AN ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED BY LOCAL PEOPLE IN MACHAKEL DISTRICT EAST GOJAM ZONE OFAMHARA REGIONAL STATE ETHIOPIA

Etagegnehu Yirsaw Yisegat

Addis Ababa University

Addis Ababa, Ethiopia

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An Ethnobotanical Study of Medicinal Plants Used by Local People inMachakel District, East Gojjam Zone of Amhara Regional State, Ethiopia

Etagegnehu Yirsaw

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This is to certify that the thesis prepared by Etagegnehu Yirsaw, entitled: *An Ethnobotanical Study of Medicinal Plants Used by Local People in Machakel District, East Gojam Zone of Amhara Regional State, Ethiopia* and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Biology complies with the regulations of the University and meets the accepted standard with respect to originality and quality.

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Name **Signature** **Date**

1---------- (Examiner) ---------- ----------

2----------(Examiner) ---------- ----------

3 Dr Ermias Lulekal (Advisor) ---------- ----------

4---------- (Department head)---------- ----------

ABSTRACT

An Ethnobotanical study of Medicinal Plants used by Local People of Machakel District,East Gojjam zone,Amhara Regional State,Ethiopia

Etagegnehu Yirsaw

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An Ethnobotanical study was conducted to document medicinal plants used by Local people and their indigenous knowledge in Machakel District, East Gojjam Zone of the Amhara Regional State. The study was conducted by involving 72 informants that were randomly selected from 12 selected kebles, from 72 (12 of them key informants). Ethnobotanical data were collected using semi-structured interview, field observation and group discussions. Data gathered were analyzed using descriptive statistics, preference ranking, direct matrix ranking, informant consensus and fidelity level. In this study, From 82 species,57 species were used for the treatment of only human health problems, 9 species are treated live stock ailments and 16 species are treated both human and live stock ailments.Asteraceae, which contributed 8 species, stood first followed by Lamiaceae. Most of the medicinal species were collected from the wild. 39 (47.5%) herbs, and the least were climbers 4 (4.8%) species.The most frequently used plant parts were leaves (35%) followed by roots (22.1%).The most frequent mode of preparation of plant medicine was pounding (34%) followed by powdering (29%). The most common route of administration was oral (37.6%) followed by dermal (34.1%). Fidelty level value showed that the most frequent diseases in the area are stomach ache, common cold and Evileye. In the study area *Echinops kebericho* was the mostscarce plant.Ranking of six species of plants showed that *Ocimium lamifolium* is the most preferred species by traditional healers for the treatment of Febrileillness.

Euclayptus globulus was the most multipurpose species. Medicinal plant in the area is threatened by agricultural expansion. Documenting the collected plants and associated indigenous knowledge can be used together with modern sciences for developing management plans for conservation and sustainable use of medicinal plants in the area.

Keywords: Ethnobotany, Evil eye, Fidelity level, Indigenous Knowledge, Machakel District, Medicinal plants

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List of Acronyms

AAU	Addis Ababa University
ASL	Above Sea Level
FL	Fidelity Level
FAO	Food and Agricultural Organization
MDARDO	MachakelDistrict Agriculture and Rural Development Office
MDEO	Machakel District Educational Office
MDHO	Machakel District Health Office
MDVHO	Machakel DistrictVeterinary Health Office
M.Sc	Master of Science
NCI	National Cancer Institute
NMSA	National Meteorological Service Agency of Ethiopia
TBK	Traditional Botanical Knowledge
USA	United States of America
WHO	World Health Organization

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Plants have not only nutritional value but also,in the eye of the local people,they have medicinal and ritual or magical values(Abbink,1995)

The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their use for religious ceremonies, ornamentation and healthcare (Schultes, 1992). In general, ethnobotany is the scientific investigation of plants as used in indigenous culture for food, medicine, magic, rituals, building, household utensils and implements, musical instruments, firewood, pesticides, clothing, shelter and other purposes (Kelbessa Urga *et al*., 2004).

Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine, and general utility including tremendous botanical expertise (Martin, 1995).

Since ancient times, plants have been indispensable sources of both preventive and curative traditional medicine preparations for human beings and livestock (Ermias Lulekal *et al*.,2008) The wide usage of traditional medicine has been attributed to cultural acceptability, efficacy against certain type of diseases and economic affordability as compared to modern medicine (Asfaw Debela *et al*.,1999).Considerable indigenous knowledge system, from the earliest times, is linked to the use of traditional medicine in different countries (Farnsworth *et al.,* 1994). Plants have not only nutritional value but also, in the eyes of the local people, they have medicinal and ritual or magical values (Abbink, 1995). Medicinal plants have important contributions in the

healthcare system of local communities as the main source of medicine for the majority of the rural population. These medical systems are heavily dependent on various plant species and plant based products.

The ways are also as diverse as the different cultures. Healing in Ethiopian traditional medicine is not only concerned with curing of diseases but also with the protection and promotion of human physical, spiritual, social, mental and material wellbeing (Makonnen Bishaw, 1991). It is widely believed in Ethiopia that the skill of traditional health practitioners is 'given by God' and knowledge on traditional medicines is passed orally from father to a favorite child, usually a son or is acquired by some spiritual procedures. Traditional healing knowledge is guarded by certain families or social groups (WHO, 1990).

The ethnomedicinal healing systems vary across cultures. In Ethiopia, there is cultural diversity and the use pattern of the various flora differ accordingly (Kebu Balemie *et al*., 2004\).

Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drugs (Pramono, 2002). The knowledge and use of plants is an integral part of many ethnic rural cultures in Ethiopia, the extent of which has not yet been studied in depth (Abbink, 1995). For instance, the ethnobotanical study of people of Machakel District has remained unexplored and no documentation has been done on the medicinal plants and the associated knowledge available before this study. Therefore, this study has been conducted to document medicinal plants used by local people for the treatment of human and livestock aliments and indigenous knowledge in Machakel District, Ethiopia.

1.2 Statement of the problem

In Ethiopia, both human and natural factors heavily contribute to the loss of medicinal plants, which links with the gradual displacement of indigenous knowledge associated with these plants. Since, there is a gap in the documentation and records on medicinal plants in the country, indigenous knowledge on usage of medicinal plants as remedies for both human and livestock ailments will be lost. Until this moment, no research on ethnobotanical study of medicinal plants was conducted in Machakel District. The findings of this study will help people of the study area to be aware of problems associated with medicinal plants and give attention for sustainable use and conservation of medicinal plants of their surroundings.

1.3 Research questions

The main focus of this study is to investigate the traditional medicinal uses of various plants which are used by Machakel District people and also to compile and document the traditional knowledge of local people in the study area on medicinal plants. The findings of the study will try to answer the following research questions:

- Are there medicinal plants, which local people use to treat their own health problems and livestock ailments?
- What are the medically important plant species used by indigenous people of the District and in which plant community types they are distributed?
- How do the local people obtain and use the plant species to treat various diseases?
- Which part of the medicinal plants is useful to treat ailments?
- How is the current status of the medicinal plants and what are the traditional conservation systems?

1.4 Objectives

1.4.1 General objective

The general objective of this study was to investigate and document the traditional medicinal plants used by the local people in Machakel District together with the available ethnobotanical information on their uses and management.

1.4.2 Specific objectives

- To document indigenous knowledge of the people on use of medicinal plants in the study area;
- To identify and document plant species that are used as medicines for the treatment of human and livestock health problems;
- To identify and document the plant parts used for medicinal purposes;
- To describe the use, preparation and administration routes of medicinal plants as remedy for human and livestock diseases;
- To find out about distribution of medicinal plants in vegetation categories;
- To assess the current conservation status and existing threats of medicinal plants;

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Origin and development of ethnobotany

Among the many definitions of ethnobotany, the one that is widely employed is “the study of the relationship between plants and people” (Balick and Cox, 1996). Ethonobotany is also defined as local people's interaction with their natural environment: how they classify, manage and use plants available around them (Martin, 1995). It is also described as “a unit of ecological study specializing in the interaction of people and the plant world "(Ford, 1978). It is an attempt to understand how people view the world of plants and their relation to it. The Prefix “ethno” refers to the study of people or “the way that other people look at the world”, while the word “botany” refers to the study of plants (Martin, 1995)

The term ethnobotany was for the first time mentioned orally by John Hershberger in 1895 during a public lecture (Balick, 1996; Cotton, 1996; Hamilton *et al.*, 2003). Currently ethnobotany has become a more diversified and multidisciplinary subject that require experts in various fields of academic study such as Botany, Anthropology, Agriculture, Linguistics, Archeology and Economics (Martin, 1995; Alexiades, 1996; Balick, 1996). Ethnobotanical studies are now growing and in fast progress throughout the world. One of the main driving forces behind this expansion is the increasing awareness of the considerable practical and social value of traditional knowledge. Ethnobotanical data collection requires a systematic approach and information can be collected through actual field observation and semi structured interviews depending on the particular objectives of the research (Martin, 1995). Ethnobotany is usefulto

define local community plant resources needs, utilization and management. Therefore, the conservation of ethnobotanical knowledge as part of living cultural knowledge and practices between communities and the environment is essential for biodiversity conservation (Martin, 1995; Balick and Cox, 1996; Cotton, 1996).

2.2 Indigenous medicinal plant knowledge

Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). People use medicinal plants for the treatment of various ailments on the basis of indigenous knowledge passed to them generation after generation.

According to Wole (2010), indigenous knowledge simply refers to health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singly or in combination to treat, diagnose and prevent illness or maintain well-being. The immediate and intimate dependency of local people on natural resources resulted in the accumulation of indigenous knowledge that helped people to adapt to and survive in the environments in which they live. It is local knowledge that is unique to a given culture or society and the base for agriculture, healthcare, food preparation, education, environmental conservation and a host of other activities (Thomas, 1995). It is a systematic body of knowledge built up by a group of people through generation of living in close contact with nature and it is cumulative and dynamic. In most developing countries, including Ethiopia, indigenous knowledge of traditional medicinal plants and their uses has been passed from one generation to the next by word of mouth. However, many young people today have little interest in traditional knowledge of medicinal plants (Endashaw Bekele and Shigeta, 2008).

Indigenous knowledge includes time-tested practices that developed in the processes of interaction of humans with their environment (Balick and Cox, 1996). It is the main resource of all ethnobotanical investigations and is generally called as Traditional botanical Knowledge (TBK). However, the continuation of this knowledge is endangered when transmission between the older and younger generation is no longer connected (Kargioglu *et al*., 2008). Indigenous knowledge is a result of many generations', long years' experiences, careful observations and trial and error experiments (Martin, 1995). Thus over centuries, indigenous people of different localities have developed their own specific knowledge on plant resource use, management and conservation (Cotton, 1996). The indigenous knowledge consists of a vast array of knowledge regarding the use of plant material for health purposes (Sidhu and Pannu, 2010).

Ethnobotany is aimed at gathering and documenting indigenous botanical knowledge, cultural practice, use and management of botanical resources and discovers benefits from plants. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed (Miollis, 1999).

2.3 Traditional medicinal plants in Ethiopia

According to Mohammed Adefa and Berhanu Abraha (2011) Ethiopia is a country characterized by a wide range of climatic and ecological conditions possessing enormous diversity of flora and fauna, including wide range of potentially useful medicinal plants. The country possesses a particularly wide range of potentially useful medicinal plants, more extensive indeed than available in many other parts of the world. Dawit Abebe (1986) estimated that 95% of traditional medical preparations in Ethiopia are of plant origin.

In Ethiopia, the long history of using traditional medicinal plants for combating various ailments can be confirmed by referring to the recent collection of medico-religious manuscripts of the Axumite kingdom (Fassil Kibebew, 2001). Pankhurst (1990) indicated that the antiquity of the traditional use of medicinal plants in Ethiopia could not be simply over looked.

In Ethiopia, it is well known that traditional medicines are widely used especially in the low-income rural parts of the country (Getachew Addis *et al*., 2002). It is reported that nearly 80% of the population in the country use plant-based traditional medicines as their healthcare system (Tilahun Teklehaymanot and Mirutse Gidey, 2007). The wide utilization of plant based traditional healthcare is mainly attributed to the fact that it makes use of locally available plant resources (Mezgebe Kassaye, 1996; WHO, 1999). The majority of medicinal plants, with few exceptions, are harvested from wild habitats, which are currently under great treat (Dawit Abebe and Ahadu Ayehu, 1993; Iwu, 1993; Girma Deffar, 1998). Inadequate health centers and shortage of medicines and personnel in clinics could also be the reasons behind using traditional medicines as a substitute for modern medication (Nyazena and Kire, 1986; Dawit Abebe, 1996).

In Ethiopia, traditional medicine still to be the only available health service system for the majority of the population (Asfaw Debela *et al*., 1999; WB, 2000). However, it is often postulated that modern health professionals consider it as a practice that serves no purpose and in their view its continued existence is merely because of lack of access to modern healthcare service (WHO, 1978; Dawit Abebe and Ahadu Ayehu, 1993). Such negative attitudes may possibly stem from misgivings about its biomedical values and probably from many other factors.

Ethiopian traditional medical system is characterized by variation and is shaped by the ecological diversities of the country, sociocultural background of the different ethnic groups as well as historical developments which are related to migration, introduction of foreign culture and religion (Getachew Addis *et al*., 2002). Previous studies showed the existence of traditional medical pluralism in the country (Slikkerveer, 1990; Dawit Abebe and Ahadu Ayehu, 1993). SThese healthcare sub-systems have their own historical background, perception about health and illness, practices and types of healers.

2.4 The role of traditional medicinal plants in human healthcare services

Plants have played crucial role as a source of traditional medicine in Ethiopia from immemorial times to combat different ailments and human sufferings (Asfaw Debella *et al*., 1999; Mirutse Giday, 2001). It was the only system available for healthcare prior to the introduction of modern medicine for prevention, diagnosis and treatment of social, mental and physical illness (Dawit Abebe, 1986). To date traditional medicine has become an integral part of the culture of the Ethiopian people due to its long period of practice and existence (Mirgissa Kaba, 1998).

Plants have been indispensable and the most important sources of both preventive and curative traditional preparation for human beings and livestock since time immemorial. By their capacity of photosynthesis, plants form the basis of the biological food web and producing oxygen which is the key for our lives and they are balancing the gases of our environment. Plants are also recycling essential nutrients, establishing soils and soil fertility, protecting areas of water catchments. They keep ecological and climatic balances further helping to control rainfall through the process of transpiration. And all these benefits of plants are directly or indirectly

linked with healthcare (Hamilton, 2004; Kelbessa Urga *et al*., 2004). Therefore, healthcare and botany have evolved as inseparable domains of human activities since various plant products are of paramount importance in traditional healthcare systems. Medicinal plants play typical role in the lives of many people in terms of health support, financial income and livelyhood security (Hamilton, 2003; 2004; Abdulhamid Bedri *et al*., 2004). Ethiopian plants have shown very effective medicinal value for some ailments of humans and domestic animals. The major reasons why medicinal plants are demanded in Ethiopia are due to culturally linked traditions, the trust the communities have in medicinal values of traditional medicine and relatively low cost in using them (Endashaw Bekele, 2007). In addition to this, there is a large magnitude of use and interest in medicinal plants in Ethiopia due to acceptability, accessibility and biomedical benefits (Dawit Abebe, 2001).

The term traditional medicine is used to explain the traditional medical practice that has been in existence even before the advent of modern medicine. It is still widely accepted and used in prevention and treatment of physical and mental disorders as well as social imbalance. Due to its intrinsic qualities, unique and holistic approaches as well as its accessibility and affordability, it continues to be the best alternative care available for the majority of the global population, particularly for those in the rural areas of developing countries.

Traditional medicine is an important healthcare system in Ethiopia. According to Tesfaye Hailemariam *et al*. (2009) 80% of the Ethiopian people use medicinal plants and plant remedies selected over centuries. Such a wide use of traditional medicine asserts that the contribution of this indigenous knowledge and resource to the enhancement healthcare needs of the Ethiopian population cannot be underestimated (Demel Teketay, 2001; Kanno, 2004). Therefore, a large

segment of the rural population still will remain without access to modern medicine and will continue to depend on medicinal plants and traditional healthcare practices (Medhin Zewdu, 2002).

According to the World Health Organization (WHO), more than 80% of Africans rely on traditional medicine and indigenous knowledge to meet their health needs (WHO, 2002). This is due to the fact that traditional medicine is accessible, affordable, culturally and socially acceptable and most people prefer it to the 'exorbitantly priced' conventional Western medicine.

Traditional medicine has also disadvantage as various authors stated (Amare Getahun, 1976; Sofowora, 1982; Dawit Abebe, 1986) lack of precision and standardization is one drawback for the recognition of the traditional healthcare system. The main disadvantage of traditional medicine are the lack of scientific proof of its efficacy which could result in the decrement of its acceptance specially by educated and most urban dwellers who entirely depend on modern medicine (Dawit Abebe, 1986). In addition, the imprecise diagnosis given by some traditional healers and when they use several types of medicinal plants species and other types of traditional medicine in combination (without scientific proof) which could result in health damage is the other negative side of the traditional medicine. Lack of precise dosage which could lead to toxicity is also the other disadvantage of traditional medicine (Dawit Abebe, 1986). In addition to this traditional healers had no accurate value of the medicines prescribed to patients. They administered the same amounts of medicine to people who have the same disease regardless of age, body weight or sex (Gidey Yirga, 2010).)

2.5 Plants in ethnoveterinary medicine

Ethiopia is rich in its livestock population; it is one of the countries in the world with the lowest unit output. The poor health condition of its livestock has partially been responsible for the low productivity (Mirutse Giday and Gobena Ameni, 2003). Livestock disease has often been described as serious of constraints to both macro-level economic development in Africa and the well-being of millions of poor livestock keepers (Andy, 1999).

Ethnoveterinary medicine, the scientific term for traditional animal healthcare, encompasses the knowledge, skills, methods, practices, and beliefs about animal healthcare found among the members of a community (McCorkle,1986 and Tamboura *et al*., 2000; Maine *et al*., 2009).

