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ETHNOBOTANICAL STUDY ON MEDICINAL PLANTS USED BY LOCAL COMMUNITIES IN DEBARK WEREDA, NORTH GONDAR ZONE, AMHARA REGIONAL STATE, ETHIOPIA

BY

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ACRONYMS

EFAP	Ethiopian Forestry Action Program
IBCR	Institute of Biodiversity conservation and Research
IK	Indigenous Knowledge
IUCN	International Union for Conservation of Nature
M.Sc	Master of Science
MPs	Medicinal Plants
UK	United Kingdom
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
NMSA	National Meteorological Service Agency
DWADO	Debark Wereda Agriculture Development Office
DWHO	Debark Wereda Health Office
SMNPO	Simien Mountains National Park Office

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ABSTRACT

An ethnobotanical study of the knowledge on use and management of medicinal plants by local people in Debark Wereda, North Gondar (Ethiopia), was conducted from October 2010 to May 2011. Semi-structured interviews, field observations and various ranking and comparison methods were employed and information was collected from a sample of 84 informants (36 females and 48 males). These included 24 key and 60 randomly selected informants. A total of 126 plant species, representing 114 genera and 57 families, were collected, and 122 of them were claimed to be traditional medicinal plants. The Asteraceae, which contributed 12 (9.52%) species, stood first followed by Fabaceae, Solanaceae and Euphorbiaceae with 11, 9 and 7 species respectively Most of the species (72) were collected from the wild while 50 were collected from homegardens. A total of 88 (76.03%) species were mentioned for the treatment of 62 human ailments while 10 species were used to treat 20 livestock health problems. Herbs were the most used plants, accounting for 60 (49.58%) species, followed by shrubs, trees and climbers. The most frequently used plant part was the leaves (50.27%) and fresh plant materials (54.39%). The common route medicine administration were oral (45.99%), followed by dermal and nasal. Some of the remedies are taken with additives and solvents including water (33.76), butter (16.88%) and honey (15.58%). The most widely used method of preparation was squeezing (33.33%) of the different plant parts followed by crushing (25%). The most commonly used application of medicinal plant was drinking (31.22%) followed by creamed (19.45%) and dropping (12.21%). Medicinal plants with higher informant consensus included Zehneria scabra, Verbascum sinaiticum and Rumex nepalensis while the disease category with the highest ICF value (0.870) was fibril illness. There was high preference for Plantogo lanceolata for treating wound while paired comparison showed Zehneria scabra to be the most preferred species for treatment of fibril illness by traditional healers. Cordia africana was shown to be the top multipurpose species while agricultural expansion, firewood collection and charcoal making were considered major threats to plants in general and medicinal plants in particular. Provisions for participation of the local people, awareness raising and establishment of protected forests need encouraging.

Key words: *Ethnobotany, Debark, traditional healers, traditional medicinal plant*

1. INTRODUCTION

1.1 Background and Justification

Ethnobotany is a broad term referring to the study of direct interrelations between humans and plants (Martin, 1995; Balick and Cox, 1996). Ethonbotany 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). The focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies and includes plants used for food, medicinal, rituals, social life and others. 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 health care (Khan *et al*., 2007). The majority of the populations in developing countries rely on herbal preparation to help enhance health. A study by Hamilton (2003) attributed the dependence on medicinal plants to the low proportion of medical doctors to patients in Africa such as Ethiopia 1:33,000; Kenya 1:7,142; Tanzania 1:33,000; Uganda 1:25,000; Malawi 1:50,000; Mozambique 1:50,000; South Africa 1:1,639 and Swaziland 1:10,000. Another hand the necessity to resist numerous health problems on one hand, and the insufficient health care coverage on the other, plays a critical role in the observed utilization of more accessible and affordable medicinal plants by the majority of Ethiopians (Getachew Addis *et al*., 2001). In Ethiopia, 80% of the people use medicinal plants and plant remedies selected over centuries. Moreover, medicinal plants remain the most important and sometimes the only source of therapeutics (Abebe Demissie, 2001).

The Ethiopian flora is estimated to contain between 6000 species of higher plants of which about 10% are endemic (perosonal communication). The country is well known for its significant geographical diversity that favors the formation of different habitats and vegetation zones. Ethiopia is also a home to many languages, cultures and beliefs that in turn have contributed to the high diversity of traditional knowledge and practices of the people in using medicinal plants. Knowledge about traditional medicine is transferred secretly from generation to generation orally especially in countries like Ethiopia (Jansen, 1981) as there is little accessibility to written documents and records on medicinal plants. The knowledge of

medicinal plant use is yet incomplete because there has not been a total inventory of medicinal plants that have been traditionally known to indigenous people (Vecchiato, 1993; cited in Mesfin Tadesse *et al.,* 2005). In addition to environmental degradation, deforestation, agricultural expansion, over exploitation and population growth is the principal threat to medicinal plants in Ethiopia (Ensermu Kelbessa *et al.,* 1992; Zemede Asfaw, 2001; Kebu Balemie *et al.,* 2004). Loss of knowledge is also aggravated by the expansion of modern education, making the younger generation underestimate its traditional values. Migration from rural areas to towns and resettlement of people from drought-stricken regions to fertile areas has also resulted in the deterioration of traditional practices (Phillips *et al.,* 1992; Fassil Kibebew and Getachew Addis, 1999). Therefore, ethnobotanical studies are useful in documenting, analyzing and disseminating of knowledge on the interaction between medicinal plants and human society.

In most situations, the traditional knowledge in Ethiopia is passed verbally from generation to generation and valuable information can be lost whenever a traditional medical practitioner passes away without conveying his traditional medicinal plant knowledge to other. In addition, the loss of valuable medicinal plants due to population pressure, agricultural expansion and deforestation is widely reported by different workers (Abebe Demissie, 2001). Especially, these problems are critical in developing countries like Ethiopia. One of the parts of Ethiopia to see such problems is the Amhara Regional State. This Region is from suffering habitat and species loss due to continued deforestation and agricultural expansion (Fentahun Mengistu and Herbert, 2010) as well as loss of associated knowledge. Little has been done to document ethobotanical knowledge which is basic for conservation and community developments activity. In addition, 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).

The objective of this study is to investigate and document the traditional medicinal plants used by indigenous people for the treatment of human and livestock aliments, to record and document the current status of traditional knowledge and utilization of medicinal plants in Debark Wereda.

1.2 Objectives of the Study

1.2.1 General objective

The General objective of this study is to investigate and document the traditional medicinal plants used by indigenous people to treat both human and livestock ailments in Debark Wereda

1.2.2 Specific objectives

The specific objectives of the study are:

- To collect, identify and document widely available traditional medicinal plants that are used by the local people for the treatment of human and livestock ailments in the study area.
- To assess current status of medicinal plants and the indigenous knowledge of the people in the study area.
- To document plant parts used, for medicinal purposes, methods of preparation and ways of administration.
- To evaluate the indigenous knowledge of the people on the use, threat and conservation measures practiced in the study area.
- To provide information that will contribute to the development of strategies for conservation and sustainable utilization of traditional medicinal plants.

1.3 Statement of the Problem

In developing countries like Ethiopia, the indigenous knowledge about traditional medicinal plants is transferred secretly from generation to generation orally. Since, there is a gap in the document and records on medicinal plants in the country. In addition the indigenous knowledge on usage of medicinal plants as remedies are getting lost owing to migration from rural to urban areas, industrialization, expansion of modern education and specialized healers do not convey their knowledge to next generation. And also in most parts of the country, the wild plants and forests are almost totally lost by human impact like deforestation, agricultural expansion, over exploitation and population growth and hence there is evident loss of biodiversity. One part of Ethiopia to see such problems is general Amhara Regional State particular in Debark Wereda. This Region is suffering habitat and species loss due to continued deforestation and over usage of medicinal plants as well as loss of associated knowledge and little has been done to document ethnobotanical knowledge which is basic for conservation and community developments activity. Until this moment, no research on ethnobotanical study of medicinal plants was conducted in Debark Wereda. The finding of this study will help people of the study area to be aware of problems associated with medicinal plants and give attention for the threatened medicinal plants. And also the documentation of the indigenous knowledge of medicinal plants can be part of the information source for those who want to conduct research in further ethnobotanical study and development of modern drug, hence to this study was initiated fill gaps in the documentation of ethnobotanical knowledge in the study area.

1.4 Research Questions

The main focus of this study is to investigate the traditional uses and remedies of various plants which are used by Debark Wereda people. The findings of the study will try to answer the following main research questions.

- Which medically important plants species are used by local people to treat their own heath problem and livestock ailments in the study area?
- Which part of the medicinal plants is useful to treat ailments?
- What is the current status of the medicinal plants?

2. LITRATURE REVIEW

2.1 Origin and Development of Ethnobotanical Study

Since ancient times, plants have been vital sources of both preventive and curative traditional medicine preparations for human beings and livestock. Historical accounts of traditionally used medicinal plants depict that different medicinal plants were in use as early as 5000 to 4000 BC in China and 1600 BC by Syrians, Babylonians, Hebrews and Egyptians (Dery *et al.,* 1999). Considerable indigenous knowledge system, from the earliest times, is linked to the use of traditional medicine in different countries (Farnsworth, 1994). Evidence obtained from observations of animals shows that even chimpanzees use a number of plant species for their medicinal value (Huffman and Wrangham, 1994).

According to Cotton (1996), ethnobotany encompasses all studies that concern the mutual relationships between plants and traditional people. Among the relationships of humans with plants, indigenous knowledge on traditional medicine is one. Thus, people depend on plants not only for food but also for preparation of remedies. The focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies and includes plants used for food, medicinal, rituals, social life and others. 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 health care (Khan *et al*., 2007). Ethnobotancal research documents the knowledge on cultural interaction of people with plants, and figure out how local people have traditionally used plants for various purposes and how they incorporate plants into their cultural tradition and religion (Balick and Cox, 1996).

Traditional people around the world posses' unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). Ethnobotanical work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices and other useful plants to Europe from Cuba (Cotton, 1996) and when other immigrants from the new world documented food, medicine and other useful plants of the Aztec, Maya and Inca peoples (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 expert in various fields of academic study such as Botany, Anthropology, Agriculture, linguistics, Archeology and Economics (Martin, 1995; Alexiades, 1996; Balick, 1996). Ethnobotany is also a rapidly growing science, attracting people with widely varying academic backgrounds and interests (MacDonald, 2009) and nowadays ethnobotany has tended to become more analytical, quantitative, cross disciplinary, and multi institutional (Hamilton *et al*., 2003). Ethnobotanical studies are now growing and in fast progress throughout the world. One of the main motivating forces behind this expansion is the increasing awareness of the considerable practical and social value of traditional knowledge.

Ethnobotany is to 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). Ethnobotany is also to save foreign exchange. Moreover, the development of medicinal plants in primary health care not only will save the foreign exchange but also will aid in conserving our national heritage (Abiot Birhanu *et al*., 2006). 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 (Wright, 2005). According to Hamilton *et al*. (2003), application of ethnobotany can lead to a strengthening of cultural diversity conservation, greater sustainability in the exploitation of plant resources, and the development of new plant products. And also application of ethnobotany can lead to rural developments by identifying and promoting useful plants resource for local use, in natural managements and conservation identified and promoting good conservation practice and in biodiversity prospecting (e.g. selecting plants for drug developments).

