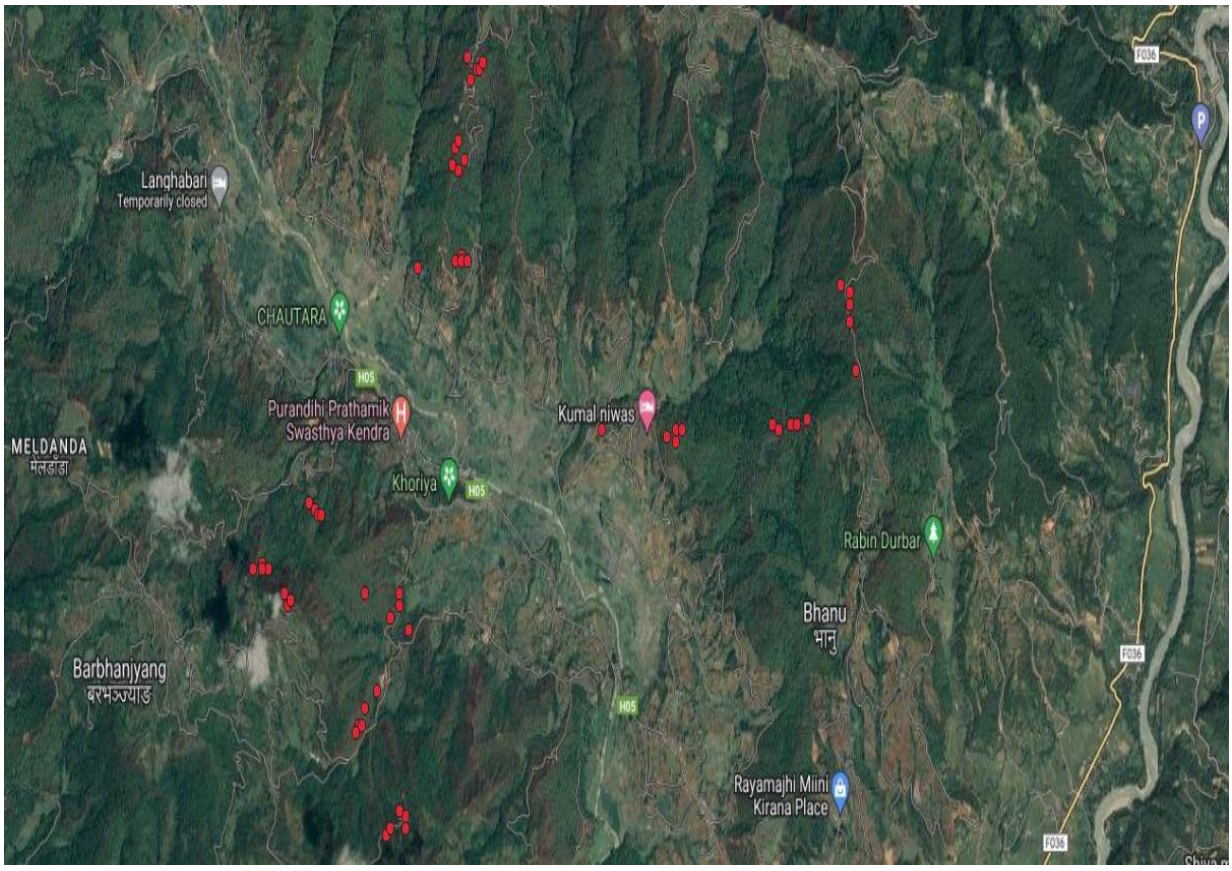

Figure 1: Satellite image of Bhanu Municipality representing the plots of the study area, red circle represents study plots**.**

Source: http://earthexplorer.usgs.gov/

Tanahun is home to more than 47 distinct castes and ethnic groups, with a significant Hindu population (83.16%). As a result, Bhanu Municipality is a marvel of the unique mid-hill culture. This district contains three different types of forests: tropical forest and subtropical forest.42.9% of the overall area is made up of forest in Bhanu municipality. Due to the variation in elevation pattern, there is a huge diversity of vegetation. The region is well renowned for a range of medicinally significant species, which are utilized for basic healthcare in the area and are also highly regarded in other regions of Nepal and in China, Tibet, and India (Garbyal *et al*., 2005).

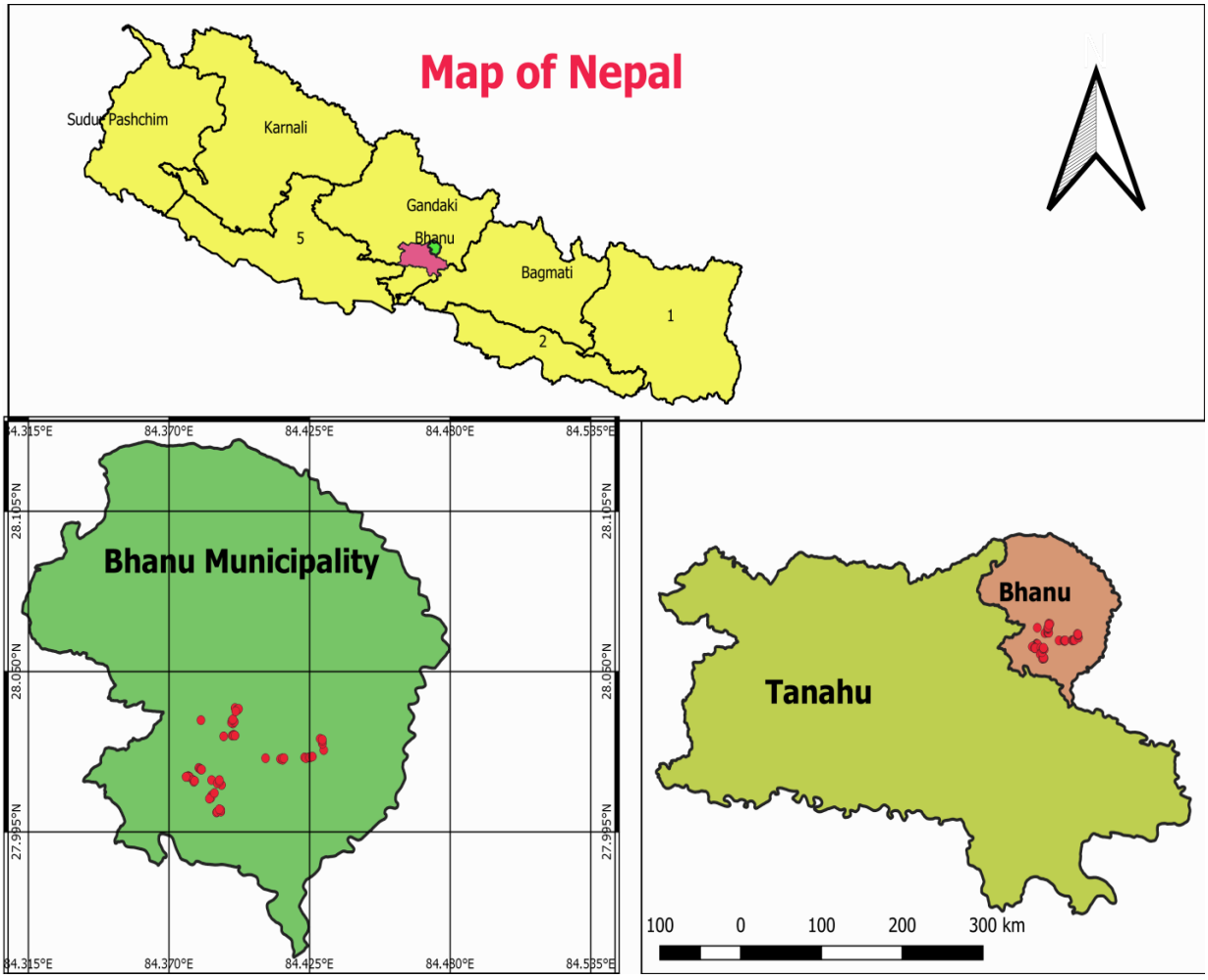

Figure 2: Map of study area showing Bhanu Municipality in Tanahu District where red circle represents study plots.

Source: QGIS 3.4.8 version with GRASS 7.6.1

3.1.2 Climatic Conditions

The Bhanu Municipality is in a moderate and subtropical climate zone. From May to August, the Southwestern monsoon brings rain to this region. While the winter is dry and pleasant from November to February, the summer is hot from March to August. The study region has a tropical environment with 800 mm of mean annual precipitation in the month of July, maximum average temperatures 20°C in the month of June, and minimum average temperatures 6°C in January. In the rainy season, the relative humidity is 95%, whereas in the dry/winter season, it ranges from 50% to 70%.

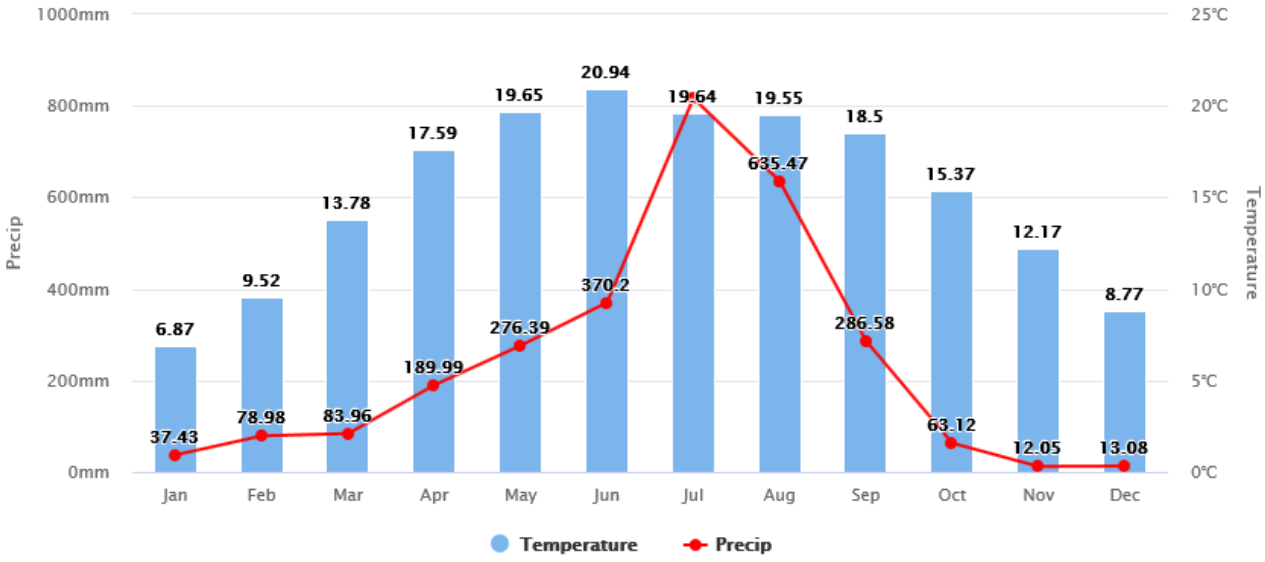

Figure 3: Graph showing mean monthly precipitation and temperature of Tanahun District
Ethnography

Source: Department of hydrology and meteorology (DHM)

3.1.3 Vegetation Status:

Tropical forests and subtropical forests are the types of forest found in this district which covers 42.9% of total area. Diversity of vegetations is high due to variation of altitude. *Shorea robusta* was the predominant plant species and regeneration status is also high along with significant companion species such as *Schima wallichi, Semecarpous anacardium, Lagerstroemia parviflora,* and *Castanopsis indica*, *Myrica esculenta, Phyllanthus emblica* (Awasthi *et al*., 2015 and Napit, 2015). There are all sorts (private, community, leasehold, religious, government owned) of forest in Bhanu Municipality. These forests are richest habitat for medicinal plants and forests products. Dalits and ethnic group (Magars) are the frequent collectors and they accumulated a disproportionate sum of forest products to address their subsistence and accessory needs.

The vegetation of study area is rich in biodiversity, indigenous medical systems and traditional knowledge. The plant species like as *Diplazium spp, Elephantus scaber, Cheilanthes spp, Asparagus racemosus, Adiantum spp, Pogostemon benghalensis, Smilax spp* are the major species having high medicinal and commercial use value over the study area. Similarly, *Ocimum gratissimum, Woodfordia fruticosa, Melastoma malabathricum, Artemisia vulgaris, Solanum surattense* were major shrubs having high medicinal and commercial use value plants. *Sorea robusta, Schima wallichi, Castanopsis indica, Myrica esculenta, Mallotus philippensis, Phyllanthus emblica, Terminalia chebula* are significantly valued trees species in Bhanu Municipality.

3.1.4 Demographic status

Bhanu Municipality is formed by integrating 13 wards. The study area covers the wards (4, 5, 6, 7). Wardwise distribution of settlement of the study site is given as follows:

Table 1: Table showing the wards of Bhanu municipality consisting different settlements

SN	Ward No.	Name of Settlements
1	4	Dhakaltar, Athgaire, Thamakot, Chisapani, Chundi Ramgha, Gaikhure
2	5	Thuldhunga, Dhandkholagaun, Bariphata, Maibal
3	6	Oklang, Baguwa, Mulabari, Katahare, Dhakalkuna, Piple
4	7	Nawarung,Dhunga Gade, Karkigaun,

The Newar, Dalit and the Magar are the main ethnic societies of the study area. They live in association with Chhetri, Brahmin, Thakuri, Gurung, Damai, Kumal, Bote, Kami, Newar and others communities. Total population of Bhanu Municipality was 13,175 (2011). They are farmer by occupation and cultivate rice, mustard, corn and lentils but also collect forest products such as wild fruits, vegetables, medicinal plants and material to build their houses, hunt wild animals.

3.2 Methods

3.2.1 Study Design

The study was an effort to investigate the vegetation of Bhanu Municipality, its link to the local population, and the state of the flora's conservation. During the field visit, the study region was conducted in various administrative wards (4,5,6,7). The primary data sources for the study were community interviews and quadrat methods for vegetation sampling. The semi-structured interviews were used to gather information on the ethnobotany of the Bhanu municipality. Along with the ethnobotanical status and management strategies of plant species, the association between phytosociological indices and use value of plant species was found in the study area.

3.2.2 Field Work

3.2.2.1 Vegetation Survey

The research region was visited in February 2022, and the vegetation was sampled using a stratified random sampling method. According to Mishra (1968), the floral composition and structure of the vegetation between 500- and 900-meters high were measured in 60 quadrats with a difference of 100 meters and sample plots that were randomly arranged with 10 m × 10 m for tree species, 5m × 5m for shrub species and 1m × 1m for herb species. Using the Global Positioning System (GPS), the geographic information for each site, including height, latitude, longitude, slope, and aspect, was measured. The Shannon diversity Index (H) and Species Richness (S) were used to construct the phytosociological parameters frequency, density, abundance, and their relative values (IVI) in accordance with Mueller Dombois and Ellenberg (1974).

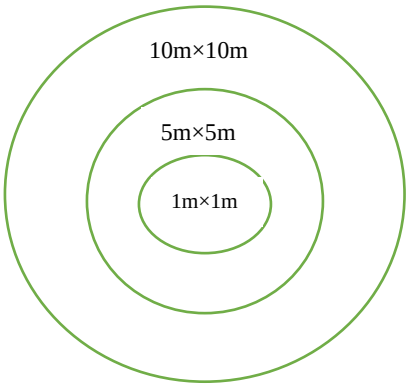

Figure 4: Plot design for vegetation in the study area.

3.2.2.2 Ethnobotanical Survey

Semi-structured interviews were used to conduct an ethnobotanical survey. To eliminate any other direct influence from third parties and to obtain accurate information, 100 individuals from all different religions, professions, cultures, and tribes participated (Phillips and Gentry 1993). Among the informants with various jobs, age groups, and genders, questions were designed to gather information regarding the presence of plant species, their uses, and the components used. The voucher specimens were made into herbaria and identified in Plant Laboratories (KATH).

3.2.2.3 Plant identification

With the help of locals and vegetation analysis, the bulk of the specific plant species were identified and gathered. Following that, the identification of these plants was done by consulting key literary works and botanical reference books (Shrestha *et al.* 2018; Malla *et al*., 1986; Polunin and Stainton, 1987; Stainton, 1988; Grierson and Long, 2000; Cullin, 2006). In the field, digital photos of various live plant species were taken, and the photo number and tag were recorded.

3.2.2.4 Herbarium Preparation

During a field trip, the specimens were photographed and collected. The herbarium specimens were prepared using the standard technique given by Lawrence (1967).