The knowledge base differs not only from region to region but also among and within communities. It has been developed through trial and error and deliberate experimentation. Therefore, it is less systematic, less formalized, and not universally recognized as a valid method of disease control in animals (Devendrakumar and Anbazhagan, 2012). Research into ethnoveterinary medicine is often undertaken as part of a community based approach that serves to improve animal health and provide basic veterinary services in rural areas (Mathius-Mundy and McCorkle, 1989).

Ethnoveterinary medicine is frequently used for treating animal by many different people around the world. It provides valuable alternatives to and complements western-style veterinary medicine. Ethnoveterinary remedies are accessible and easy to prepare and administer, at little or no cost to the farmer (Jabbar *et al*., 2005). In many poor rural areas, ethnoveterinary medicine

can play an important role in animal production and livelihood development, and often becomes the only available means for farmers treat ill animals (McCorkle, 1986; Tamboura *et al*., 2000; Maine *et al*., 2009).

Enthnoveterinary medicinal plants are used extensively and quite effectively for primary healthcare treatment to make domestic animals productive and healthy. The indigenous knowledge of the veterinary healthcare system acquired by traditional herbal healers is orally transferred from one generation to other (Phondani *et al*.,2010). The importance of the traditional knowledge on ethnoveterinary practices by specialists and local healers who are knowledgeable and experienced in traditional systems of treatment, but their knowledge has not been documented, and is dwindling fast (Jain, 1999). Traditional veterinary medicine is very important in developing countries where conventional remedies for animal healthcare are inaccessible or unaffordable to poor rural farmers (McGaw *et. al.,* 2007).

According to the United Nations Food and Agricultural Organization (FAO), the lack of drugs to treat diseases and infections results in losses of 30-35% in the breeding sector of many developing countries, where poor animal health remains the major constraint to increased production (FAO, 2002). Therefore, much effort is needed in research and integration of the ethnoveterinary practices in developing countries (Mathias and McCorkl,1989).

2.6 Medicinal plants as the base for development of modern drugs

According to WHO (2001) medicinal plant can be defined as herbal preparations produced by subjecting plant materials to extraction, fractionation, purification, concentration or other

physical or biological processes which may be produced for immediate consumption or as a basis for herbal products. Plants have been a source of medicine and a major resource for healthcare since ancient times, with some traditional herbal medicines in use for more than 2,000 years. The modern pharmaceutical industry is paying more attention to plants as scientists re-discover that plant life is an almost infinite resource for medicine development (Thomson, 2010). One fourth of modern medicines available on prescription today owe their origins of raw material to higher plants of tropical forests. Out of these, 74% are derived from plants that have some related use in traditional herbal medicine. Increasing emphasis on the use of medicinal plants in searching for new drugs is undoubtedly a productive strategy (Liu and Yaniv, 2005).

Plants are the basis for the development of modern drugs and medicinal plants have been used for many years in daily life to treat diseases all over the world (Ates and Erzdogrul, 2003; Jimene z-Medina *et al*., 2006). Traditional medicinal plants are a therapeutic resource used by the population of the African continent specifically for healthcare, which may also serve as starting materials for drugs (Sofowora, 1993). A medicinal plant is one whose one or more of its organs contains substances that can be used for therapeutic purpose or which are precursors for the synthesis of useful drugs (Sofowora, 1982). However, the knowledge of medicinal plants is rapidly dwindling due to the influence of western lifestyles, and lack of interest of the younger generations to carry on the tradition (Muthu *et al*., 2006).

Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs. Right from its beginning, the documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day (Balick and Cox, 1996; Fabricant and Farnsworth, 2001). These most plant

derived drugs were originally discovered through the study of traditional cure and folk knowledge of indigenous people (Balick and Cox, 1996). Out of the total flowering plants reported from the world, more than 50,000 are used for medicinal purposes (Govaerts, 2001).

Ethnopharmacology is the scientific study of ethnic groups and their use of drugs. It is distinctly linked to plant use, botany, as this is the main delivery of pharmaceuticals (Thomas, *et al*., 1996). Ethnopharmacology and natural product drug discovery remains a significant hope in the improving the poor livelihoods of rural communities. Many modern pharmaceuticals have their origin in ethnomedicine and ethnoveterinary medicine, which relies upon a local pharmacopoeia (Tamboura, *et al*., 2000). The ethnopharmacology knowledge is a holistic system approach that can serve as an innovative and powerful discovery engines for newer, safer and affordable medicines (Patwardhan, 2005).

Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drug (Pramono, 2002; Wright, 2005). An average of 25% of modern drugs contains one or more active principles obtained from plants (Medhin Zewdu, *et al.*, 2001). Drug discovery based on ethnobotanical leads serves or is advantageous because it is clearly tested through centuries. For example, indigenous peoples experiment with the plants in their environment, often over many generations and identify those that have bioactive compounds (Balick and Cox, 1996).

Ethiopia is a rich source of medicinal plants, the knowledge and use of plant is an integral part of many ethnic rural cultures, the extent of which has not yet been studied in depth (Abbink, 1995). Indigenous knowledge systems, can guide the development of new crop varieties and medicines

(Balick and Cox, 1996).Some of the indigenous plants of Ethiopia (e.g. *Phytolacca dodecandra*, commonly known as endod) can evidence this as source of Molluscide in control of Shistosomiasis. In addition to this, Maytansine, an active principle against cancer was isolated from Maytenus species (Sebsebe Demissew and Ermias Dagne, 2001); it was collected and studied by the National Cancer Institute (NCI USA). The authors indicated that the result was hidden after 1972.

2.7 Ethnobotanical research on medicinal plants in Ethiopia

In Ethiopia, little emphases have been given to traditional medicinal studies over the past decade (Debella Hunde, 2004). Therefore, it can be said that ethnobotanical studies are merely at the start in Ethiopia though there have Mbeen some attempts in investigating medicinal plants uses and there is as yet no in depth study on the relation between medicinal plant and indigenous knowledge on sustainable management of such plant resources.

The study ofIn Ethiopia, though there has been some organized ethnomedicinal studies, there is limited development of therapeutic products and the indigenous knowledge on usage of medicinal plants as folk remedies are getting lost owing to migration from rural to urban areas, industrialization, rapid loss of natural habitats and changes in life style. In addition, there is a lack of ethnobotanical survey carried out in most parts of the country. In view of these, documentation of the traditional uses of medicinal plants is an urgent matter and important to preserve the knowledge (Tilahun Teklehaymanotand Mirutse Giday, 2007). Furthermore, most of the ethnomedicinal studies in northern part of Ethiopia are focused on 'Medihanit Awakie' (professional traditional medicine practitioners) and the ancient medicomagical and/or medico-

spiritual manuscripts and old Gee'z manuscripts (Dawit Abebe and Ahadu Ayehu, 1993; Abbink, 1995), and ignore the knowledge of ordinary people in the locality (Hareya Fassil, 2005). Thus, only application proper ethnobotanical methodology where general imformants and key informants can provide balanced documentation of the indigenous knowledge on medicinal plants of Ethiopia.

Recently, among the researchers conducted on ethnobotanical study of medicinal plants in Ethiopia, Ermias Lulekal *et al.* (2008) collected the highest number. Ethnomedicinal uses of 230 plants species were documented from Mana Angetu District, which is found in Bale Zone of Oromia Region. Of these, 181 (78.70%) were used as human medicine, 27 (11.74%) as livestock medicine and the remaining were 22 (9.7%) uses for treating both human and livestock ailments. Similar study by Mirutse Gidey (2001), on Zay people indicated herbs are first in which Zay people derive their medicine (55%), followed by trees and shrubs (33%). Whereas, the study conducted by Ermias Lulekal *et al.* (2008) on ethnobotanical study of medicinal plants in Mana Angetu District stated that shrubs rank first with 47.83% followed by herbs 23.91% and trees 19.13% in which indigenous people of Mana Angetu derive their and livestock remedies.In addition to the above point, ethnobotanical study of medicinal plants in Wonago Woreda by Fisseha Mesfin *et al*. (2009) revealed that shrubs were the most harvested for medicinal purpose (43.2%) followed by herbs (34.5%), trees (20.9%) and climbers (1.2%). Moreover, the study explained that the most frequently utilized plant parts were roots (35.8%), followed by leaves (24.6%). In terms of their growth location, the study showed that traditional medicinal plants were harvested mostly from natural vegetation area followed by homegardens.

Different parts of plants are being used for medicine in order to cure human or livestock diseases in Ethiopia. However, roots and leaves are the most widely utilized plant parts. According to Tizazu Gebre (2005), roots are the most used plant part (35.7%), followed by leaves (32.9%). Moreover, this study explained that 68.6% of herbal remedies were applied orally and 31.4% were applied externally. People use medicinal plant parts, to treat human or livestock ailments while they are fresh, dried or both. The study of Gidey Yirga (2010) in Central Tigray revealed that some of the medicinal preparations were used fresh or in dried state, as these plants are used in both forms, the chance of using the medicinal plants under different seasons of the year is increased and traditional healers preserve the plant that they could not find in dry season in different ways like hanging the plant material.

2.8 Threats to and Conservation of medicinal Plants

2.8.1 Threats to medicinal plants

Many of the threats to medicinal plant species are similar to those causing endangerment to plant diversity generally. The most serious proximate threats generally are habitat loss, land degradation and over-harvesting (Hamilton, 1997). Medicinal plants can have other uses besides as sources of medicines, and the threats from over-harvesting may be due to effects of collection for purposes other than medicinal. The majority of species of plants in traditional or herbal medical treatments are harvested in the wild rather than cultivated. As a result, many plant species have become extinct and some are endangered. It is therefore necessary that systematic cultivation of medicinal plants be introduced in order to protect threatened species. As population

grows, demand for traditional medicines will increase, and pressure on medicinal plant resources will become greater than ever (Hamilton, 2003).

According to Zemede Asfaw (2001), medicinal plants are considered to be at conservation risk due to over use and destructive harvesting. Root and bark collection may kill the plant in harvest (Dawit Abebe and Ahadu Ayehu, 1993). People use many wild species of plants for food, medicine, clothing, shelter, fuel, fiber, income generation and the fulfilling of cultural and spiritual needs throughout the world (Zemede Asfaw, 2001). Like other developing countries, the loss of valuable medicinal plants in Ethiopia due to population pressure, loss of habitat, agricultural expansion and deforestation is widely reported by different workers in Ethiopia (Zemede Asfaw, 2001; Kebu Balemie *et al*., 2004). In addition to the above point, medicinal plants can be lost due to ecological degradation, loss of indigenous knowledge, loss of cultural assets, threat of illegal smuggling and misuse of resources to medicinal plant conservation, lack of a suitable scheme for equitable sharing of benefits arising from biological resources, and underdeveloped market may prevent cultivators from producing medicinal plants for the market and traditional healers may not participate and fully collaborate (Endashaw Bekele and Shigeta, 2008).

2.8.2 Conservation of medicinal Plants

Conservation is defined as the protection, preservation, and careful management of natural resources. Medicinal plant conservation strategies need to be understood and planned based on an understanding of indigenous knowledge and practices (Berkes and Turner, 2006). The issue of medicinal plant conservation in Ethiopia today calls for aggressive studies and documentation

before the accelerated ecological and cultural transformation distort the physical entities and the associated knowledge base (Endashaw Bekele, 2007). The most serious proximate threats when extracting medicinal plants generally are habitat loss, habitat degradation, and over harvesting (Hamilton, 2003). Developing markets for natural products, particularly those that are harvested from the wild, can trigger a demand that cannot be met by available or legal supplies and demands a conservation initiative (Swanson, 1998) so the local populations are not exploited, causing more damage to their resources (Leony and Voeks, 2004).

According to Hamilton (2003), several themes consistently arise in the various sets of recommendations that have been compiled relating to the conservation of medicinal plants, such as those associated with international conferences. They include: the need for co-ordinated conservation action, based on both in situ and ex situ strategies; inclusion of community and gender perspectives in the development of policies and programmes; the need for more information on the medicinal plant trade; the establishment of systems for inventorying and monitoring the status of stocks of medicinal plants; the development of sustainable harvesting practices; encouragement for micro-enterprise development by indigenous and rural communities; and the protection of traditional resource and intellectual property rights

Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Zemede Asfaw, 2001), this can be possible in places of worship (churches, mosques, grave yards, etc), scared grooves, farm margins, river banks, road sides, live fences of gardens and fields.

CHAPTER THREE

3. MATERIALS AND METHODS

3.1 Description of the study area

3.1.1 Geographical location

This study was carried out in Machakel woreda (district), Machakel District is found in East Gojjam Zone, Amhara National Regional State, Ethiopia. Machakel woreda is located between $10^0$19'75" - $10^0$41' 00" N and $37^0$16'46" - $37^0$45'42" E geographic coordinates (Leul, 2011; Figure 1). The woreda is situated at some 330 km northwest of Addis Ababa and 270 km south of Bahir-Dar, the Regional center. The total area of the study woreda is about 795.59 square km (CSA, 2013).

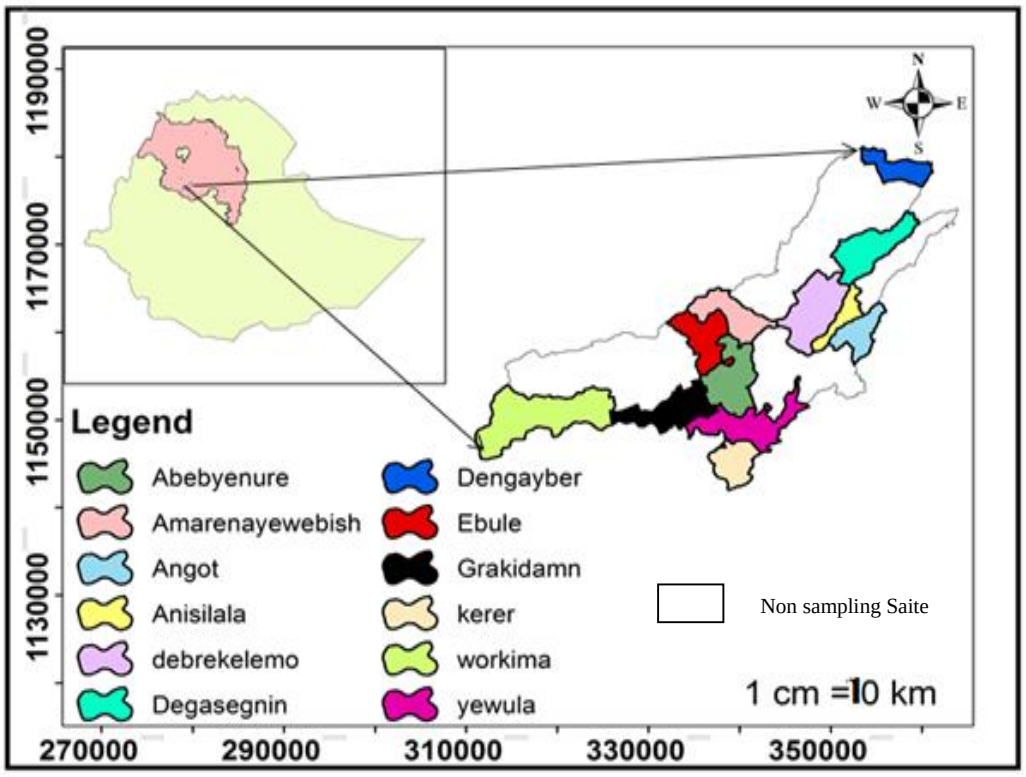

Figure 1Map of Ethiopia and Amahara Regional State showing the study area

3.1.2 Topography, soil and Climate

In the study area the altitude ranges between 1200 and 3200 ma .s .l (MWoAE, 2014). The mean annual temperature varies between 8^0-24^0 c and the total annual rainfall is between 1500 - 1900 mm. The rainfall pattern is unimodal mainly occurring between June and September. Red (Nitosols group), Black (Vertisols group), Brown (Cambisols group) and Gray (Luvisols group) are the major soil types that cover the study woreda (Leul, 2011; MWoAE, 2014).

3.1.3 Vegetation

The vegetation of the study area consists of various trees.The natural vegetation of the study area is dominated by different trees like YabeshaTsid (*Juniperus procera*),, Sholla(*Ficus ovata*),Embuacha (*Rumex nervousus*),Wanza (*Cordia africana*) ,Weyra (*Olea europea subsp cuspidate*) Agam (*Carssia spinarum*), Gerawa (*Vernonia amygdalina*) and Baharzaf (*Euclaptys globulus*) among others..