According to Martin (1995), ethnobotanists often have to work without the support of colleagues in order to establish close relationships with communities. However, in order to achieve more detailed and reliable results, ethnobotanical studies need participation of various disciplines such as plant taxonomy, anthropology, linguistics, economic botany and others and 'ethnobotanist' has the role of ''explorer'' and they have a great responsibility to share the information they collect from the local people with the great collection of human knowledge (Arihan and Mahin, 2007). Cotton (1996) noted that identification of new drugs based on traditional medicinal plants in the areas of pharmaceuticals is among the potential application of ethnobotanical inquiry in

recent decade. Ethnobotanical studies are good sources of information for such investigations. Cotton (1996) added to the above concept that identification of new drugs based on traditional medicinal plants in the areas of pharmaceuticals is among the potential applications of ethnobotanical inquiry in recent decades.

2.2 Indigenous Knowledge

Indigenous knowledge (IK) is, broadly speaking, the knowledge used by local people to make a living in a particular environment (Warren, 1991). Terms used in the field of sustainable development to designate this concept include indigenous technical knowledge, traditional environmental knowledge, rural knowledge, local knowledge and farmer's or pastoralist's knowledge. Indigenous knowledge can be defined as "A body of knowledge built up by a group of people through generations of living in close contact with nature" (Johnson, 1992).

IK is now considered to be cultural knowledge in its broadest sense, including all of the social, political, economic and spiritual aspects of a local way of life. Sustainable development researchers, however, have found the following categories of indigenous knowledge to be of particular interest: resource management knowledge and the tools, techniques, practices and rules related to pastoralism, agriculture, agroforestry, water management and the gathering of wild food; classification systems for plants, animals, soils, water and weather; empirical knowledge about flora, fauna and inanimate resources and their practical uses; and the worldview or way the local group perceives its relationship to the natural world (Emery, 1996).

Indigenous knowledge is important for an essential first step for development projects, allows better innovation and adaptation of technologies, adds to scientific knowledge, increases understanding between researchers and local people, increases the local capacity to experiment and innovate and empowers local people (Warburton and Martin, 1999). And also relevance to conservation and sustainable development because of locally appropriate, diversified production systems, respect for nature, flexible and social responsibility (Dewalt, 1994).

According to Stephan and Justin (2003), indigenous knowledge is the local knowledge that is unique to a given culture or society and the base for agriculture, health care, food preparation, education, environmental conservation and a host of other activities. 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. The complex knowledge, beliefs and practices, generally known as indigenous knowledge develops and changes with time and space. One important feature of indigenous knowledge system is its adaptive skills for local people acquired informally though interaction with the natural environments (Zemede Asfaw and Tigist Wondimu, 2007). Indigenous knowledge systems also refer to sets of concepts, beliefs and perceptions comprising the stock of knowledge as well as the process by which it is acquired, stored and transmitted. One of the widely used indigenous knowledge system in many countries is the knowledge and application of traditional medicine. Such knowledge known as ethnomedicinal knowledge involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescriptions to the patients (Farnsworth, 1994). The immediate and intimate dependence of indigenous people on local resources resulted in the accumulation of indigenous knowledge, which helps the people to adapt to and survive in the environments in which they lived (Martin, 1995). Indigenous knowledge on remedies in many countries including Ethiopia passed from one generation to the other generation verbally with great secrecy (Jansen, 1981). Such secrete and crude transfer makes indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer (Amare Getahun, 1976), hence there is a need for systematic documentation and record of such useful knowledge through ethnobotanical research, record and use of indigenous knowledge, raise awareness in the community about the value of indigenous knowledge, help communities record and document their local practices providing computers, video equipment, etc and make indigenous knowledge available to disseminate indigenous knowledge back to the community through newsletters, videos, books and other media.

2.3 Traditional Medicine

Traditional medicine has been defined by the World Health Organization (WHO, 2008) as “the sum total of all knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental or social imbalances and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing.” This system of health care is also known as folk medicine, ethnomedicine, or indigenous medicine.

According to World Health Organization, more than 3.5 billion people in the developing world rely on medicinal plants as components of their healthcare (Balick and Cox, 1996). In another hand, about 60-85% of the population in every country of the developing world has to rely on traditional medicine (Sofowora, 1982). The practice of traditional medicine is widespread in China, India, Japan, Pakistan, Sri Lanka and Thailand. In Africa, traditional medicine is a part of the people's culture despite the fact that this form of medicine is not as well organized as, for example, in India and China. Practitioners include herbalists, bonesetters, village midwives or traditional birth attendants, traditional psychiatrists, herb sellers, and other specialists (Sofowora, 1996).

Traditional medicinal plants play typical role in the lives of many people in terms of health support, financial income and livelily hood security (Hamilton, 2003, 2004; Abdulhamid Bedri *et al*., 2004). Plants in general and medicinal plants in particular are invaluable, fundamental and most useful to almost all life on the earth, one of the most significant uses of plants is the phytomedicinal role, i.e., the benefits of medicinal plants. Traditional medicine has also drawbacks 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. Lack of precise dosage which could lead to toxicity is also the other disadvantage of traditional medicine (Dawit Abebe, 1986). The measurements used to determine the dosages are not standardized and depend on the age and physical appearance of the patient, socio cultural explanation of the illness, diagnosis and experience of individual herbalist (Dawit Abebe and Ahadu Ayehu, 1993; Pankhurst, 1995).

2.4 The Importance of Medicinal Plants for Development of Modern Drugs

Ethnopharmacology is a highly diversified approach to drug discovery involving the observation, description, and experimental investigation of indigenous drugs and their biologic activities. It is based on botany, chemistry, biochemistry, pharmacology, and many other disciplines (anthropology, archeology, history and linguistics) that contribute to the discovery of natural products with biologic activity (Vlietink and Vanden, 1991). And also Ethnopharmacology is the cross-cultural study of how people derive medicines from plants, animals, fungi, or other naturally occurring resources (Casagrande, 2005). In addition, Taxonomy and the newer discipline ethnobotany have now become an integral part of drug discovery from plants (Jachak

and Sakalani, 2007). Searching new drug from traditionally used medicinal plant can be the shortest path to success (Berhanemeskel Weldegerima, 2009) and indigenous people remain the ultimate resource for retrieving this information for the purpose of application, particularly in modern medicine (MacDonald, 2009).

According to Levantine and Mahon (1996) about 75-90% of the rural population in the World (excluding Western countries) relies on herbal medicine as their only health care. WHO estimate that 70-80% of people in developing countries including Africa depend on traditional medicine for their health care (Cunningham, 1994). This is not only because of poverty when people cannot afford to buy costly modern drugs, but traditional systems are also more culturally acceptable, and meet the psychological needs in away modern medicine does not (Brown, 1994). The integration of modern health system and traditional medicine will provide a better public health service.

The number of higher plant species (angiosperms and gymnosperms on this planet is estimated between 250,000-500,000 (Mahesh and Satish, 2008). Of these, only about 6% have been screened for biologic activity and a reported 15% have been evaluated phytochemicaly (Fabricant and Farnsworth, 2001). Estimates show that about 25,000 to 75,000 species of higher plants have been used in traditional medicine (Farnsworth, 1980). Evidently, traditional knowledge of medicinal plants is important in development of new modern drugs. Currently there are more drugs (e.g. aspirin from *Ulmaria* (Rosaceae), Quinine from *Cinchona pubescens* (Rubiaceae), Morphine from *Papaver somniferum* (Papaveraceae) and ephedrine from *Ephedra sinica*) prescribed in North America and Europe. About 80 drugs prescribed in the industrialized world as a whole, most of them were discovered based on information derived from ethnobotanical investigation (Balick and Cox, 1996).

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 (Wright, 2005). An average of 25% of modern drugs contains one or more active principles obtained from plants (Medhin Zewdu *et al.,* 2001). Various modern drugs were extracted from medicinal plants through the use of plant material as indigenous cure in folklore or traditional system of medicine (Verma and Singh, 2008) and it is believed that half of the top 25 best selling medicines in the world originate from natural materials including plant materials (Ohigashi, 2008). In the United States,

of the top 150 prescription drugs, at least 118 are based on natural sources (Roberson, 2008). For instance, Quinine, which is used to treat malaria was derived from the bark of the cinchona tree, has long played a major role. Among the most popular extracts used in Europe are garlic (*Allium sativum* antimicrobial blood cholesterol lowering), Ginkgo (*Ginkgo biloba*, circulatory insufficiency) and others.

Ethiopia is a rich source of medicinal plants however, 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). Perhaps the best-known species is *Phytolacac dodecandra*. Extracts of the plant, commonly known as endod, are used as an effective molluscicide to control shistomiasis (Aklilu Lemma *et al.,* 1984) and 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. Some plants having similar uses elsewhere can be taken as indication of there pharmacological effectiveness having been tested in different area by different cultures (Tesfaye Hailemariam *et al.,* 2009). Therefore, development of new drug is important in order to alleviate the problem showed. In United States of America, plant derived anti-cancer drugs save at least 30,000 lives per year (Roberson, 2008) and even drug for deadly diseases like HIV/AIDS could be discovered by ethnobotanical approaches, by taking indigenous knowledge as a base.

2.5 The Importance of Traditional Medicinal Plants in Human Health Care Service

Plants in general and medicinal plants in particular are important, fundamental and most useful to almost all life on the earth, one of the most significant uses of plant is the phytomedicinal role, i.e., the benefits of medicinal plants. Plants have contributed to modern medicine, through providing ingredients for drugs or having played central role in drug discovering some drugs having botanical origin, extracted from plants. Traditional medicinal plants has remained as the most affordable and easily accessible source of treatment in the primary healthcare system of resource poor communities and the local therapy is the only means of medical treatment for such communities. Like any other developing and list developed nations, the available modern health care services of the country are not only insufficient but also inaccessible and unaffordable to the majority (Haile Yineger *et al*., 2008). This problem along with the rapidly increasing human

population and cultural resistances towards the use of modern medicines means that the majority of the people in Ethiopia are dependent on traditional medicines of mainly plant origins to manage various human ailments (Dawit Abebe, 2001). This is true in Ethiopia where nearly 80% of population still relies on plants to prevent and cure various health problems (Dawit Abebe and Ahadu Ayehu, 1993). In developing counties leaning to and favoring traditional medicinal plants is mainly due to inaccessibility of modern medical system, economic and cultural factors (Abbie, 1996). According to konno (2004), easy accessibility efficacy on treatment and affordable cost in getting health services are main reasons in preferring tradition medicine to modern medication.

Medicinal plants play typical role in the lives of many people in terms of health support, financial income and lively hood security (Abdulhamid Bedri *et al*., 2004; Hamilton, 2003; Hamilton, 2004). 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 and helping to control rainfall through the process of transpiration. And all these benefits of plants are directly or indirectly linked with health care (Hamilton, 2004; Kelbessa Urga *et al*., 2004). Therefore, health care and botany have evolved as inseparable domain of human activities since various plant products are of paramount importance in traditional health care systems.

The World Health Organization (WHO) estimates that about 80% of the world' people relay chiefly on traditional medicine, mostly of plant origin to meet their primary health care needs (Duke, 1992; Farnsworth *et al.,* 1985). According to Mekonnen Bishaw (1990) and Tesema Tanto *et al.,* (2003) about 80% of human population and over 90% livestock in Ethiopia rely on traditional medicine. The livestock or ethnoveterinary medicine provides traditional medicines which are locally available and usually cheaper than standard treatments. Not only in Ethiopia but also globally and in all developing countries and especially in tropical Africa, using traditional medicinal plants is common and form the back bone of traditional therapy since the majority of the people depend on this traditional medicinal plants for their health care, and this global importance and utilization of medicinal plants has considerably in creased in the last two

decades. And thus, today, medicinal plants play a great role also world wide of the health services.