3.2.2.5 Information on Medicinal and Non medicinal Plants

Information on medicinal and non-medicinal plant species were gathered through field trips, interviews with locals, and reading of relevant literature. Local people were typically the sources of knowledge about usage of medicinal plants and their parts. The collected plant species' local names, functions, parts, distribution, habits, habitat, latitude, and longitude were all verified.

3.2.2.6 Ethno-botanical Documentation

The final tables were made by including information on local names, scientific name, life forms, sources, parts used, medicinal uses (Appendix I) based on (Shrestha and Dhilon, 2003).

3.2.2.7 Phytosociological parameters

Vegetation analysis of the study area was conducted in sampling field as described above. The ecological parameters used to study the vegetation composition were density, relative density, frequency, relative frequency, coverage, relative coverage, basal area, relative basal area and Importance Value Index (IVI) as per Zobel *et al*., (1987). Similarly, Shannon index and Simpsons diversity index were also calculated (de Lima Araújo *et. al.*, 2014).

3.3 Vegetation Analysis

Frequency is the proportion of sampling units containing the species.

$$\textbf{Frequency (F)} = \frac{\text{Number of quadrats in which an individual species occurred}}{\text{Total number of quadrats sampled}} \times 100$$

Relative frequency can be obtained by comparing the frequency of occurrences of all the species present.

$$\textbf{Relative Frequency (RF, \%)} = \frac{\text{Frequency of individual species}}{\text{Sum of the frequencies of all species}} \times 100$$

Density is the total number of individuals of particular species counted in all the plots of specific sites. It is expressed in number per hectare for large species and for small species number of individual per square meter (Zobel *et al*., 1987). It was calculated as

$$\textbf{Density (stem/ha)} = \frac{\text{Total number of individuals of a species in all plots}}{\text{Total number of plots studied} \times \text{Size of the plot (m2)}} \times 10000$$

Relative density can be obtained by comparing the density of occurrences of all of the species present.

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

Basal Area (BA)

Basal area is one of the characters which determine dominance. Basal area cover indicates the amount of ground occupied by the stem which is given by: Basal area = $\pi d^2/4$

Where,d = DBH (diameter at the breast height) π = 3.1416

$$\textbf{Basal area of a species (m}^2\textbf{/ha)} = \frac{Total\ basal\ area\ of\ a\ species}{Size\ of\ the\ plot\ (m2)} \times 10000$$

Relative Basal Area (RBA)

Relative basal area can be obtained by comparing the basal area of occurrences of all of the species present.

$$\textbf{Relative Basal Area (RBA, \%)} = \frac{\text{Basal area of individual species}}{\text{Total basal area of all species}} \times 100$$

Importance Value Index (IVI)

Relative frequency, Relative density, and Relative basal area each indicate a different aspect of the importance of a species in a community. Therefore, the sum of these three values should give a good overall estimate of the importance of a species. This sum is called the importance value.

IVIa =RFa +RDa + RBAa

Where,

IVIa = Importance Value Index of species a

RFa = Relative Frequency of species a

RDa= Relative Density of species a

RBAa = Relative Basal Area of species a

Species Diversity Index (H')

The Shannon index (Shannon and Weiner, 1949) is one of the most employed variables for the estimation of species diversity; for its determination is employed the formulation:

$H' = -\sum Pi.\ln (Pi)$

Where,

H' = Species Diversity Index

Pi = proportion of the species Pi = ni / N

N = total importance value of plants

ni = importance value of each species

Simpson's Dominance Index

Simpson's diversity index given by Simpson (1949) is an accepted and often used calculation of plant diversity within a habitat. Within a sample area all plants of all species are counted. The diversity is then calculated using the following equation.

$D = \sum (ni/N)\ 2$

Where,

D = Simpson's Dominance Index

N = total importance value of plants

ni = importance value of each species

Use value (UV)

The relative importance of a plant species used as medicine in the study areas was calculated with the help of the use value (UV) for species (Phillips *et al*. 1996).

$UVi=\sum Ui/Ni$

Where Ui is the number of use-reports cited by each informant for a given plant species i and N is the total number of informants interviewed for a given plant species i. Use values are high when there are many use-reports for a plant and low when there are few reports related to its use.

3.4 Statistical Data Analysis

The correlation between Use Value and sub parameters of phytodiversity like RD, RF, and IVI were evaluated through SPSS. The statistical significance between IVI and Use Value was calculated by one way ANOVA by using IBM SPSS static software version 25 Inc., Chicago, II, USA. One way ANOVA were performed after using normality test of collected data.

CHAPTER 4

RESULTS

A total of 116 plant species were documented from the study area. Among all of the total species, 23 species (20%) were trees with Euphorbiaceae as a dominant family followed by Anacardiaceae and Theaceae, 37 species (32%) were shrubs with Lamiaceae and Euphorbaceae as a dominant family followed by Fabaceae and Utricaceae and 56(48%) species were herbs with Asteraceae as dominant family followed by Poaceae and Lamiaceae (as shown in figure 5).

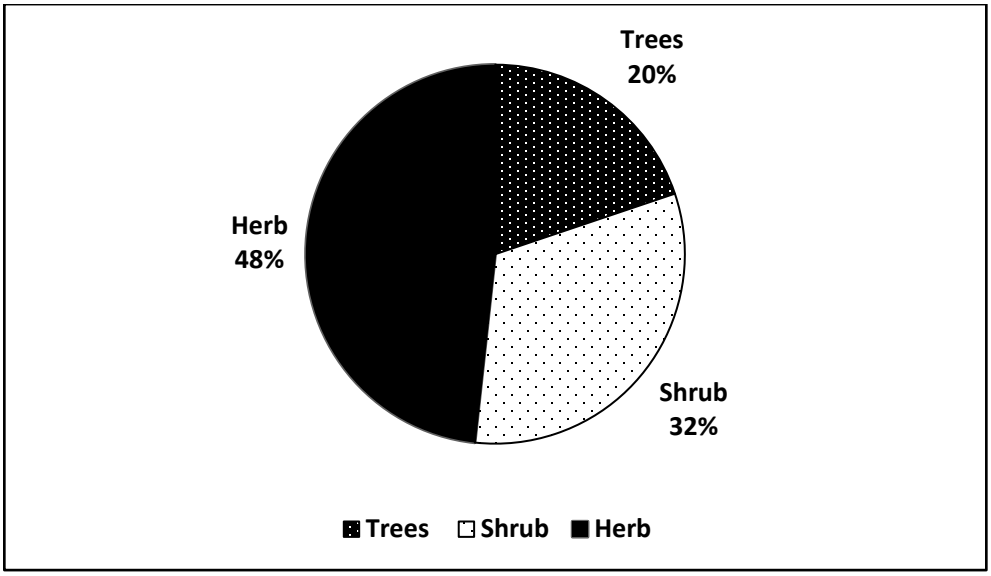

Figure 5: Percentage weightage of vegetations in various life forms.

Among the 23 species of trees recorded in the study site, *Shorea robusta, Schima wallichii, Castanopsis indica, Myrica esculenta, Lagerstroemia parviflora, Careya arborea, Semecarpus anacardium, Eurya acuminata* were major dominant species. Similarly in herb layer *Capillipedium assimile, Dicranopteris linearis, Imperata cylindrica, Hedyotis auricularia L, Eragrostis spp, Lygodium japonicum, Elephantopus scaber, Smilax ovalifolia* were dominant species. *Clerodendrum infortunatum, Flemingia strobilifera, Inula cappa, Melastoma melabathricum, Hypericum cordifolium, Premna barbata, Phyllanthus sp, Woodfordia fruticosa, Phyllanthus parvifolius* were major shrubs species in the study area.

4.1 Vegetation in herb layer

A total of 56 species belonging to 52 different genera and 33 families with importance Value index of dominant species is shown in the figure below in which *Capillipedium assimile* was the most dominant species in the herb layer with IVI 48.83 followed by *Dicranopteris linearis,* with IVI 37.84. Similarly, the other associated species in herb layer were *Imperata cylindrical* (27.98*), Hedyotis auricularia* (23.26*), Eragrostis* spp (19.64), *Lygodium japonicum* (19.55), *Elephantopus scaber* (8.76), *Smilax ovalifolia* (8.70) and so on. (Appendix III). Most of the collected herb species possess medicinal importance in different extent. (Fig: 6)

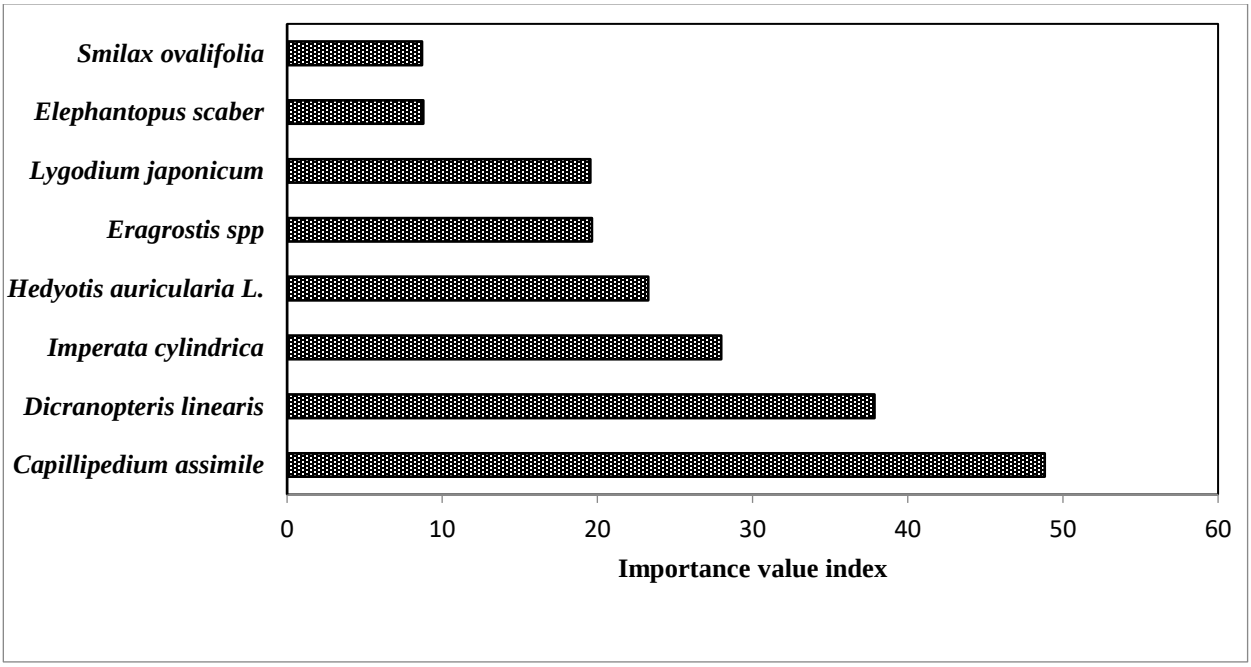

Figure 6: Importance value Index of herb species

4.2 Vegetation in Shrub layer

Similarly, 37 species of shrubs belonging to 33 different genera and 24 families with importance Value index of dominant species is shown in the figure below in which *Clerodendrum infortunatum* with IVI 51.20 was the most dominant species followed by *Flemingia strobilifera,* with IVI 45.48. Besides these species *Inula cappa* (23.83), *Melastoma melabathricum* (23.25), *Hypericum cordifolium* (13.69), *Premna barbata* (13.25), *Phyllanthus sp,* (13.22) *Woodfordia fruticose* (13.07), *Phyllanthus parvifolius* (11.19) and so on (Appendix III) were associates shrub species in the shrubs layer. (fig:7)

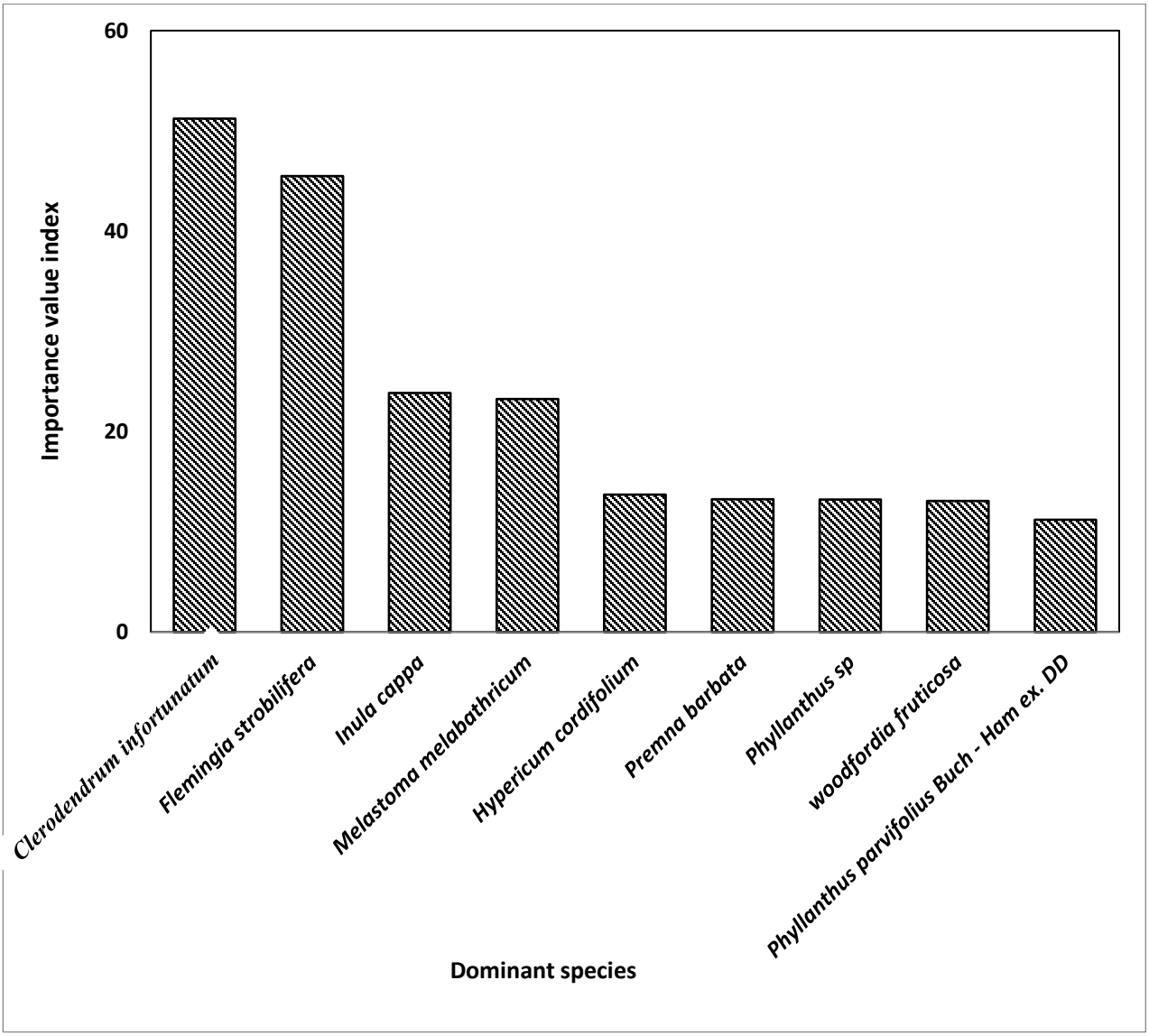

Figure 7: Importance value index of shrubs species

4.3 Vegetation in Tree layer

Similarly, 23 species of trees belonging to 19 different genera and 19 families with importance Value index of dominant species is shown in the figure below in which *Shorea robusta* with IVI 171.12 was most dominant species followed by *Schima wallichii* with IVI 53.74. Similarly, *Castanopsis indica* (20.21), *Myrica esculenta* (5.49), *Lagerstroemia parviflora* (5.19), *Careya arborea* (4.48), *Semecarpus anacardium* (4.46), *Eurya acuminate* (4.25) and so on (Appendix III) were major associate species of tree in the trees layer. Collected tree species are widely used in medicinal and timber purpose in our study site. (fig:8)