3.1.4 People, land use and agriculture

According to Central Statistics Agency of Ethiopia (2013), the woreda population for July 2016 is 139,522 out of which 68982 are males and 70,540 are females. The male-female sex ratio of the woreda is about 97:79 indicating that females slightly out numbered males. Out of the total population residing in the study woreda, the majority (89.6%) are rural, while the remaining (10.4%) are urban dwellers. Agriculture is the dominant economic activity and the basic livehood of the majority of residents of the study area. The farming system is characterized by a typical mixed crop-livestock system that is carried on a subsistence scale mostly for household

consumption and not geared to market conditions. Land and livestock are therefore the most important livelihood assets of the study area. The main crops produced in the area are tef (*Eragrostis tef*), barley (*Hordeum vulgare*), wheat (*Triticum aestivum*), and maiz (*Zea mays*). Oil seeds and pulses are also among the crops grown in the study *woreda* (MWoAE, 20160). (Table 1)

Table1 Major Food crops growing in the Machakel District

Crop categories	Scientific name	Local name (Amharic)	English name
Cereals	*Hordeum vulgare*	Gebs	Barley
	Eragrosatis teff	Teff	Teff
	Triticum aestivum	Sndie	Wheat
Vegetables	*Allium cepa*	Key shenukrt	Shallot
	Allium sativum	Nech shenukrt	Garlic
	Brassica oleracea	Tikel gomen	Cabbage
	Cucurbita pepo	Duba	Pumpkin
Fruits	*Citrus aurantifolia*	Lomi	Lime
	Malus sylvestris	Apple	Apple
Root crop	*Solanum tuberosum*	Dinch	Potato
	Daucus carota	Karot	Carrot
Pulses	*Vicia faba*	Bakela	Bean
	Pisum sativum	Ater	Pea
	Cicer aestivum	Shinbra	Chickpea
	Lens culinaris	Msr	Lentil
Oil crops	*Linum usitatissimum*	Telba	Seed
Stimulants	*Catha edulis*	Chat	Khat
	Coffea Arabica	Buna	Coffee

Source: Modified from (MDARDO ,2016)

3.1.5 Educational services and healthcare status

According to Machakel District Educational Office (MDEO, 2017) there are 52 elementary schools (1-8), one General secondary and preparatory school (9-12) Three high school(9-10) and one middle level vocational and educational training institute. The District has Six health centres and twenty four health post (MDHO, 2017)

Table 2 Ten top diseases of 2016/17 seen in Macahkel District

(Source; MDHO,2016/17)

No.	**Types of Disease**	**No. of Patient**
1	Thyphoid	450
2	Pneumonia	390
3	Dirrhoea/non bloody/	356
4	Urinary tract infection	302
5	unspecified disease	250
6	Injury	200
7	Malaria	197
8	Hypertension andother related disease	140
9	Diabets	70
10	Trauma ,bone fracture etc	55

3.1.6 Live stock population and their status

Livestock population is relatively high in machakel District. However, their products (milk, meat, egg and honey) are not that much due to poor management, inadequate and low quality feed supply and prevalence of various animal diseases.

According to Machakel District Agricultural and Rural Development Office report, the livestock population consists of cattle sheep,goat, horse, donkey, mule, hen and bee. The most common animal diseases in the district include: endoparasite (lung worm and liver worm), ectoparasite (anthrax), pastrolosis, sheep and goat pox and rabies. Rabies mostly occurred in Dega type of agro ecological zone.(MDVHO,2017)

3.2 Materials

Plant press, notebook, plastic bag, and digital camera were the materials used in the field interview questions

3.3 Methods

3.3.1 Reconnaissane survey and selection of study sites

Reconnaissance survey was conduct between September 30, 2017 to October 25, 2017 .in the study area in order to obtain information on the sampling sites, local healer's location and other facilities before data collection.

There are Tewenty four kebeles in the district. Out of these Tewelve were selected included in this reasearch. These are Yewwula, Kerer, Gira kidamen, Degasegnin, Amriyewubesh, Abeb yenure, Ansilala, Workima, Ebule, Dengayber, Deber kelemo and Angot. The kebeles were selected purposively based on the information collected on the availability of practitioners, users and forests with the help of local community and elders for ethnobotanical data collection.

3.3.2 Informant selection

A total of 72 informants (47 males and 25 females) with the ages between 20 and 85 were randomly included regardless of sex, social status and educational background. From these, twelve key informants were purposively selected based on recommendations from elders, local

authorities and heads of the Traditional Medicines Association Office. The traditional healers identified were asked for their consent to share their knowledge only for the purpose of this study.

3.3.3 Methods of Ethnobotanical data collection

Ethnobotanical data were collected between November 2017 to Feburary 2018 during field trips made to the sites based on the methods given by Martin (1995); Cotton (1996) and Alexiades (1996). Ethnobotanical techniques were employed to collect information on the use of medicinal plants by local people and their traditional knowledge in Machakel District.The methods used for ethnobotanical data collection were semi structured interviewes, observations, group discussion, and guided field walks with informants .These methods were used to collect information about indigenous knowledge on health, local names of plants and their sources, part (s) used, method of preparation, diseases treated, dosage, route of administration, adverse effect .

3.3.3.1 Group discussion and semi-structured interview

A brief group Discussions were conducted with eight male key informants on threats to medicinal plant in Girakidamen kebele (Figure 2) Semistructured questions were employed for interviewing the informants to record and collect information on medicinal plants (local name, plant parts, and condition of preparations, method of preparation and application and route of administration) and also interviewed informants about Marketable medicinal plants . All of the interviews were held in Amharic, the vernacular language of the local people. The methods and techniques followed procedures recommended by Martin (1995), Cotton (1996) and Alexiades (1996)

Figure 2 Group discussion with key informants on threats to medicinal plant in Girakidamen kebele (Photo courtesy byAndualem Bimerew, 2018)

3.3.3.2 Guided field walkand field observation

Walking with Guided field has played vital role inorder to take sample, habits and other uses of medicinal plants mentioned. Field observations were performed with the help of traditional healers and local guides who were interviewed to obtain the available data in the study area. (Figure 3) All the necessary information was recorded on habit, and plant communities of medicinal plants.

Fig.3 Guided field walk and specimen collection in yewula kebele of study area(Photo courtesy by Andualem Bimerew,2018)

3.3.3.3 Reliability of information

Informants were interviewed at least twice for evaluating the reliability of information during interview, discussions and collection on the actual fieldwork with informants. Consequently, if the idea of the informant deviates from the original information, it was rejected since it is considered as unreliable. Only the response of an informant that is in harmony with each other was taken as relevant and used for data analysis. This method was adopted from Alexiades (1996).

Figure 4 Interview with informant (Photo, courtesy by Andualem Bimerews,2018)

3.3.4 Plant specimen collection and identification in Machakel District

The local name, habits and associated information of the plant specimens were recorded for each of the plant species, then, the plant specimens were pressed, dried and taken to the National Herbarium (ETH), Addis Ababa University. Identification of the plant specimens was done both

in the field, and later at the National Herbarium (ETH) using taxonomic keys in the Flora of Ethiopia and Eritrea. Then, identified specimens were cheked by Doctor ErmiasLuelkal and stored at the National Herbarium, Addis Ababa University.

Fig.5 Part of the field activity (Photo courtesy by Andualem Bimerew, 2018)

3.3.5 Visual recognition of plant community types

In this study, categorization of vegetation into plant ommunity type was done through described by Martin (1995). Based oncurious visualization of the vegetation structure and Morphological characteristics or general appearance of vegetation such as growth of the dominant plant species that can be categorized into different plant community types.

3.3.6 Data analysis

3.3.6.1 Descriptive statistics

Ethnobotanical data were entered in to Microsoft Excel 2007 spreadsheet and summarized using descriptive statistics. Descriptive statistical methods such as percentage and frequency were employed to analyze and summarize the data on medicinal plants and associated knowledge Martin (1995).The most useful information gathered on medicinal plants reported by local people; medicinal value, condition of preparation, application, methods of preparation, route of administration, diseases treated, dosage, plant parts used, growth forms, and threatening factors were analyzed. Then, the results were presented with graphs, table and pi-chart

3.3.6.2 Preference ranking

Preference ranking can be used for evaluating the degree of preference or levels of importance of certain selected plants.According to Martin (1995), preference rankinginvolves asking people to think of some items and request them to arrange those items according to a given criteria. Such criteria may be personal preference, or the list of plants resources that people feel are becoming increasingly rare in their communal forests. Therefore, in this study the set of eight plants were selected from the list of medicinal plants, which were reported as scarce by most informants in the study area. Then, these plants were presented to eight randomly selected key informants (out of 12) to rank according to their degree of scarcity. Each rank was given a numerical value (1, 2, 3, and so on) with the most scarce medicinal plant species being given the highest value of5 while the least important was assigned a value of 1. Then, the numbers were summed and ranked.

A single ailement can be treated by several plant species. In such case the key informants show preference towards plant species on the basis of their healing power against Febrileillness as

described by Martin (1995). In such a manner that eight key informants were randomly selected and asses the degree of effectiveness of six medicinal plants that are noted for treating Febrile illness. Eight key informants responses were recorded, total value summarized and rank made based on the report of eight key informants.

3.3.6.3 Direct matrix ranking

Direct matrix ranking was performed following Martin (1995) in order to compare multipurpose use of medicinal plants. Based on information gathered from informants, eight multipurpose tree species were selected out of the total medicinal plants and seven use diversities of these plants were listed for eight selected key informants to assign use values to each species. Each key informant was asked to assign use values: 5= excellent, 4= very good, 3 = good, 2 = less used, 1 = least used, 0 = not used, for each species. Accordingly, each key informant gave use values for the eight multipurpose medicinal plants, total values (eight key informants' value) of each use diversity for species were taken, and the values of each species were summed up and ranked.

3.3.6.4 Fidelity level (FL)

Many medicinal plant species could be used in the same use category and due to this, it is interesting to determine the most preferred species used in treatment of a particular ailment, which can be done with the fidelity level of Friedman *et al*. (1986). The fidelity level (FL), the percentage of informants claiming the use of a certain plant species for the same major purpose, was calculated for the most frequently reported diseases or ailments.

3.3.7 Ethical consideration

Data collection was conducted after permission was obtained from Administrative Office and the individuals who were willing to participate in the research.Special ethical considerations were taken from the beginning to the end of data collection. In view of ethical considerations, approaching of the informants was very systematic. Informants were informed that the objective of the research was for educational purpose, compiling and documenting of medicinal plants of the study area but not for commercial purposes. This was confirmed by showing letter from District Administrative Office. Most informants accepted the idea and gave information freely on medicinal plants used in the area**.**

CHAPTER FOUR

4. RESULTS

4.1 Traditional medicinal plants of Machakel District

4.1.1 Taxonomic diversity and endemicity of medicinal plants

4.1.1.1 Taxonomic diversity

A total of Eighty two medicinal plant species belonging to 44 Family and 75 genera were collected, identified and documented in this study (Appendix 6). Asteraceae was found to be the most dominant species family that contains 8 species followed by Lamiaceae species in Table 3 and Appendix 6.

Table 3 Distribution of medicinal plant species into family's and genera

Family	Number of species	Species in percentage	No of genera	Genera in percentage
Asteraceae	8	9.7	5	6.6
Lamiaceae	6	7.3	6	8
Solanaceae	5	6.09	5	6.6
Fabaceae	3	3.6	3	4
Euphorbiaceae	3	3.6	3	4
Apiaceae	1	1.2	1	1.33
Cucurbitaceae	3	3.6	2	2.66
Rosaceae	5	6.09	4	5.33
Poaceae	4	4.87	4	5.33
Polygonaceae	3	3.6	3	4
Rutaceae	3	3.61	3	4
Brassicaceae	4	4.87	2	2.66
32 families/	34	41.46	34	45.3
Total = 44	82	100	75	100

4.1.1.2 Endemic medicinal plants of the study area

Four endemic medicinal plants were collected from the study area .These Endemic medicinal plant species were harvested from the wild vegetation (Table 4).

Table 4 Medicinal plants of the study area those found endemic to Ethiopia

No	**Scientific Name**	**Family**
1	*Echinops kebericho*	Asteraceae
2	*Echinops longisetus*	Asteraceae
3	*Thymus schimperi*	Lamiaceae
4	*Urtica simensis*	Urticaceae

4.1.2 Habits of medcinal plant

Regarding the diversity of habits of Ethnomedicinal plants in the study area, herbs were frequently reported with (39,47.5%) species followed by shrubs with (22,26.8%) species. (Figure 6).

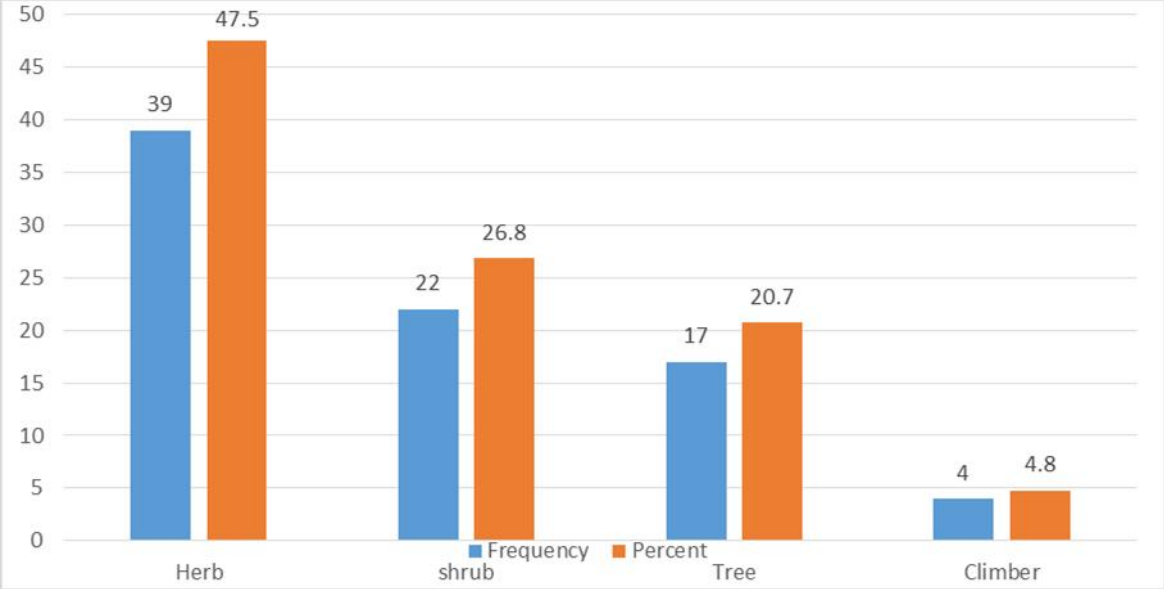

Figure.6 Habits of medicinal plant

4.1.3 Plant community types in the study area

4.1.3.1. Plant community types in natural habitat

Based on dominant plant species, the natural vegetation of the study area can be categorized visually into two major groups.

***A Juniperus procera* dominated plant community**This plant community type is predominantly found in three study sites (yewula, Abebinure and Girakidamen) and also found around few churches of the study area *Impatiens rothii*, *Olea europaea* subsp. *cuspidata*, and *Verbascum sinaiticum* are medicinal plant species obtained from this community type.

B. *Eucalyptus globulus* plantation dominated community type

This plant community type is found almost in all study sites. *Eucalyptus globulus* is the most dominant plantation tree species in the study area (Figure 8). It is one of the good income generating plants for the farmers in the study area. *Kalanchoe petitiana, Osyris quadripartite* and *Pennisetum sphacelatum* are common herb medicinal plants that occur in this community type.

Figure 7.*Eucalyptus globulus* plantationdominated community type (Photo courtesy by Etagegnehu Yirsaw; 2018)

4.1.3.2. plant community types in home garden habitat

A. *Rhamnus prinoides* dominated plant community

This type of community is mainly found in some of the study sites (Angot,Abebeinure,Gira kidamen (Figure 9). Most medicinal plants were harvested from *Rhamnus prinoidies* dominated plant community type.This the fact the *Rhamnus prinoides* dominated plant community type is

fenced and carefully protected by farmers.. Some of the medicinal plant species were *Allium sativum, Artemisia rehan Ruta chalepensis, Brassica oleracea,Capsicum annuum, Catha edulis,Cucurbita pepo, Daucus carota, Euphorbia ampliphylla,Malus sylvestris, Ocmium lamiifolium, Ricinus communis and Zenheria scarba*.

Figure 8.Community type dominated by *Rhamnus prinoides* (Photo Courtesy by Etagegnehu Yirsaw, 2018)

B. *Coffea arabica* dominated plant community

This type of community is mainly found in Gira kidamn and Workima. The community includes the following medicinal plants: *Allium cepa, Citru limon, Lycopersicon esculentum* and *Saccharum officinarum*.

4.1.4 Distribution and diversityof medicinal plants in Different Habitat

The present study showed that local people of the study area obtain medicinal plants from wild areas, their own homegardens and crop fields. Medicinal plants were collected either from natural (uncultivated) wild habitats or agricultural areas of the homegarden and crop fields. (Table 5)

Table 5 Habitats of medicinal plants

Habitat	No of plant species	Percentage
WILD	48	58.5
HOMEGARDEN	34	41.4

4.2 Sources of Indigenous knowledge on medicinal plants

Most of the traditional knowledge of medicinal plants is passed orally and through secret along the family line from parents. Of the total informants, medicinal plant knowledge gained from families(57%), and the least (8.3%) from religious books such as "*etse debdabe''*and *''awde negest"*. During interview, indigenous knowledge on medicinal plants was differing among gender and age. Elder people are more knowledgeable on medicinal plants than the younger ones.

Any health problem except very few are believed to have traditional remedy by professional practitioners called '*medhanit awakiwoch*.these practioners belived that health problems such as snake bite,hepatits,mental disorders and evil eye don't have modern medication and they advice the local people to get treatment traditionally

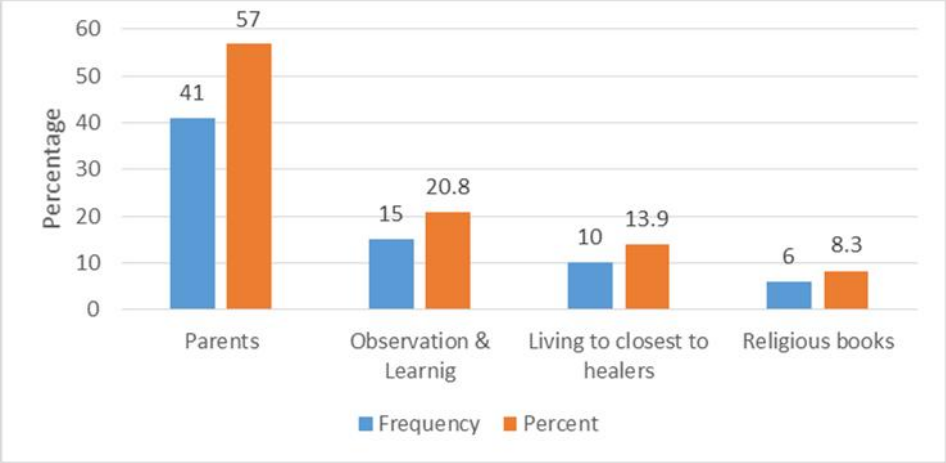

Figure 9.source of indegineous knowledge on medicinal plants

4.3 Medicinal plants use in the study area

4.3.1 Medicinal plants used to treat human and livestock health problems

Out of the total collected and identified medicinal plants, 57 (69%)species were reported as traditional medicine for treatment of human ailments only (Appendix 2) and 9 (10.9%) species were reported as traditional medicine for treatment of livestock ailments only (Appendix 3). A total of 16 (19.5%) species were reported as traditional medicine for treatment of both livestock and human ailments (Appendix 4).