Medicinal plants have also economic importance besides their critical role in the health care provision of much of the world population (Medihn Zewdu *et al.,* 2001). These plants are commonly traded in various forms in different countries (Lange, 1998), currently large number of medicinal plants have been found their way as raw materials of modern bio-pharmaceutical industries (Rai *et al.,* 2000). Ethiopia is endowed with a number of economically useful medicinal plants. But Ethiopia is not known in developing the low for importing and exporting medicinal plants legally. The country exports only some agricultural products such as coffee, cotton, niger seed, linseed, castor seed and *catha edulis* as a means of getting foreign currency. Dawit Abebe (2001) emphasized that there is a large magnitude of use and interest in medicinal plants in Ethiopia due to acceptability, accessibility and biomedical benefit. Haile Yineger and Dilnesaw Yehwalawu, 2005) in their study on Sokoru District added that traditional medicines are useful for poor people who have little access and couldn't afford the cost of modern medicine.

In addition to this, traditional systems are also more culturally acceptable and meet the physiological needs in a way modern medicine does not (Fassil Kibebew, 2001). Indeed, there is growing recognition that revitalization and promotion of traditional health practices alongside modern health services is the most promising means for ensuring affordable and sustainable health care for poor communities throughout Africa (Cunnigham, 1993). The study conducted by Teferi Flatie *et al.* (2009), on Bertha community revealed that herbal remedies remain important component of public health care there, as it is the only option for some illnesses and the next alternative when modern medicine fails. Traditional medicine can save foreign exchange. Moreover, the development of medicinal plants in primary health care not only will save the foreign exchange but also will aid in conserving our national heritage (Abiot Birhanu *et al.,* 2006).

In Ethiopia, there is a large magnitude of use and interest in medicinal plants due to socio-cultural acceptability, accessibility, affordability and biomedical benefits of the traditional medicinal plants. In other words, in all regions of the country, traditional medicine has high

acceptability since it is an integral part of the local culture and hence, people often rely on their efficient and less costly alternative health care (Konno, 2004; Mwambazi, 1996; WHO, 2000). It is also noted that since medicinal plants are often within easy reach compared to modern drugs that are dispensed in remotely located health institutions, so most people in Ethiopia rely on the medicinal plants for treating their livestock and themselves (Abbiw, 1996; WHO, 2000; Dawit Abebe, 2001; Konno, 2004).

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 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).). Local healers did not have enough awareness about cleanness of the equipments which are to prepare the medicines.

2.6 Ethnobotanical Studies of Medicinal Plants Research in Ethiopia

Traditional medicine has been practiced for the last several thousands of years but only found its legitimate place in the WHO program only about 35 years ago (WHO, 1978). Furthermore, pharmaceuticals industries and western researches on plant based drugs have now rediscovered that plants have much to contribute to the discovery of new, effective, safe and profitable therapeutic agents (Pistorius and VanWiik, 1993). Most pharmaceuticals companies recently have developed mechanisms to involve indigenous people collect plant samples on the recommendations of the traditional practitioners. This approach is reported to be more successful

than random collections of sample of medicinal plants (Alexiades, 1996; Balick and Cox, 1996; Asfaw Debela *et al*., 1999).

WHO established a worldwide program to promote and develop basic and applied research in traditional medicine (WHO, 1978). Medicinal plants then have got special attention and regional offices were established by world health organization to coordinate basic and applied research activities on medicinal plants. To preserve indigenous knowledge of plant use in general and traditional medicine in particular, an ethnobotanical survey of losses studied socio cultural group is very crucial. However in Ethiopia research and documentation on medicinal plants have been started only very recently (Mesfin Tadesse and Sebsibe Demissew, 1992). As this was neglected and considered irrelevant in the past (Dawit Abebe and Ahadu Ayehu, 1993) only little effort has so far been made to record and documents the medicinal plants use and the associated knowledge. And also a limited number of papers dealt with specific socio cultural groups in specific areas when compared to the countries varied Flora and the socio cultural diversity this studies incomplete as medicinal plants healing systems differed from culture to culture. Hence, attention should be given to the field of ethnobotanical studies of the country with all necessary endeavors to have a full picture of the countries medicinal plant potentials.

Currently, among the research conducted on ethnobotanical study of medicinal plants in Ethiopia, Ermias Lulkal *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 as herbs stood first in which Zay people derive their medicine (55%), followed by trees and shrubs (33%). Whereas, the study conducted by Debela Hunde *et al*., (2004), in Boosat around Welenchiti area stated that shrubs rank first with 59% followed by herbs 14% by which indigenous people of Boosat derive their and livestock remedies. In addition to the above point, ethnobotanical study of food and medicinal plants of Danio Gade (home gardes of Gamo people) by Belachew Wassihun *et al*., (2003) revealed that the majority of medicinal plants were herbs (66.6%) followed by shrubs (22.2%) for this particular study. Moreover, the study explained that the most frequently utilized plant parts are the leaves (66.6%) followed by the roots (16.6%). In terms of their growth location, the study showed that about 61.11% of the medicinal plants were wild while the

remaining 38.9% were grown close to home. From this study finding, one can easily imagine that those grow close to homes provide good evidence for home gardens being useful as habitat for medicinal plants. It was also reported that ethnoveterinary service is among the uses of medicinal plants (Debela Hunde *et al.,* 2004). Some of the works that have been carried out includes: Amare Getahun (1976); Jansen (1981); Dawit Abebe (1986); Dawit Abebe and Ahadu Ayehu (1993); Mirutse Giday (1999); Kebu Balemi *et al.,* (2004); Debela Hunde *et al.,* (2004) and Ermias Lulekal (2005). Although, only small fractions of the world's plants have been investigated scientifically so far, human kind already reaped enormous benefits from it (Farnsworth *et al.*, 1985). More than ever, plant diversity remains vital for human well beings and still provides a significant number of remedies required in health care. There for the crucial role played by plant derived products in human and livestock health, the need for systematic scientific investigation is unquestionable.

Different parts of plants are being derived for medicine in order to cure human or livestock diseases in Ethiopia. However, roots and leaves are widely utilized plant parts. According to Tizazu Gebre (2005), roots are the most used plant part (35.7%), followed by leaves (32.9%). Beside this, the study explained as 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) on Central Tigray revealed as some of medicinal preparation were fresh or 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 pounding and hanging the plant material.

Related studies by Kebu Balemie *et al.,* (2004), Kebu Balemie (2006) indicated that malaria, jaundice, cough and stomachache are among the human ailments treated with medical plants. It was also pointed out that veterinary problems due to leech, tsetse, anthrax, tick and intestinal worms were among the diseases treated with medicinal plants recorded in the Fentalle study area, Eastern Shewa and upper Omo valley in southern Ethiopia. The study also underlined the indigenous knowledge of the Dawro people in herbal preparations that mostly involve concoction an infusion of leaves, fruits, seeds, stems and roots. His finding is in line with the findings of Debela Hunde *et al*., (2004) by their studies conducted on the use and management of

ethnoveterinary medicinal plants by indigenous people in 'Boosat', Welenchiti area despite their diverse role in treating various diseases and ailments in both humans and animals, medicinal plants are facing an increasing pressure from both natural and anthropogenic factors as many of the literature sources indicated. The results of this ethnobotanical study are expected to give a clue on the current status of traditional knowledge and utilization of medicinal plants in Debark Wereda.

2.7 Plants in Ethoveterinary Medicine

In Ethiopia as well as in most developing countries, animal disease remains one of the principal causes of poor livestock performance, leading to an ever increasing gap between the supply of, and the demand for, livestock products (Teshale Sori *et al*., 2004). Ethnoveterinary medicine and realted study is one of the most important means of controlling livestock diseases. Ethnoveterinary medicine which refers to traditional animal health care knowledge and practices comprising of traditional surgical and manipulative techniques, traditional immunization, magic-religious practices and beliefs, management practices and the use of herbal remedies to prevent and treat arrange of disease problems encountered by livestock holders (Tafesse Mesfine and Mekonnen Lemma, 2001). Ethnoveterinary medicine provides traditional medicines, which are locally available and usually cheaper than standard treatments. Livestock offers in many harsh environments the only way of survival and constitutes a driving force for food security and sustainable development in developing countries like Ethiopia. Stock raisers, both farmers and herders have developed their own ways of keeping their animal health and productivity. They treat and prevent live stocks disease using sometimes age old home made remedies, surgical and manipulative techniques. These indigenous local animal health care beliefs and health care practices constitute an ethno veterinary medicine.

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). The document also stated that disease related economic losses have been estimated at 4 billion US dollar annually for Africa as a whole**.** In Ethiopia, livestock production plays an important role in the lively hood and economy of majority of the population. Ethiopia is one of the leading countries of Africa in livestock population (Mirutse Giday and Gobena Ameni, 2003). Although Ethiopia is rich in its livestock population, it is one of the countries in the world

with the lowest unit out put. The poor health condition and of its livestock has partially been responsible for the low productivity (Mirutse Giday and Gobena Ameni, 2003). The ever declining provision of animal health services has resulted in the appearance of a number of epizootic diseases reducing the economic efficacy of livestock production in Africa (Mirutse Giday and Gobena Ameni, 2003). An Ethnovetarinery medicine involves the use of medicinal plants surgical techniques and livestock management practices to prevent and treat a range of animal diseases (Mathias, 1996). The study conducted by (Wirtu *et al.,* 1997) revealed as animal health care were provided by the owners, traditional healers, and veterinary professionals. Besides, most modern drugs are expensive and as a result, not affordable by the majority of Ethiopian farmers and pastoralists, most of them rely on their traditional knowledge practices and locally available materials (mainly plants) in the control of diseases of their domestic animals (Mirutse Giday and Gobena Ameni, 2003).

In spite of its permanent importance as live stock health care system, the various traditional veterinary practices remained undocumented in Africa and Ethiopia (Dawit Abebe and Ahadu Ayehu, 1993). Thus creation of awareness on Ethnoveterinary medicine emphasizing on useful plants used for treatment of live stock has paramount importance to live stock management. In addition, proper documentation and understanding of farmer's knowledge, attitude and practices about the occurrence, cause, treatments, prevention and control of various ailments is important in designing and implementing successful live stock production (Tafesse Mesfine and Mekonen Lemma, 2001).

2.8 Threats and Conservation of Traditional Medicinal Plants

2.8.1 Major Threats to medicinal plants and associated indigenous knowledge

The harvesting of species of medicinal value is greater as there is evidence that extinction of such plants species is obvious. Disturbance and over exploitation by humans are causing major global reduction of plant diversity (Bownder, 1987; IUCN, 1991). According to IUCN (1978) an average of one out of species of vascular plants known are rare or are under sever threat. According to WHO (1986), about 90 % of plant materials used as medicinal plants are collected from the wild with parallel regeneration programs and as a result many medicinal plant species are driven to extinction or sever genetic loss. When a population may suffer both from

hetrozygosity and allelic diversity loss and if such threats continue genetic drift can be avoided. Over exploitation may lead to scarcity and incase of medicinal plants this means more time will be needed to collect parts of plants required by traditional healers. Cunningham (1996) observed that with increased scarcity, commercial trade develops and price rise and this means more exploitation will occur. Actually, this is what brings unsustainable models (Brigham *et al.,* 1996). Another threat to medicinal plants is a result of demand of botanicals locally and/or at international level which results in over exploitation and lack of regeneration programs.