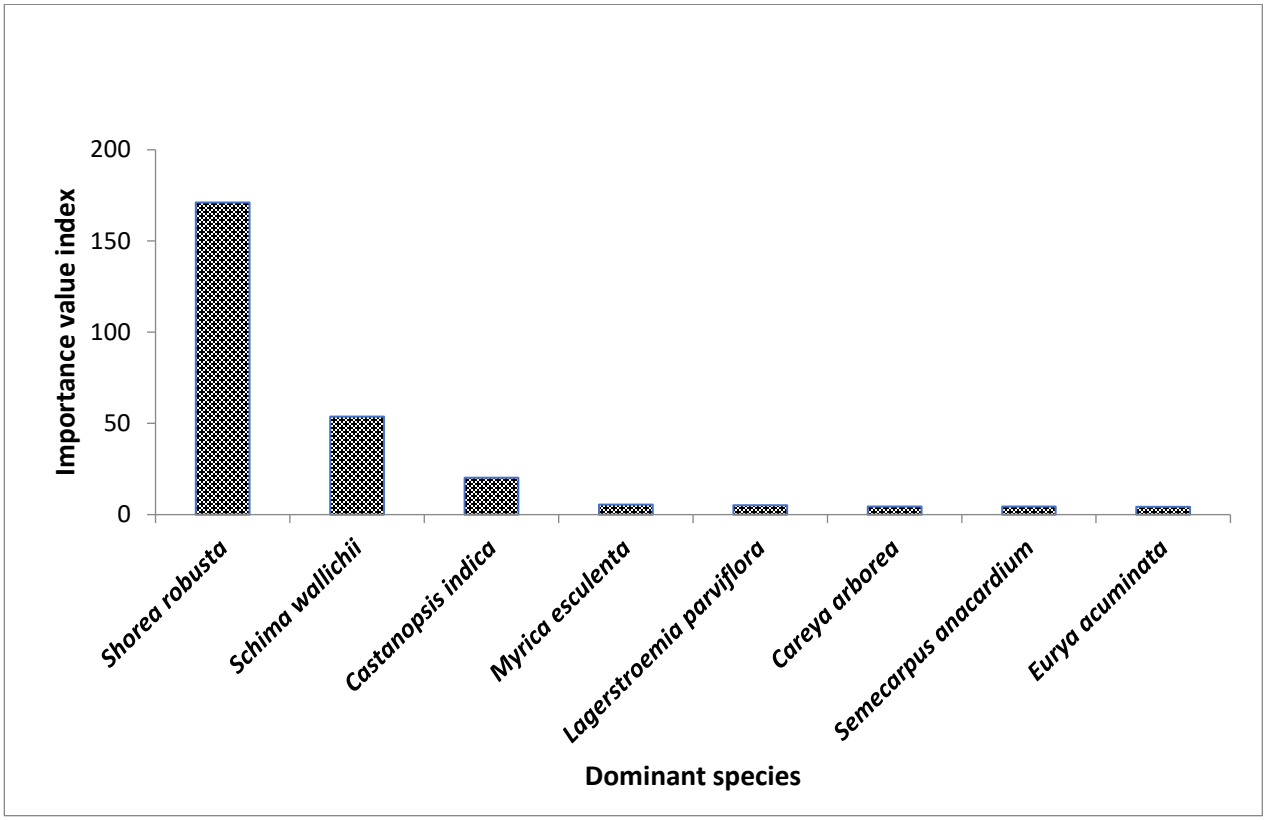

Figure 8: Importance value index of tree species

4.4 Diversity Index:

Simpson's Diversity Index (D) and Shannon-Wiener Index (H) were used to analyze the diversity status. Among three life forms, the diversity index of Herb was found maximum with 0.90 followed by shrubs and trees as shown in (Table 2). The Shannon-Wiener Index (H) was also higher in herbs as compared to shrubs and trees. However, the species in shrub layer were evenly distributed with evenness index 0.76 followed by herbs and trees. (Table2)

Table 2: Table showing the diversity index of the field

	1-D	**H**	**Hmax**	**Evenness**
Herb	0.90	2.91	4.02	0.72
Shrubs	0.89	2.77	3.61	0.76
Trees	0.52	1.27	3.13	0.40

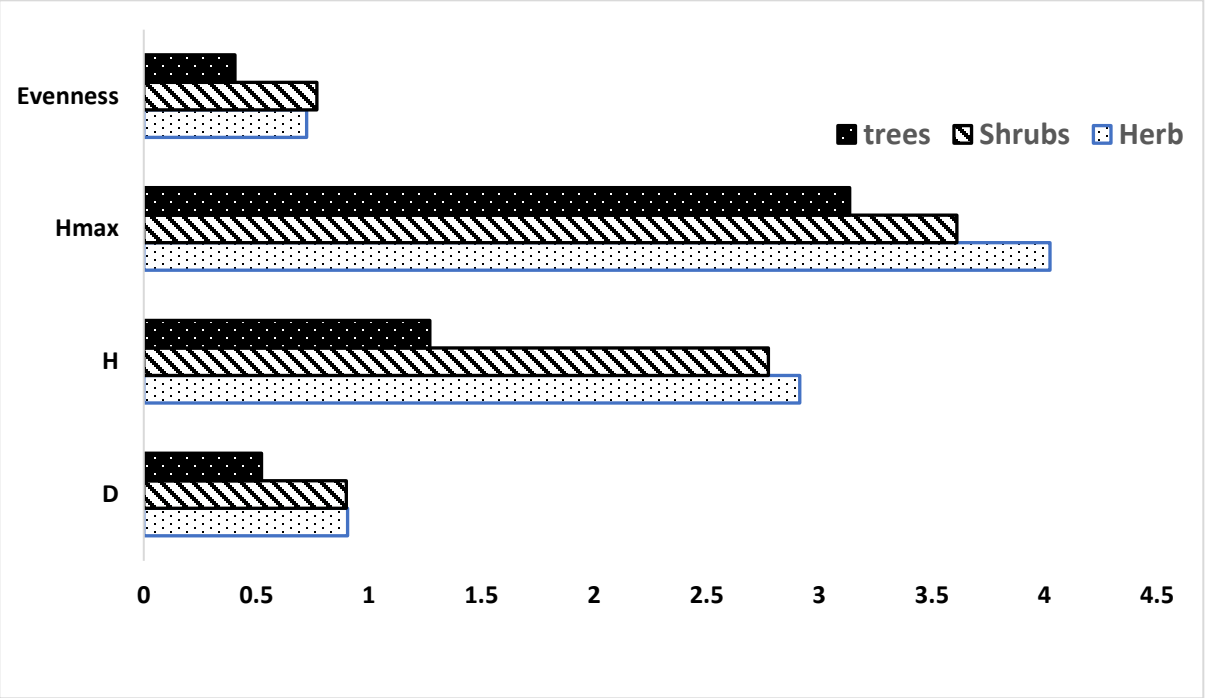

Figure 9: Figure showing diversity index

4.5 Medicinal and total use value of species

The study sites were observed with various use values as medicinal use value (MUV), religious use value (RUV), other use value (OUV) and sum of all these use values as total use value (TUV). In the study area the medicinal use value in tree species of *Terminalia chebula* was higher than Myrica esculenta followed by *Ceiba pentandra*, *Phyllanthus emblica* and *Mallotus philippensis* respectively. (fig: 10)

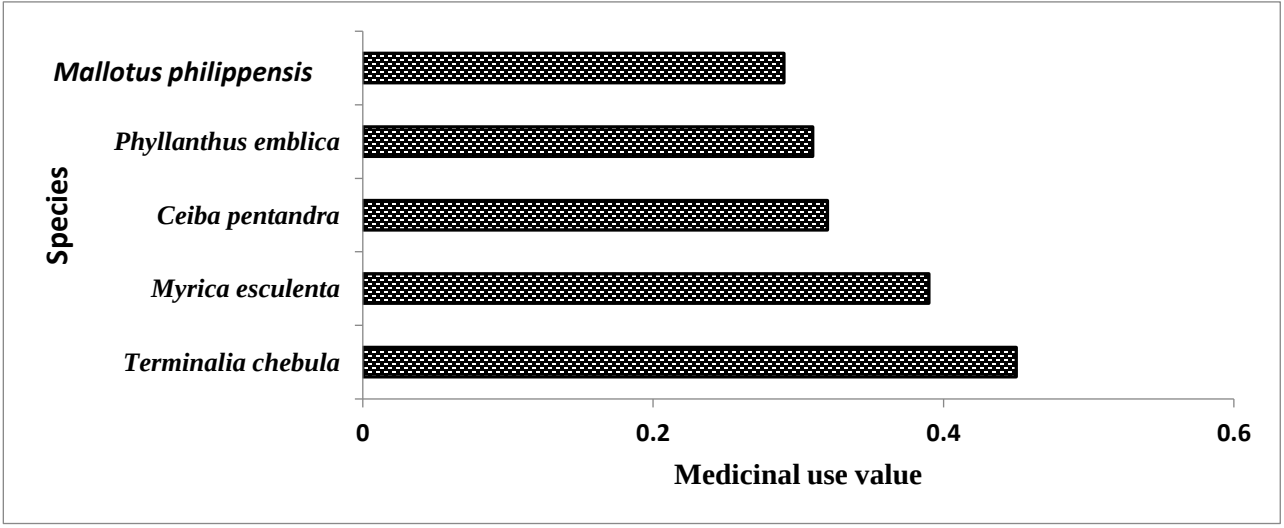

Figure 10: Medicinal use value of major five tree species

Similarly, *Shorea robusta* had higher TUV followed by *Mangifera indica, Myrica esculenta, Terminalia chebula, Ficus semicordata* respectively. (Fig:11)

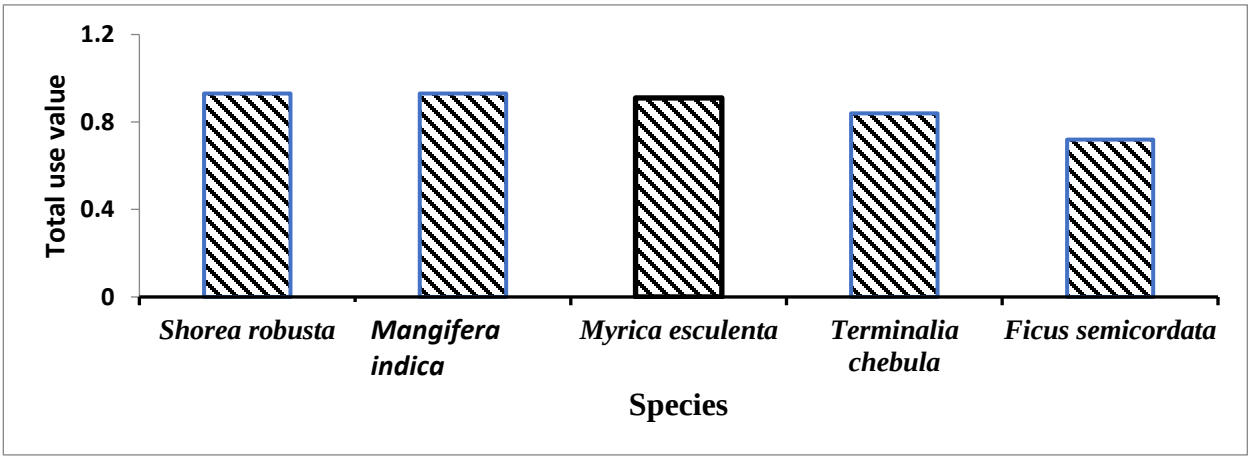

Figure 11: Total use value of major five tree species

Among the shrub's species, *Colebrookea oppositifolia* was the major species having higher MUV than *Boehmeria platyphylla* followed by species *Hypericum japonicum, Inula cappa, Strobilanthes atropurpureus* respectively. (Fig:12)

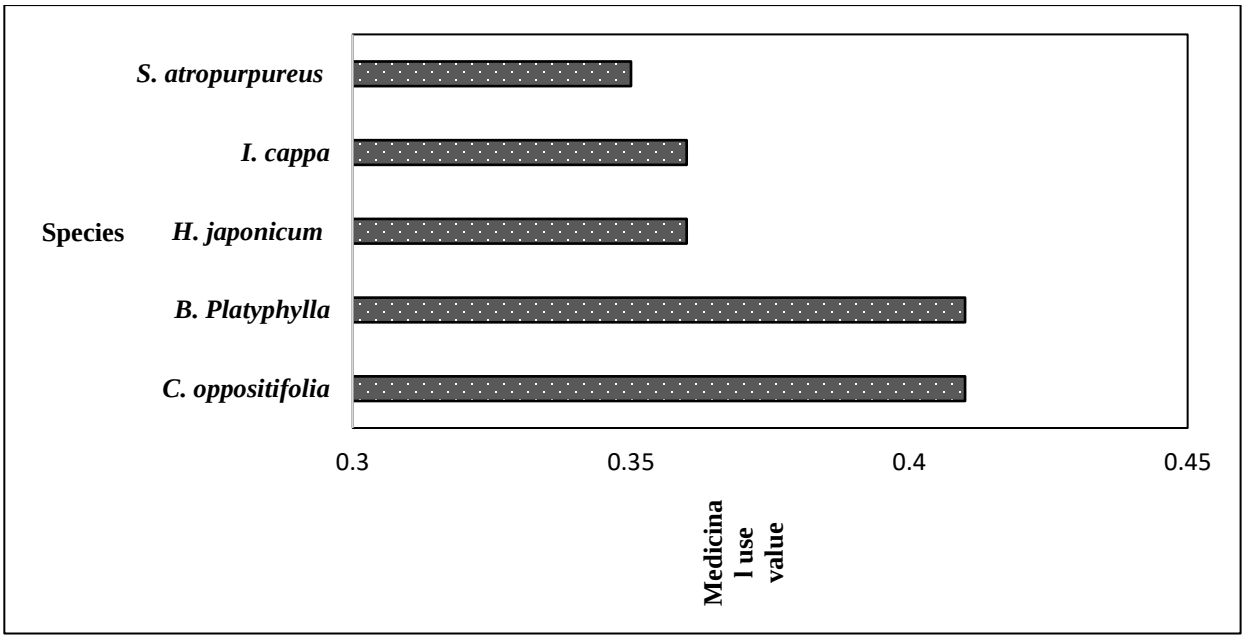

Figure 12: Medicinal use value of major five Shrub species

Likewise, the TUV of *Colebrookea oppositifolia* species were greater than *Viburnum erubescens,*

Strobilanthes atropurpureus Nees, *Rubus foliosus* , *Boehmeria platyphylla* respectively. (Fig:13)

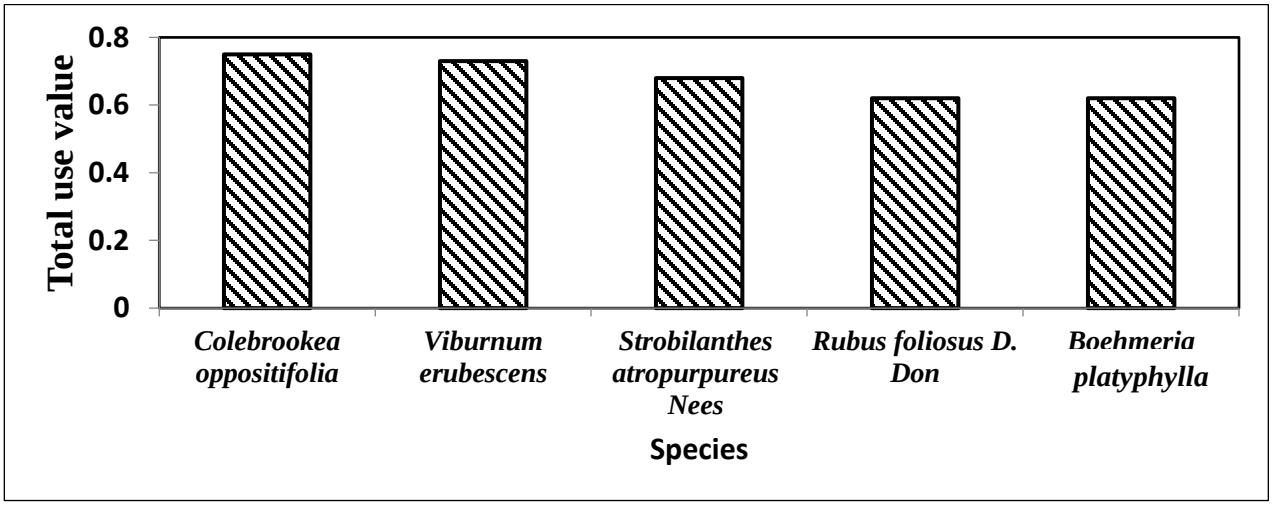

Figure 13: Total use value of major five shrub species

The herbs species ie. *Elephantopus scaber* were the most common species having high MUV.*Asparagus racemosus* were also the major herbs species having high MUV followed by species *Ageratina adenophora, Pogostemon benghalensis, Aeschyanthus parviflorus* respectively. (Fig:14)