4.3.2 Plant parts used

The local people of the study area collect different plant parts for preparation of taditional medicine (e.g. leaves, roots, seeds, stem, barks, fruit, flower and latex). The most widely used plant part for the preparations of remedy for treatment of human and livestock health problems were leaves (35%) followed by roots (22%) (Figure 9).

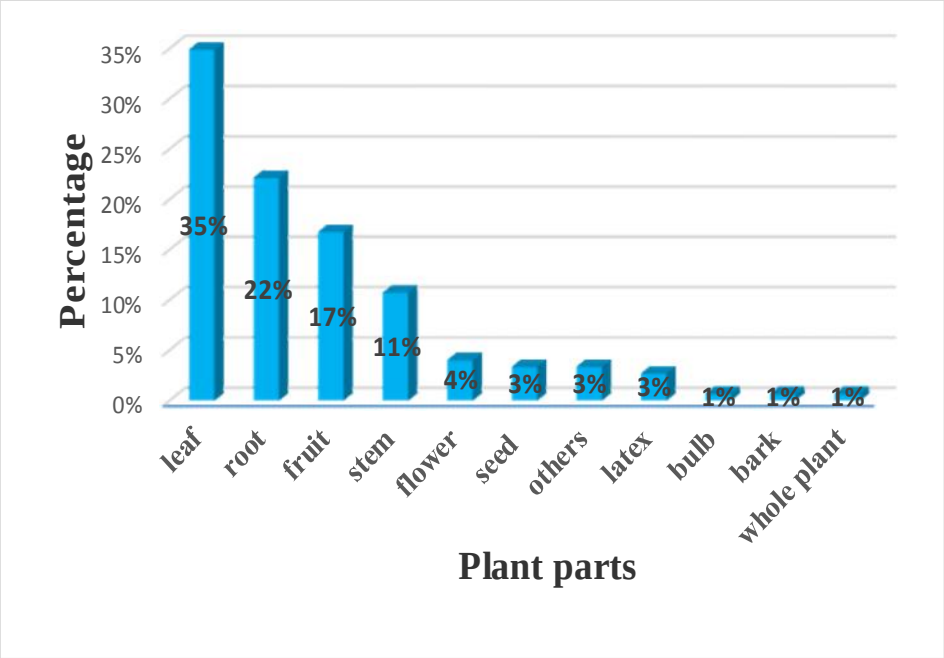

Fig.10 Preparation of remedy

4.3.3 Conditions of preparation of herbal remedies

Local people of the study area prepare hebal remedy for various ailments while medicinal plants are in fresh form, dried or fresh and dried. Most of medicinal plants (43.2%) were reported to be used in fresh form, (31.6%) of the medicinal plants were used in dry form as represented in the pie chart below (figure12)

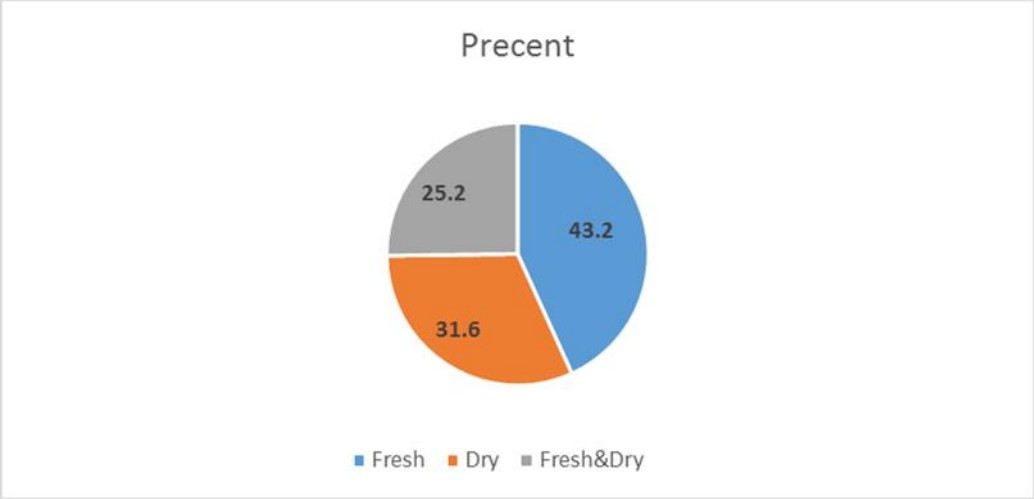

Figure11. Conditions of preparation of herbal remedies

4.3.4 Method of preparation and application of remedies from medicinal plants

4.3.4.1 Method of preparation

Regarding the preparation of medicine for human and livestock, the local people employ various methods of preparation of traditional medicines for different types of ailments. Among these, the principal method ofremedy preparation forms were pounding (34%), whereas Crushing (2%) was the least method of preparation of remedies (Table 6).

Table 6 Ways of preparation of remedy in Machakel District

Types of preparation	Frequency	Percentage
pounding	41	34
Powdering	35	29
Squeezing	17	14
Chewing	10	8
Boiling	5	4
Cooking	4	3
Soaking	4	3
Crushing	3	2
Unprocessed	1	1
Latex collection	1	1
Others	1	1

4.3.4.2 Application of remedies

The prepared traditional medicines were reported to be applied in a number of methods. The largest parts of prepared remedies were reported to be applied by drinking (28.1%) followed by creaming (16.4%), whereas swallowing (1.25%) was the least (Table 7).

Table 7. Types of application of prepared remedy in Machakel District

Type of Application	No. of application (Frequency)	Percentage
Drinking	45	28.1
Creaming	28	17.5
Eating	20	12.5
Tying	16	10
Inhaling	14	8.75
Bathing	11	6.8
Pasted on	9	5.6
Sucking	6	3.7
Dropping	5	3.1
Swallowing	2	1.25
Others	4	2.5
Total	160	100

4.3.5 Dosage and route of administration of medicine

Dosages were estimated using spoon (‘Mankia’), cup (‘Sini’), Tiwa,glass (‘Birchiko’) and clay plate for liquids to be administrated, and for powders as spoon numbers or in some cases handful (‘Efeign’).

The most favoured administration route was oral (37.6%) and the least is anal (1.2%).

Table 8 Route of administration of medicine in Machakel District

Route of administration	Frequency	Percentage
Oral	60	37.3
Dermal	55	34.2
Oral and Nasal	20	12.4
Neck	7	4.3
Nasal	5	3.1
Ocular	5	3.1
Ear	4	2.5
Tooth surface	3	1.9
Anal	2	1.2
Total	**161**	**100**

4.4 Human and livestock ailments treated by medicinal plant

In the study area atotal of 68 human and live stock ailments were reported to be treated using 82 species recorded (Appendix 7). Accordingly, evil eye is treated using large number of medicinal plants (10 species) followed by stomach ache using 8 species.

4.5 Important medicinal plants in the study area

4.5.1 Informant consensus

Curative medicinal plants for treatment of certain disease were frequently cited by Informants in the study area. In this study, *Lepidium sativum* was reported by 52 informants (72.2%),these and other more frequently cited medicinal plants are shown in(Table 9)

Table 9. Top commonly known medicinal plant species in Machakel district

Medicinal plant	No. of informants	% of informants
Lepidium sativum	52	72.2
Allium sativum	51	70.8
Zehneria scabra	49	68
Withania somnifera	47	65.3
Cucumis ficifolius	46	63.9
Clematis simensis	44	61.1
Ocimium lamiifolium	43	59.7
Ruta chalepensis	40	55.6
Lupins albus	39	54.2
Artemisia abyssinica	37	51.4

4.5.2 Preference ranking

4.5.2.1 Ranking of threatened plants

Preference ranking was performed on eight of the major scarce medicinal plants provided by most informants during the interview. Therefore, eight medicinal plants were provided to eight key informants to show their views about scarcity of the given medicinal plant species in their

environment. The results showed that *Echinops kebericho* was the most scarce medicinal plant. All the eight key informants who participated in this exercise knew about the medicinal value of the plant and that it is not available in the area. The least scarce species was *Embelia shimperi.*

Table 10 Ranking of scarce medicinal plants in Machakel District

Medicinal plant	**Key Informants (I1-I8)**								**Total Score**	**Rank**
	I_1	**I_2**	**I_3**	**I_4**	**I_5**	**I_6**	**I_7**	**I_8**		
Withania somnifera	5	2	3	4	2	2	4	4	26	6
Cucumis ficifolius	5	5	4	5	3	4	3	3	32	3
Aloe Trigonantha	4	5	4	4	3	3	3	4	30	4
Echinops kebericho	5	5	5	5	4	4	5	4	37	1
Cliematis simensis	5	3	3	4	3	4	3	3	28	5
Podocarpus falactus	4	3	2	3	2	4	3	4	25	7
Embelia Schimperi	4	5	3	1	2	3	4	2	24	8
Phytolacca dodecandra	5	5	5	4	3	4	5	4	35	2

4.5.2.2 Ranking of most prefeered Medcinal splants

It was observed that a single ailement can be treated by several plant species in the study area. Six medicinal plants were frequently reported to treat febrile illness. Eight key informants participated ranking of these six species so as to identify the most prefereed species for treating

febrile illness. *Ocimum lamifolium* was found the most preferred species followed by *Zehneria scabra to* treat febrile illness.The least preferred one was B*rassica carinata*(Table 11).

Table 11 Ranking of most prefeered Six medicinal plants used to treat Febrile illness in Machakel District

Medicinal plant	Key Informants (I1-I8)								Total Score	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8		
Lepidum sativum	1	3	2	2	2	1	2	1	14	5
Zehneria scabra	4	3	2	4	2	3	2	3	23	2
Eucalyptus globulus	3	1	1	1	2	1	2	2	13	4
Salvia nilotica	2	3	2	2	3	1	3	3	19	3
Ocimuium lamiifolium	4	4	4	3	3	4	3	4	29	1
Brassica carinata	1	1	1	2	1	1	2	2	11	6

4.5.3 Direct matrix ranking for multipurpose medicinal plant

People of the study area reported medicinal plant species that had multiple uses. In this study six species were selected on the basis of their multipurpose values and six use categories were listed for Eight key informants to assign use valves to each species.The results of the direct matrix ranking showedthat *Eucalyptus globulus* was found to be largely used by the local community for multiple purposes followed by *Olea europaea subsp*. *Cuspidta (*table 12)**.**

Table 12 Direct matrix ranking for eight species and seven main use in Machakel District

Main uses	Medicinal plant species							
	Ficus Vasta	*Ficus sur*	*Croton macrostachyus*	*Podo carpus falcatus*	*olea europaea subsp. cuspidta*	*Cordia africana*	*Eucalyptus globulus*	*Juniperus procera*
Key informant	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8
Charcoal	3	3	3	4	3	3	4	4
Construction	1	2	2	4	4	3	4	2
Fence	1	0	0	1	1	1	3	2
Fire wood	2	2	3	3	3	3	5	4
Medcine	3	4	4	3	5	4	5	3
Tool	2	3	1	2	4	4	4	4
Total	12	14	13	17	20	18	25	19
Rank	8	6	7	5	2	4	1	3

4.5.4 Fidelity level (FL)

The fidelity level was calculatedthose diseases frequently reported by informants. These diseases include evil eye, stomachache and commoncold. The traditional practitioners employed their indigenous knowledge to manage these frequent diseases and important medicinal plant species were identified for those diseases.

Table 13 Fidelity value of medicinal plants for the most frequently reported disease

Disease treated	**Medicinal plant**	**Ni**	**N**	**Fidelity index**	**(NI/N)100**
Evil eye	*Carissa spinarum*	14	15	0.93	93
	Caprris tomentosa	23	24	0.95	95
	Clerodendrum myricodes	18	19	0.94	94
Common cold	*Ruta chalepensis*	14	18	0.77	77
	Thymus shimperi	3	5	0.6	60
	Artemisia abyssinica	23	25	0.92	92
Stomach ache	*Lepidium sativum*	24	25	0.96	96
	Allium sativum	21	25	0.84	84
	Cucumis ficifolius	12	18	0.66	66

4.6 Reported Marketability of Medicinal Plant

Medcinal plants in the study area were not sold in the market for particular purpose of medicine. During the interview the respondants explained the most healers prepared and sold medicinal plants in the home rather than selling in the market. Since the local people prefer either collecting these plants by themselves fromvegetaion in the district to prepare the medicine. In the study area medicinal plants were sold in the open market for other purposes other than medicinal value as spices (*Allium sativum),* food (such as *Cicer arietinum,Malus sylsvestris*), Stiumulant(Coffe Arabica), and fumigation (such as *Otostegi integrifolia*).

4.7 Threats to and conservation of medicinal plants in the study area

4.7.1 Threats to medicinal plants

People need plants for their daily life activity. In Machakel District from the interview of informants, various causes of threats to medicinal plants were recorded in the area. The reported causes can be generally grouped into natural and human induced factors. However, as reported in this study most of the causes for the threats to medicinal plants and the associated indigenous knowledge are the anthropogenic factors such as deforestation due to overexploitation of plants for different uses/charcoal, fire wood, wood for construction , overgrazing, cutting and burning of plants to create new agricultural lands and others. Informants ranked agricultural expansion as the most serious threat to the medicinal plants followed by charcoal making. The least threats to medicinal plants as perceived by informants were Drought(Table 15). Informants reported that due to population pressure, agricultural practice was expanded to grazing lands and forests in the area.

Table 14. Ranking of threats to medicinal plants (values 1-5: 1 is the least destructive threat and 5 is the most destructive one)

Major Threats	**Key Informants (I1-I8)**								**Total Score**	**Rank**
	I_1	**I_2**	**I_3**	**I_4**	**I_5**	**I_6**	**I_7**	**I_8**		
Agricultural expansion	5	5	3	3	4	5	4	5	34	1
Over grazing	4	3	1	1	3	3	1	2	18	4
Construction material	1	3	1	2	3	1	3	2	16	5
Charcoal making	4	2	4	4	3	4	5	3	29	2
Drought	3	3	1	2	2	2	1	1	15	6
Fire wood collection	3	3	4	3	5	4	3	2	27	3

4.7.2 Conservation of medicinal plants

Local people of the area have some actual belief on healing power of plants and they know their habitat, distribution, harvesting technique, time of harvest and the status of a plant in the area. For instance, according to the informants, the healer or collector should not chat with other persons and should be prayed before and during collection. The healers also know the direction and site from which the plant should be harvested. Plant apex, main root and regenerating parts are not harvested. This is to keep and increase the regenerating capacity of the plant. Therefore, this harvesting technique has direct or indirect contribution to the conservation of medicinal plants, since they limit excessive harvesting of these plants in one way or another.

The other observed conservation mechanism of medicinal plants in the study area was *Juniperus procera* and *Euclayptus globulus* dominated plant community which is the only protected area in Gojjam dure Forest in Yewula Kebele and some of the medicinal plants are conserved for other values in church forests. Guards protected these areas and no cutting of any plant species is allowed for charcoal making, construction material, fire wood and other purposes. This activity has an important contribution for conservation of medicinal plant species that are found in that forest. On the other hand, it was also observed that the local farmers make use of their indigenous knowledge in protecting important plant species on their farmlands, homegardens, or as live fence.

CHAPTER FIVE

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Diversity and endemicity of medicinal plants in study area

A total of eighty two species of medicinal plant species distributed in 44 families and 75 genera were reported for their use in treating human and livestock diseasess.This showed that the local people are knowledgeable about traditional medicinal plants. The existence and utilization of such a large no of medicinal plants by local people in the study area indicates that the majority of the people used and continued to use indigenous medicinal practices for diverse ailments. Similarly different researchers reported different number of medicinal plants in their studies, (Muhamed Adefa,2011,Ermias Lulekal *et.al*.,2008) .

39(47.5%) medicinal plants were reported as herbs.Similar findings were reported by Endalew Amenu (2007), Mirutse Giday *et al*., (2009), Tesfaye Awas and Sebsebe Demissew (2009), Muhamed Adefa (2011), and Emiru Birhane *et al.* ,2011 in their ethnomedicinal studies in different areas in Ethiopia. In the contrary Haile Yinger *et al*. ,2008 has found shrubs followed by trees to have the highest proportion. On the other hand Ermias Lulekal *et al.* ,2008 and Fisha Mesfin *et al.*,2009 have found shrubs to have the highest proportion of medicinal use followed by herbs in their ethnobotanical research areas. This might be due to variation in the availability of vegetation types in the study areas. 48 (58.5%) of the medicinal plants were found in the wild than as cultivated plants . Tesfaye Hailemariam *et al*. ,(2009), Ermias Lulekal*et al*., (2008), andFeisha Mesfin *et al*. (2009) have found similar findings in their study of medicinal plants of Wonago, Mana Angetu and Low lands of Konta Ada'adistricts respectively.

The medicinal plants documented were distributed into 75 genera and 44 families. Amongthe families *Asteraceae (*8species)was found to have the largest number of medicinal plants. Similar studies by Endalew Amenu (2007) and Mirutse Giday *et al*. ,2009, have also reported that *Asteraceae* made the largest proportion of medicinal plants.This was true since the family Asteraceae is the largest and most widely distributed family in the flora area.