Many people of our world exploit our Earth mercilessly, as if there were no tomorrow, the greatest danger elsewhere in our country is losing the indigenous knowledge of our own cultural and our biodiversity resource including the medicinal plants of our locality. people use many wild species of plants for food, medicines, clothing, shelter, fuel, fiber, income generation and the fulfilling of cultural and spiritual needs throughout the world (Zemede Asfaw, 2001) Recent evidence from Ethiopia as well as other countries indicates that the existence of these indigenous resources are threatened. The most serious proximate threats generally are habitat loss, habitat degradation and over harvesting (Hamilton, 1997). According to Maundu *et al.,* (2004), the main threats of the medicinal plants (unsustainable use of medicinal plants) in Africa are a high population growth rate, competing land uses of natural vegetation to other forms of land use such as agriculture, environmental degradation, loss of local knowledge, increasing commercialization of traditional medicine, increasing demand in the local and world market, lack of appropriate policies and legislation or failure to enforce, poverty and high unemployment rate, low prices of medicinal plants, invasive species, undue pressure on specific preferred species and slow plant growth. Environmental degradation, deforestation, agricultural expansion, over exploitation and population growth are the principal threats to medicinal plants in Ethiopia (Ensermu Kelbessa *et al*., 1992; Mirutse Giday, 2001; Zemede Asfaw, 2001; Kebu Balemie *et al*., 2004). Generally, there are two sources of threats to medicinal plants, i.e. man made and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, invasive alien species, honey collection degradation, agriculture expansion and habitat distraction are caused threat to medicinal plants. Likewise, natural causes include recurrent drought, bushfire, disease and pest outbreaks (Ensermu kelbessa *et al.,* 1992).

According to Jansen (1981), in Ethiopia, even though the traditional medicinal partitions are the best source of information about the knowledge of medicinal plants, it was found very difficult to obtain their traditional medicinal information as they considered their indigenous knowledge as a professional secrete, only to be passed orally to their elder son at oldest age. According to Amare Getahun (1976), practitioners do not want to tell the use of medicinal plants because they believe the healing power of the plant losses its curative and healing virtues; therefore it should be secrete (that is, the name of the plant and its reputed use should not be disclosed). In addition to the knowledge on traditional medicine are commonly passed from generation to generation orally, valuable information can be lost whenever a medicinal plant is lost or when a traditional medical practitioner dies without passing his/her indigenous knowledge to others (Cunningham, 1993; Cunningham, 1996; Cunningham 2001; Getachew Birhan and Shiferaw Dessie, 2002). Gebre Markos Wolde Sillessie (1998), Showed that the drought and famine that repeatedly visited Ethiopia for the last few decades and punished many lives of humans, animals and plant species by causing shortage of rain fall and change of weather conditions is related to deforestation and environmental degradation (EFAP, 1994). In addition to migration from rural areas to towns and resettlement of people from drought-stricken regions to fertile areas has also resulted in the deterioration of traditional practices (Phillips *et al*., 1992).

According to Debela Hunde *et al.,* (2004), stressed as modern education has an impact on the knowledge. In another hand loss of knowledge is also aggravated by the expansion of modern education, making the younger generation underestimate its traditional values. He pointed out that those students who attended modern schools are showing unwillingness to learn from their parents, which is an evidence for the gradually disappearing traditional knowledge. The study conducted by (Tesfaye Hailemariam *et al.,* 2009), shows as most of the knowledge on herbal remedies handled by elders who are 41-50 years old. This hints at the fact that ethnomedicnal knowledge is concentrated in the elderly members of the community and the relative difficulty in its transfer from the elders to the young generation.

According to (Mirutse Giday *et al*., 2009), the finding of revealed as acculturation of the young generation become a major threat to the continuation of traditional medicinal knowledge and practice. Ethnomedicinal knowledge diminishes with the death of elderly knowledgeable members of society since only a few young people are willing to acquire the knowledge. In

addition, invention of alien weeds like Parthenium has adverse impact on medicinal plants and climate change e.g. Increase temperature year by year and severe drought lead to difficulty to survive the more water consuming medicinal plants in the future (Muthuswamy and Solomon, 2009). Therefore, ethnobotanical study are useful in documenting, analyzing and disseminating knowledge on the relationship between medicinal plants and human society.

2.8.2 Conservation of medicinal plants

According to Getachew Berhan and Shiferaw Dessie (2002) the knowledge of medicinal plants is commonly secretly passed orally from generation to generation. In this process valuable information can be lost whenever a medicinal plant is lost or when a traditional medical practitioner dies without passing his/her indigenous knowledge to others. Hence, documentation of indigenous knowledge and making herbaria for future use is also recommended to conservation of the declining medicinal plants (Muthuswamy and Solomon, 2009). And also to create awareness on the contribution of traditional medical practice towards fulfilling the primary healthcare needs should be created among the youth (Mirutse Giday *et al*., 2009). It was pointed out that young generation has no interest to know about medicinal plants and efforts should be made to incorporate traditional medicine in school curricula so that younger people appreciate its usefulness (Mirutse Giday *et al*., 2009).

As stated Zemede Asfaw (2001) in Ethiopia, traditional medicine as elsewhere in other developing countries is faced with a problem of sustainability and continuity mainly due to loss of taxa of medicinal plants, loss of habitats of medicinal and other categories of plants and cultures. Conserving the diverse cultures with indigenous medicinal and other knowledge that exists with the traditional communities has also contributed greatly in giving value to the biodiversity and maintains the resource for generation (Medhin Zewdu, 2002). Thus for the conservation of plant biodiversity, both in-situ and ex-situ conservation methods can be applied (Frankel *et al.,* 1995). The growing recognition of the importance of medicinal plants in meeting local and global health care needs provides an important opportunities for conservationists, traditional medicine practitioners, local communities and others to work together to develop mutually supporting solutions to problems associated with forest loss and biodiversity erosion. Now a day's sustained and co-ordinate efforts are needed to transform currently unsustainable practices of medicinal plants mining from wild sources to more ecologically sustainable, socially

acceptable and economically equitable production and utilization systems (Parrotta, 2002). Generally, there are some conservation measures that have been under taken around the world aimed at protecting threatened medicinal plant species from further destruction (Cunningham, 1993). This includes in-situ conservation (on their natural habitats like natural reserves and parks e.g. homegardens) and ex-situ (field gene bank, seed bank and botanical garden) conservation. In order to conserve useful plants (including medicinal plants) which are threatened due to natural or manmade factors in Ethiopia, in-situ and ex-situ conservation strategies should be complimentarily implemented (Abebe Demissie, 2001).

2.8.2.1 Conservation of medicinal plants in homegardens

Homegarden is commonly defined as land use system involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses, the whole tree-crop animal unit being intensively managed by family labour (Fernandes and Nair, 1986; Christanty, 1990). It also defined as a small scale, supplementary food production system by and for household members that mimics the natural, multilayered ecosystem (Hoogerbrugge and Fresco, 1993). Homegardens have been variously named in English language as agroforestry homegardens, backyard gardens, village forest gardens, dooryard gardens, house gardens, mixed, kitchen, farmyard, roof top garden, household or homestead farms, compound farms or gardens (Talukder *et al*., 2001). However, some local names as Shamba and Chagga in East Africa are also very popular names worldwide as they represent well their systems. In Ethiopia, a very common Amharic vernacular name equivalent for the term homegarden is "Yeguaro-ersha" or a closer alternative might be "Yeguaro Meret*"* meaning a land at the backyard of a house (Zemede Asfaw, 2001).

In the tropics, two types of homegardens are recognized based on their contribution to the benefits of households. The first types are small scale supplementary food production systems around the house in areas where the subsistence of the owners is based on their land use. The second category of homegardens stretched from fields around the house that constitute the most important means of the livelihood for farming households. Most of the homegardens in the highlands of eastern Africa belong to this category (Zemede Asfaw, 2004). It is also

homegardens are subdivided in to two basic types as city or urban and the village or rural homegardens (Christanty, 1990).

According to World Health organization (1985) medicinal plants form the bases of traditional or indigenous health care systems used by the majority of the population of most developing nations. Homegardens can be used to grow certain traditional herbs and spices. Plant based medicinal systems, although in practice for thousands of years, are now coming to the fore front and attempts are being made to recognize their medicinal properties (Tizazu Gebre, 2005). In Ethiopia, most medicinal plants used by the herbalists are collected from the natural vegetation. Home based medicinal plant use relies on plants of the homegarden crops, weeds and that grow wild around human habitation. The cultivated medicinal plants are mostly produced in homegardens either for medicinal or other primary purposes. Medicinal plants of homegarden are known to the public as the knowledge on them is open or public (Zemede Asfaw, 2001). However, when the biological diversity in the area goes too depleted and plants distributions shrink to the far away forest some healers have been observed planting than gardens. So, homegarden are sources of tradition medicinal plants (easily affordable and locally available resource) and a means of conserving medicinal plants in different countries.

3. DESCRIPTION OF THE STUDY AREA

3.1 Location

The Amhara National Regional State covers 179,062 km^2 and is subdivided into 11 Zones of which the North Gondar Zone is the largest. The North Gondar Zone covers 62,020 km^2 with 732 kebeles. Debark is one of the 105 weredas in the Amhara Region of Ethiopia and there are 19 Weredas and 732 kebele administration in north Gondar Zone (Mesele Yihune, 2006). Debark Wereda is situated at 13° 08'N and 37° 53'E at an elevation of 1000-4200 m a. s. l. (Fentahun Mengistu and Herbert, 2010) (Figure 1) with most parts falling in the range of 1500-2300 m and 2300-3200 m a. s. l. However, few areas in the wereda have altitudes ranging from 500-1500 m and above 3200 m a. s. l. (Fentahun Mengistu, 2008). The total area of the Wereda is 282, 105.00 hectares (282.105 km^2). Of these, Debark Wereda comprises 31 kebeles, 28 rural and three urban (Debark town). It is part of the northern Gonder Zone. Debark is bordered on the south by Dabat, on the west by Sanja, on the northwest by Tigray Region, on the north by Addi Arkay and on the east by Jan Amora. This Wereda is crossed by the Limalimo Mountains, which form the western end of the Simien and the rivers include the Zarima. It is located at about 850 km north of Addis Ababa, and Debark is located 24.4 away km from Dabat, 36.8 km from Addi Arkay, 102 km from Gondar, 109.7 km from Indaselassie and 282 km away from Bahir Dar (Ethiopian Roads Authority, 2007).