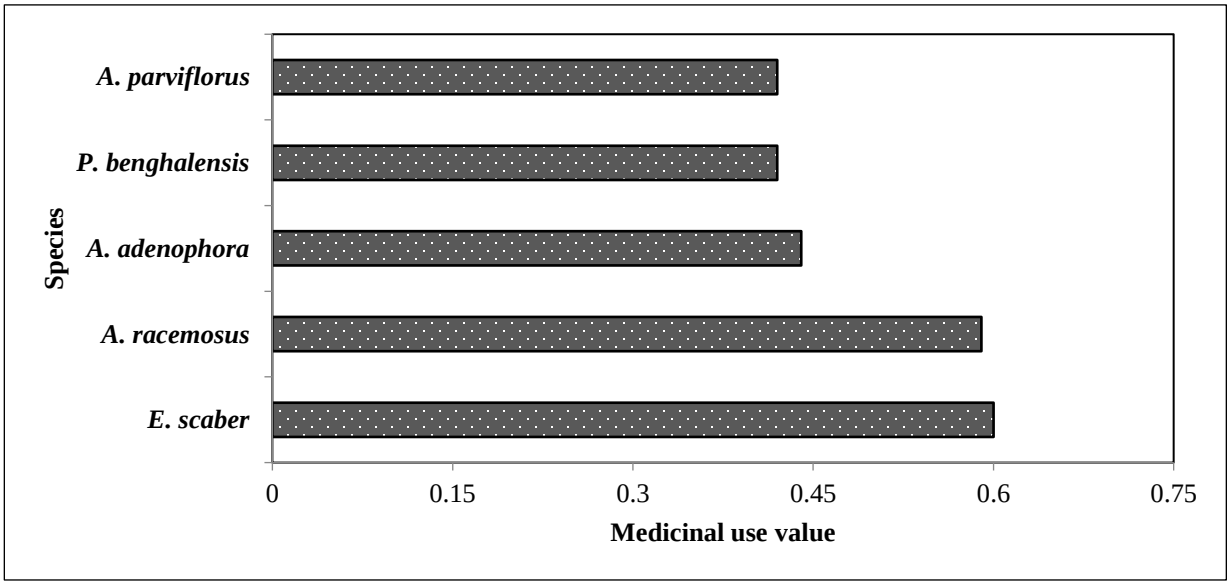

Figure 14: Medicinal use value of major five herb species

Similarly, *Achyranthes aspera* species had higher TUV followed by *Ageratina adenophora, Oxalis corniculata , Asparagus racemosus and Elephantopus scaber* respectively. (Fig:15)

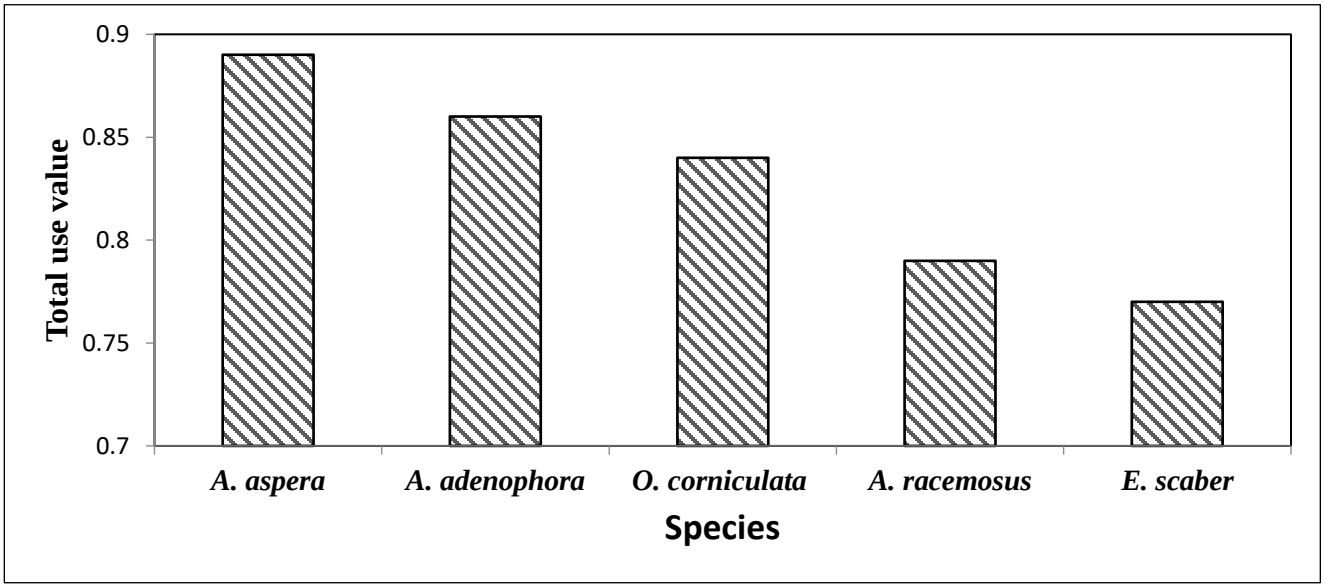

Figure 15: Total use value of major five herb species

4.6 Relationship between Use value and vegetation

4.6.1 Herb layer:

Correlation is a statistical measure that express the extent to which two variables are linearly related. It is a common tool for describing simple relationship without making a statement about cause and effect. While observing the use value and IVI of herb layer, a weak relation between IVI and use value of species was observed (figure:16) Similarly, the subsets of UV and IVI were also found weakly related. Both RD and RF showed negligible relation with use value.

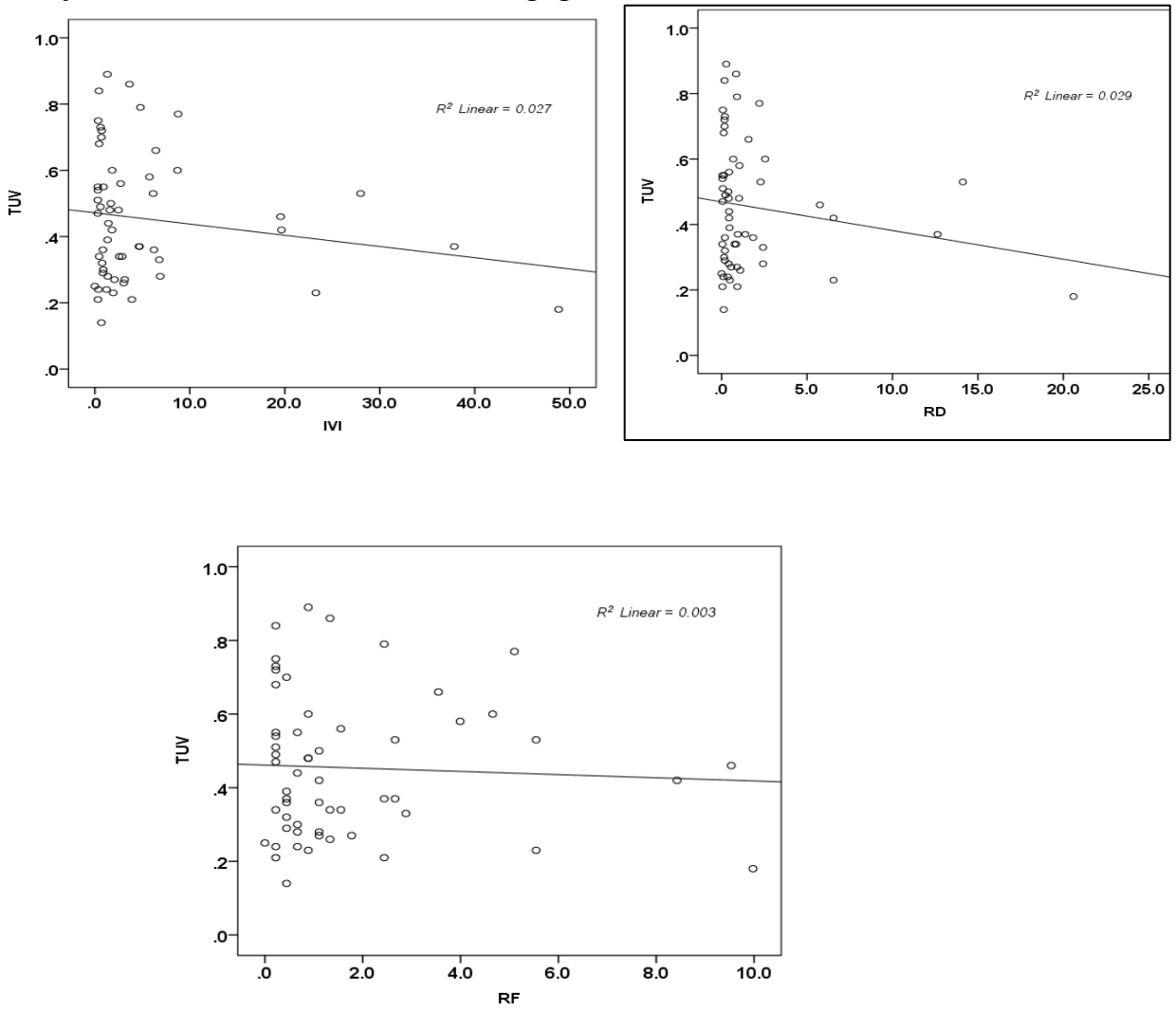

Figure16: Correlation of herb species between TUV and vegetation parameter

The ANOVA test showed that the IVI of herb species was statistically insignificant to UV (p>0.05) as shown in (Table 3)

Table 3: Significance test of IVI and Use value (UV) of herbs species

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.021	53	.038	1.903	.333
Within Groups	.060	3	.020		
Total	2.081	56			

*****ANOVA is significance at 0.05leve**l**

4.6.2 Shrub Layer:

Correlation is a statistical method used to assess a possible linear association between two continuous variables. It is simple both to calculate and to interpret. In our study site, there was a weak relation between IVI and use value of species within shrub layer. Similarly, the subsets of IVI that is RF and RD were also found weakly related. Both RD and RF showed negligible relation with use value. (Fig:17)

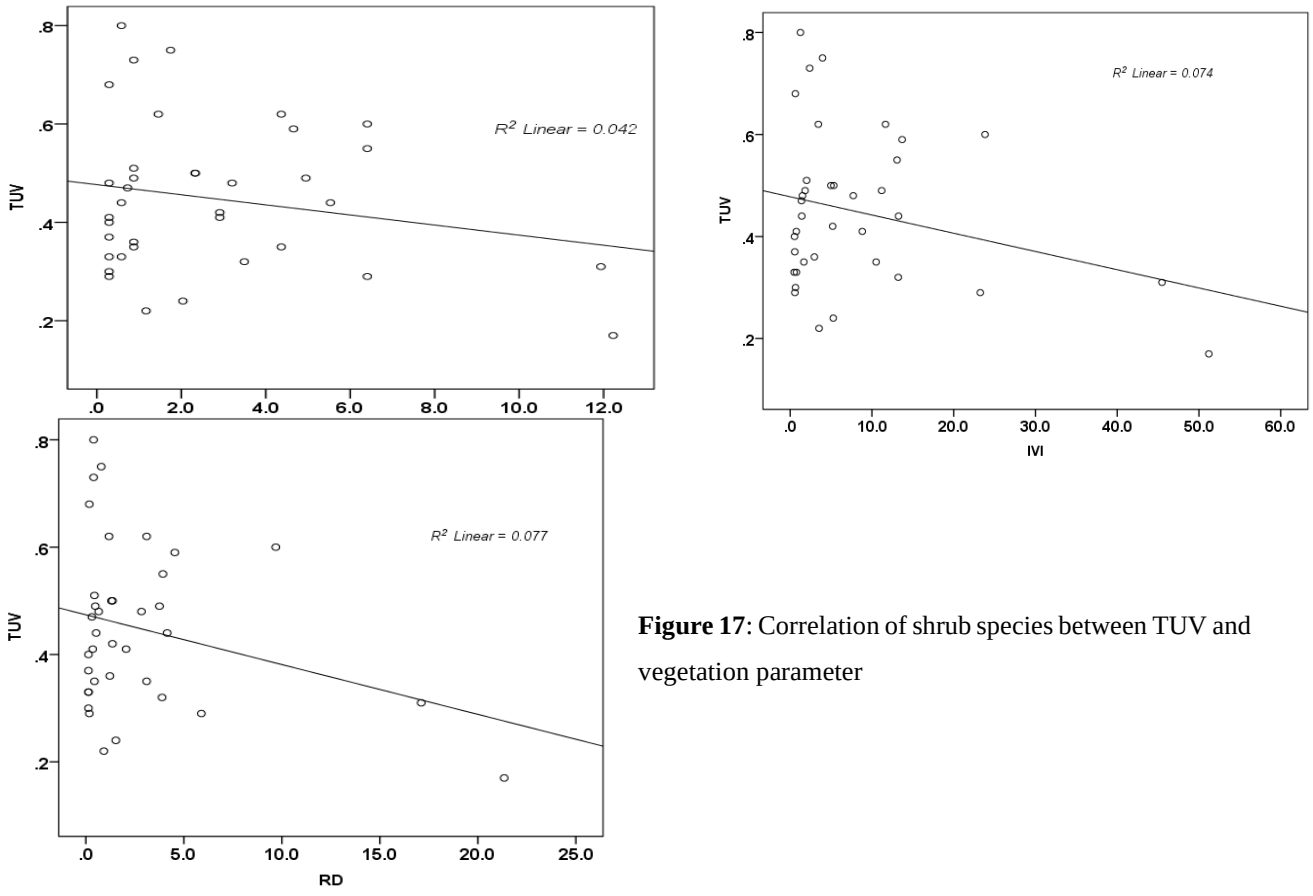

Figure 17: Correlation of shrub species between TUV and vegetation parameter

The One-way ANOVA test showed that the IVI of shrub species was statistically significant to UV (p>0.05) as shown in (Table:4)

Table 4: Significance test of IVI and Use value (UV) of shrub species

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.823	36	.023		0
Within Groups	0.000	0			
Total	.823	36			

*****ANOVA is significance at 0.05 level

4.6.3 Tree Layer:

Correlation is a method of assessing a possible two-way linear association between two continuous variables. It is a dimensionless quantity that takes a value in the range −1 to +1. While assessing the impact of use value on IVI of tree layer, a weak relation between IVI and use value of species was observed (figure:18). Similarly, individually RD and RF which contribute to IVI also showed negligible relation to use value.

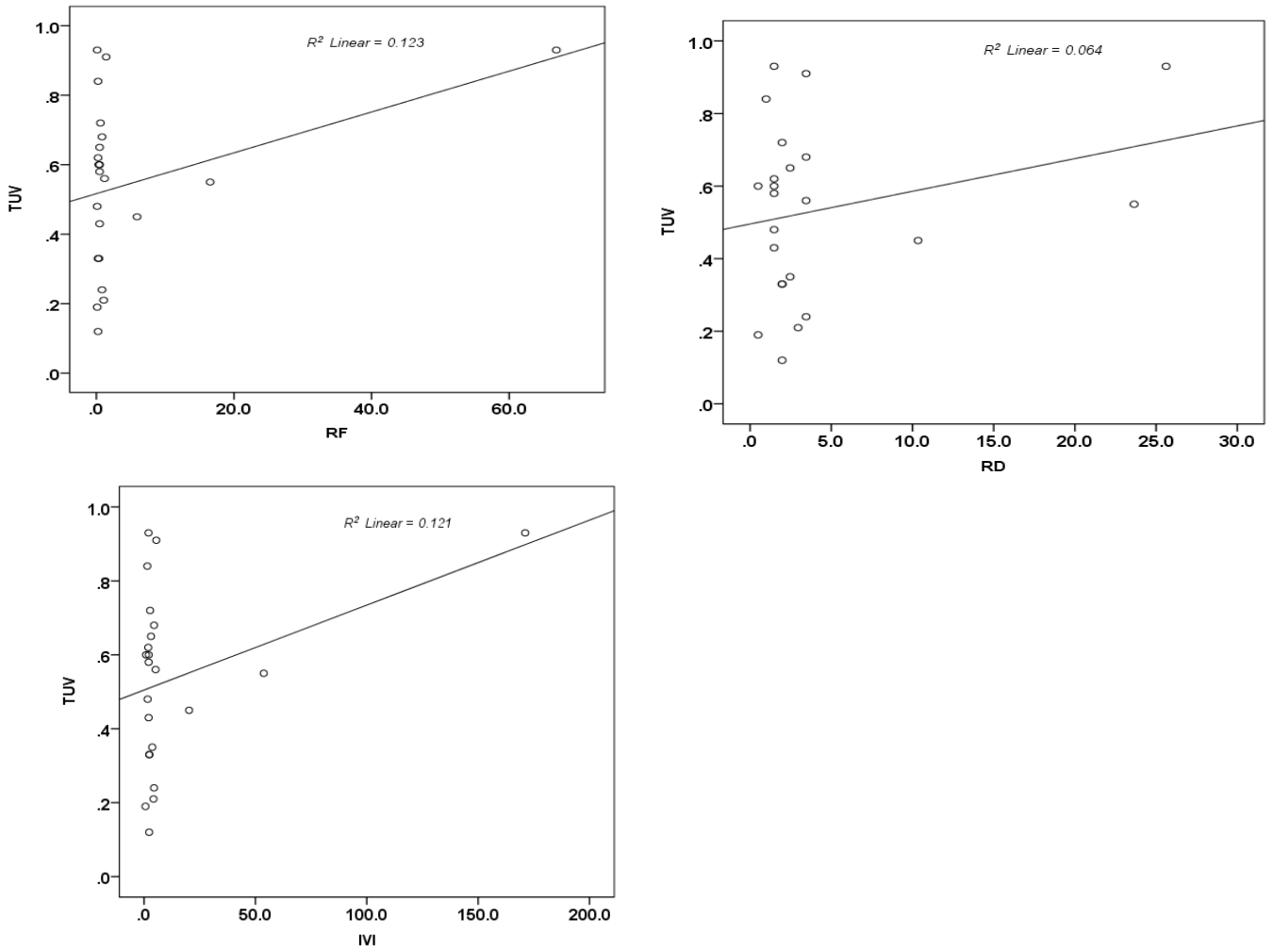

Figure 18: Correlation of tree species between TUV and vegetation parameter

One-way ANOVA was carried out to show the relation between the IVI of plant species and UV. The ANOVA test showed that the IVI of tree species was statistically significant to UV (p>0.05) (Table:5)

Table 5: Significance test of IVI and Use value (UV) of tree species

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.256	22	.057		0
Within Groups	0.000	0			
Total	1.256	22			

*****ANOVA is significance at 0.05 level

CHAPTER 5

DISCUSSION

5.1 Structure and Diversity of Plants

Out of the total area of Forest, 82.68% (4.93 million ha) lies outside Protected Areas and 17.32% (1.03 million ha) inside Protected Areas. Within the Protected Areas, Core Areas and Buffer Zone contain 0.79 and 0.24 million ha of Forest, respectively. Nepal occupies about 0.1 percent of the global area but harbors over three percent of the world's known flora. A total of 284 flowering plants are endemic to Nepal. The number of known species in Nepal is: 6,073 angiosperms; 26 gymnosperms; 534 pteridophytes; 1,150 bryophytes; 365 lichens; 1,822 fungi and 1,001 algae (GoN, 2014). Phytogeographically, Nepal is located in the Oriental Region (Polunin, 1964).