Four endemic medicinal plants were collected from the study area .These Endemic medicinal plant species were harvested from the wild vegetation are *Echinops kebericho ,Echinops longisetus,Thymus schimperi and Urtica simensis.*

5.1.2 Sources and habits of medicinal plants

In the study area (48,58.5%) medicinal plants were harvested from the wild in different natural ecosystems of the study area including natural forests, grazing lands, farmlands, cliff and around churches. In contrast to natural habitats, homegardens contributed less number (34, 41.4 %) of medicinal plants. This result is similar with the findings of other ethnobotanical studies elsewhere (Ermias Lulekal *et al*., 2008; Tesfaye Hailemariam *et al*., 2009; Getu Alemayehu, 2010; Nigussie Amsalu, 2010; Emiru Birhane *et al*., 2011; Gidey Yirga *et al*., 2011) in which wild areas are the most important sources of medicinal plants.So, the wild vegetation is homed repository of medicinal plants in both enclosed and unenclosed habitats.

5.1.3 Medicinal plant distribution in vegetation categories

Medicinal plants were distributed in different plant community types. Among the plant community types, *Rhamnus prinoides* dominated plant community type was the major source of

medicinal plants. This community type was found at the homegardens. Therefore, these places are carefully protected and fenced by the local farmers. According to Zemed Asefaw (2001), cultivation for medicinal plants maintained in home gardens in Ethiopia. Most of themedicinal plants found in this plant community were cultivated by the local people for other purposes such as food, ornamental and others. Getaneh Gebeyehu (2011) finding showed that some wild Medcinal plants are also cultivated inhomegarden.

Juniperus procera and *Eucalyptus globulus*dominated community type was the second important source of medicinal plants. This is mainly due to the fact that this community covers large area and is not suitable for easily harvesting compared with other plant community types.

5.1.4 Source of indigenous knowledge on medicinal plants

The major medicinal plant knowledge was gained from parents (57%). This was due to the secrecy of knowledge transfer between family members. The same result was reported by Getaneh Gebeyehu (2011) in Mecha District, West Gojjam that concluded family members were the major sources of indigenous knowledge. The second main source of knowledge was observation and learning which accounted for(20.8%) and the knowledge was gained from Living to closest to healers through use of traditional medicine of those knowledgeable persons for treatment of ailments with payment and by repeatedly observing the species used and studying the practiceandand traditional medicine is believed to be effective if done within a family or with a close relative.(8.3%) from religious books such as "*etse debdabe''*and *''awde negest"*. According to most elders and healers, parents transferring of knowledge about medicinal plants to their sons

5.1.5 Medicinal plants used to treat human and livestock ailments

Eighty two medicinal plant species were collected and documented for treatment of human and livestock ailments from the study area. The number of reported medicinal plants and their uses by the local people of the District indicates the depth of the local indigenous knowledge on medicinal plants and their applications. Out of the collected medicinal plants, more number(57) medcinal plants were reported as being used to treat human diseases compared with medicinal plant species reported for their use to treat livestock ailments. This result shows that the local communities have more indigenous knowledge and give emphasis to the uses of medicinal plants to treat human ailments than livestock diseases. Similar findings were reported by Ermias Lulekal (2008) in Mana Angetu district and Moa Megersa (2010)in Wayu Tuka District, East Wollega.

5.1.6 Plant parts used, conditions and mode of preparation

Leaves (35%) were the most widely used plant parts in preparation of remedies followed by roots (22%). This is consistent with the findings of other researchers elsewhere (Mirutse Giday, 2001; Haile Yineger and Delenasaw Yewhalaw, 2007; Mirutse Giday *et al*., 2009; Tesfaye Hailemariam *et al*., 2009; Getnet Chekole, 2011; Mohammed Adefa and Berhanu Abraha, 2011). This may be due to ease of preparation and the presence of more bioactive ingredients in leaves. Inaddition, collecting leaves does not pose a great danger to the existence of an individual plant when compared with the collection of an underground part, stem or whole plant. On the other hand, the findings of other studies in other parts of the country reported that roots are the most widely used plant parts in their study sites (Fisha Mesfin, 2007; Ermias Lulekal *et al*., 2008; Fisha Mesfin *et al*., 2009; Teferi Flatie *et al*., 2009; EmiruBirhane *et al*., 2011).

The majority of medicinal plants were used in fresh (43.2%) and either of the two (25.1%) for the preparation of remedy .This is similar with the findings reported by Endalew Amenu (2007); Haile Yineger and Delenasaw Yewhalaw (2007); Haile Yineger *et al*. (2008); Moa Megersa (2010) and the majority of medicinal plants were used in fresh (43.2%) form followed by dried (31.6%) and either of the two Nigussie Amsalu (2010). This is related to the effectiveness of fresh materials in treatment as the contents are not lost before use compared to the dried forms.

In the study mostly the plant remedies are prepared by pounding (34%) followed by powdering (29%). This is in line with the finding of Endalew Amenu (2007) in Chelya District reportedthat pounding was the dominant method of preparation of remedy followed by Powdering. However, Getaneh Gebeyehu (2011), in a similar study on people of Mecha District reported that most of the plant remedies are prepared by squeezing.

5.1.7 Route of administration, dosage and application of medicinal plants

Route of administration of medicinal plants depends on the nature of ailments to be treated, given both internally and externally. The most popular way of administration of traditional medicines were oral (37.1%) followed by dermal (34.1%).

Various ethnobotanical researchers elsewhere in Ethiopia have also indicated oral route as the predominant route of administration (Mirutse Giday, 2001; Etana Tolasa, 2007; Tilahun Teklehaymanot and Mirutse Giday, 2007; Ermias Lulekal *et al*., 2008; Fisseha Mesfin *et al*., 2009; Tesfaye Hailemariam *et al*., 2009; EmiruBirhane *et al*., 2011; Gidey Yirga *et al*., 2011. The knowledge of traditional healers in Machakel district, in using different measurements to determine dosage for treatment of various diseases is also poor. They usually use different ways

of measurement using devices such as spoons,Efign cups and glasses, numbers (for leaves, seeds, & fruits) and lining of the smallest finger (for roots, steams or barks). Therefore, the measurements used to determine the dosages are not standardized, and most of the doses are given by assumptions of age, physical appearance, and sex and health conditions. Generally, the limitation of a fixed dosage for a given preparation is the existing problem of traditional medicinal plant remedies in various parts of the country as indicated by different researchers (Etana Tolasa, 2007; Ermias Lulekal *et al*. 2008; Fisha Mesfin *et a*l, 2009 and Mirutse Giday *et al*., 2009).In the same way Amare Getahun (1976),Sofowora (1982) and Dawit Abebe(1986) concluded that lack of precision and standardization as one draw back of traditional medicine.

The prepared traditional medicines were applied in various methods. drinking (28 .1%) was the most popular way of application of traditional herbal medicine followed by creaming (17.5%) in the area.This result agrees with the work of Endalew Amenu (2007) in Chelya District which indicated that drinking was the predominant application.The intake of remedies orally could be applied by drinking, eating, inhaling, others, with mixing of additives like water, sugar, butter, salt, milk, honey, injera, tea, local bevarages like ‘TELLA’ and ‘AREKIY’. Mixing of these additives during the preparations or administration help to improve the intake safety of remedies and to minimize discomfort andadverse effects. Porridge prepared from *Eragrostis teff* was also mentioned as an important antidote for some preparations.

In the study area ,atotal of 68 Human and live stock ailments were reported to be treated using 82 Species recorded . Accordingly Evil eye is treated using large number of medicinal plants(10) species followed by stomach ache using (8) species. This indicates that agiven medicinal plant(s) could be used for treatment of several human livestock ailments and the treatment of ailments using different plant species. Similarly,(Muhammed Adefa,2009)have reported that a single ailment is treated by two or more plant species.

Ranking of medicinal plants showed that there are some medicinal plants that are preferred by local people than the others. As the informants told ,this knowledge comes from long time practice. The local community had long experienced knowledge that they used to differentiate the effectiveness of medicinal plants to treat local ailments. The results of Preference ranking showed that *Ocimium lamiifolium* were the most preferred to treat febrile illness followed by *Zehneria scabra and Brassica carinata* the least preferred to treat febril illness.However,Eskedar Abebe ,(2011) reported that *plantogo lanceolata* is the most preferred species against wound followed by *Rumex nerveousus* in Debark Woreda,North Gonder, Ethiopia.

The results of the direct matrix ranking revealed that *Euclayptus globulus* standsfirst followed by *Olea europaea* subsp. *Cuspidata,Juniperus procera, Podocarpus falcatus, Cordia african ,Ficus ovata,Croton macrostachyus and Ficussur* respectively. On the other hand,Eskedar Abebe,(2011) ,reported that *Olea europea* is extensively usedin Debark and Minjar shenkora Woreda ,respectively.

This result also shows threats over harvesting of plants which affected useful plants. For example, *Cordia africana* and *Juniperus procera* were among damaged species in the area due

to their over use for construction and furniture making. This finding is similar with other ethnobotanical researches conducted in Minjar District of Amhara Region, Ethiopia by Getu Alemayehu (2010).

The medicinal plants that are widely used by the local people have higher FL values than those that are less popular. The most preferred species *Caparris tomentosa* for evil eye had an FL value of to the disease category 95, *Lepidium sativum* had 96 for stomach ache and the FL of *Artesmia abyssinica* was 0.92 for Commoncold. As many plant species may be used in the same use category, it is interesting to determine the most preferred species used in treatment of particular ailment (Friedman *etal*. 1986). Medicinal plants with higher FL value need to be seriously considered for further Ethnopharmacological studies (Tesfaye Hailemariam, 2009).

5.1.8 Reported Marketability of Medicinal Plant

In the study area medicinal plants were sold in the open market for purposes other than medicinal value as spices (*Allium sativum),* food (such as *Malus sylsvestris,Cicer arietinum*) and fumigation (such as *Otostegi integrifolia*), Stimulant (Coffe arabica),The key informants percivied that selling herbals in the market decreases the efficacious potential of the medicine. This might be to maintain the secrecy of medicinal plants knowledge. Moreover, they stated that the local people prefer to buy or get herbals directly from healers instead of buying it from the market. This might related to the fact that the local people didn't have the experience and lack awareness about marketability of herbals. On the other hand it might be due to strong relationship between the local healers and the society that marketable plants are still keptat homefor inhouse services. Similarly Etana Tolasa (2007), Mirutse Giday (2001), Mirutse Giday

et al. ,(2009), Getu Alemayehu (2010) and Nigusie Amsalu (2010) reported that medicinal plants are mainly sold in the market for other uses their study sites than for medicinalvalue.

5.1.9 Threats and conservation of medicinal plants in the study area

Nowadays, the loss of biodiversity in Ethiopia in general and in the study area in particular is a serious problem. It is caused by both anthropogenic and natural factors. Environmental degradation, agricultural expansion, loss of forests and woodlands, over-harvesting, fire, cultivation of marginal lands, overgrazing and urbanization appear to be the major threats to the medicinal plants of Ethiopia (Endashaw B*ekele, 2007).*

Echinops kebericho, Cucumis ficifolius, Withania somnifera and *Phytolacca dodecandra* are rare species in the area as many informants reported. The most cited threats to medicinal plants of the area were agricultural expansion in relation to population growth, charcoal making, fire wood collection, over grazing, drought and construction materials. From these, agricultural expansion was the major threat to medicinal plants in Machakel District followed by charcoal making. The results of Fisha Mesfin *et al*., (2009) and Nigussie Amsalu (2010) indicated that agricultural expansion was the major threat on medicinal plants in Wonago and Farta districts respectively. According to Sofowara (1982) the loss of medicinal plants associates with the missing of advantages gained from medicinal plants and indigenous knowledge associated with plants. Getaneh Gebeyehu (2011) finding showed thatsome wild medicinal plants are also cultivated in homegarden. Homegardens are important sites for the conservation of medicinal plants and for transferring of the indigenous knowledge from older to the younger generation. Some traditional practitioners have started cultivating medicinal plants in homegardens. According to Zemede

Asfaw (2001), cultivation for medicinal value accounted for 6% of the plants maintained in homegardens in Ethiopia. Some traditional practitioners had started to conserve medicinal plants by growing them in homegardens in the area. These are *Cymbopogoncitratus, Lippiaadoensis* and *Ocimum lamiifolium*. In most situations, the homegardens are fenced and protect the medicinal plants from grazing and unwise harvesting. In addition, some of the medicinal plants are conserved for other values in church forests in the area.

Juniperus procera and *Eucalyptus globulus* dominated plant community was the only protected forest in the study area. Thus, this community type was providing important contribution for *in-situ* conservation of wild growing medicinal plants. However, this conservation practice is not sufficient and further *in-situ* conservation of other wild plant communities is neded

5.2 Conclusion and Recommendations

5.2.1 Conclusion

Eighty Two medicinal plant species which belong to 44 families and 75 genera were collected, identified and recorded. This indicated that, the study area is rich in medicinal plants diversity. Asteraceae was the leading family which was represented by8 plant species. From the total medicinal plants, 57 species were used to treat only human ailments, 9 species were used to treat only livestock ailments and 16 species were used to treat both human and livestock ailments. Sixity eight human and livestock ailments were reported to be treated by traditional medicine in the study area. Most (48) of the medicinal plants were collected from wild vegetation. However, homegardens were also found very important, which contributed 34 species, therefore; the local people should be enhanced homegardening in their area. The source of Indigneous knowledge gained from parents.

Herbs were found to be the dominant growth forms used for preparation of traditional remedies followed by shrubs and trees. Leaves were also found to be the most frequently used plant parts followed by roots for preparation of traditional medicine. Most of the herbal remedies are prepared from fresh materials and administered orally. The results revealed that many wild medicinal plant species are under growing pressures from various anthropogenic factors. The major threats to medicinal plants in this study area are agricultural expansion to forests and grazing lands followed by charcoal making. Therefore, awareness raising movement is needed for the local community to conserve medicinal plants.

5.2.2 Recommendation

Based on the results, the following recommendations are forwarded:

- The district's health office should support the traditional medicinal practitioners' association properly which in turn helps in securing primary health care of the local people of the district.
- The local government should support the establishment of ethnobotanical gardens.
- The local people should use medicinal plants mainly for their medicinal value other than their multiporpuse values.
- Elders who have high respect should participate in awareness creation for healers and youngsters to minimize the loss of indigenous knowledge of medicinal plants.
- The traditional practitioners should properly share their indigenous knowledge on medicinal plants not only for their families but also for other local communities inorder to strengthen this indigenous knowledge of medicinal plants.
- The local people should be educated about the sustainable utilization and management of medicinal plants.
- The traditional healers and local communities should be cultivating medicinal plant species in their homegardens.
- District Agricultural and Rural Development office should be encourage the local people to cultivate and protect endemic plant species in the study area such as *Thymus schimperi,Urtica simensis Echinops kebericho* and *Echinops longiestu.*
- *Echinops kebericho* was the more scarce medicinal plant in the study area, therefore, the District Agricultural and Rural Development Office should be brought this medicinal plant protect and encourage the local people to Conserve this plant.
- Wereda administration office should provide education and awareness raising to indigenous knowledge and skill of traditional medicine practitioners have to be encouraged and protected.
- To give more support to the finding of this research,further scientific investigation are nedded for *Lepidium sativum* and *Artemisia abyssinica* to the pharmaceutical Purpose.

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APPENDICES

Appendix 1 Medcinal plant used by local people in study area with scientific name, Family, local Name Habit (H-Herb,S-Shurb,T-Tree,CL-Climber) Habitat (HG-Home garden,W-Wild) and Collection no.

No	Scientific Name	Family	Local Name (Amharic)	Habit	Habitat	Collection No.
1	*Allium cepa* L.	Alliaceae	Key shinkurt	H	HG	EY060
2	*Allium sativum* L.	Alliaceae	Nech shinkurt	H	HG	EY05
3	*Aloe trigonantha Leach.*	Aloaceae	Wende iret	H	W	EY059
4	*Artemisia rehan Chiov*.	Asteraceae	Arti	H	HG	EY052
5	*Artemisia abyssinica Sch.Bip.*	Asteraceae	Chikugne	H	W	EY051
6	*Bersama abyssinica* Fresen.	Melianthaceae	Azamir	S	HG	EY058
7	*Brassica carinata* A.Br.	Brassicaceae	Gomenzer	H	HG	EY04
8	*Brassica nigra (L)Koch.*	Brassicaceae	Senafich	H	HG	EY03
9	*Brassica oleracea* L.	Brassicaceae	Tql gomen	H	HG	EY053
10	*Buddleja polystachya* Fresen.	Loganiaceae	Anfar	T	W	EY057
11	*Caparris tomentosa* Lam.	Capparidaceae	Gumero	S	W	EY018
12	*Carissa spinarum* L.	Apocynaceae	Agam	S	W	EY056
13	*Carthamustinctorius*L.	Asteraceae	Suf	H	W	EY055
14	*Catha edulis* (Vahl) Forssk. ex Endl.	Celastraceae	Chat	T	HG	EY02
15	*Capsicum annum L.*	Solanceae	Karia	H	HG	EY056
16	*Cicer arietinum L.*	Fabaceae	Shimbera	H	HG	EY054
17	*Citrus limon(*L.) Burm .f.	Rutaceae	Lomi	T	HG	EY074
18	*Clausena anisata(*Wild.)Benth.	Rutaceae	Limich	S	W	EY070
19	*Clematis simensis* Fresen.	Ranunculaceae	Yeazo areg	Cl	W	EY014
20	*Clerodendrum myricoides*(Hochst.*)* Vatke	Lamiaceae	Misrich	S	W	EY055
21	*Coffea arabica* L.	Rubiaceae	Bunna	T	HG	EY067
22	*Combertum terminalia* Friss *et al.*.	Combertaceae	Abalo	S	W	EY013
23	*Cordia africana* Lam.	Boraginaceae	Wanza	T	W	EY066
24	*Croton macrostachyus* Del.	Euphorbiaceae	Bisana	T	W	EY012
25	*Cucurbita pepo L.*	Cucurbitaceae	Duba	CL	HG	EY017