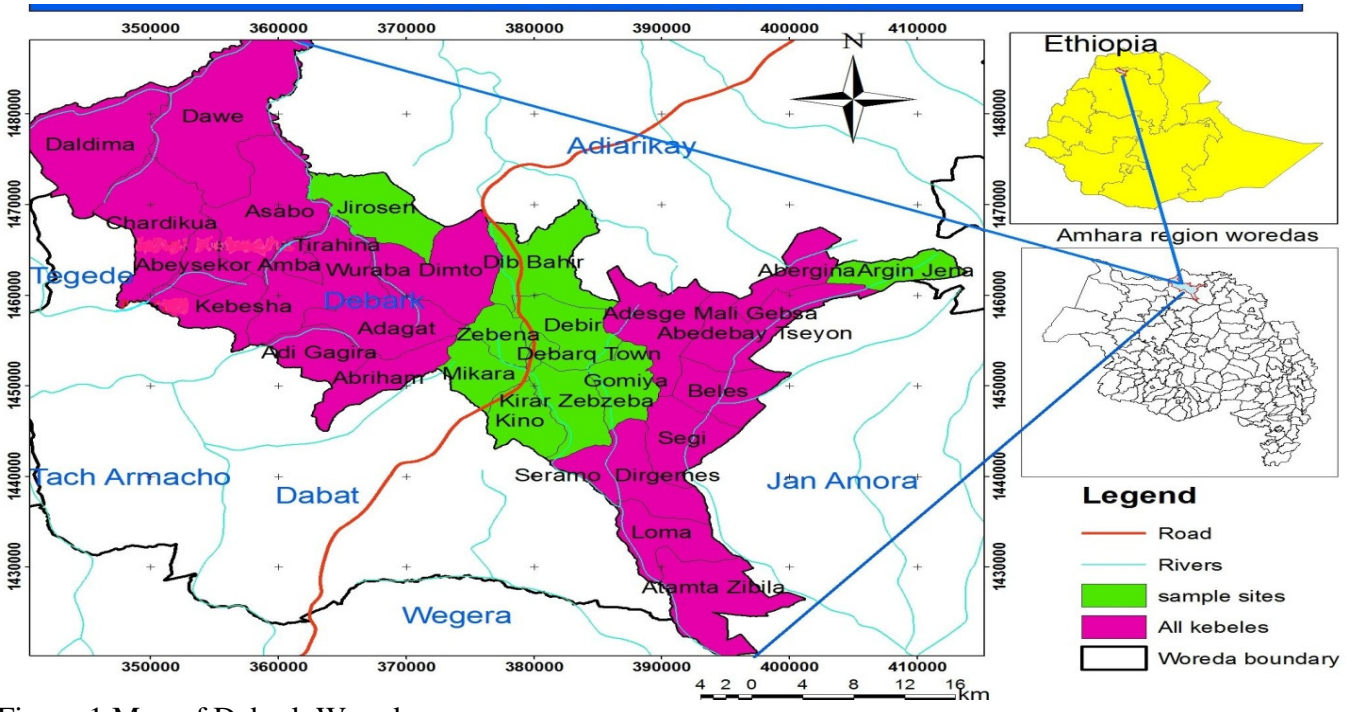

Figure 1 Map of Debark Wereda

3.2 Soil and Drainage

In Debark Wereda, there are five dominant soil types, namely: Acrisols, Cambisols, Phacozems Lithosols and Nitosols, each covering about 48.5%, 25.2%, 11.8%, 11.5% and 3.4% respectively. Agroecologically, Debark Wereda is classified into 14.4% Kolla (500-1500 m), 47.5% Weina Dega (1500-2300 m), 34.1% Dega (2300-3200 m) and 4% Wurch (above 3200 m). Altitude in Debark Wereda ranges from 1000-4200 m a. s. l. Most parts of the Wereda lay between 1500-2300 m and 2300-3200 m a. s. l. However, few of the areas in the Wereda have altitudes ranging from 500-1500 m and above 3200 m a. s. l. (Fentahun Mengistu, 2008). The topography, vegetation and rainfall pattern in the Wereda encourages the existence of many perennial rivers. In Debark Wereda, there are many small and large rivers (Asere, Belegeze, Araro, Abera and Chlu, Lome, Meytmket, Mneguro, Serakeba) that have been providing an irrigational function under traditional system such as Abera and Asere.

3.3 Topography

Debark Wereda has a total area of 282,105,00 hectares (282.105 km^2) of which 25.8% is under cultivation for growing both annual and perennial crops, while 35.4%, 30.8% and 6.7% of the total land area is occupied by grassland and bare land, pasture and forest respectively. From the total area, 13,408 hectares are covered by urban centres and the remaining part is by rural. Altitude of the Wereda rises from 1,000 to 4,200 meters (Fentahun Mengistu and Herbert, 2010). The topography of the Wereda is 20% hill, 60% flat and 20% mountain. In Debark Wereda, the largest mountain is Emet Gogo with an altitude is 3926 m a. s. l. and others includes Chennek, Gich, Sankaber, Buyt Ras, with altitude of 3620 m, 3600 m, 3250 m and 3230 m respectively.

3.4 Climate

Based on 1995- 2005 climate data, the average maximum temperature in the study area was recorded in December (22.79^{O}C) and November (21.87^{O}C). On the other hand, average minimum temperature recorded was during September (6.52^{O}C) and August (6.94^{O}C). But throughout the year, the maximum and minimum temperature ranges from 16.56^{0}C to 22.79^{0}C and 6.62^{0}C to 10.37^{0}C respectively (Figure 2).

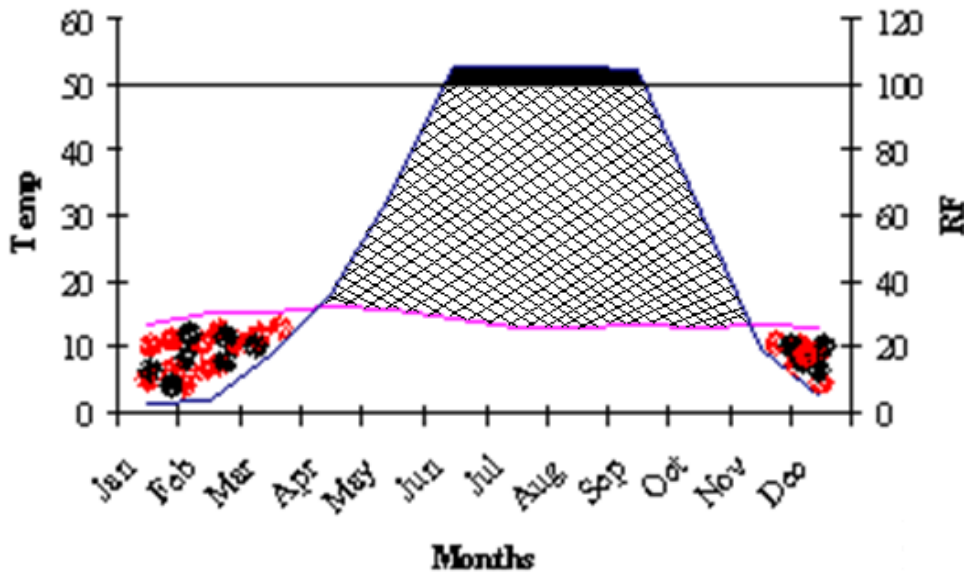

Figure 2 Climadiagram of Debark Wereda data of from 1995-2005. Data Source (NMSA, 2011)

3.5 Rainfall

According to the ten years rainfall summarized data, the study area has a high rainfall distribution between June and October. The mean monthly rainfall of the study area is 100.8mm (Figure 2).

3.6 People, Population and Healthcare Status

This Wereda has an estimated total population of 183,386 of these 15, 5791 are rural people and 27,595 are urban dwellers, which is greater than the Zone average of 14.1%. With an estimated area of 1,512.22 square kilometers, Debark has an estimated population density of 111.2 people per square kilometer, which is greater than the Zone average of 60.23. The largest ethnic group reported in Debark is the Amhara (99.42%); all other ethnic groups made up 0.58% of the population. Amharic is spoken as a first language by 99.46%; the remaining 0.54% speak all other primary languages reported. About 93.78% practice Ethiopian Orthodox Christianity and 6.16% of the informants are said to be Muslims.

According to the report of Debark Wereda Health Office (DWHO, 2011), the first ten major diseases in the area are: internal parasites, malaria, diarrhea, eye disease, gastritis, wound, skin diseases, rheumatism, tonsillitis and STDs (Table 1). These diseases mostly affect people living in the rural areas where the health services are in shortage, As well, they are unable to afford the

high cost of modern drugs and because of being far from health services. In eight kebeles of Debark Wereda, there is one hospital, 12 health centres, 3 clinics, 25 health stations, 1 private clinic and 2 traditional drug vendors.

Table 1 Ten top diseases seen in Debark Wereda

No.	Types of Disease	2006/7	2007/8	2008/9	2009/10
1	Diarrhea	975	418	475	588
2	Eye diseases	1,166	399	264	599
3	Gastritis	2,703	845	678	1,022
4	Internal parasites	2,772	1,392	334	1,011
5	Malaria	1,871	1,700	665	1,322
6	Rheumatism	996	280	164	330
7	Skin diseases	940	277	366	349
8	STDs	83	54	212	63
9	Tonsillitis	462	184	349	239
10	Wound	899	334	571	294

Source: (DWHO, 2011)

3.7 Livestock

Livestock population is relatively high in Debark Wereda. However, their productivity is very low as in most places in the country. The livestock resources of Debark Wereda have not yet been exploited. Their performance (milk, meat, egg, honey production) and contribution to the regional and national economy is very low mainly due to poor management, low genetic potential due to inbreeding, inadequate and low quality feed supply, and the prevalence of various animal diseases (DWADO, 2011). The domestic animals are cattle 75,363; goats 72,321; sheep 72,298; donkeys 9,582; horses 6,725 and mules 1,318 and others (Table 2). In the Wereda, livestock makes a substantial contribution to the rural economy. Most rural farming, transport and source of income do directly or indirectly link with them. The most important animal diseases in Debark Wereda include: bacterial infections (black leg, anthrax and hen typhoid) and ectoparasites (ticks, mites, lice and insect flies), viral infections (rabies, African horse sickness, foot and mouth disease) (DWHO, 2011).

Table 2 Number of livestock seen in Debark Wereda

Livestock	Rural	Urban	Total
Cow	2,832	4,577	7,409
Ox	21,978	1,533	23,511
Young bull	10,710	838	11,548
Heifer	16,210	4,173	20,383
Calves	11,600	912	12,512
Sheep	34,966	37,332	72,298
Goat	70,734	1,587	72,321
Horse	5,093	1,632	6,725
Mule	1,105	213	1,318
Donkey	8,850	732	9,582
Hens	83,614	1,690	85,304
Bees	11,064	120	11,184
Camels	8	-	8

3.8 Agriculture

Debark Wereda has an ideal agro-ecology for agriculture such as crop production, livestock rearing and cultivating different annual and perennial plants. The land in the Wereda is 91,774.90 hectare for cultivation, 14,411.90 hectare for grazing, 11,883.3 for forestry, 12,479.70 hectare covered by water and valleys, 7,483.70 for settlement and construction and 6,841.43 hectare others use. Of these urban covered 677 (annual, 600; perennial,77) hectare for cultivation, 872 for forestry, 268 hectare for grazing, 134 hectare covered by water and valleys, 1,737 hectare for settlement and constriction and 402 hectare for others uses (DWHO, 2011). The major food crops grown in the area are given in Table 3. The seed farming complex is a common practice in the area where teff (*Eragrostis tef*), noug (*Guizotia abyssinica*), barely (*Hordeum vulgare*), sorghum (*Sorghum biclolor*), beans (*Vicia faba*), peas (*Pisum sativum*), wheat (*Tritrcum* spp.) and maize (*Zea mays*) are widely cultivated crops. But small-scale irrigation is possible in the Wereda, and some cash crops such as vegetables, coffee and even chat are grown. Nevertheless, the main means of the people's livelihood in the Wereda, both in the highlands and in lowlands, is livestock raising, herding and trading for cash and food (Yves, 2001).

Table 3 Major food crops grown in the study area

Crop category	**Scientific name**	**English name**	**Local name (Amharic)**
Cereals	*Sorghum bicolor*	Sorghum	Mashila
	Zea mays	Maize	Bekelo
	Eragrostis tef	Tef	Tef
	Hordeum vulgare	Barley	Gebs
	Triticum aestivum	Wheat	Sndie
	Eleusine coracana	Finger millet	Dagussa
Vegetables	*Capsicum annuum*	Chili	Berbere
	Allium cepa	Shallot	Key shenukrt
	Lycopersicon esculentum	Tomato	Timatim
	Cucurbita pepo	Pumpkin	Duba
	Allium sativum	Garlic	Nech shenukrt
	Brassica integrifolia	Cabbage	Tikel gomen
Fruits	*Carica papaya*	Papaya	Papaya
	Citrus avrantifolia	Lime	Lomi
	Citrus sinensis	Orange	Burtukan
	Malus sylvestris	Apple	Apple
	Mangifera indica	Mango	Mango
	Persea americana	Avocado	Avocado
	Psidium guajava	Guava	Zeytune
Stimulants	*Catha edulis*	Khat	Chat
	Coffea arabica	Coffee	Buna
Pulses	*Cicer aestivum*	Chickpeas	Shinbere
	Pisum sativum	Pea	Ater
	Vicia faba	Broad Bean	Bakela
Oil crops	*Linum usitatissimum*	Lin seed	Telba
	Brassica carinata	Kale seed	Gomenzer
	Guizotia abyssinica	Niger seed	Noug
Root crop	*Ipomoea batatus*	Sweet potato	Skuar dinch
	Solanum tuberosum	Potato	Dinch
	Beta vulgaris	Sugar beet	Keyisir
	Daucus carota	Carrot	Karot

Source: (DWADO, 20110

4. MATERIALS AND METHODS

4.1 Reconnaissance Survey and Selection of Study Sites

A reconnaissance survey of the study area was conducted from October 9 to 21, 2010 and the data were collected from November 1, 2010 to December 30, 2010. Debark Wereda has a total of 31 kebeles. Out of these, 12 kebeles found in different altitudinal ranges were selected for ethnobotanical data collection. The traditional healers, used as key informants, were identified with the assistance of local authorities, elders and knowledgeable persons.