The study conducted in Bhanu Municipality, Tanahun district of Nepal, documented total of 116 plant species having 23 species (20%) of trees,37 species (32%) of shrubs and 56(48%) species herbs which implies that study area was highly diversified. The diverse vegetation in the study site indicates high ethnobotanical relations supported by the research conducted by (Uprety *et al*., 2010) in Tanahun region, found 221 different plant species, of which 80 were herbs, 68 were trees, 28 were shrubs, 19 were climbers, 18 were pteridophytes, 5 were lianas, and 3 were epiphytes out of which the majority of the 43% of the species were used as food, medicine, or timber. By the locals, making them valuable from ethnobotanical perspective. This proportion was comparable to studies on medicinal plants conducted in West Nepal (Kunwar *et al*., 2006) in Central Nepal (Shrestha and Dhillion, 2003), (Bhattarai and Tamang, 2017). In the community forest of Tanahun district, 73 NTFP were listed and their medicinal benefits were presented in the community forest user groups (Sedai, 2010). Among wide varieties of plant species, *Shorea robusta* was the dominant species in the study area with IVI 171.12 followed by *Schima wallichii* with IVI 53.74. Similar result was noted by (Oli and Subedi, 2015) as *Shorea robusta* was most common species in the study. This might be due to the similar altitudinal range of study area.

Similarly, herbs were the most common type of medicinal plants listed in this study (43%), followed by trees and shrubs (Uniyal *et al*., 1998). In the herb layer, *Capillipedium assimile, Dicranopteris linearis, Imperata cylindrical, Hedyotis auricularia* L., *Eragrostis* spp, *Lygodium japonicum, Elephantopus scaber, Smilax ovalifolia* were dominant species of the study site. The research conducted by (Pradhan *et al* ,2020) found the most common life form was a herb (41%), followed by trees (29%), shrubs (14%), climbers (9%), grasses (3%), epiphytes (1%), ferns (1%), and fungus (1%). Similar patterns were observed in other regions of Nepal (Bhattarai *et al*. 2010; Ghimire *et*

al. 2018; Kunwar *et al*. 2015; Rokaya *et al*. 2010; Uprety *et al*. 2010; Bhattarai, 2018). Due to their wide availability, herbs were commonly found plant varieties that were frequently used for medical purposes. (Shrestha and Dhillion 2003; Uprety *et al*. 2010a). This may be the reason that *Elephantopus scaber* in the study site were the most common species having high MUV followed by *Asparagus racemosus, Ageratina adenophora, Pogostemon benghalensis, Aeschyanthus parviflorus* respectively. However, *Capillipedium assimile, Dicranopteris linearis, Imperata cylindrical, Hedyotis auricularia* L., *Eragrostis* spp, *Lygodium japonicum,*were dominant species of herbs but had less MUV.

Among 37 species in shrub layer, *Clerodendrum inflatorium, Flemingia strobilifera, Inula cappa, Melastoma melabathricum, Hypericum cordifolium, Premna barbata, Phyllanthus sp, woodfordia fruticosa,Phyllanthus parvifolius* were dominant. As a dominant species, different members of the *Clerodendrum* genus have been reported to have ethnomedical value in a variety of indigenous medical systems and as folk remedies (Shrivastava and Patel, 2007).

5.2 Use Value and Vegetations

Use value (UV) is an index widely used to quantify the relative importance of useful plants. It combines the frequency with which a species is mentioned with the number of uses mentioned per species, and is often used to highlight prominent species of interest. As the study area is rich in biodiversity, indigenous medical systems and traditional knowledge, the distant forest areas were always prioritized for foraging wild and quality species (Manzardo, 1977). Cultural factors, traditional knowledge and intensive land use are the driving forces behind the uses of plants and their products for living (Kunwar *et al*., 2018b). The findings of study is similar to (Stepp and Moerman 2001; Rokaya *et al*., 2012 and Kunwar *et al*., 2016) which recorded the outstanding presence of herbaceous plants in medical ethnobotany. Because of declining interest and acceptance of traditional health care systems among younger generation, the knowledge-base is gradually eroding in younger generation. (Negi *et al*., 2017). TUV showed weak correlation association with IVI, neither the association was significant at level of subsets. However, the ANNOVA test suggested insignificant association between the UV and IVI in herb layer and significant association in shrub and tree layer. The study conducted in Caatinga forest, Brazil there were weak relations between IVI and plant UV (Albuquerque and Lucena, 2005). It is therefore reasonable to assume that if the use pressure is directed to the species of less IVI, then the resource scarcity and biodiversity conservation could be jeopardized. Thus, the study of plant use is always helpful in developing strategies for conservation of plants and forests (Sanchez-Azofeita *et al*., 2005). The

pattern of plant use may change depending on the use (categories) that informants attribute to each species in the region.

The weak association between MUV and phytosociological indices indicates that availability is not always the most important factor for determining the most popular medicinal plants in local knowledge systems. Among the subset of phytosociological index, abundance was significant and frequency was more important than basal area (dominance) for medicinal use (Lucena *et al*., 2007). Lawrence *et al*. (2005) stated that "the abundance of a species is only a crude reflection of its overall appearance, and measures of ecological dominance (such as basal area) might better indicate the impacts of plant appearance on human values". Weak association of MUV with phytosociological indices may be explained primarily by the direct harvesting and/or by the popularity of the particular uses of that species. *Elephanthopus scaber* is one of the top five useful species in the area, and is popular for its medicinal uses since people believe that its leaves are useful for curing seven ailments (cultural preoccupancy). Species popularity and usefulness are often related (Araujo *et al*., 2008), meaning that the knowledge of plant use is less influenced by availability of plants and more dependent on cultural preoccupancy and resource quality.

The people in Nepal's rural areas are very closely connected to their surrounding forest, which is essential for the supply of foodstuffs, energy, building materials and other useful goods. Medicinal plants have been recognized as a valuable and cheap source of unique phytoconstituents that are widely used in the development of medicines against various diseases. The traditional way of collecting and using plant resources from the wild has evolved into a culture, particularly in rural areas. The traditional system of medicine has been relied upon by a substantial number of the world's population, especially in emerging countries. The use of herbal medicinal products is popular due to their cheap and natural origin with higher safety margins, less or no side effects. *Terminalia chebula*, as a medicine to treat many of the diseases such as cough, fever, etc. which were preceded by Myrica esculenta in our study area, has been taken more widely than any other tree species. From the earliest period of civilization, a plant known as Tahbula is used to treat many diseases in the Unani System of Medicine (USM) (Akhtar and Husain, 2019). It has also been shown to be effective for the treatment of GI and Restoring Conditions (Peterson *et al.*, 2017). In clinical trials, it has been shown to be effective in treating asthma, sore throats, vomiting, hiccough, diarrhoea, dysentery, bleed piles, ulcers, gout, heart disease and bladder diseases (Bag *et al.*, 2013). Similar use of this species for burns and injuries was reported by (Manandhar 1989a, 1993a; Siwakoti and Varma, 1996; Siwakoti and Siwakoti, 1998) also reported its use in stomachache,

wounds, sores and burns similar to the present findings, but also reported its use for rheumatism, diarrhoea and dysentery and as carminative and purgative, not cited by the people in the study area. (Malla, 1994) reported its use for diarrhoea and dysentery, stomach ache, bone fracture, rheumatoid arthritis, etc, which supported the current results. In addition, like in earlier research (Gautam and Devkota, 1999; Poudyal, 2000; Webb and Sah, 2003), *Shorea robusta* was the most commonly used tree species with a high TUV (Gautam, 2001). *S. robusta* forest products in various categories, such as compost, fibre, fishing tools, fodder, food, farm implements, medicinal products and ornaments, as identified (Gautam, 2005). These products are made from different parts of the plants, such as roots, seeds, bark and leaves. There are differences in the use of products and preferences between ethnic groups and their availability. It may have a profound positive or negative impact on the harvesting of these products. In our study area, which has the highest MUV, *Colebrookea oppositifolia* and *Boehmeria platyphylla* had a large number of uses for therapeutic purposes. *C. oppositifolia* was considered as a powerful plant based medicinal product that is used to treat numerous diseases in the study conducted (Viswanatha, 2020). Various parts of the plant have been scientifcally validated for pharmacological activities such as antimicrobial, anti-convulsant, anti-stroke, anti-ulcer, anti-fertility, hepatoprotective, cardioprotective, wound healing, and anti-hypertensive activities (Ajaib *et al.*, 2018). Similarly, *B. platyphylla* was major medicinal plants in Yakkha community of Chanuwa VDC, Dhankuta Nepal (Subba, 2016) which is similar to our findings. *B. platyphylla's* root juice paste is used quickly to stop bleeding in minor cut and wounds. A decoction of the plant is given to livestock for diarrhea and dysentery. A paste of the root is used to treat cattle wounds and cuts (Choi *et al*., 2012). Shinwari and Malik (1989) concluded a field study of plant utilization of Northern Baluchistan. The common ethnobotanical uses of plants in Jatlan area, District Mirpur in Pakistan and suggested *Viburnum erubescens* as most commonly used shrub species for wide range of purpose (Shahzad and Qureshi, 2001) coincident to our findings. In herb species *Elephantopus scaber* and *Asparagus racemosus* were used extensively. *Elephanthopus scaber* has long been used by local people in Indonesia and in other countries and has also been traded as "tea" especially in China (Silalahi, 2021). Similar to what we found it was used as an antipyretic, cardiotonic, dysuria, diarrhea, dysentery, abdominal pain, diuretics, fever products, chest pain medicines, pneumonia, scabies and leukemia.However, high-UV species are often disproportionately cultivated species, with wild-collected plants ranking lower. There is evidence to suggest that the use of wild edible species has fallen out of favor in some cultures, due to a loss of traditional knowledge among younger generations and negative associations with

collecting wild plants in the older generation (as it can be reminiscent of past food insecurity; Hadjichambis *et al*., 2008; Quave and Pieroni 2015). Additionally, rapid development in areas inhabited by indigenous people is contributing to the loss of wild habitats and traditional knowledge of them; as viable ecosystems are being converted to agricultural land, many useful plants are removed and become more difficult to locate and therefore utilize (Ramirez, 2007). The secrecy of ethnomedicinal knowledge is a common practice (Giday *et al.*, 2009) and traditional healers hardly share their knowledge to outsiders with the belief that effectiveness would decrease if knowledge is reveled (Shrestha *et al.*, 2014). This secrecy was also reported from the Humla District of western Nepal (Rokaya *et al.*, 2010), Makwanpur District of central Nepal (Luitel *et al.*, 2014) and Ilam District of eastern Nepal (Bhattarai, 2017). One of the most important reasons for the depletion of traditional knowledge is the non-sharing attitude (Pradhan and Badola, 2008). A particular type of modernization, such as education, commercial activities, acculturation and so on, may contribute to the degradation of traditional knowledge (Quinlan and Quinlan, 2007). Greater use of modern medicine and the lack of successors of faith healers (Manandhar and Chaudhary, 1992), because they are easily influenced by the modernization (Bhattarai, 2017), further accelerate the depletion. The migration of rural and urban people further aggravates the process of knowledge loss. The depletion of plant resources may also be a cause, as there are more and more humans involved in the activities such as building roads, deforestations, fires, altered farming patterns etc. It is clear therefore that in the local community, language, culture and traditional practices are being destroyed. In turn, knowledge of ethnobotany is deteriorating. Moreover, if the written documentation is insufficient or unavailable, it will be dangerous for this knowledge (Rani *et al.*, 2017). Therefore, through documentation and dissemination, this work will contribute to the preservation of ethnobotanical knowledge of local communities as a means of communication between indigenous communities and the scientific community in order to preserve traditional knowledge (Subba *et al.*, 2016).

The few species were either highly preferred or have multiple uses in the study area. Some of the plant species fall in threat categories of IUCN (*Shorea robusta, Terminalia chebula*). Moreover, some threatened species are highly preferred over all the species such as *Shorea robusta* (UV=0.93), *Terminalia chebula* (0.84). In order to guarantee their sustainable availability, a priority should therefore be given to those species in the field of cultivation and continuous management as far as possible (Shrestha *et al.*, 2014). In addition, it will help alleviate the pressure on these species in their native environment and yield benefits for poor and deprived communities (Bhattarai, 2017).

In order to assure that these species can be made available for a longer period of time, the priority should thus be given to cultivation and sustainable management. This will lead to reduction of the pressures on these species in nature, as well as an economic benefit for disadvantaged communities (Bhattarai, 2017). In this area, it is also necessary to establish Participatory management, education and awareness programs that assist in optimizing the benefits of the medicinal products sector (Bhattarai and Khadka, 2016).

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Bhanu municipality represent a tropical and sub-tropical forest area with diverse and unique flora. The people of this area showed a large repertoire of knowledge that helps them determine different plant use strategies in conjunction with ecology, culture and geography. This knowledge is the result of the area's biodiversity, deep cultural importance of using local endemics and the compliance of using local resources in reference to the geo-ecological constraints.

The results of the current study showed that the study area is home to a wide variety of medicinal plant species and a wealth of ethno-medical knowledge. The bulk of the locals who have settled in this region have extensive understanding of how medicinal plants can be used for basic healthcare. The study identified 116 species of plants, were trees with Euphorbiaceae as a dominant family followed by Anacardiaceae and Theaceae, shrubs with Lamiaceae and Euphorbaceae as a dominant family followed by Fabaceae and Utricaceae and herbs with Asteraceae as dominant family followed by Poaceae and Lamiaceae. MUV of *Terminalia chebula* in trees, *Colebrookea oppositifolia* in shrub layer and *Elephantopus scaber* species in herb layer were frequently observed in the study.

In vegetation profile trees like *Shorea robusta, Schima wallichii, Castanopsis indica,* etc, shrubs like *Clerodendrum infortunatum, Flemingia strobilifera, Inula cappa* and herbs like *Capillipedium assimile, Dicranopteris linearis, Imperata cylindrical* were dominated species.

The present study reveals that some people of Bhanu municipality have immense knowledge regarding the use of medicinal plants and rely on them for treatment of various kinds of diseases. Many species used as medicine are under threatened due to more extensive use, overgrazing, habitat destruction, high preference or rare existence.