Appendix 1 cont…

25	*Cucumis ficifolius* A. Rich.	Cucurbitaceae	Yemdir embway	H	W	EY065
26	*Cupressus lusitanica* mill.	Cupressaceae	Yeferrenj stid	T	HG	EY019
27	*Cymbopogon citratus(*DC.) Stapf.	Poaceae	Tejesar	H	HG	EY011
28	*Datura stramonium* L.	Solanaceae	Astenager	H	HG	EY068
29	*Daucus carota* L.	Apiaceae	Karrot	H	HG	EY064
30	*Echinops kebericho* Mesfin	Asteraceae	Kebericho	H	W	EY072
31	*Echinops longisetus* A .Rich	Astreaceae	Koshelie	S	W	EY028
32	*Embelia schimperi* Vatke.	Myrsinaceace	Enkoko	S	W	EY07
33	*Eucalyptus globulus* Labill.	Myrtaceae	Nech bahirzaf	T	W	EY015
34	*Euphorbia ampliphylla* Pax	Euphorbiaceae	Kulkual	T	HG	EY062
35	*Ficus ovate* Vahl.	Moraceae	Shola	T	W	EY010
36	*Ficus vasta* Forssk.	Moraceae	Warka	T	W	EY063
37	*Guizotia schimperi* Sch. Bip.ex Walp.	Asteraceae	Mech	H	W	EY09
38	*Guizotia abyssinica (L.F)* Cass.	Asteraceae	Nug	H	HG	EY08
39	*Hagenia abyssinica* (Bruce) J.F. Gmel.	Rosaceae	Kosso	T	W	EY016
40	*Hordeum vulgare* L.	Poaceae	Gebs	H	W	EY034
41	*Impatiens rothii*Hook.F	Balsaminaceae	Gishilt	H	W	EY045
42	*Juniperus procera* Hochst. ex. Endl.	Cupressaceae	Yabesha tid	T	W	EY033
43	*Justicaschimperiana* Hochst.ex.nees	Acanthaceae	Smiza	S	HG	EY06
44	*Kalanchoe petitiana* A.Rich	Crassulaceae	Endahahula	H	HG	EY037
45	*Lepidium sativum*L.	Brassicaceae	Feto	H	HG	EY021
46	*Linum usitatissimu*m L.	Linaceae	Telba	H	W	EY077
47	*Lippia adoensis*Hochst. ex Walp. Var.adonesis.	Verbenaceae	Kessie	H	W	EY031
48	*Lupinus albus* L.	Fabaceae	Gbto	H	HG	EY078
49	*Lycopersicon esculentum*Mill.	Solanaceae	Timatim	H	HG	EY020
50	*Malva verticillata L.*	Malvaceae	Lut	H	W	EY01
51	*Malus sylvestris* Miller	Rosaceae	Apple	T	HG	EY079
52	*Maytenus arbutifolia* (A.Rich.) Cuf.	Celastraceae	Atat	S	W	EY043
53	*Mentha spicata* L.	Lamiaceae	Nana	H	HG	EY080
54	*Myrica salicifolia* A. Rich.	Myricaceae	Shinet	T	W	EY042
55	*Nicotiana tabacum* L.	Solanaceae	Tinbaho	H	HG	EY041
56	*Ocimium lamiifolium* Hochst. ex Benth.	Lamiaceae	Dama kessie	S	HG	EY030
57	*Olea europea*subsp. *cuspidata (*Walle ex G.Don) Cif.	Oleaceae	Weyra	T	W	Y023

Appendix 1 cont…

58	*Osyris quadripartita* Decn.	Santalaceae	Keret	S	W	EY035
59	*Otostegia integrifolia* Benth.	Lamiaceae	Tnjut	S	W	EY069
60	*Pennisetum sphacelatum* (Nees) Th. Dur. & Schinz	Poaceae	Sindedo	H	W	EY038
61	*Phytolacca dodecandra*L'Hérit	Phytolaccacae	Endod	S	W	EY081
62	*Podocarpus falcatus* (Thumnb.) Mirb.	Podocarpaceae	Zgba	T	W	EY046
64	*Rhamnus prinoides* L'Herit	Rhamnaceae	Gesho	S	HG	EY024
65	*Ricinus communis* L.	Euphorbiaceae	Chakma	S	W	EY075
66	*Rosa abyssinica* Lindley	Rosaceae	Kega	S	W	EY022
67	*Rosa* x *richardii* Rehd.	Rosaceae	Tsigiereda	S	HG	EY025
68	*Rubus apetalus* Poir	Rosaceae	Engory	S	W	EY038
69	*Rumex nervosus*Vahl.	Polygonaceae	Embacho	S	W	EY026
70	*Rumex nepalensis* spreng.	Polygonaceae	Yewusha milas	H	W	EY029
71	*Ruta chalepensis* L.	Rutaceae	Tenadam	H	HG	EY039
72	*Saccharum officinarum* L.	Poaceae	Shenkora Ageda	H	HG	EY027
73	*Salvia nilotica* Juss. ex Jack.	Lamiaceae	Hulegeb	H	W	EY082
74	*Sesamum orientale L.*	Pedaliaceae	Selit	H	HG	EY040
75	*Silene macrosolen* A. Rich.	Caryophyllaceae	Wogert	H	W	EY032
76	*Stephaniaabyssinica* DilloEn&A.Rich) Walp	Menispermaceae	Yeyt jero	Cl	W	EY044
77	*Thymus schimperi* Ronniger	Lamiaceae	Tosign	H	W	EY048
78	*Trigonella foenum- graecum* L.	Fabaceae	Abish	H	W	EY047
79	*Urtica simensis* Steudel	Urticaceae	Sama	H	HG	EY08
80	*Vernonia amygdalina* Del.	Asteraceae	Girawa	S	W	EY046
81	*Withania somnifera*(L.) Dunal in DC.	Solanaceae	Giziewa	S	W	EY081
82	*Zehneria scabra* L.	Cucurbitaceae	Hareg resa	CL	HG	EY049

Appendix 2 List of medicinal plants used for treating only human ailments in the study area; with scientific name, family, local name, habit (climber- CI, herb- H, shrub- Sh and tree- T), parts used (leaf- L, root- R, stem- St, bark- Br, bulb- Bu, latex- Lt, seed- Se, fruit- Fr and flower-Fl), CP- condition of preparations (fresh- F, dried- D and fresh or dried- F/D), disease treated, preparation and application and route of administration.

No.	Scientific Name	Family	Local Name	Habit	Parts used	CP	Diseases Treated	Preparation and Application	Route
1	*Allium cepa*	Alliaceae	Key shinkurt	H	Bu	F	Tinea versicolor	The bulb of *Allium cepa* with the root of *Rumexabyssinicus* are crushed, mixed with juice of *Citrus limon* and salt and then creamed on affected part.	Dermal
2	*Artemisia rehan*	Asteraceae	Arti	H	R	F	Stomach ache	The root is chewed and sucked the juice.	Oral
3	*Bersama abyssinica*	Melianthaceae	Azamir	S	L & R	D	Hypertension	The leaf and root are powdered, mixed with water and drunk.	Oral
					L & R	D	Cough & Ascaries	The leaf and root are crushed, powdered, boiled with milk and drunk.	Oral
4	*Brassica carinata*	Brassicaceae	Gomenzer	H	L	F	Jaundice	The leaf is boiled and the water drank.	Oral
							Febrill illness	The dried is put on fire and the smoke is inhaled.	Nasal
5	*Brassica oleracea*	Brassicaceae	Tql gomen	H	L	F	Gastritis	The leaf is boiled and the water drunk repeatedly.	Oral
6	*Caparris tomentosa*	Capparidaceae	Gumero	S	R	D	Evil eye	The root of*caparris tomentosa* with root of *ocimium lamifoliium* and*carissa spinarum* are pounded andthen tied with a pice of cloth aroundthe neck.	Neck
					R	F	Skin disease	The root of *Caparris tomentosa* are crushed,boiled for long time and the water drunk	Oral

Appendix 2 cont…

7	*Capsicum annuum*	Solanaceae	Karia	H	Fr	F	Malaria	The *Capsicum annuum* withbulb of *Allium sativum* are wittled, soaked with water and eaten by injera after once a day.	Oral
				H	Fr	F	The loss of appetite	The fruitis eaten with enjera	Oral
8	*Carthamus Tinctorius*	Asteraceae	Suf	H	Se	D	Cough	The seed is pounded with bulb of*Alliumsativum*, boiled with honey and then drunk.	Oral
9	*Catha ednlis*	Celastraceae	Chat	T	L	F	Asthma	The leaf of *Cathaedulis* with leaf of *coffeaarabica* are boiled with honey and drunk.	Oral
10	*Cicer arietinum*	Leguminosae	Shimbera	H	Se	D	Malaria	Germinated dried and pounded being mixed with *Allium sativum* and drunk with skimmed milkSoaked in water for 3 dayes and drunk the filtrate	Oral
11	*Citrus limon*	Rutaceae	Lomi	T	Fr	F	Tinea versicolor	The fruit of *Citrus limon* issqueezed, mixed with pounded bulb of *Alliumcepa,* root of *Rumexabyssinicus* and salt and then creamed on affected part.	Dermal
					Fr	F	Cancer	The fruit of *Citruslimon* is squeezed, mixed with latex of *Euphorbia tirucalii,* heated in the sun and then creamed on affected part.	Dermal
12	*Clematis simensis*	Ranunculaceae	Yeazo areg	CI	R	D	Wart	The root of *Clematis simens* are dried, crushed, powdered, mixed with special honey and creamed on affected part.	Dermal
					L	D	Eczema	The leaf of *Clematis simensis* with root of *Urtica simensis* are dried, crushed, powdered, mixed with butter and creamed on affected part.	Dermal
					L	F	Retained placenta	The leaf is squeezed and the juice drunk.	Oral
13	*Clerodendrum myricoides*	Lamiaceae	Misrich	S	R	D	Evil eye	The root are pounded,dried,put onfire and the smoke is inhaled	Nasal
					L	F	Janudice	The leaf is boiled and the water drunk	Oral
					L	F	Bleeding in the nose	The leaf is inserted in to nostril	Nasal

Appendix 2 cont…

14	*Coffea Arabica*	Rubiaceae	Bunna	T	L	F	Common cold	The leaf is boiled and the water drunk.	Oral
15	*Combertum terminilia*	Combertaceae	Abalo	S	S	D	Eczema	Pounded being mixed with honey or butter and smearDried,pounded being mixed with burned sheep horn and fresh butter Pounded being mixed with *Allium sativum* and *Ruta chalepensis* and tied up on neck	Dermal Neck
16	*Cordia africana*	Boraginaceae	Wanza	T	Br	D	Tumor & Wart	The root is pounded, mixed with butter or honey and creamed on affected part.	Der mal
17	*Croton macrostachyus*	Euphorbiaceae	Bisana	T	L	F	Jaundice	The leaf of *Croton macrostachyus* are squeezed and one glass of the juice with milk or tela drunk for three days.	Oral
							Ring worm	The leaf of Croton macrostachyus creamed the affected part.	Dermal
					R	D	Evil eye	The root of *Croton macrostachyus* with root of *Cymbopogon citratus* are pounded, dried, put on fire and the smoke is inhaled.	Oral & Nasal
18	*Cucurbita Pepo*	Cucurbitaceae	Duba	CL	Fr	F	Headahe	The fruit pounded and tied on head	Dermal
19	*Cymbopogon citratus*	Poaceae	Tejesar	H	R	D	Evil eye	The root of *Cymbopogon citratus* with root of *Croton macrostachyus* are pounded, dried, put on fire and the smoke is inhaled.	Oral & Nasal
				S	L	D	Dandruff	The leaf is crushed powdered mixed with butter and creamed onaffected part.	Dermal
20	*Daucus carota*	Apiaceae	Karrot	H	R	F	Kidney problem & Night blindness	Eating of the root repeatedly.	Oral
21	*Echinops kebericho*	Asteraceae	Kebericho	H	R	D	Evil eye	The dried root is pounded, put on fire and the smoke is inhaled.	Oral & Nasal
22	*Echinops longisetus*	Asteraceae	Koshelie	S	L	D	Wound	The leaf of *Echinops longisetus* with leaf of*Hagenia abyssinica*are dried higly roasted powdered,mixed with butter and creamed affected part.	Dermal

Appendix 2 cont…

23	*Embelia schimperi*	Myrsinaceae	Enkoko	T	Se	F	Tape worm	Dried ,pounded and drunk with tela	Oral
24	*Euphorbia ampliphylla*	Euphorbiaceae	Kulkual	T	Lt	F	Syphilis	The latex is mixed with powder of red tef, baked, ate and then whey drunk.	Oral
25	*Ficus ovata*	Moraceae	Shola	T	Fr	F	Constipation	Eating the fruit, after eating the milk drunk.	Oral
26	*Guizotia abyssinica*	Asteraceae	Nug	H	Se	F	Cough	Pounded and boiled with water and drunk.	Oral
27	*Guizotia schimperi*	Asteraceae	Mech	H	L	F	Tape worm	The leaf of *Guizotia schimperi* with leaf *verbascum sinaiticum* are pounded mixed with water and drunk.	Oral
28	*Hagenia abyssinica*	Rosaceae	Kosso	T	L	D	Allergic dermolitia	The leaf is highly roasted, powdered, mixed with butter and creamed on affected part.	Dermal
					L	D	Wound	The leaf of *Hagenia abyssinicaare* dried, highly roasted, powdered, mixed with butter and creamed on affected part.	Dermal
					F	D	Tape worm	The flower is powdered, mixed with milk and drunk for three days.	Oral
29	*Hordeum Vulgare*	Poaceae	Gebs	H	Se	D	Diarrhoea	The seed is roasted, powdered, mixed with little hot water, salt and sugar and then ate.	Oral
30	*Impatiens rothii*	Balsaminaceae	Gishilt	H	R	F	Fire burn	The root is pounded and tied on affected part.	Dermal
31	*Linum usitatissimum* .	Linaceae	Telba	H	Se	D	Gastric	The seed of *Linum usitatissimum* is boiled with water and mixed with sugar and then drunk during feeling pain.	Oral
32	*Lippia adoensis*	Verbenaceae	Kessie	H	R	D	Smallpox	The root is pounded, put on fire and the smoke is inhaled.	Oral & Nasal
33	*Lupinus albus*	Fabaceae	Gbto	H	Se	F/D	Hypertension	The seed is ate.	Oral

Appendix 2 cont…

34	*Lycopersicon esculentum*	Solanaceae	Timatim	H	L & St	F	Gonorrhoea	The leaf and stem of *Lycopersicon esculentum*areboiled and drunk.	Oral
35	*Malus sylvestris*	Rosaceae	Apple	S	Fr	F	Diabetes	Eating of the fruit.	Oral
36	*Maytenus arbutifolia*	Celastraceae	Atat	S	R	D	Kidney problem	The root is crushed, powdered, mixed with water and one cup drunk every day.	Oral
37	*Mentha spicata*	Lamiaceae	Nana	H	L	D	Head ache	The leaf is mixed with tea and drink	Oral
					L	D	Syphilis	The leaf is pounded, mixed with butter and creamed on affected part.	Dermal
38	*Myrica salicifolia*	Myricaceae	Shinet	T	Br	D	Headache	The bark is powdered, mixed with butter and tied on the head.	Dermal
					Br	F	Intestinal parasite	The bark is crushed, boiled with water and one glass each drunk for three days.	Oral
					L	F	Congenital abnormality	The leaf of *Myrica salicifolia* is pounded,soaked with water and then bathed the whole body for seven days.	Dermal
39	*Ocimium lamiifolium*	Lamiaceae	Damakessie	S	L	F	Febril illness	The leaf is squeezed and the juice drunk.	Oral
40	*Olea enropaea* subsp. *Cuspidate*	Oleaceae	Weyra	T	L	D	Eye disease	The leaf of *Olea europaea* subsp. *Cuspidata* with leaf of *Ocimium iamiifolium* are crushed, powdered and added through the eye.	Ocular
41	*Osyris quadripartita*	Santalaceae	Keret	S	L	F	Circumcision wound	The leaf is pounded, squeezed and creamed on affected part.	Dermal
							Congenital abnormality	The leaf of *osyrisquadripartita* with the leaf of *Rhamnus prinoides are* pounded soaked with waterand then bathed the whole body for seven days	Dermal
					L	F	Toothache	The leaf is boiled and the boiled water is caught on feeling parts of teeth.	Tooth surface

Appendix 2 cont…

42	*Phytolacca dodecandra*	Phytolaccaceae	Endod	S	L	F	Jaundice	The leaf is squeezed; the juice is mixed with fresh milk and then drunk.	Oral
43	*Podocarpus falcatus*	Podocarpaceae	Zgba	T	L	F	Congenital abnormality	The leaf of *Podocarpus falcatus* are pounded, soaked with water and then bathed the whole body for seven days.	Dermal
					Br	D	Eye disease	The bark is highly roasted, powdered and then creamed every night.	Ocular
					Fr	F/D	Melasma	The fruit is pounded and creamed on affected part.	Dermal
					Br	D	Evil eye	The bark is pounded, put on fire and the smoke is inhaled.	Oral & Nasal
44	*Rhamnus prinoides*	Rhamnaceae	Gesho	S	Fr	D	Scabies	The fruit is dried, powdered, mixed with butter and the creamed on affected part.	Dermal
					L	F	Uvulitia	The apex part of leaf is pounded, mixed with water and drunk with residue.	Oral
					L	F	Congenital abnormality	The leaf of *Rhamnus prinoides* with leaf of *Osyris quadripartita* are pounded, soaked with water and thenbathed the whole body for seven days.	Dermal
45	*Ricnuscommunis*	Euphorbiaceae	Chakma	S	L	F	Tape worm	The leafof*Ricnuscommunis*withleafof*Silene macrosolen are* pounded, mixed with water and drunk.	Oral
46	*Rosa abyssinica*	Rosaceae	Kega	S	Fr	F	Ascaries	The fruit is ate.	Oral
47	*Rubus apeatlus*	Rosaceae	Engory	S	L	F	Anemia	The leaf isboiled, mixed with honey and then drunk.	Oral