4.2 Sampling of Informants

A total of 84 informants (36 females and 48 males), five individuals from each of the study sites age of above 20 years were selected randomly from the local people by a tossing coin. Out of these, 24 key informants were selected by purposive random sampling based on the recommendations of local authorities, knowledgeable elders and developmental agents. The other 60 informants were selected randomly from the local people of the study area. This was done by tossing a coin and using him/her as informant whenever head of the coin was up if he/she volunteered to participate.

4.3 Data Collection

The techniques used in ethnobotanical data collection included group discussion, semi-structured interviews, field observations or guided field walks with informants and market survey.

4.4 Group Discussion

Discussions were conducted at each kebele with five to seven informants and residents in seeking to understand the traditional medicinal system of the people and its management and to know how knowledge is maintained and transferred from one generation to other generations. And discussions took place based on the checklist of questions prepared before hand in English and translated to Amharic.

4.5 Semi-Structured Interviews

Interviews were based on, around a semi-structured checklist of topics consisting 16 main questions (Appendixces) prepared before hand in English, and translated to Amharic. The

questions were prepared with the following main components: (a) personal data of the respondents which includes the name, address, age, and gender, (b) information on medicinal plants such as vernacular name, parts of the plant used, time and season of collecting plant material, preparation, dosage, administration, side-effect and antidote and contraindication (s) of the various remedies.

4.6 Guided Field Walk

Guided field interview were made with informants and all relevant data including the vernacular names of plants, habit, habitat of the plant, the parts used, the preparation methods and modes of administration and disease condition treated as well as the strategies they use for the conservation of medicinal plants and the preservation of the indigenous knowledge on medicinal plants were recorded. Field observations were performed with the help of local guides, as well as interviewee in the study area.

4.7 Market Survey

Two 2 kebeles were selected for market survey. During the study, market surveys were made to record the names of the medicinal plants and other aspects of of herbal drugs sold in the local markets of the study area. Semi-structured interviews were conducted with drug sellers, producers and consumers to assess the other aspects of plant materials based on semi-structured checklist of topics consisting 11 main questions (Appendix 10).

4.8 Specimen collection and identification

Medicinal plants were collected from wild and cultivated areas. The local names, habits and associated plants were collected. The collected voucher specimens were taken to the National Herbarium of Ethiopia (Addis Ababa University). The identification was done from January to February by using taxonomic keys and various volumes of the flora of Ethiopia and Eritrea. Finally, the identification of the voucher specimens were confirmed by my advisor Prof. Sileshi Nemomissa and deposited at National Herbarium of Ethiopia (Addis Ababa University).

4.9 Ethical Considerations

Data collection was performed after permission was obtained from Debark Wereda Administrative offices and the individuals who were targeted for the research.

4.10 Data Analysis

The gathered date were computed by preference ranking, paired comparison and direct matrix ranking according to Martin (1995), Alexiades (1996) and Cotton (1996). Informant consensus, ranking and informant consensus factor were computed.

4.10.1 Descriptive statistics

Descriptive statistical methods such as percentage and frequency were employed to analyze and summarize the data on medicinal plants, associated knowledge, management methods, use and conservation. The most useful information gathered on medicinal plants reported by local people include medicinal value, application, methods of preparation, route of application, disease treated, dosage, part and habit used was analyzed through descriptive statistical analysis according to Martin (1995), Alexiades (1996) and Cotton (1996).

4.10.2 Informant consensus

In order to evaluate the reliability of information during the interview, informants were contacted at least 2-3 times for the same ideas and the validity of the information was proved and recorded. Consequently, if the idea of the informant deviates from the original information, it was rejected since it is considered as unreliable. Only the relevant ones were statistically analyzed. This method was adopted from Alexiades (1996).

The Informant Consensus Factor (ICF) was calculated for each category to identify the agreements of the informants on the reported cures for the group of ailments. The ICF were calculated as follows: number of use citations in each category (n_{ur}) minus the number of species used (n_t), divided by the number of use citations in each category minus one (Heinerich *et al.,* 1998). The factor provides a range of 0 to 1, where a high value acts as a good indicator for a high rate of informant consensus.

$$ICF = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

Where, ICF= Informants Consensus Factor

n_{ur}= number of use citation in each category

n_t= number of species used

4.10.3 Preference ranking

Preference ranking was conducted following Martin (1995) for six most important medicinal plants used in treating wound (Table 22), as traditional healers treat it usually. Ten informants were selected to identify the best preferred medicinal plant species for treatment of wounds. Each informant was provided with six medicinal plants reported to cure this disease with leaves of medicinal plant used being paper tagged name and asked to assign the highest value (6) for the most preferred species, against this illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining ones. The value of each species was summed up and the rank for each species was determined based on the total score. This helped to indicate the rank order of the most effective medicinal plants used by the community to treat the disease.

4.10.4 Direct matrix ranking

Direct matrix ranking was conducted following Martin (1995) and Cotton (1996). This was conducted considering several attributes of medicinal plants such as their use as food, medicine, fire wood, building, charcoal and making fence. These were uses of medicinal plants commonly reported by key informants. Based on information gathered from informants, seven multipurpose tree species were selected out of the total medicinal plants and seven use diversities of these plants were listed for seven selected key informants to assign use values to each species (Table 23). The seven use values include medicinal, fodder, food, firewood, construction, charcoal, fencing and furniture making. By adding the scores given, it was possible to compare use values of medicinal plants and also to identify the main cause for over harvesting of the plants. Based on information gathered from informants, the average value of each use diversity for a species was taken and the values of each species summed up and ranked.

4.10.5 Paired comparison

This analytical tool can be used for evaluating the degree of preferences or levels of importance of certain selected plants/parts of plants (Nemarundwe and Richards, 2002). Paired comparisons to indicate the efficacy and popularity of five medicinal plant species used to treat fibril illness were employed as described by Martin (1995). In such a way that ten key informants were randomly selected and allowed to show their responses independently for pairs of five traditional medicinal plants that are noted for fibril illness. A list of the pairs of selected items with all

possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to selected informants and their responses were recorded, total value summarized and rank made based on the report of the informants (Table 24).

4.10.6 Jaccard`s coefficient of similarity

Jaccard`s Coefficient of Similarity (JCS) was carried out in order to see species composition similarity among different weredas. It was computed between the study areas with other areas, which were studied by other authors in different parts of the country. JCS was calculated as follows (Kent and Coker, 1992).

$$JCS = \frac{c}{(a+b+c)}$$

Where, JCS= Jaccard`s Coefficient of Similarity

a= Number of species which is found in habitat Wereda A

b= Number of species found only in habitat Wereda B and

c= Number of common species found in habitatWeredas A and B

Accordingly, a= Number of species found only in Debark Wereda

b= Number of species found only in Other Wereda and

c= Number of species found in Debark Wereda and Other Wereda

5. RESULTS AND DISCUSSION

5.1 A Summary of Information about the Informants in the Study Area

5.1.1 Ages of informants

The distribution of informants with respect to age class shows that, the majority of knowledgeable elders are in the age class of 41 to 50 (Table 4).

Table 4 Ages of informant in the study area

Informant's age	No. of informants	Percentage (%)
16-30	12	14.28
31-40	16	19.05
41-50	24	28.57
51-60	20	23.80
61-70	8	9.52
71-80	2	2.38
81-90	2	2.38
Total	84	100

5.1.2 Marital Status of Informants in Debark Wereda

Of the total informants, 79.76% were married, but 13.09% and 7.14% were single and divorced respectively (Table 5).

Table 5 Marital Status of Informants

	Sex		Total	Percentage (%)
Marital Status	F	M		
Married	25	42	67	79.76
Single	7	4	11	13.09
Divorced	4	2	6	7.14
Total	36	48		

5.1.3 Educational status of informants

The result shows that 47 (55.96%) were illiterate followed by writing and reading 27.38% and the least is >12 (7.14%) and others (Table 6). This shows that there is a negative relationship

between the educational level of informants and their ethnobotanic knowledge. As educational level increases ethnobotanic knowledge decreases.

Table 6 Educational status of informants

Educational status	Grade	Percent of total
Illiterate	47	55.96
Writing and reading	23	27.38
8-12	8	9.52
>12	6	7.14
Total	84	100

5.2 Land Form Classification

The local people in Debark divide land form into five main types:-

Wotageba:- Land not used for grazing land or agricultural activities.

Terrarama:- Mountain area characterized with higher altitude and covered with vegetations e.g. *Grewia ferruginea*, *Dispcopodium penninervum, Olea europaea* subsp. *cuspidata, Hagenia abyssinica, Clausena anisata, Acacia abyssinica, Brucea antidysenterica* and *Buddleja Polystachya.*

Medama:- Meaning level-land that serves especially for grazing but it also serves for cropping. It is cultivable or cultivated land for growing different crops.

Shelequama:- Refers to valley landform that does not serves grazing and agricultural activities but sometimes for grazing on the slopes because of the low level.

Korebta:- Refers to a smaller elevation (hills) compared to Terrarama, sometimes on which agriculture, grazing and other practices can be performed

5.3 Indigenous Vegetation Classification

The local people also have techniques of classifying vegetation into three main types:-

Chaka or Den:- This type of vegetation is with densely populated plant species and composed of a range of larger trees, where many wild animals stay. In the study area, some local people commnty call it Chaka and others refer to it as Den. This type of vegetation has declined in the study area because of agricultural expansion and plant species like *Acacia abyssinica, Clausena anisat, Cordia africana, Croton macrostachyus, Dombeya torrida* and *Hagenia abyssinica*. This vegetation type is found in Argin Jena, Abergina, Adesge Mail Gebsa and Dib Bahir.

Kutquato:- Open woody and shrub land with patches of trees, bushes, shrubs and herbaceous species. It is common near agricultural margins and mountain escarpments. Plant species like

Rhus glutinosa, Dispcopodium penninervum, Phytolacca dodecandra, Rubus steudneri and *Rosa abyssinica* are found.

Yeser Meda:- Refers to an area covered by grass and serves especially as grazing land.

5.4 Soil classification by Indigenous People

The local people classify soil based on soil characteristics such as color of the soil, fertility of the land, and other criteria. The following four soil types have been identified by local people:-

Walka Afer: This soil type refers to black soil and with better fertility and production in contrast to other soil types. The people use this soil to grow crops like *Eragrostis tef, Allium sativum, Sorghum bicolor*, *Zea mays, Allium cepa*, *Pisum sativum*, *Hordeum vulgare* and *Triticum aestivum*.

Shasherma: Mix of both red soil and black soil type suitable for crop production (for examples *Guizotia abyssinica* and *Eragrostis tef*).