6.2 Recommendations

- The community's accessibility to national markets and the sustainable use of MP would both contribute to improving the socioeconomic circumstances in this underdeveloped region.
- Nurseries of some important MP should be established. Herbal Industries should be brought in contact with the local communities and it will provide the collectors better economic returns and thus better conservation environment to the flora.
- It may be possible to guarantee community mobilization and participation in conservation. It is important to support community-based organizations in fulfilling their mandate.

CHAPTER 7
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Appendices

Appendix-I: Eumeration and occurrence of plant species and their uses

S. N	Scientific Name	Local Name	Family	Parts Use	Habit	Diseases (uses)
1	*Abrus precatorius* L.	Ratigedi	Fabaceae	Leaves, root	S	Cold, cough, fever, wounds
2	*Achyranthes aspera* L.	Datiwan	Amaranthaceae	Shoot, root, flower,seeds	H	Asthma, cold, , cough, dog bite, snake bite, scorpion bite, dysentery, , headache, , pneumonia, skin diseases
3	*Adiantum philippense* L.	Kane sinki	Asteraceae	Whole plant	H	Wound healing, diabetes, anti-hair fall
4	*Aeschyanthus parviflorus* (D. Don) Spreng	Thirjo	Gesneriaceae	Whole plant	H	Increase fertility
5	*Ageratina adenophora* (Spreng.) King and H. Rob	Banmara	Asteraceae	Stem, leaves	H	Blood cogulating, antimicrobial, antifungal, skin disease
6	*Ageratum conyzoides* L.	Gandhe	Asteraceae	Stem, leaves	H	Dysentery, diarrhea
7	*Alstonia scholaris* (L). R. Br.	Chattiwan	Apocynaceae	Latex, leaves, bark	T	Chest pain, fever, intestinal worms, vomiting, skin diseases
8	*Amaranthus spinosus* L.	Ban lude	Amaranthaceae	Leaves	H	Appetizer, stomach problems
9	*Ampelocissus latifolia* (Roxb.) Planch.	Purini	Vitaceae	Leaves, bark, roots	S	Fractures, dysentery, dental problem
10	*Antidesma acidum* Retz.	Archal	Euphorbiaceae	Fruits and leaves	S	Anti-diabetic, appetizer, stomachache
11	*Artemisia vulgaris* L.	Titepati	Asteraceae	Whole plant	S	Antioxidant, antibacterial, and antifungal
12	*Arundinella nepalensis* Trin.	Kharuki	Poaceae	Rhizome	H	Cut, wound
13	*Asparagus racemosus* Willd.	Kurilo	Asparagaceae	Whole plant	H	Anti-inflammatory, antibacterial, reproductive agents.
14	*Barleria cristata* L.	Bhede kuro	Acanthaceae	Leaves, roots	H	Anemia, toothache, snake and insects bite
15	*Bauhinia variegate* L.	Koiralo	Fabaceae	Root, bark, flowers, stem bark	T	Roots for snake poison, flower for anticancer,skin disease
16	*Bidens pilosa* L.	Kalo kuro	Asteraceae	Leaves, young shoots	H	Hypertension, ulcers, diabetes
17	*Boehmeria spp* Buch.Ham. ex	Khasreto	Urticaceae	Root, leaves	S	· Antioxidant, weight loss, anticancer,

	D.Don					
18	*Boehmeria platyphylla* Buch.-Ham. ex D.Don	Gargaro	Urticaceae	Root, leaves	S	Antioxidant, weight loss, anticancer,
19	*Calopogonium mucunoides*	Gahate jhar	Leguminosae	Leaves	H	Bacterial infection, diarrhoea
20	*Calopogoniummucunoides* Desv. HERB	Gahatelahara	Fabaceae	Leaves	S	Anti- diarrheal and antibacterial
21	*Capillipedium assimile* (Steud.) A. Camus	Muse khari	Poaceae	Whole	H	Wounds
22	*Careya arborea* Roxb.	Kyamuna	Lecythidaceae	Fruit, seed, flower	T	Loose motions, ulcers, cough, cold
23	*Castanopsis indica* (Roxb. ex Lindl.) A.DC	Katus	Fagaceae	Leaves, bark, seed	T	Bark for chest pain,
24	*Ceiba pentandra* (L.) Gaertn.	Kutsimal	Malvaceae	Seeds, tender leaves, flower, wood ashes	T	Diabetes, headache
25	*Cheilanthes albomarginata* Clarke (CA)	Kaan sinki	Pteridaceae	Whole plant	H	Cuts, wounds, stomach disorder,ulcers
26	*Chromolaena odorata* (L.)	Seto banmara	Asteraceae	Stem, leaves	H	Wounds, burns, skin disease
27	*Chrysopogon aciculatus*(Retz.) Trin.	Kure ghans	Poaceae	Root seed	H	Snake bite, intestinal worm
28	*Cissampelos pareira* L.	Gujar gano	Menispermaceae	Root, seed	H	Fever, cough, diarrhoea
29	*Cleome viscose* L.	Ban tori	Cleomaceae	Leaves, seeds	H	Fever, blood disease
30	*Clerodendrum infortunatum* L.	Ghatu	Verbenaceae	Root, leaf	S	Antidandruff, headache, diarrhea
31	*Colebrookea oppositifolia* Sm.	Dhursul	Lamiaceae	Roots	S	Nose bleeds, bleeding, Epilepsy, fever, anti-fertility, wounds
32	*Conyza japonica* (Thunb.) Less.ex DC	Salaha jhar	Asteraceae	Flower, root	H	Dysentery,pneumonia, eye problems
33	*Costus speciosus* (J.König) C.Specht.	Betlauri	Costaceae	Rhizome, leaves	S	Wounds, Cuts, Snakebites, , Pimples, Diarrhea, Sore throats
34	*Crassocephalum crepidioides* (Benth.) S.Moore	Anikale jhar	Asteraceae		H	
35	*Crotalaria*	Chinchin	Fabaceae	Roots,	H	Hypertension

	prostrate Rottb. Ex Wild	e		leaves, and stem		
36	*Crotalaria retusa* L.	Chinchine	Fabaceae	Root, leaves	H	Fever, scabies
37	*Crotalaria spp*	Chinchine	Leguminosae	Leaves, branch,root	H	Eczema, wounds and cuts
38	*Cuscuta reflexa* Roxb.	Aakasbeli	Convolvulaceae	Stem	H	Fever, body pain, jaundice
39	*Cyperus rotundus*	Mothe	Cyperaceae	Root, leaves	H	Fever, scabies
40	*Desmodium spp*	Van gahate	Leguminosae	Leaves, stems	H	Digestive, anti-inflammatory
41	*Dicranopteris linearis* (Burm.f.) Underw.	Hade unyu	Gleicheniaceae	Young leaves, rhizome	H	Wound, fever
42	*Dioscorea bulbifera* L.	Gittha	Dioscoreaceae	Corms and tuber	H	Piles,cough, diabetes, sore throat
43	*Diplazium esculentum* (Retz.) Sw.	Nigro	Athyriaceae		H	Diabetes,smallpox, asthma diarrhea, dysentery, headache,fever, wounds, pain, bone fracture
44	*Diplazium multicaudatum* (Wall.) Sledge	Kuthurke	Athyriaceae	Rhizome, leaves	H	· Diabetes, smallpox, asthma, diarrhea,
45	*Drynaria propinqua* (Wall. ex Mett.) J.Sm. ex Bedd.	Unue	Polypodiaceae	Rhizome	H	Stomach ache, fever, coughs
46	*Elatostema sessile* . J. R. Forster and G. Forster	Gagleto	Urticaceae	Leaves	S	Abdominal disorder, blisters, pimples
47	*Elephantopus scaber* L.	Sasrabuti	Asteraceae	Whole plant	H	Antiswelling, headache, sikinrash,kidneystones,fever,
48	*Elsholtzia balanda* (Benth.) Benth	Ban silam	Lamiaceae	Fresh leaves	H	High bloods pressure
49	*Engelhardia spicata* Lechen ex Blume	Mauwa	Jugladaceae	Root, bark, leaves, flower	T	Flower for abdominal pain
50	*Eragrostis spp*	Charidana	Poaceae	Root	H	Skin disease
51	*Eurya acuminate* DC.	Jhigane	Theaceae	Leaves	T	Typhoid, diarrhea, sore throat
52	*Ficus semicordata* Buch .-Ham. ex Sm.	Khaneu	Moraceae	Bark, root, fruits, latex	T	Diarrhea, headache, fever, and gastric problems,
53	*Flemingia*	Bhatwasi	Leguminosa	Stem,	S	Analgesic, anti-inflammatory,

	strobilifera (L.) W.T.Aiton		e	Leaves, roots		epilepsy
54	*Fraxinus spp* L.	Timureghas	Oleaceae	Stem bark, root bark	S	Antioxidant, anti-inflammatory, wound healing, anifungal
55	*Garuga pinnata* Roxb.	Dabdabey	Burseraceae	Fruits	T	Antibacterial, antidiabetic
56	*Globba*	Devisaro	Zingiberaceae	Root, leaves	H	Cough, cold, snake bite
57	*Gonostegia hirta* (Hassk.) Miq.	Chiplelahari	Urticaceae	Root	H	Fever, urinary problem, swelling and wounds
58	*Hedyotis auricularia* L.	Majitejhar	Rubiazceae	Leaves and root	H	Dysentery and cholera ,lowering blood pressure
59	*Hypericum japonicum* Thumb.ex Murray	Kanikeghans	Hypericaceae	Whole plant	S	Bacterial diseases, hepatitis, gastrointestinal disorders, swellings,
60	*Hypericum cordifolium* L.	Arelli	Hypericaceae	Whole plant	S	Menstrual disorder, backache, dislocation of bone, fever, diarrhea
61	*Imperata cylindrica* var. indicaAndersson	Sirughas	Poaceae	Whole plants	H	Anti-bacterial, anti-inflammatory
62	*Inula cappa* (Buch.-Ham. ex D. Don) DC.	Gaitihare	Asteraceae	Root, bark	S	Bronchitis, asthma,diabetes, fever, hypertension
63	*Lagerstroemia parviflora* Roxb.	Botdhayero	Lythraceae	Leaves	T	Sugar, Hypertension, kidney and bladder problems
64	*Lidenbergia grandiflora* (Buch-Ham ex.D.Don)Benth.	Bhendiphool	Orobanchaceae	Leaf, shoot	H	Bronchitis, skin diseases
65	*Lindenbergia indica* (Linn.) Kuntze	Baghmukheghas	Scrophulariaceae	Stem, leaves, root	H	Skin eruption, bronchitis
66	*Lygodium japonicum* (Thumb.) Sn.	Nagbeli	Lygodiacea e	Whole plant	H	Kidney stone, dysentery, cold
67	*Lyonia ovalifolia* (Wall.) Drude	Angari	Ericaceae	Twigs and leaves	T	Analgesic, anti-inflammatory, antimicrobial, antioxidant, anti-cancer
68	*Macaranga indica* Wight	Malata	Euphorbiaceae	Leaves	S	Stomach-ache, dysentery, cough and fever, wounds
69	*Magnifera indica* L.	Aanp	Anacardiaceae	Fruit, pulp, leaves, flowers, and bark	T	Bark is use for cough, hypertension, toothache,diarrhea
70	*Mallotus*	Sindure	Euphorbiac	Leaves,	T	Antifungal, anti-diabetic

	philippensis (Lam.) Müll.Arg. ·		eae	roots		
71	*Melastoma melabathricum* (L.)	Angeri	Melastomaceae	Whole plant	S	Dysentery, indigestion, l, stomachache, piles
72	*Mesea chisia* Buch.-Ham. ex D. Don	Bilaune	Myrsinaceae/ Primulaceae	Roots, bark, branches, and leaves	S	Fevers, cough and ulcers
73	*Mussaenda macrophylla* Wall.	Dhobini	Rubiaceae	Leaves	S	Cancer, fever, cough, ulcer and dysentery
74	*Myrica esculenta* Buch.-Ham. exD.Don.	Kafal	Myricaceae	Bark, fruits	T	Asthma, cough, ulcers, teethache, overbleeding
75	*Nephrolepis auriculata* L.	Pani amilo	Oleandraceae	Rhizome, leaves	H	Fever,cough, headache, unconsciousness,
76	*Ocimum gratissimum* L.	Ban tulsi	Lamiaceae	Seed, root, leaves	S	Fever, cold, diarrhea, headache
77	*Osbeckia nepalensis* L.	Chulesi	Melastomaceae	Roots	S	Asthma, fever, diabetes
78	*Oxalis corniculata* L.	Chari amilo	Oxalidaceae	Flowers, leaves	H	Scurvy, fever, inflammation
79	*Periploca calophylla* (Wight) Falc	Sikari lahara	Apocynaceae	Whole plant	H	Anti-inflammatory, wound healing
80	*Phyllanthu ssp* L.	Syaphune	Euphorbiaceae	Whole plant parts	S	Gastropathy, diarrhoea, dysentery, fevers, scabies, wounds
81	*Phyllanthus emblica* L.	Amala	Euphorbiaceae	Bark, seed, flower, fruit	T	Digestion, treat constipation, reduce fever and cough,cold
82	*Phyllanthus parvifolius* Buch - Ham ex. DD	Kadawala	Euphorbiaceae	Whole plant	S	Treat kidney complaints, stomachache, colds, skin diseases, fever, jaundice;
83	*Plantago erosa* ex Roxb	Isabagol	Plantaginaceae	Leaves	H	Wound, cut, insect bite
84	*Pogostemon benghalensis* (Burm.f.) Kuntze	Rudilo	Lamiaceae	Stem, leaves, root	H	Headache, fever
85	*Premna barbata* Wall. ex Schauer	Gineri	Lamiaceae	Bark, leaves	S	Joint pain, throat infection
86	*Rabdosia ternifolia* (D.Don) H. Hara	Charpatey	Lamiaceae	Leaves and stem	H	Fever, swelling, cold
87	*Rubus ellipticus* Sm.	Aiselu	Rosaceae	Stem, leaves, root	S	Stomach pain headaches, fruits for indigestion
88	*Rubus foliosus* D.	Kalo	Rosaceae	Bark,	S	Dysentery, diarrhea, whopping

	Don	aainselu		roots, fruit		cough, colitis, toothache,
89	*Rungia spp*	Khorsenj	Acanthaceae	Whole plant	H	Cough, fever
90	*Sapium insigne* Royle	Khirro	Euphorbiaceae	Latex, leaves,	T	Treating wounds, snake bites, eczema, schistosomiasis
91	*Schima wallichii*	Chilaune	Theaceae	Barks	T	Fever,Head lice, Bark juice for flukes remmoovel from lever
92	*Scutellaria discolor* Colebr.	Ratapatey	Lamiaceae	Leaves, root	H	Epilepsy,cramp, cough fever
93	*Selaginella denticulate* L.		Selaginellaceae	Whole plant	H	Dibetes, cancer, antibacterial
94	*Semecarpus anacardium* Linn.	Kagbhalayo	Anacardiaceae	Fruits, gum, pericarp	T	Antiinflammatory,, antimicrobial, dysentery, fever, asthma
95	*Shorea robusta*	Sal	Dipterocarpaceae	Leaves and Bark	T	Piles,wounds,menopausal,seminalweekness
96	*Smilax ovalifolia* Roxb.	Kukurdaino	Liliaceae	Stem, leaves, root	H	Jaundice, skin problems, toothache, stomach pain
97	*Solanum surattense* L.	Kantakari	Solanaceae	Roots, fruit, leaves	S	Cough, chest pain, vomiting, hair fall, scabies, skin diseases
98	*Stephania glandulifera Cissampelos parera*	Batulopatey	Menispermaceae	Root	H	Antidiarrhoeal, antibacterial, asthma, tuberculosis,
99	*Strobilanthes atropurpureus* Nees	Kibbu	Acanthaceae	Leaf, root	S	Urinal problems, jaundice, inflammation, blood sugar
100	*Syzygium cumini* (L.)	Jamuna	Myrtaceae	Fruits	T	Asthma, thirst, dysentery, ulcers, diabetes
101	*Tectaria Crodonta* (Wall. Ex J. Sm.) C. Chr.	Kaloneuro	Tectariaceae	Young leaf	H	Gastric and stomach pain
102	*Tephrosia purpurea* L.	Sakinu	Fabaceae	Whole plant	S	Jaundice, kidney disorder
103	*Terminalia chebula* Retz.	Harro	Combretaceae	Fruits, gum, pericarp	T	Cough, cold, diabetes, fever
104	*Themeda triandra* (Forssk.)	Kharghas	Poaceae	Root	H	Dysmenorrhoea (painful periods)
105	*Thespesia lampas* (Cav.) Dalzell.	Ban kapas	Malvaceae	Roots, fruits	S	Sexual disease, antifungal, jaundice
106	*Thysanolaena maxima* (Roxb. ex Hornem.) Honda	Amriso	Poaceae	Root, young leaf, flower	S	Tuberculosis, antibacterial, stomach problems
107	*Trichilia connaroides*	Akhataruwa	Meliaceae	Flowers, leaves	T	Arthritis, tonsillitis, anti-inflammatory

	(Wight andArn.)					
108	*Tridax procumbens* L.	Husure jhar	Asteraceae	Leaves	H	Diarrhea, dysentery
109	*Triumfetta pilosa* Roth.	Jhinjhitika	Tiliaceae	Leaves	H	Diabetes
110	*Urena lobata* L.	Bhere jhar	Malvaceae	Root, leaves	H	Nausea, diabetes,
111	*Viburnum erubescens* Wall. ex DC.	Assare	Viburnaceae	Roots	S	Cough
112	*Viscum articulatum* Burm.f	Hardchur	Santalaceae	Leaves, stem	S	Factures, fever, epilepsy,
113	*Vitex negundo* L.	Simali	Lamiaceae	Leaves	S	Diabetes, hemorrhoids, coughs, burns, joint pains
114	*Woodfordia fruticosa* (L.) Kurz	Dhayero	Lythraceae	Stem, leaves, root	S	Bleeding, wounds, ulsers
115	*Xeromphis spinosa* (Thunb.) Keay	Mainkada	Rubiacerae	Bark	T	Burn, allergens
116	*Zizyphus mauritiana* Lam.	Hade bayer	Rhamnaceae	Roots, bark, fruits, leaves	S	Tuberculosis, small poxdysentary asthma, fever

H=Herb, S=Shrub, T=Tree

Appendix-II: Family with number of genera and species.