Appendix 2 cont…

48	*Ruta chalepensis*	Rutaceae	Tenadam	H	Fr	F	Hypertension,Acute sickness & Stomach ache	Eating of the fruit.	Oral
					Fr	F	Diabetes	The fruit is pounded, boiled with water and then drunk.	Oral
					Fr	F	Ascaries	The fruit of *Ruta chalepensis* with bulb of *Allium sativum* and seed of *Lepidium sativum* are pounded, soaked and then eaten by injera after three days.	Oral
					Le	F	Common cold	The leaves of *Ruta chalepensis* immersed in h. tea and then drunk	Oral
					Le	F	Evil eye	The leaves of *Ruta chalepensis* with bulb of*Allium sativum* are pounded And mixed with the root of *Carissa spinarumand* tied with apice of cloth around the neck.	Neck
					Fr	F	Tinea nigra	The fruit of *Ruta chalepensis* with bulb of *Allium sativum* are pounded, and mixed with butter and thencreamed on affected part.	Dermal
49	*Saccharum officinarum*	Poaceae	Shenkora Ageda	H	St	F	Cough	The stem bark is peeled and removed; the peeled stem is chopped, boiled with water for long time and then the boiled water drank.	Oral
50	*Salvia nilotica*	Lamiaceae	Hulegeb	H	L	F	Febril illness	The leaf is squeezed and the juice drunk.	Oral
51	*Silene macrosolen*	Caryophyllaceae	Wogert	H	L	F	Tape worm	The leaf *Silene macrosolen* with leaf of *Ricnus communis*are pounded, mixed with water and drunk.	Oral
					R	D	Headache	The root is dried, pounded placed on fire and the smoke is inhaled.	Oral & Nasal
					R	F	Diarrhoea	The root is chewed and sucked.	Oral
					R	D	Syphilis	The root is pounded, mixed with whey, filtered and one cup drunk.	Oral
					Fr	F	Syphilis	Eating of seven fruits.	Oral
52	*Sesam orientale*	Pedaliaceae	Selit	H	S	F	Stomach ache	Pounded and boiled with water drunk the filtrate	Oral

Appendix 2 cont…

53	*Thymus Schimperi*	Lamiaceae	Tosign	H	F1	D	Common cold	The flower is boiled with water & sugar and drank in the form of tea every morning.	Oral
					L	D	Lung Tuberculosis(TB	The leaf is pounded, mixed with honey and then ate.	Oral
					L & R	D	Vomiting	The leaf and root are pounded, mixed with honey and ate	Oral
54	*Trigonella foenum-graecum*	Fabaceae	Abish	H	Se	D	Melasma	The seed is powdered, mixed with self urine and then creamed on affected part.	Der mal
					Se	D	Gastritis	The powder of *Trigonella foenum-graecum* is soaked with water, water is decanted, then mixed with other water and sugar and then drunk.	Oral
55	*Urtica simensis*	Urticaceae	Sama	H	L	F	Gastritis & Heart failure	Eat in the form of wot by injera against gastritis.	Oral
					R	D	Eczema	The root of *Urtica simensis* with leaf of *Clematis simensis* are dried, pounded, mixed with butter and creamed on affected part.	Dermal
56	*Vernonia amygdalina*	Asteraceae	Girawa	S	L	F	Acute sickness	The leaf is squeezed and the juice drunk.	Oral
57	*Zehneria scabra*	Cucurbitaceae	Hareg resa	Cl	L	F	Emergency	The leaf of *Zehneria scabra* pounded ,mixed with honey and then ate	Oral
					L	F	Eye diseases	The leaf is boiled and the evaporate is steamed	Nasal
					L	F	Febrile illness	The leaf is squeezed creamed body parts	Dermal

Appendix 3 List of medicinal plants used for treating only livestock ailments in the study area; with scientific name, family, local name, habit(H-Herb,S-Shurb,T-Tree,CL-climber) parts used (L-Leaf,R-Root,St-Stem,Br-bark,Bu –bulbLt-Latex,Se-Seed,Fr-Fruit,Fl-Flower) condition of preparations (fresh- F, dried- D and fresh or dried- F/D), disease treated, preparation and application and route of administration.

No	Scientific Name	Family	Local Name	Habit	Parts used	CP	Diseases Treated	Preparation and Application	Route
1	*Buddleja polystachya*	Loganiaceae	Anfar	Tree	Leaf	F	Leech	The leaf of *Buddleja polystachya* is pounded, squeezed and the juiced runk.	Oral
2	*Clausena anista*	Rutaceae	Limich	S	Leaf	F	Leech	Squeezed being mixed with *nicotiana tabacum, Allium sativum* and dropped in to the nostril .	Nasal
3	*Ficus vasta*	Moraceae	Warka	Tree	Leaf	F	Emergency	The leaf of *Ficus vasta* is pounded, soaked with water and then drunk with residue.	Oral
					Bark	D	Eye disease	The bark of *Ficus vasta* is crushed, powdered and added through the eye.	Ocular
4	*Justicia schimperiana*	Acanthaceae	Smiza	Shurb	Leaf	F	Emergency	Squeezed and drunk	Oral
5	*Juniperus procera*	Cupressaceae	Yabesha tid	Tree	Leaf	F	"Goleba"	The leaf of *Juniperus procera* with leaf of *Eucalyptus globulus* are pounded, squeezed and the juice drunk.	Oral
6	*Malva verticillata L.*	Malvaceae.	Lut	Herb	Root	F	Bloating	Fresh root is chewed	Oral
7	*Nicotiana tabacum*	Solanaceae	Tinbaho	Herb	Leaf	F	Leech	The leaf of *Nicotiana tabacum* is pounded, squeezed and the juice is added through the left nose.	Nasal
8	*Pennisetum sphacelatum*	Poaceae	Sindedo	Herb	Root	D	Rh factor	The root of *Pennisetum sphacelatum*are tied with a piece of cloth around the neck.	Neck
9	*Rosa* x *richardii*	Rosaceae	Tsigiereda	Shrub	Root	F/ D	Eye disease	The root of *Rosa x richardii* is warped and tied around the neck.	Neck

Appendix 4 List of medicinal plants used for treating both human and livestock ailments in the study area; with scientific name, family, local name, habit (climber- CI, herb- H, shrub- Sh and tree- T), parts used (leaf- L, root- R, stem- St, bark- Br, bulb- Bu, latex- Lt, seed- Se), fruit- Fr and flower- Fl), use (Hu- Human, Livestock- Ls), condition of preparations (fresh- F, dried- D and fresh or dried- F/D), disease treated, preparation and application and route of administration.

No	Scientific name	Family	Local name	Habit	Parts used	Use	CP	Diseases treated	Preparation and Application	Route
1	*Allium sativum*	Alliaceae	Nech shinkurt	H	Bu	Hu	F	Abdominal pain	The bulb of *Allium sativum* is peeled and ate.	Oral
					Bu		F	Jaundice	The bulb of *Allium sativum* with *Capsicum annuum* are whittled and eaten by injera.	Oral
					Bu		F	Malaria	The bulb of *Allium sativum* with *Capsicum annuum* are whittled, soaked with water and eaten by injera after once a day.	Oral
					Bu		D	Emergency	The bulb of *Allium sativum* with *Lepidium sativum* are powdered and mixed water and drunk before eating.	Oral
					Bu		F	Ascaries	The bulb of *Allium sativum* with *Lepidium sativum* and fruit of *Ruta chelepensis* are pounded, soaked with little water and then eaten by injera after three days.	Oral
					Bu		F	Tinea nigra	The bulb *Allium sativum* with fruit of *Ruta chelepensis* are pounded,and mixed with butter and then creamed on affected part.	Dermal
					Bu		D	Stomach ache	The bulb of*Allium sativum* with seed of *Lepidiumsativum*iscrushed,powdered,mixed withcoffe and then drunk	Oral
					Bu	Ls	D	"Eeynewog"	The bulb of *Allium sativum* with root of *Cucumis ficifolius,Daturastramonium* and *Capparis tomentosa* are pounded,Dried, put onfire and the smoke is inhaled.	Oral&Nasal
					Bu	Ls	F	Coccoides	The bulb of *Allium sativum* is crushed,mixed with powdered seed of *Lepidium sativum*and water and thendrunk	Oral

2	*Aloe trigonantha*	Aloaceae	I ret	H	Lt	Hu	F	Wound	The sap (latex) of this plant is put on wound and then cover by piece of cloth.	Dermal
				E	Lt	Ls	F	Diarrhoea	Eating of the (latex) of the leaf.	Oral
3	*Artemisia abyssinica*	Asteraceae	Chikugn	H	L	Hu	F	Common cold	Inhaling the fresh leaves through the nose.	Nasal
					L		D	Evil eye	The leaf of *Artemisia abyssinica* is pounded and tied with a piece of cloth around the neck.	Neck
					L		D	Typhus	The leaf of *Artemisia abyssinica* with leaf of are pounded and put on fire and the smoke is inhaled.	Oral & Nasal
					L	Ls	D	"Eyenewog"	The leaf of *Artemisia abyssinica* withroot of *Cucumis ficifolus* and*Datura stramonium* are ponded and tied with a piece of cloth around the neck.	Neck
4	*Brassica nigera*	Brassicaceae	Senafich	H	S	Hu	F	Ascaries	Pounded being and homogenized with water.	Oral
					S			'Bloating	Pounded and homogenized water	Oral
					S			Stomachache	Pounded and homogenized water	Oral
5	*Carissa spinarum*	Apocynaceae	Agam	S	R	Hu	D	Evil eye	The root of *Carissa spinarum* with leaf of *Ruta chalepensisand Caparris tomentosa* are dried, pounded, put on fire and the smoke is inhaled.	Oral & Nasal
					R		F	Wound	The root of *Carissa spinarum* with leaf of *Solanum anguvi* are crushed then put on wound.	Dermal
6	*C ucumis Ficifolius*	curbitaceae	Yemdir embway	H	R	Hu	F/ D	Stomach ache	The root of *Cucumis ficifolius* is chewing and sucked during the feeling of ache.	Oral
					R		D	Gonorrhoea	The root of *Cucumis ficifolius* withroot of *Phytolacca dodecandra* are powdered, mixed	Oral

									with water and then drunk.	
					R		F	Abdominal pain	The root of *Cucumis ficifolius* with leaf or *Vernonia amygdalina* are crushed, mixed with water and then drunk.	Oral
					R		D	Rabies	The root of *Cucumis ficifolius* with root of *Cyphostemma adenocaule* are pounded, powdered and swallowed with honey.	Oral
					L		F	Blotting	The leaf of *Cucumis ficifolius* with pounded boiled and one glass of water drunk.	Oral
					R		D	Evil eye	The root of *Cucumis ficifolius* with root of *Withania somnifera* are pounded and tied with a piece of cloth around the neck.	Neck
					R		D	Acute sickness	The root of *Cucumis ficifolius* are chewed and sucked.	Oral
					R	Ls	D	"Eyenewog"	The root of *Cucumis ficifolius* with leaf of *Artemisia abyssinica* are pounded and tied with a piece of cloth around the neck.	Neck
7	*Cupressuslusitanica*	Cupressaceae	Yeferengtsid	T	Se	L	F	Bloating	The leaves powdered is squeezed and mixed water and drunk.	Oral
8	*Datura stramonium*	Solanaceae	Astenager	H	Se	Hu	D	Toothache	The seed of this plant is powdered, mixed with butter, put in metal container, then put on burnt metal and then steamed.	Oral
					L		F	Wound	The leaf is squeezed and creamed on infected part.	Dermal
					L		F	Deafness	The leaf is squeezed and the juice is added through the ear.	Ear
					Se		D	Tumor	The seed of *Datura stramonium* with leaf of *Clematis simensis* are powdered, mixed with goat urea, bolus by cotton and pasted on the injured part.	Dermal
					L		F	Scabies	Squeezed the leaf and creamed on affected part.	Dermal
					R	Ls	D	"Eyenewog"	The root of *Datura stramonium* withroot of *Cucumis ficifolus* and leaf of *Artemisia abyssinica* are pounded and tied with a piece of	Neck

									cloth around the neck.	
9	*Eucalyptus globulus*	Myrtaceae	Nech bahir zaf	T	L	HU	F	Common cold	The leaf is boiled and fumigate with vapour.	Oral & Nasal
					L		F	Febrile illness	The leaf is boiled and steamed the vapour.	Oral & Nasal
					L	Ls	F	"Goleba"	The leaf of *Eucalyptus globulus* with leaf of *Juniperus procera* are pounded, squeezed and drunk one cup of juice.	Oral
10	*Kalanchoe petitiana*	Crassulaceae	Endahah ula	H	L	Hu	F	Tape worm	The leaf of *Kalancheo petitiana* are crushed, mixed with water and drunk.	Oral
					R		D	Swallowing	The root is powdered and put on the injured part.	Dermal
					L		F	Breast swelling	The fresh leaf put fire and heated the affected part.	Dermal
					L		F	Eczema	The leaf is squeezed and creamed on affected part.	Dermal
					L		F	Bone fracture	The affected part is tied by fresh leaf.	Dermal
					R	Ls	F	Rabies	The root is crushed, mixed with milk and then drunk.	Oral
1 1	*Lepidium sativum.*	Brassicaceae	Feto	H	Se	Hu	D	Abdominal pain	The seed is powdered, mixed with water and drunk.	Oral
					Se		D	Stomach ache	The seed of *Lepidium sativum* with bulb of *Allium sativum* are powdered, mixed with coffee and then drunk.	Oral
					Se		D	Febile illness	The powdered seed of *Lepidium sativum* withpounded and soaked with little water and then drunk.	Oral
					Se	Ls	D	Coccoides	The seed is powdered, mixed with pounded bulb of *Allium sativum* and water and then drunk.	Oral
					Se		D	“Goleba”	The seed of *Alliumsativum* with leaf of oral juniperus procera are pounded, squeezed and	Oral

									drunk one cup.	
12	*Otostegia integrifolia*	Lamiaceae	Tnjut	S	L	Hu	F	Blotting	The leaf is squeezed and the juice drunk.	Oral
					L		F	Acute sickness	The leaf of *Otostegia integrifolia* of are squeezed and the juice drunk.	Oral
					L		F	Abdominal pain	The leaf is squeezed and the juice drunk.	Oral
					R	Ls	D	"Eyenewog "	The root of *Otostegia integrifolia* are pounded and then tied with a piece of cloth around the neck.	Neck
13	*Rumex Nervosus*	Polygonacea e	Embac ho	S	L	H u	F	Circumcisio n wound	The leaf is soaked in boiled water and heated the wounds.	Dermal
					L	Ls	F	Leech	The leaf is crushed, squeezed and then drunk	Oral
14	*Rumexnepalen sis*	Polygonceae	Yewush a milas	H	R	Ls	F	Thining	The root Pounded and feed	Oral
						H		Retained placenta	Rubbed the vagina	Derm al
15	*Stephina abyssinica*	Menispermac eae	Yayt jero	S	R		F	Bloating Stomach ache	Chewed Pounded being *Stephina abyssinica* and homogenized with water and drink.	Oral
					L	Ls	F	Diarrhoea	The leaf is pounded, mixed with water and then drunk.	Oral
16	*Withania somnifera*	Solanaceae	Giziewa	S	R	Hu	D	I m potency	The root of *Withania somnifera* are powdered, mixed with honey and then ate in vacant house and the body parts of the patient are free from water for twenty four hours.	Oral
					R	Hu	D	Evil eye	The root is tied with a piece of cloth around the neck.	Neck

Appendix 5 List of multiple uses of medicinal plants other than medicinal uses

Scientific Name	Family	Local Name	Habit	Other uses
Allium cepa	Alliaceae	Key shinkurt	Herb	Food as spice
Allium sativum	Alliaceae	Nech shinkurt	Herb	Food as spice
Aloe trigonantha	Aloaceae	Iret	Herb	Leaves for forage
Artemisia abyssinica	Asteraceae	Chikugn	Herb	-
Artemisia rehan	Asteraceae	Arti	Herb	Used as aromatic
Bersama abyssinica	Melianthaceae	Azamir	Shrub	, fences, edible fruits
Brassica carinata	Brassicaceae	Gomenzer	Herb	Leaves for food
Brassica nigra	Brassicaceae	Senafich	Herb	Food
Brassica oleracea	Brassicaceae	Tql gomen	Herb	Leaves for food
Buddleja polystachya	Loganiaceae	Anfar	Tree	Firewood , fences
Caparris tomentosa	Capparidaceae	Gumero	Shrub	Firewood, fences
Capsicum annuum	Solanaceae	Karia	Herb	Edible fruit
Carissa spinarum	Apocynaceae	Agam	Shrub	Fences, firewood, edible fruit
Carthamustinctorius	Asteraceae	Suf	Herb	Food
Catha edulis	Celastraceae	Chat	Tree	Leaves for stimulant
Cicer arientinum	Leguminosae	Shimbera	Herb	Food
Citrus lemon	Rutaceae	Lomi	Tree	Edible fruit
Clausena anisata	Rutaceae	Limich	Herb	Teeth brush
Clematis simensis	Ranunculaceae	Yeazo areg	Climber	Firewood
Coffea arabica	Rubiaceae	Bunna	Tree	Fruits for stimulant
Clerodendrum myricoides	Lamiaceae	Misrich	Shrub	Fire wood
Combertum terminalia	Combertace	Abalo	Tree	-
Cordia africana	Boraginaceae	Wanza	Tree	Firewood,traditional house construction, furniture making, traditional agriculture tool making, charcoal, household tool making, spiritual tool making
Croton macrostachyus	Euphorbiaceae	Bisana	Tree	Traditional agriculture tool making, charcoal, firewood