Key Afer: This soil is red soil type; it is less fertile in comparison to the black soil. But, it can enable to grow crops of various types by applying fertilizer. The people use this soil to grow crops like *Hordeum vulgare*, *Triticum aestivum* and *Zea mays*.

Nech Afer: This type of soil is white soil which is not suitable for crop production.

5.5 Visual Vegetation Classification

A. Community dominated by *Juniperus procera* and *Rosa abyssinica*

This type of community is recorded the localty in known as Lamalimo Forest. It is predominantly observed at an altitude range of 2300-3000 m a.s.l. The major species obtained from this community type are *Rhus glutinosa, Brucea antidysenterica, Buddleja polystachya, Clutia abyssinica, Croton macrostachyus, Dispcopodium penninervum, Plucrea ovalis, Clematis simensis, Rubus steudneri, Juniperus procera, Acacia abyssinica, Maytenus arbutifolia, Solanum dasyphyllum* and others. Most of the medicinal plants, more than 30 which are used for treating human and livestock ailments are abundantly found in this community type. This community type is found in Dib Bahir kebeles.

Figure 4 Community type dominated by *Juniperus procera* and *Rosa abyssinica* Photo taken by Eskedar Abebe, 2011).

B. Community dominated by Afro-alpine plants

This is community dominated by *Lobelia rhynchopetalum* which is among the giant rosette herbs with stem. The plants occupy the highest mountain in the study area, on the average greater than 3000 m a.s.l. and found in only Argin Jena Kebele. The vegetation is highly degraded in the study area because of natural and environmental degradation including grazing, agriculture, deforestation and their medicinal and other useful values. The number of species in this vegetation type is relatively low when compared with others.

Figure 5 Community type dominated by Afro-alpine plants (Photo by SMNPO, 2011).

C. *Eucalyptus globulus* plantation

This type of community is recorded in almost all study sites. It is one of the good income generating plants for the farmers in the area. The major species observed in this type of community are *Eucalyptus* species, other herbs and small shrubs. This community type is mostly distributed between 2,700-4000 m a.s.l. and encompasses about 10 kebeles including Argin Jena, Mikara, Debir, Kirar Zebzabe, Kino, Gomya and Dib Bahir. *Eucalyptus globulus* is the most dominant plantation species in the study area. This community type is dominated by sandy soil, clay soil and silt soils.

D. Community dominated by *Ficus thonningii* and *Euphorbia tirucalli*

This community is predominantly observed at altitudes between 1500-2300 m a.s.l. It is characterized by trees with larger canopy, under covereds with herbs and shrubs. The major species obtained from this community type are: *Rumex nervosus, Rosa abyssinica, Croton macrostachyus, Euphorbia ampliphylla, Juniperus procera, Eucalyptus globulus* and others. This community type is found in Beles, Segi, Loma, Kirar Zebzabe, Atamitana Zible and Seramama Midr Gemes study sites. This community type is dominated by sandy soil, clay soil and sandy lame soils.

E. Community dominated by *Acacia abyssinica* and *Eucalyptus globules*

This type of vegetation is found in Kirar Zebzeba, Kino, Mikara and Zebena associated plant species include *Juniperus procera, Euphorbia ampliphylla, Rosa abyssinica, Solanecio gigas* and others.

F. Community dominated by *Hagenia abyssinica* and *Erica arborea*

Common woody plant species are dominated by *Hagenia abyssinica* and *Erica arborea*. The plants occupy the highest mountain in the study area, on the average between 3000-4000 m a.s.l. The common trees include *Maytenus arbutifolia, Hypericum revolutum, Acacia abyssinica* and *Eucalyptus globulus*. This community type is found in Adisgiena Milgesa, Aberina and Argin Jena study sites.

G. *Cupresses lusitania* plantation

This community is predominantly observed at an altitude range from 1500-2300 m a.s.l. The major species obtained from this community type are *Rosa abyssinica, Ficus sur, Plucrea ovalis, Nuxia congesta, Dombeya torrida, Erica arborea, Anogeissus leiocarpa, Maytenus arbutifolia*, *Grewia ferruginea, Carissa spinarum, Rumex nervosus, Maesa lanceolata, Acacia abyssinica, Podocarpus falcatus* and others. This community type is found in Dib Bahir, Debir, Gomiye and Zebena and Wurabana Dimto study sites.

H. Community dominated by *Juniperus procera* and *Ficus sur*

Common woody plant species dominated by *Juniperus procera* and *Ficus sur*. This community is predominantly observed at an altitude range from 2300-3000m a.s.l. The major species obtained from this community type are *Rosa abyssinica, Croton macrostachyus, Cordia africana, Podocarpus falcatus, Acokanthera schimperi, Albizia gummifera, Phytolacca dodecandra, Embelia schimperi, Buddleja Polystachya, Syzygium guineense, Nuxia congesta, Otostegia integrifolia, Rhamnus Prinoides* and *Maytenus arbutifolia.*

I. Community dominated by *Ficus vasta* and *Zizlphus spina-christi*

This community is predominantly observed at an altitude range from 2300-3000m a.s.l. The major species obtained from this community type are *Acacia abyssinica, Calotropis procera Euphorbia ampliphylla, Euphorbia tirucalli, Coffea arabica* and others. This community type is found in Jirosen and Tirahina study sites.

5.6 Plants in the Homegardens

The local community of the study area obtains many services from homegardens. They provide food, spices, medicine and other services. A good number of medicinal plants have been obtained in and around gardens of local people in the study area that are used for different human ailments. The people of the study area cultivate diverse plant species in their homegardens (Appendix 5-7). The number of plants recorded was 50 species in 47 genera and 27 families. In terms of species Asteraceae had seven species followed by Fabaceae with six species, Solanaceae with four species and others (Table 7).

Table 7 Numbers of genera, family and plant species in the homegardens

Family	Numbers of genera	Percents	Numbers of species	Percents
Asteraceae	7	14.89	7	14
Fabaceae	6	12.76	6	12
Solanaceae	4	8.15	4	8
Myrtaceae	3	6.38	3	6
Alliaceae	1	2.13	2	4
Rutaceae	2	4.24	2	4
Brassicaceae	2	4.24	2	4
Cucurbitaceae	2	4.24	2	4
Poaceae	2	4.24	2	4
Lamiaceae	1	2.13	2	4
Polygalaceae	1	2.13	2	4
others 16 families	1	34.04	1	32

5.6.1 Habit of plants in homegardens

Analysis of growth forms of these medicinal plants reveals that herbs constitute the largest category with 31 species (62%) followed by shrubs with 11 species (22%), %), trees with 6 species (12%) and climbers accounted for 2 species (4%).

Table 8 Service categories of homegarden plants

Service category	**Total no. of species**	**Percent**
Only medicinal	15	30
Medicinal, food, spice and cash income	4	8
Food and cash income	4	8
Medicinal and cash income	4	8
Medicine, forage, food and cash income	4	8
Food	2	4
Medicine and fence	2	4
Forage, food and cash income	2	4
Medicine, fire wood, charcoal and fence	2	4
Medicine and ornamental	1	2
Cash income and beverage	1	2
Medicine, food and cash income	1	2
Spice and cash income	1	2
Medicine, cash income and stimulant	1	2
Medicine, cash income and house materials	1	2
Medicine, fire wood, charcoal, cash income and fence	1	2
Medicine, fence, forage and fire wood	1	2
Fire wood, charcoal, ornamental and cash income	1	2
Medicine, fire wood, charcoal, fence and construction	1	2
Medicine, fire wood, cash income, fence and soap	1	2

5.7 Diversity Plant Resources in the Study Area

A total of 126 species belonging to 114 genera and 57 families were collected and identified in the study area (Appendixces). Of these, 76 species were collected from the vegetation in the wild and 50 species were obtained from homegardens. This finding is a good indicator for the presence of considerable diversity of plant species both in the wild as well as in the homegardens of the study area. In terms of family distribution, Asteraceae stood first contributing 12 (9.52%) species, followed by Fabaceae 11 (8.73%) species, Solanaceae nine (7.14%) species, Euphorbiaceae seven (5.56%) species and other families consist of one representative species 30 (23.80%) (Table 9). This agrees with the finding of Endalew Amenu (2007) in which family Asteraceae is the dominant family followed by Fabaceae.

Table 9 Distribution of collected species in different family

Family	Number of genera	Percent	Number of species	Percent
Asteraceae	10	8.77	12	9.52
Fabaceae	11	9.65	11	8.73
Solanaceae	7	6.14	9	7.14
Euphorbiaceae	5	4.38	7	5.56
Lamiaceae	4	3.50	5	3.97
Malvaceae	4	3.50	4	2.38
Cucurbitaceae	3	2.63	3	2.38
Moraceae	1	0.88	3	2.38
Myrtaceae	3	2.63	3	2.38
Polygonaceae	1	0.90	3	2.38
Rosaceae	3	2.63	3	2.38
Rutaceae	3	2.63	3	2.38
Alliaceae	1	0.88	2	1.59
Acanthaceae	2	1.75	2	1.59
Amaranthaceae	2	1.75	2	1.59
Anacardiaceae	2	1.75	2	1.59
Apocynaceae	2	1.75	2	1.59
Brassicaceae	2	1.75	2	1.59
Combretaceae	2	1.75	2	1.59
Cuppressaceae	2	1.75	2	1.59
Loganiaceae	2	1.75	2	1.59
Myrsinaceae	2	1.75	2	1.59
Oleaceae	2	1.75	2	1.59
Poaceae	2	1.75	2	1.59
Ranunculaceae	2	1.75	2	1.59
Rhamnaceae	2	1.75	2	1.59
Scrophulariaceae	2	1.75	2	1.59
The remaining 30 species	1	26.31	1	23.80

5.7.1 Habit

Regarding the habit diversity, herbs were the most common and stood first with 60 species (49.58%), followed by shrubs 31 species (23.96%), trees 29 species (21.48%) and climbers six species (4.95%) (Figure 5). The dominance of herbs is due to easy availability to local people and their abundance in the area. The analysis of the data also showed that the majority of medicinal plants in the homegardens are herbs. This finding is in line with most medicinal plant inventories in Ethiopia (Debela Hunde, 2001; Ermias Lulekal, 2005; Endalew Amenu, 2007) in which herbs are the dominant growth form of medicinal plants.

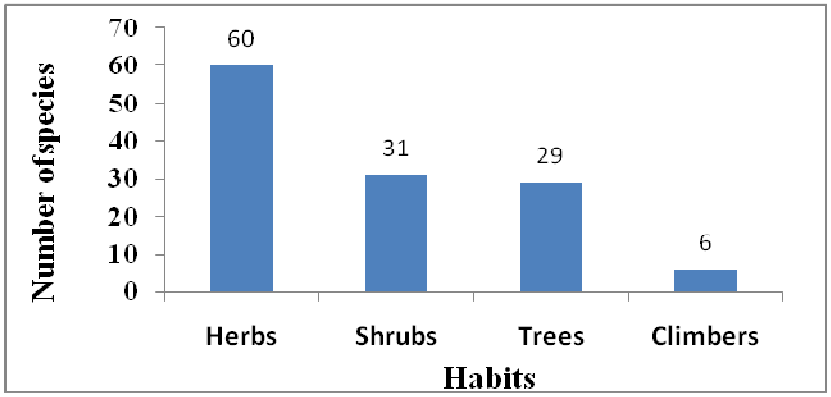

Figure 5 Habits of plants that are collected in the study area

5.8 Ethnomedicinal Plant Species Used by People of Debark Wereda

In the study area a total of 122 medicinal plant species were gathered and documented that are used for the treatment of human and livestock ailments. From these, 88 species (76.03%) were used as human medicine, ten species (9.91%) as livestock medicine and the remaining 24 species (14.04%) were used for treating both human and livestock ailments (Figure 6). These plants are distributed in 113 genera and 56 families. The family Asteraceae stood first contributing 12 (9.83%) species, followed by Fabaceae 11 (9.01%) species, Solanaceae nine (7.38%) species, Euphorbiaceae seven (5.73%) species, Lamiaceae five (4.10%) species and Malvaceae four (3.28 %). Whereas, Myrstaceae Polyonaceae, Cucurbitaceae, Rosaceae, Rutaceae represented three (2.45%) species each and other 30 families consist of one representative species 30 (24.60%).