S.N	Family	No.of Species
1	Acanthaceae	3
2	Amaranthaceae	1
3	Anacardiaceae	2
4	Apocynaceae	2
5	Asparagaceae	1
6	Asteraceae	11
7	Burseraceae	1
8	Cleomaceae	1
9	Combretaceae	1
10	Convolvulaceae	2

11	Costaceae	1
12	Cyperaceae	1
13	Dioscoreaceae	1
14	Dipterocarpaceae	1
15	Ericaceae	1
16	Euphorbiaceae	7
17	Fabaceae	6
18	Fagaceae	1
19	Gesneriaceae	1
20	Gleicheniaceae	1
21	Hypericaceae	2
22	Jugladaceae	1
23	Lamiaceae	8
24	Lecythidaceae	1
25	Leguminosae	4
26	Liliaceae	1
27	Lygodiaceae	1
28	Lythraceae	2
29	Malvaceae	3
30	Melastomaceae	2
31	Meliaceae	1
32	Menispermaceae	2
33	Moraceae	1
34	Myricaceae	1
35	Myrsinaceae/ Primulaceae	1
36	Myrtaceae	1
37	Oleaceae	1
38	Oleandraceae	1
39	Orobanchaceae	1
40	Oxalidaceae	1
41	Plantaginaceae	1

42	Poaceae	7
43	Polypodiaceae	1
44	Pteridaceae	1
45	Rhamnaceae	1
46	Rosaceae	2
47	Rubiaceae	3
48	Santalaceae	1
49	Scrophulariaceae	1
50	Selaginellaceae	1
51	Solanaceae	1
52	Tectariaceae	1
53	Theaceae	2
54	Tiliaceae	1
55	Urticaceae	4
56	Verbenaceae	1
57	Viburnaceae	1
58	Vitaceae	1
59	Zingiberaceae	1

Appendix III: Vegetation Analysis of Medicinal Plants

Hrebs:

S. N	ScientificName	Local Name	F	RF	C	RC	D	RD	IVI
1	*Achyranthes aspera*	Datiwan	6.667	0.887	4.50	0.164	0.183	0.267	1.317
2	*Adiantum philippense* L.	Kane sinki	3.333	0.443	2.00	0.073	0.117	0.170	0.686
3	*Aeschyanthus parviflorus*	Thirjo	1.667	0.222	5.00	0.182	0.133	0.194	0.597
4	*Ageratin aadenophora*	Banmara	10.000	1.330	40.50	1.472	0.583	0.849	3.651
5	*Ageratum conyzoides*	Gandhe	8.333	1.109	5.00	0.182	0.267	0.388	1.678
6	*Amaranthus spinosus* L.	Ban lude	8.333	1.109	7.20	0.262	0.300	0.437	1.807
7	*Arundinella nepalensis*	Kharuki	3.333	0.443	91.00	3.307	0.650	0.946	4.696
8	*Asparagus racemosus*	Kurilo	18.333	2.439	40.20	1.461	0.617	0.897	4.797
9	*Barleria cristata* L.	Bhede kuro	13.333	1.774	13.00	0.472	0.617	0.897	3.144
10	*Bidens pilosa*	Kalo kuro	1.667	0.222	1.00	0.036	0.033	0.049	0.307
11	*Calopogonium mucunoides*	Gahate jhar	5.000	0.665	1.90	0.069	0.100	0.146	0.880
12	*Capillipedium assimile*	Muse khari	75.000	9.978	502.50	18.259	14.150	20.594	48.831
13	*Cheilanthes albomarginata*	Kaan sinki	21.667	2.883	40.70	1.479	1.667	2.426	6.787
14	*Chromolaena odorata*	Seto banmara	5.000	0.665	2.70	0.098	0.100	0.146	0.909

15	*Chrysopogon aciculatus*	Kure ghans	8.333	1.109	92.00	3.343	1.667	2.426	6.877
16	*Cissampelos pareira*	Gujar gano	6.667	0.887	16.00	0.581	0.700	1.019	2.487
17	*Cleome viscosa*	Ban tori	6.667	0.887	7.00	0.254	0.467	0.679	1.820
18	*Conyza japonica*	Salaha jhar	11.667	1.552	20.00	0.727	0.300	0.437	2.715
19	*Crassocephalum crepidioides*	Anikale jhar	1.667	0.222	1.00	0.036	0.033	0.049	0.307
20	*Crotalaria prostrata* Rottb. Ex Wild	Chinchin e	20.000	2.661	33.00	1.199	1.567	2.280	6.140
21	*Crotalaria retusa*	Chinchine	5.000	0.665	5.50	0.200	0.250	0.364	1.229
22	*Crotalaria* spp	Chinchine	18.333	2.439	23.00	0.836	0.950	1.383	4.657
23	*Cuscuta reflexa*	Aakasbeli	5.000	0.665	9.00	0.327	0.300	0.437	1.429
24	*Cyperus rotundus*	Mothe	1.667	0.222	1.50	0.055	0.067	0.097	0.373
25	*Desmodium* spp	Van gahate	5.000	0.665	7.70	0.280	0.283	0.412	1.357
26	*Dicranopteris linearis*	Hade unyu	20.000	2.661	620.50	22.547	8.683	12.638	37.846
27	*Dioscorea bulbifera*	Gittha	26.667	3.548	35.70	1.297	1.083	1.577	6.422
28	*Diplazium esculentum*	Nigro	1.667	0.222	1.50	0.055	0.050	0.073	0.349
29	*Diplazium* spp	Kuthurk e	10.000	1.330	19.00	0.690	0.583	0.849	2.870
30	*Drynaria propinqua (*.ex Mett.) J.Sm. ex Bedd.	Unue	8.333	1.109	90.00	3.270	1.267	1.843	6.223

31	*Elephantopus scaber*	Sasrabuti	38.333	5.100	40.20	1.461	1.517	2.207	8.768
32	*Elsholtzia balanda*	Ban silam	1.667	0.222	1.50	0.055	0.033	0.049	0.325
33	*Eragrostis spp*	Charidana	63.333	8.426	128.50	4.669	4.500	6.549	19.644
34	*Globba*	Devisaro	1.667	0.222	1.50	0.055	0.033	0.049	0.325
35	*Gonostegia hirta*	Chiple lahari	6.667	0.887	7.50	0.273	0.283	0.412	1.572
36	*Hedyotis auricularia* L.	Majite jhar	41.667	5.543	307.50	11.174	4.500	6.549	23.266
37	*Imperata cylindrica*	Siru ghas	41.667	5.543	229.00	8.321	9.700	14.117	27.982
38	*Lidenbergia grandiflora* (Buch-Ham ex.D.Don)Benth.	Bhendiphool	3.333	0.443	12.00	0.436	0.317	0.461	1.340
39	*Lindenbergia indica*	Bagh mukhe ghas	3.333	0.443	3.50	0.127	0.133	0.194	0.765
40	*Lygodium japonicum*	Nagbeli	71.667	9.534	117.50	4.270	3.950	5.749	19.553
41	*Nephrolepis auriculata*	Pani amilo	1.667	0.222	9.00	0.327	0.117	0.170	0.719
42	*Oxalis corniculata*	Chari amilo	1.667	0.222	1.00	0.036	0.117	0.170	0.428
43	*Periploca calophylla*	Sikari lahara	3.333	0.443	6.00	0.218	0.133	0.194	0.856
44	*Plantago erosa*	Isabagol	1.667	0.222	0.50	0.018	0.050	0.073	0.313
45	*Pogostemon benghalensis*	Rudilo	1.667	0.222	3.00	0.109	0.083	0.121	0.452
46	*Rabdosi*	Charpate	3.333	0.443	3.50	0.127	0.083	0.121	0.692

	aternifolia (D.Don) H. Hara	y							
47	*Rungia* spp.	Khorsenj	10.000	1.330	17.00	0.618	0.750	1.092	3.040
48	*Scutellaria discolor* Colebr.	Ratapate y	3.333	0.443	6.00	0.218	0.133	0.194	0.856
49	*Selaginella denticulata*		1.667	0.222	4.00	0.145	0.150	0.218	0.585
50	*Smilax ovalifolia*	Kukurdaino	35.000	4.656	41.30	1.501	1.750	2.547	8.704
51	*Stephania glandulifera*	Batulopa tey	30.000	3.991	19.70	0.716	0.717	1.043	5.750
52	*Tectariam acrodonta*	Kalo neuro	6.667	0.887	15.50	0.563	0.333	0.485	1.935
53	*Themda triandra*	Khar ghas	1.667	0.222	5.00	0.182	0.033	0.049	0.452
54	*Tridax procumbens* L.	Husure jhar	11.667	1.552	7.30	0.265	0.517	0.752	2.569
55	*Triumfetta pilosa*	Jhinjhiti ka	8.333	1.109	11.00	0.400	0.383	0.558	2.066
56	*Urena lobata*	Bhere jhar	18.333	2.439	14.70	0.534	0.633	0.922	3.895

F=Frequency, RF=Relative frequency, D=Density, RD=Relative density, C=Coverage, RC=Relative Coverage, IVI=Importance Value Index

Shrubs:

S.N	ScientificName	Local Name	F	RF	C	RC	D	RD	IVI
1	*Abrus precatorius* L.	Ratigedi	5.000	0.873	15.50	0.866	0.019	1.222	2.962
2	*Ampelocissus latifolia*	Purini	25.000	4.367	54.50	3.046	0.047	3.099	10.512
3	*Antidesma acidum*	Archal	13.333	2.329	29.50	1.649	0.021	1.353	5.331
4	*Artemisia vulgaris*	Titepati	3.333	0.582	5.50	0.307	0.008	0.524	1.413
5	*Boehmeria platyphylla*	Gargaro	25.000	4.367	75.00	4.192	0.047	3.099	11.658
6	*Boehmeria sps*	Khasreto	1.667	0.291	2.50	0.140	0.002	0.131	0.562
7	*Calopogonium mucunoides*	Gahatelahara	1.667	0.291	4.00	0.224	0.002	0.131	0.646
8	*Clerodendrum infortunatum*	Ghatu	70.000	12.227	315.50	17.636	0.326	21.345	51.207
9	*Colebrookea oppositifolia*	Dhursul	10.000	1.747	25.50	1.425	0.012	0.786	3.958
10	*Costus speciosus*		1.667	0.291	2.00	0.112	0.002	0.131	0.534
11	*Elatostema sessile*	Gagleto	11.667	2.038	30.50	1.705	0.023	1.528	5.270
12	*Flemingia strobilifera*	Bhatwasi	68.333	11.936	294.00	16.434	0.261	17.111	45.481
13	*Fraxinus spp.*	Timureghas	6.667	1.164	26.00	1.453	0.014	0.917	3.534
14	*Hypericum cordifolium*	Arelli	26.667	4.658	80.50	4.500	0.069	4.540	13.697

15	*Hypericum japonicum* Thumb.	Kanike ghans	3.333	0.582	5.00	0.279	0.006	0.393	1.255
16	*Inula cappa*	Gaitihare	36.667	6.405	138.50	7.742	0.148	9.690	23.837
17	*Macaranga spp.*	Malata	5.000	0.873	6.50	0.363	0.007	0.437	1.673
18	*Melastoma melabathricum*	Angeri	36.667	6.405	196.00	10.956	0.090	5.893	23.253
19	*Meseachisia*	Bilaune	4.167	0.728	6.30	0.352	0.005	0.306	1.386
20	*Mussaenda macrophylla*	Dhobini	1.667	0.291	1.00	0.056	0.002	0.131	0.478
21	*Ocimum gratissimum*	Ban tulsi	18.333	3.202	30.00	1.677	0.043	2.837	7.716
22	*Osbeckia nepalensis*	Chulesi	16.667	2.911	16.70	0.933	0.021	1.353	5.198
23	*Phyllanthu* spp	Syaphune	20.000	3.493	104.50	5.841	0.059	3.885	13.220
24	*Phyllanthus parvifolius* Buch - Ham ex. DD	Kadawala	28.333	4.949	44.50	2.487	0.057	3.754	11.190
25	*Premna barbata*	Gineri	31.667	5.531	64.00	3.577	0.063	4.147	13.255
26	*Rubus ellipticus*	Aiselu	13.333	2.329	24.00	1.342	0.020	1.310	4.980
27	*Rubus foliosus* D. Don	Kalo aainselu	8.333	1.456	14.50	0.811	0.018	1.179	3.445
28	*Solanum surattense*	Kantakari	3.333	0.582	1.00	0.056	0.002	0.131	0.769
29	*Strobilanthes* spp.	Kibbu	1.667	0.291	3.00	0.168	0.003	0.175	0.633

30	*Tephrosia purpurea*	Sakinu	1.667	0.291	2.00	0.112	0.005	0.349	0.752
31	*Thespesia lampas*	Ban kapas	1.667	0.291	10.00	0.559	0.010	0.655	1.505
32	*Thysanolaena maxima*	Amriso	5.000	0.873	8.50	0.475	0.007	0.480	1.829
33	*Viburnum erubescens*	Assare	5.000	0.873	20.00	1.118	0.006	0.393	2.384
34	*Viscum articulatum*	Hardchur	1.667	0.291	2.00	0.112	0.003	0.175	0.578
35	*Vitex negundo*	Simali	16.667	2.911	69.00	3.857	0.031	2.052	8.820
36	*Woodfordia fruticosa*	Dhayero	36.667	6.405	49.00	2.739	0.060	3.929	13.072
37	*Zizyphus mauritiana* Lam.	Hade bayer	5.000	0.873	12.50	0.699	0.007	0.437	2.009

F=Frequency, RF=Relative frequency, D=Density, RD=Relative density, C=Coverage, RC=Relative Coverage, IVI=Importance Value Index

Trees:

S.N	**ScientificName**	**Local Name**	**F**	**RF**	**D**	**RD**	**BA**	**RBA**	**IVI**
1	*Alstonia scholaris*	Chattiwan	8.333	2.463	0.001	0.945	0.108	0.274	3.682
2	*Bauhinia variegate*	Koiralo	5.000	1.478	0.000	0.118	0.008	0.020	1.616
3	*Careya arborea*	Kyamuna	11.667	3.448	0.001	0.827	0.084	0.212	4.487
4	*Castanopsis indica* (Roxb)	Katus	35.000	10.345	0.008	5.906	1.570	3.965	20.216
5	*Ceiba pentandra*	Kutsimal	5.000	1.478	0.000	0.236	0.057	0.144	1.858
6	*Engelhardia*	Mauwa	6.667	1.970	0.000	0.236	0.034	0.086	2.293

	spicata								
7	*Eurya acuminate*	Jhigane	10.000	2.956	0.002	1.063	0.092	0.233	4.251
8	*Ficus semicordata*	Khaneu	6.667	1.970	0.001	0.591	0.050	0.128	2.689
9	*Garuga pinnata*	Dabdabey	8.333	2.463	0.001	0.472	0.071	0.180	3.115
10	*Lagerstroemia parviflora* (Roxb.)	Bot dhayaro	11.667	3.448	0.002	1.181	0.225	0.568	5.198
11	*Lyonia ovalifolia*		1.667	0.493	0.000	0.118	0.010	0.024	0.635
12	*Magnifera indica*	Aanp	5.000	1.478	0.000	0.118	0.152	0.384	1.980
13	*Mallatus philippensis*	Sindhure	5.000	1.478	0.001	0.472	0.039	0.098	2.048
14	*Myrica esculenta* Buch.-Ham. ex D. Don	Kafal	11.667	3.448	0.002	1.417	0.250	0.632	5.498
15	*Phyllanthus emblica* L.	Amala	5.000	1.478	0.001	0.472	0.057	0.144	2.094
16	*Sapium insigne* (Royle) Benth and Hook.	Khirro	6.667	1.970	0.000	0.236	0.026	0.065	2.271
17	*Schima wallichii*	Chilaune	80.000	23.646	0.023	16.536	5.368	13.559	53.740
18	*Semecarpus anacardium* Linn.	Bhalayo	11.667	3.448	0.001	0.827	0.073	0.185	4.460
19	*Shorea robusta*	Sal	86.667	25.616	0.094	66.851	31.139	78.655	171.122
20	*Syzygium cumini* (L.)	Jamuna	5.000	1.478	0.001	0.472	0.039	0.099	2.049
21	*Terminalia chebula* Retz.	Harro	3.333	0.985	0.000	0.236	0.097	0.246	1.468

22	*Trichilia connaroides*	Aakhataruwa	1.667	0.493	0.001	0.354	0.008	0.020	0.867
23	*Xeromphis spinosa*	Mainkada	6.667	1.970	0.001	0.354	0.032	0.081	2.406

F=Frequency, RF=Relative frequency, D=Density, RD=Relative density, C=Coverage, RC=Relative Coverage, IVI=Importance Value Index

Appendix-IV

Table showing Use Value and use categories

Herbs:

Total number of observants =100

S. N	Scientific Name	Religious	RUV	Timber	TUV (timber)	Medicinal	MUV	Others	OUV	Total	TUV
1	*Adiantum philippense* L.	5	0.05	0	0	36	0.36	29	0.29	70	0.7
2	*Achyranthes aspera*	22	0.22	0	0	37	0.37	30	0.3	89	0.89
3	*Aeschyanthus parviflorus* (D. Don) *Spreng*	7	0.07	0	0	42	0.42	24	0.24	73	0.73
4	*Ageratina adenophora*	7	0.07	0	0	44	0.44	35	0.35	86	0.86
5	*Ageratum conyzoides*	7	0.07	0	0	11	0.11	32	0.32	50	0.5
6	*Amaranthus spinosus* L.	0	0	0	0	18	0.18	24	0.24	42	0.42
7	*Arundinella nepalensis* Trin.	0	0	0	0	5	0.05	32	0.32	37	0.37
8	*Asparagus racemosus* Willd.	6	0.06	0	0	59	0.59	14	0.14	79	0.79
9	*Barleria cristata* L.	0	0	0	0	12	0.12	15	0.15	27	0.27
10	*Bidens pilosa* L.	1	0.01	0	0	22	0.22	32	0.32	55	0.55
11	*Calopogonium mucunoides*	1	0.01	0	0	14	0.14	15	0.15	30	0.3
12	*Capillipedium assimile*	0	0	0	0	9	0.09	9	0.09	18	0.18
13	*Cheilanthes albomarginata*	1	0.01	0	0	13	0.13	19	0.19	33	0.33
14	*Chromolaena odorata*	6	0.06	0	0	14	0.14	35	0.35	55	0.55

15	*Chrysopogon aciculatus* (Retz.) Trin.	0	0	0	0	12	0.12	16	0.16	28	0.28
16	*Cissampelos pareira* L.	0	0	0	0	22	0.22	26	0.26	48	0.48
17	*Cleome viscosa* L.	0	0	0	0	34	0.34	26	0.26	60	0.6
18	*Conyza japonica*	2	0.02	0	0	32	0.32	22	0.22	56	0.56
19	*Crassocephalum crepidioides*	2	0.02	0	0	15	0.15	30	0.3	47	0.47
20	*Crotalaria prostrata* Rottb. Ex Wild	5	0.05	0	0	24	0.24	24	0.24	53	0.53
21	*Crotalaria retusa* L.	2	0.02	0	0	12	0.12	10	0.1	24	0.24
22	*Crotalaria spp*	1	0.01	0	0	14	0.14	22	0.22	37	0.37
23	*Cyperus rotundus*	1	0.01	0	0	14	0.14	10	0.1	25	0.25
24	*Cuscuta reflexa* Roxb.	0	0	0	0	32	0.32	12	0.12	44	0.44
25	*Desmodium spp*	0	0	0	0	14	0.14	14	0.14	28	0.28
26	*Dicranopteris linearis*	3	0.03		0	12	0.12	22	0.22	37	0.37
27	*Dioscorea bulbifera*	4	0.04	0	0	32	0.32	30	0.3	66	0.66
28	*Diplazium esculentum*	3	0.03	0	0	40	0.4	32	0.32	75	0.75
29	*Diplazium multicaudatum* (Wall.) Sledge	0	0	0	0	24	0.24	10	0.1	34	0.34
30	*Drynaria propinqua* (Wall. ex Mett.) J.Sm. ex Bedd.	2	0.02	0	0	12	0.12	22	0.22	36	0.36
31	*Elephantopus scaber*	5	0.05	0	0	60	0.6	12	0.12	77	0.77
32	*Elsholtzia balanda*	0	0	0	0	9	0.09	12	0.12	21	0.21
33	*Eragrostis spp*	3	0.03	0	0	3	0.03	36	0.36	42	0.42
34	*Globba*	6	0.06	0	0	20	0.2	28	0.28	54	0.54
35	*Gonostegia hirta*	2	0.02	0	0	21	0.21	25	0.25	48	0.48
36	*Hedyotis auricularia L.*	0	0	0	0	11	0.11	12	0.12	23	0.23
37	*Imperata cylindrica* var. indica Andersson	4	0.04	0	0	11	0.11	38	0.38	53	0.53
38	*Lidenbergia grandiflora* (Buch-Ham ex.D.Don)Benth.	2	0.02	0	0	18	0.18	19	0.19	39	0.39
39	*Lindenbergia indica* (Linn.) Kuntze	2	0.02	0	0	14	0.14	16	0.16	32	0.32
40	*Lygodium japonicum*	2	0.02	0	0	24	0.24	20	0.2	46	0.46

41	*Nephrolepis auriculata*	7	0.07	0	0	34	0.34	31	0.31	72	0.72
42	*Oxalis corniculata* L.	2	0.02	0	0	40	0.4	42	0.42	84	0.84
43	*Periploca calophylla*	0	0	0	0	16	0.16	20	0.2	36	0.36
44	*Plantago erosa* ex Roxb	0	0	0	0	25	0.25	26	0.26	51	0.51
45	*Pogostemon benghalensis* (Burm.f.) Kuntze	7	0.07	0	0	42	0.42	19	0.19	68	0.68
46	*Rabdosia ternifolia* (D.Don) H. Hara	0	0	0	0	4	0.04	10	0.1	14	0.14
47	*Rungia spp*	0	0	0	0	14	0.14	12	0.12	26	0.26
48	*Scutellaria discolor* Colebr.	0	0	0	0	12	0.12	17	0.17	29	0.29
49	*Selaginella denticulata*	0	0	0	0	29	0.29	20	0.2	49	0.49
50	*Smilax ovalifolia* Roxb.	7	0.07	0	0	24	0.24	29	0.29	60	0.6
51	*Stephania glandulifera*	2	0.02	0	0	32	0.32	24	0.24	58	0.58
52	*Tectaria macrodonta*	0	0	0	0	12	0.12	11	0.11	23	0.23
53	*Themda triandra*	0	0	0	0	10	0.1	24	0.24	34	0.34
54	*Tridax procumbens* L.	2	0.02	0	0	13	0.13	19	0.19	34	0.34
55	*Triumfetta pilosa*	0	0	0	0	15	0.15	12	0.12	27	0.27
56	*Urena lobata*	1	0.01	0	0	10	0.1	10	0.1	21	0.21

Shrubs:

Total number of observants =100

S. N	**Scientific Name**	**Religious**	**RUV**	**Timber**	**TUV (timber)**	**Medicinal**	**MUV**	**Others**	**OUV**	**Total**	**TUV (total)**
1	*Abrus precatorius* L.	0	0	0	0	19	0.19	17	0.17	36	0.36
2	*Ampelocissus latifolia*	0	0	0	0	11	0.11	24	0.24	35	0.35
3	*Antidesma acidum*	2	0.02	0	0	31	0.31	17	0.17	50	0.5
4	*Artemisia vulgaris*	12	0.12	0	0	24	0.24	8	0.08	44	0.44
5	*Boehmeria Platyphylla*	11	0.11	0	0	41	0.41	10	0.1	62	0.62

6	*Boehmeria platyphylla*	0	0	0	0	21	0.21	16	0.16	37	0.37
7	*Calopogonium mucunoides*	0	0	0	0	18	0.18	12	0.12	30	0.3
8	*Clerodendrum inflatorium*	0	0	0	0	15	0.15	2	0.02	17	0.17
9	*Colebrookea oppositifolia*	25	0.25	0	0	41	0.41	9	0.09	75	0.75
10	*Costus speciosus*	0	0	0	0	25	0.25	15	0.15	40	0.4
11	*Elatostema sessile*	0	0	0	0	16	0.16	8	0.08	24	0.24
12	*Flemingia strobilifera*	0	0	0	0	15	0.15	16	0.16	31	0.31
13	*Fraxinus sps*	0	0	0	0	11	0.11	11	0.11	22	0.22
14	*Hypericum cordifoliu m*	7	0.07	0	0	26	0.26	26	0.26	59	0.59
15	*Hypericum japonicum* Thumb.	18	0.18	0	0	36	0.36	26	0.26	80	0.8
16	*Inula cappa*	0	0	0	0	36	0.36	24	0.24	60	0.6
17	*Macaranga indica* Wight	5	0.05	0	0	8	0.08	22	0.22	35	0.35
18	*Melastoma melabathricum*	0	0	0	0	21	0.21	8	0.08	29	0.29
19	*Mesea chisia*	0	0	0	0	21	0.21	26	0.26	47	0.47
20	*Mussaenda macrophylla*	0	0	0	0	25	0.25	8	0.08	33	0.33
21	*Ocimum gratissimu m*	11	0.11	0	0	26	0.26	11	0.11	48	0.48
22	*Osbeckia nepalensis*	9	0.09	0	0	12	0.12	21	0.21	42	0.42
23	*Phyllanthus parvifolius* Buch -	0	0	0	0	25	0.25	24	0.24	49	0.49

	Ham ex. DD										
24	*Phyllanthus spp*	11	0.11	0	0	15	0.15	6	0.06	32	0.32
25	*Premna barbata*	0	0	0	0	29	0.29	15	0.15	44	0.44
26	*Rubus ellipticus*	0	0	0	0	15	0.15	35	0.35	50	0.5
27	*Rubus foliosus* D. Don	16	0.16	0	0	31	0.31	15	0.15	62	0.62
28	*Solanum surattense*	2	0.02	0	0	23	0.23	8	0.08	33	0.33
29	*Strobilanthes atropurpureus* Nees	19	0.19	0	0	35	0.35	14	0.14	68	0.68
30	*Tephrosia purpurea*	4	0.04	0	0	18	0.18	19	0.19	41	0.41
31	*Thespesia lampas*	16	0.16	0	0	11	0.11	21	0.21	48	0.48
32	*Thysanolaena maxima*	6	0.06	0	0	24	0.24	19	0.19	49	0.49
33	*Viburnum erubescens*	22	0.22	0	0	25	0.25	26	0.26	73	0.73
34	*Viscum articulatum*	0	0	0	0	24	0.24	5	0.05	29	0.29
35	*Vitex negundo*	17	0.17	0	0	21	0.21	3	0.03	41	0.41
36	*woodfordia fruticosa*	8	0.08	0	0	32	0.32	15	0.15	55	0.55
37	*Zizyphus mauritiana* Lam.	11	0.11	0	0	26	0.26	14	0.14	51	0.51

Trees:

Total number of observants =100

S. N	Scientific Name	Religious	RUV	Timber	TUV (timber)	Medicinal	MUV	Others	OUV	Total	TUV(Total)
1	*Alstonia scholaris* (L). R. Br.	0	0	9	0.09	26	0.26	0	0	35	0.35
2	*Bauhinia variegate* L.	4	0.04	5	0.05	24	0.24	15	0.15	48	0.48
3	*Careya arborea* Roxb.	7	0.07	21	0.21	29	0.29	11	0.11	68	0.68
4	*Castanopsis indica* (Roxb. ex Lindl.) A.DC	0	0	30	0.3	8	0.08	7	0.07	45	0.45
5	*Ceiba pentandra*	0	0	5	0.05	32	0.32	25	0.25	62	0.62
6	*Engelhardia spicata* Lechen ex Blume	0	0	25	0.25	8	0.08	0	0	33	0.33
7	*Eurya acuminate* DC.	0	0	0	0		0	21	0.21	21	0.21
8	*Ficus semicordata*	8	0.08	31	0.31	19	0.19	14	0.14	72	0.72
9	*Garuga pinnata* Roxb.	0	0	13	0.13	28	0.28	24	0.24	65	0.65
10	*Lagerstroemia parviflora* Roxb.	0	0	26	0.26	18	0.18	12	0.12	56	0.56
11	*Lyonia ovalifolia*	0	0	2	0.02	17	0.17	0	0	19	0.19
12	*Mangifera indica* L.	45	0.45	15	0.15	30	0.3	3	0.03	93	0.93
13	*Mallatus philippensis*	0	0	0	0	29	0.29	14	0.14	43	0.43
14	*Myrica esculenta*	18	0.18	11	0.11	39	0.39	23	0.23	91	0.91
15	*Phyllanthus emblica*	9	0.09	1	0.01	31	0.31	19	0.19	60	0.6

16	*Sapium insigne* Royle	0	0	0	0	12	0.12	0	0	12	0.12
17	*Schima wallichii*	2	0.02	35	0.35	15	0.15	3	0.03	55	0.55
18	*Semecarpus anacardium*	10	0.1	0	0	14	0.14	0	0	24	0.24
19	*Shorea robusta*	5	0.05	70	0.7	10	0.1	8	0.08	93	0.93
20	*Syzygium cumini*	2	0.02	28	0.28	21	0.21	7	0.07	58	0.58
21	*Terminalia chebula*	0	0	35	0.35	45	0.45	4	0.04	84	0.84
22	*Trichilia connaroides* (Wight & Arn.)	0	0	19	0.19	26	0.26	15	0.15	60	0.6
23	*Xeromphis spinosa*	2	0.02	0	0	23	0.23	8	0.08	33	0.33

Appendix-V: Questions for Semi-Questionnaire survey

Name/caste of the respondent:

Age:

Sex:

Education status:

Occupation:

Q.1. How many members are there in your family?

Q.2. What type of medicine you are using to cure disease?

Q.3. Which disease you are using Ayurvedic medicine?

Q.4. Name the plant and parts you are using to cure the disease? And for what other purposes you harvest the plants?

Q.5. How do you prepare the medicine?

Q.6. From whom do you learn to prepare the medicine?

Q.7. In which season and how do you harvest the plants?

Q.8. From which parts of the forest, you harvest the plants?

Q.9. What suggestion would you like to give for the sustainable utilization and conservation?

Q.10.Is there is side effect of this medicine? If yes then what type of side effect is there?

Q.11.Do you recommend others to use these medicinal plants or not?

Appendix-VI: PHOTO PLATES

(A) Ethnobotanical Study in Community

(B)) Field Study

(C) Seed of *Terminalia chebula*

(D) Drying for traditional medicine

(E) Grazing

	
(F) *Colebrookea oppositifolia*	**(G)** *Adiantum species*
	
(H) *Flemengia*	**(I)** *Asparagus racemosus*
	
(J) *Terminalia chebula* tree	**(K)** *Hedyotis auricularia*

Study of Ethnoecology and Phytosociology of Vegetation with its Use Value and Conservation Status of Bhanu Municipality, Central Nepal.

ORIGINALITY REPORT

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SIMILARITY INDEX

PRIMARY SOURCES

1	Ripu M. Kunwar, Maria Fadiman, Santosh Thapa, Ram P. Acharya, Mary Cameron, Rainer W. Bussmann. "Plant use values and phytosociological indicators: Implications for conservation in the Kailash Sacred Landscape, Nepal", Ecological Indicators, 2020 Crossref	585 words — 4%
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