Cucumis ficifolius	Cucurbitaceae	Yemdir embway	Herb	Forage
Cucurbita pepo	Cucurbitaceae	Duba	CL	Food
Cupressuslusitanica	Cupressaceae	Yeferenjtsid	Tree	Fire wood,making charcoal
Cymbopogon citratus	Poaceae	Tejesar	Herb	Forage
Datura stramonium	Solanaceae	Astenager	Herb	-
Daucus carota	Apiaceae	Karrot	Herb	Edible root
Echinops kebericho	Asteraceae	Kebericho	Herb	-
Echinops longisetus	Astreaceae	Koshelie	Shrub	Fire wood
Embelia schimperi	Myrsinacceae	Enkoko	Shrub	Edible fruit
Eucalyptus globulus	Myrtaceae	Nech bahir zaf	Tree	Firewood, charcoal ,fences, traditional house construction, traditional agriculture tool making, household tool making
Euphorbia ampliphylla	Euphorbiaceae	Kulkual	Tree	Fences
Ficus ovata	Moraceae	Shola	Tree	Edible fruit, furniture making, traditional house construction, traditional agriculture tool making
Ficus vasta	Moraceae	Warka	Tree	Charcoal, firewood, furniture making, traditional house construction, traditional agriculture tool making, spiritual tool making
Guizota abyssinica	Asteraceae	Nug	Herb	Food
Guizotia schimperi	Asteraceae	Mech	Herb	Forage ornamental purpose during holyday
Hagenia abyssinica	Rosaceae	Kosso	Tree	Firewood, traditional agriculture tool making, household tool making
Hordeum vulgare	Poaceae	Gebs	Herb	Food, forage
Impatiens rothii	Balsaminaceae	Gishilt	Herb	Roots for finger colour
Juniperus procera	Cupressaceae	Yabesha Tid	Tree	Fences, firewood, traditional agriculture tool making, traditional house construction, Shade
Justicia schimperiana	Acanthaceae	Smiza	Shurb	Fire wood
Lepidium sativum	Brassicaceae	Feto	Herb	Forage
Linum usitatissimum	Linaceae	Telba	Herb	Food, forage

Lippia adoensis	Verbenaceae	Kessie	Herb	Leaves for spice and washing container milk
Lupinus albus	Fabaceae	Gbto	Herb	Food, forage
Lycopersicon esculentum	Solanaceae	Timatim	Herb	Fruits for food
Malus sylvestris	Rosaceae	Apple	Tree	Edible fruit
Maytenus arbutifolia	Celastraceae	Atat	Shrub	Fences
Mentha spicata	Lamiaceae	Nana	Herb	Spice
Musa x *paradisiaca*	Musaceae	Muse	Herb	Edible fruit
Myrica salicifolia	Myricaceae	Shinet	Tree	Firewood, charcoal, traditional construction house
Nicotiana tabaccum	Solanaceae	Tinbaho	Herb	-
Ocimium lamiifolium	Lamiaceae	Dama kessie	Shrub	Firewood
Olea europaea subsp. *cuspidata*	Oleaceae	Weyra	Tree	Charcoal, firewood, furniture making, traditional agriculture tool making, spiritual purpose, fumigate of traditional household utensil, tooth brushing
Osyris quadripartita	Santalaceae	Keret	Shrub	Firewood
Otostegia integrifolia	Lamiaceae	Tnjut	Shrub	For fumigate of traditional alcohol container
Pennisetum sphacelatum	Poaceae	Sindedo	Herb	Traditional household tool making, traditional house construction, forage
Phytolacca dodecandra	Phytolaccacae	Mehan Endod	Shrub	Firewood, washing of cloth
Podocarpus falcatus	Podocarpaceae	Zgba	Tree	Traditional house construction, traditional household tool making, firewood, charcoal
Rhamnus prinoides	Rhamnaceae	Gesho	Shrub	Leaves used for traditional alcohol making, tooth brushing
Ricnus communis	Euphorbiaceae	Chakma	Shrub	Firewood, traditional agriculture tool making
Rosa abyssinica	Rosaceae	Kega	Shrub	Edible fruit, fences
Rosa x *richardii*	Rosaceae	Tigiereda	Shrub	Ornament
Rubus steudneri	Rosaceae	Engory	Shrub	Edible fruit, fences
Rumex nervosus	Polygonaceae	Embacho	Shrub	Firewood, charcoal

Appendix 5 cont…

Rumex nepalensis	Polygonaceae	Yewsha milas	Herb	-
Ruta chalepensis	Rutaceae	Tenadam	Herb	Food spice
Saccharum officinarum	Poaceae	Shenkor Ageda	Herb	Stem for food
Salvia nilotica	Lamiaceae	Hulegeb	Herb	-
Sesamum oriontale	Pedaliceae	Selit	Herb	Seed for food
Silene macrosolen	Caryophyllaceae	Wogert	Herb	Forage, household fumigation during coffee ceremony
Stephania abyssinica	Menispermaceae	Yeyt joro	Herb	-
Thymus schimperi	Lamiaceae	Tosign	Herb	Food spice, forage
Trigonella foenum-graecum	Fabaceae	Abish	Herb	Food, forage
Urtica simensis	Urticaceae	Sama	Herb	Food, forage
Vernonia amygdalina	Asteraceae	Girawa	Shrub	Firewood, fences, leaves used for washing of traditional alcohol container
Withania somnifera	Solanaceae	Giziewa	Shrub	Firewood
Zehneria scabra	Cucurbitaceae	Haregresa	Climber	-

Appendix 6 Number of medicinal plant species and genera in each family

Number	**Family**	Number of plant species	Percentage	Number of genera	Percentage
1	Asteraceae	8	9.75	5	6.6
2	Lamiaceae	6	7.3	6	8
3	Fabaceae	3	3.6	3	4
4	Solanaceae	5	6.09	5	6
5	Euphorbiaceae	3	3.6	3	4
6	Apiaceae	1	1.21	1	1.33
7	Cucurbitaceae	3	3.6	3	4
8	Rosaceae	5	6.09	4	5.3
9	Poaceae	4	4.8	4	5.3
10	Polygonaceae	2	2.43	3	4
11	Rutaceae	3	3.6	3	4
12	Brassicaceae	4	4.8	2	2.6
13	Myrsinaceae	1	1.21	1	1.33
14	Loganiaceae	1	1.21	1	1.33
15	Oleaceae	1	1.21	1	1.33
16	Apocynaceae	1	1.21	1	1.33
17	Alliaceae	2	2.43	1	1.33
18	Aloaceae	1	1.21	1	1.33
19	Celastraceae	2	2.43	2	2.6
20	Myrtaceae	1	1.21	1	1.3
21	Moraceae	2	2.43	1	1.33
22	Ranunculaceae	1	1.21	1	1.33
23	22 families	21	25.6	22	29.3
Total	44	82	100	75	100

Appendix 7 Human and livestock diseases which are treated by medicinal plants in the study area

No	Local name	Name of disease	No of medicinal plant
1	Alkit	Lecch	3
2	Asim	Asthma	1
3	Ayne beshta	Eye disease	5
4	Buda	Evil eye	10
5	Cancer	Cancer	1
6	Chabit	Gonorrhea	2
7	Chegura	Gastrits	4
8	Chiefie	Eczema	5
9	Chirt	Ring worm	1
10	Dafnt	Night blindness	1
11	Demmgifit	Hypertension	3
12	Demmanes	Aneima	1
13	Dengetegna	Acute sickness	4
14	Dinkurna	Deafnes	1
15	Ebtet	Swellowing	1
16	Esatkatlo	Fire burn	1
17	Uvulitia	Etil mewred	1
18	Ekek	Scabies	1
19	Eynewog	Eynewog	4
20	Fentata	Small box	1
22	Forefor	Dandruf	1
23	Goleba	Goleba	3
24	Gunfan	Common cold	5
25	Hodkurtet	Stomach ache	8
26	Hodmenfat	Bloating	5
27	Kintarot	Wart	2
28	Kitgn	Syphils	3
29	Koso	Tape worm	5
30	Kulalite beshta	Kideny problem	2
31	Kunchir	Kunchir	1
32	Kusl	Wound	4
33	Lebe dekam	Heart failure	1

34	Lash	Tinea nigra	2
35	Meidat	Melisma	1
36	Mekesat	Thinning	2
37	Meshabtat	Cogoneital abnormality	3
38	Moybagne	Emergency	4
39	Mich	Fibrile illness	5
40	Nekersa	Tumor	2
41	Qukucha	Tinea versicolor	2
42	Rasmetat	Headache	4
43	Seberat	Bone fracture	1
44	Sal	Cough	1
45	Herpes zoster	Shereritmeshenat	1
46	Samba nekersa	Lung tuber culosis	2
47	Shotallay	Rh-factor	1
48	Tekmat	Diarrhoea	4
49	Tesbo	Typhus	1
50	Tewket	Vommiting	1
51	Wosfat	Ascaris	7
52	Woba	Malaria	3
53	Yeangit tegegne tilatel	Intestinal paresite	1
54	Yehod beshta	Abdomial pain	4
55	Yeblit dekam	Impotency	1
56	Yewof beshta	Janudice	4
57	Yemegb flagot mekenese	Loss of appitite	1
58	Yewosha beshta	Rabies	2
59	Yegedie lige mekert	Retained placenta	1
60	Yekodabeshta	Skin disease	1
61	Yebab nekesha	Snake bite	3
62	Yetres kurtmat	Tooth ache	1
63	Yekoda allergy	Allergic dermolita	1
64	Yetut ebtet	Breast swellowing	1
65	Yegrzat kusil	Circumcision wound	2
66	Yedoro fengel	Coccoides	2
67	Yehod drekt	Contsipation	1
68	Yeskur beshat	Diabets	2

Appendix 8 Chek list of semi-structured questions used for discussion and interview for the collection of ethnobotanical data

I. General Information on Respondents

1. Kebeles_____Village (Specific locality) _____Date_____.
2. Name _____Age __ Sex _____, Marital status (single or Marid)_____,

   Educational level _____, Occupation_____, Religion _____

II. Ethnobotanical Information

3. What is the most common disease of humans in your area?
4. What are the most common diseases of animals in your area?
5. How do member of the local community prevent, control and cure a given disease in your area?
6. Can you tell me the Dominant plant community type in your area?
7. Mention plant species used to treat a given disease in the area (give local names)
   a. Plants used to treat human diseases
   b. Plants used to treat animal diseases
   c. Plants used to treat both human and animal disease
8. From where do you collect medicinal plants? Wild, home garden, etc.
9. What part/parts of the medicinal plants are collected for medicinal use?
10. What are the methods of preparation?
    a. Preparation forms: crushed, powder, chewed etc.
    b. Used alone, mixed with water or other etc.
    c. Condition: dried, fresh, both.
11. How is it taken? Route of administration (Oral, nasal, dermal)
12. Could you tell me the amount used or dosage that are used for various disease treatments?

13. Does the dosage vary? For instance, age group, sex etc.
14. Are there nutraceutical plants (used as medicine and food)?
15. Is there any noticeable side effect of the medicine? If yes, how can you overcome the effect?
16. Are the medicinal plants marketable?
17. Are there members of the community who frequently use the medicinal plant
18. How is the indigenous knowledge passed from elders to younger people in the study area?
19. Are there threats to the medicinal plants? List out the main threats
20. Mention medicinal plants that become rare in recent years in your area?
21. Are there economic groups who mostly or occasionally use these medicinal plants?
22. How do the local people preserve medicinal plants?
23. Are there traditional medicinal plants conservation methods in the area? Include the management practices by indigenous people
24. Is the plant currently cultivated in the study ?
25. Is there any effort made to conserve the medicinal plants in the area?
26. Are there limitations in utilization of some medicinal plants in the locality?

Appendix-9 Name of informants in study area, Name, Sex, Age, Martial status, Educational status, kebele, Occupation

No.	Name	Sex	Age	Marital Status	Educational Status	Kebele	Occupation
1	Mulu Tilahun	M	56	Married	7	Yewula	Farmer
2	Atalay yerdaw	M	45	Married	4	Yewula	Farmer
3	Kebadu wrta*	M	50	Married	2	Yewula	Farmer
4	Admase alemu	M	76	Married	Illiterate	Yewula	Farmer
5	Yeshe Awgchew	F	50	Divorced	Illiterate	Yewula	Housewife
6	Derbew Kelemu	M	30	Married	9	Yewula	Farmer
7	Lamesgen Mere*	M	50	Married	8	D/Kelemu	Farmer
8	MuluhabteHaile	F	64	Divorced	Illiterate	D/Kelemu	Housewife
9	Astu W/gebrael	M	40	Married	4	D/Kelemu	Farmer
10	Negeset Mekonn	F	27	Single	10	D/kelemu	Housewife
11	Workie Mequanet	F	45	Married	Illiterate	D/Kelemu	Housewife
12	Kefe Eshetu	M	45	Married	Read & write	D/kelemu	Farmer
13	DemessieTesfaye *	M	47	Married	5	Dengaye aber	Farmer
14	TamirieAragaw	F	40	Divorced	Illiterate	Dengaye aber	Housewife
15	Almaw Abebe	M	35	Married	11	Dengayeaber	Farmer
16	Fenta Damtew	M	30	Married	6	Dengaye aber	Farmer
17	TekaGetaneh	M	29	Single	10	Dengayeaber	Farmer
18	Abebaw Yrga	M	50	Married	Illiterate	Dengayeabere	Farmer
19	PriestAbateAyale*	M	62	Married	Read & write	Abebyenure	Farmer
20	Belaye meharie	M	57	Married	Read & write	Abebyenure	Farmer
21	Tademike Eshetie	F	45	Married	Illiterate	Abebeyenure	Housewife
22	Sewenet kefale	M	85	Married	3	Abebeyenure	Farmer
23	Priest Wubale kidane	M	60	Married	10	Abebeyenure	Farmer
24	Sintayehu Sharew	F	35	Married	Illiterate	Abebeyenure	Housewife
25	Ashenafie getachew *	M	69	Married	Illiterate	Girakidamen	Farmer
26	Alemenesh Minalu	F	50	Married	Illiterate	Girakidamen	Housewife
27	Yemenu Dememelashe	M	85	Married	Illiterate	Gira kidamen	Farmer
28	Etale Yradu	F	38	Married	8	Gira kidamen	Housewife
29	Taye Kebede	M	74	Married	Illiterate	Girakidamen	Farmer
30	Mintamer Aschalew	F	30	Single	Illiterate	Girakidamen	Housewife
31	Priest Adis F/senbet*	M	52	Married	4	Degasigne	Farmer
32	Aseresie G/tsadik	F	38	Married	6	Amarenayewbish	Housewife
33	Priest Woundiferaw W/rufael	M	60	Married	3	Amarenayewbish	Farmer
34	Etagegn H/michakel	F	50	Married	Illiterate	Amarenayewbish	Housewife

35	Goggam Zergaw	M	27	Married	5	Amarenayewbish	Farmer
36	Mulunesh Anagaw	M	35	Married	6	Amarenayewbish	Farmer
37	Ashanefie Legese*	M	67	Married	Illiterate	Amarenayewbish	Farmer
38	Priest Yirsaw Gizaw	M	66	Married	4	Angot	Weaver
39	Gerbachew Andargie	M	65	Divorced	Illiterate	Angot	Farmer
40	Rta tamiru	M	24	Single	10	Angot	Teacher
41	Yenguse Mekonen	F	33	Married	Illiterate	Angot	Housewife
42	Bancheu Mulatu	F	64	Married	Illiterate	Angot	Housewife
43	MollaWondaferew*	M	30	Married	10	Angot	Farmer
44	Adaye Manaye	F	32	Single	3	Ansilala	Housewife
45	Abebayehu Adamu	M	55	Married	6	Ansilala	Farmer
46	Priest Molla Yesgat	M	35	Married	Read & write	Ansilala	Farmer
47	Zenashe Gete	F	43	Married	Read & write	Ansilala	Housewife
48	Beyenech Getinet	F	45	Married	Illiterate	Ansilala	Housewife
49	Tileksew Mulate*	M	57	Married	Illiterate	Ansilala	Farmer
50	Achamyelehe Mekonn	F	48	Married	Illiterate	Ebule	Housewife
51	Getachew Yrga	M	30	Married	6	Ebule	Farmer
52	Etagegn Debas	F	54	Divorced	Illiterate	Ebule	Housewife
53	Alsgnene Mekonn	F	52	Married	Illiterate	Ebule	Farmer
54	Esubalew H/Geberiele	F	48	Married	Illiterate	Ebule	Housewife
55	Priest Getachew Belaye*	M	59	Married	3	Ebule	Farmer
56	EnateneshWorkneh	F	45	Married	Illiterate	Kerere	Housewife
57	MAstwal Abebe	F	70	Married	Illiterate	Kerere	Housewife
58	Asnaku Demissew	F	20	Single	10	Kerere	Health extension
59	Belaye Sebsebe	M	72	Married	5	Kerere	Farmer
60	Priest Meberate Zewdie	M	30	Married	7	Kerere	Farmer
61	Engdaw Shewaye*	M	50	Married	12	Kerere	Traditional healer and nurse
62	Priest Demese Azene	M	45	Married	5	Werkma	Farmer
63	Andualem Beyene	M	55	Married	4	Werkema	Farmer
64	ChanieWodmeneh	M	60	Married	Illiterate	Werkema	Farmer
65	Nega Enawgaw	M	48	Married	4	Werkema	Farmer
66	Trunesh Enawgaw	F	56	Married	Illiterate	Werkema	Housewife
67	Edmealemtmie*	M	43	Married	7	Wekema	Farmer
68	Getachew yengese	M	58	Married	10	Degasegnin	Farmer
69	Nigus Azene	M	47	Married	7	Degasegnin	Farmer
70	Girma Zwdie	M	52	Married	8	Degasegnin	Farmer
71	PriestAbebe Mulatu	M	48	Married	Read & write	Degasegnin	Farmer
72	Estalu Bimeraw	F	39	Married	4	Degasegnin	Housewife

Key: *- key informants

Declaration

I, Etagegenehu Yirsaw Yisegat confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis. The material contained in this thesis has not previously been submitted for a degree at Addis Ababa University or any other university and all the sources of materials used for thesis are acknowledged.

Name Etagegenehu Yirsaw

Signature_____

Date- August 2018

Place- Addis Ababa University

This thesis has been submitted for examination with my approval as an academic advisor.

Advisor; Ermias Lulekal (PhD)

Signature _____

Date_____