Of these 122 medicinal plants studied, 72 species were gathered from the wild and 50 species from homegardens. This result indicates that the local communities mostly depend more on medicinal plants collected from the wild than those from homegardens. But, the activity of cultivating medicinal plants in homegardens is also not bad because the number of medicinal

plants obtained in homegarden is also promising. This finding agrees with the general pattern seen in many investigations in Ethiopia in which more medicinal plants are collected from the wild than homegardens (Endalew Amenu, 2007; Etana Tolasa, 2007; Haile Yineger and Delenasaw Yewhalaw, 2007).

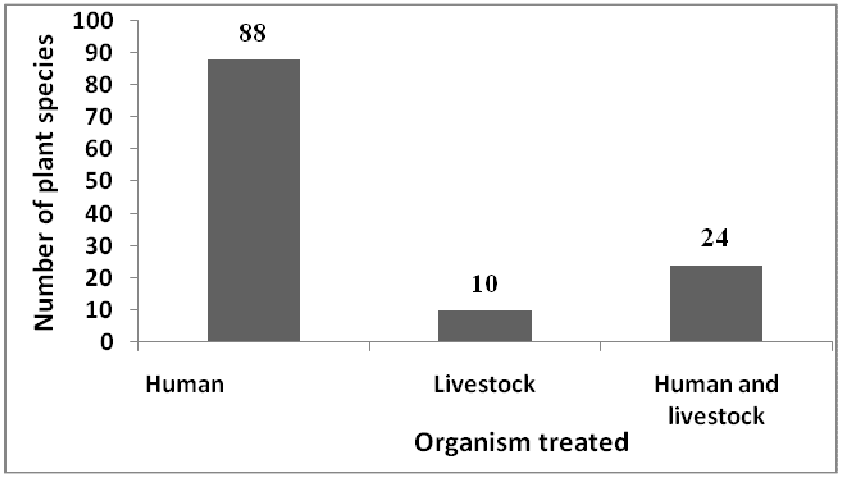

Figure 6 Proportion of medicinal plants used to treat human, livestock and both human and livestock diseases

5.8.1 Habit

Regarding the habit diversity, herbs were the most common and stood first with 60 species (49.58%), followed by shrubs 30 species (23.96%), trees 26 species (21.48%) and climbers six species (4.95%) (Figure 7). The dominance of herbs is due to easy availability to local people and their abundance in the area. The analysis of the data also showed that the majority of medicinal plants in the homegardens are herbs. This finding is in line with most medicinal plant inventories in Ethiopia (Endalew Amenu, 2007; Ermias Lulekal, 2005; Debela Hunde, 2001) in which herbs are the dominant growth form of medicinal plant.

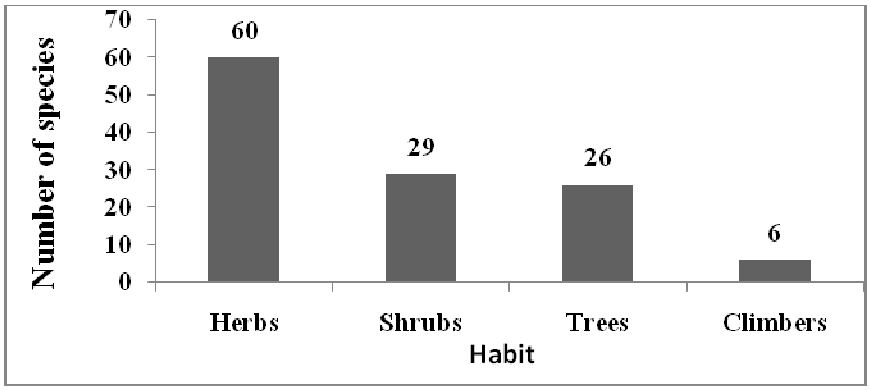

Figure 7 Habits of medicinal plant species in the area

5.8.2 Plant parts used

The most widely used plant part for the preparations of remedy were leaves, which accounted for 50.27% followed by roots (16.29%), seed (14.48%) and others (Table 10).

Table 10 Plant Parts used in preparation of remedies

Parts used	Number of species	
	Total	Percentage
Leaf only	111	50.27
Root only	36	16.29
Seed only	32	14.48
Latex/sap only	9	4.07
Bark only	7	3.16
Stem only	6	2.71
Fruit only	5	2.26
Whole plant	4	1.80
Bulb	3	1.36
Root and leaf	2	0.90
Bark and root	1	0.45
Flower,	1	0.45
Flower and leaf	1	0.45
Rhizome	1	0.45
Seed and leaf	1	0.45
Total	221	100

5.8.3 Route of administration

People of the study area mostly administer traditional medicine orally. Oral accounts (45.99%) followed by dermal (38.29%), nasal (7.66%) and others (Figure 8). Local people also reported that various additives were given during administration of traditional medicine.

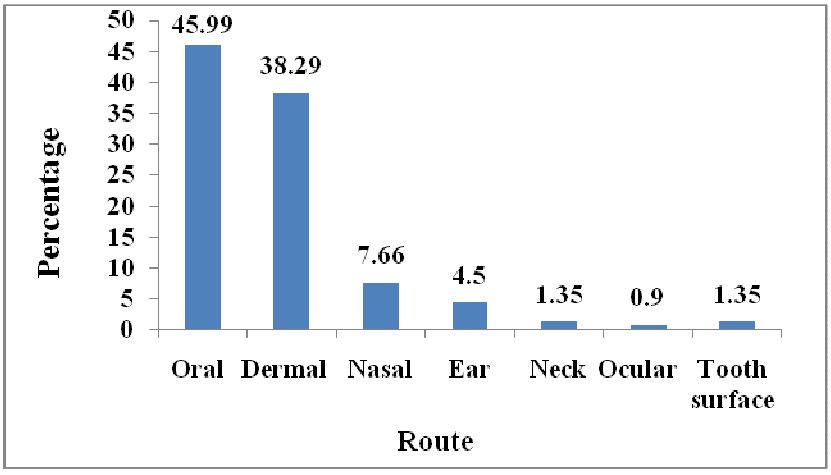

Figure 8 Route of administration of traditional medicine in the study area

5.8.4 Conditions of Preparation of Herbal Remedies

The results showed that herbal remedies are prepared using fresh material 118 (55%), while 68 (32%) were used in the case of dried plant material and 29 (13%) either fresh or dried (Figure 9). Similarly, a study conducted by Teshale Sori *et al*., (2004) in Borana, Oromia Reginal State, south Western Ethiopia. Showed that using fresh materials for different health problems is more than dry materials or dry or fresh.

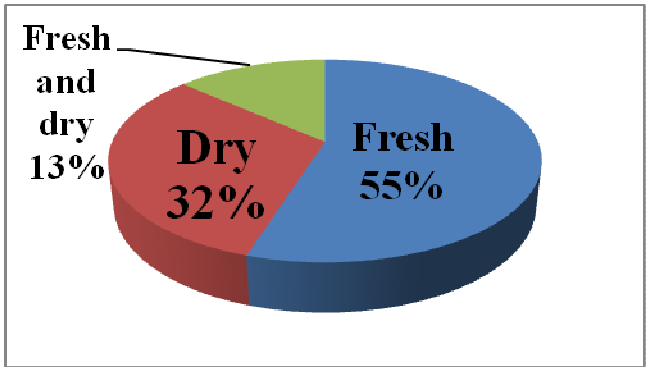

Figure 9 Condition of remedy preparation from plant

5.8.5 Solvents and additives

Some of the remedies are taken with different additive and solvents, the solvent used is water. The additives include butter, honey, milk, sugar, "tella", "tej", kerosene, 'teff' flour, oil, boiled coffee or tea and *Citrus* juice (Table 11). These additives have importance in reduction of pain, to get better taste and reduce adverse effects such as vomiting and diarrhea and enhance the efficacy and healing conditions as explained by informants. For example, the bark of *Cordia africana* with the root of *Plumbago zeylanica* is powdered, mixed with butter and then creamed on the affected part until recovery to treat tumors ("nekersa"). The bark of *Croton macrostachyus* is crushed, powdered and mixed with the flour of *Cicer arietinum*, water is added and the mixture backed qand eaten before any food for 3 days to treat ascariasis.

Table 11 Solvents and additives used in medicinal preparation

Solvents and additives	No. of informants who cited the species	Percent of total
Water	26	33.76
Honey	13	16.88
Butter	12	15.58
Milk	11	12.98
Sugar	4	5.19
"teff" flour	4	5.19
Oil	3	3.89
"tella"	3	3.89

Kerosene	2	2.59
"tej"	1	1.29
Sour milk or "ergo"	1	1.29
Boiled coffee or tea	1	1.29
Citrus juice	1	1.29

5.9 Medicinal plants Used to Treat Only Human Diseases

The numbers of ethnomedicinally important plant species that are used to treat human ailments recorded in 12 kebeles of Debark Wereda are 63 different diseases of humans treated by 88 plant species. These plants belong to 85 genera and 50 families. Family Asteraceae and Fabaceae contributed eight species each, Euphorbiaceae, Lamiaceae, Malvaceae and Solanaceae four species each and others (Table 12). Some of the medicinal plants recorded are also used as remedies in other parts of Ethiopia. Fisseha Mesfin (2007) documented 30 plant species and 25 plant species are mentioned in Endalew Amenu (2007). The dominance of family Asteraceae for the treatment of human diseases was reported in the work of Endalew Amenu (2007), Seyoum Getaneh (2009) and others.

Table 12 Number of taxa and plant families used in the treatment of only human diseases

Family	**Number of genera**	**Percent**	**Number of Species**	**Percent**
Asteraceae	8	9.41	8	9.09
Fabaceae	8	9.41	8	9.09
Euphorbiaceae	4	4.71	4	4.55
Lamiaceae	3	3.52	4	4.55
Malvaceae	4	4.71	4	4.55
Solanaceae	4	4.71	4	4.55
Cucurbitaceae	3	3.52	3	3.40
Polygonaceae	1	1.18	3	3.40
Rosaceae	3	3.52	3	3.40
Rutaceae	3	3.52	3	3.40
Apocynaceae	2	2.36	2	2.72
Brassicaceae	2	2.36	2	2.72
Myrtaceae	3	3.52	2	2.72
Poaceae	2	2.36	2	2.72
Ranunculaceae	2	2.36	2	2.72
Rest 33 families	1	38.82	1	37.50

5.9.1 Sources of medicinal plants

From the medicinal plants that are used for human ailments, 52 species were collected from the wild vegetation and 36 species from homegardens. These indicated that the local people obtain medicinal plant species from wild vegetation than homegardens. This resulte agrees with Debela

Hunde (2001); Ermias Lulekal (2005); Endalew Amenu (2007) and Seyoum Getaneh (2009): that documented more human medicinal plants harvested in the wild rather than homegarden.

5.9.2 Habits

This study revealed that medicinal plants used to treat human ailments constitute herbs 47 species (53.40%), shrubs 20 species (22.72%), trees 16 species (18.18%) and climbers five species (5.68%) (Figure 10) This finding shows that the most represented life forms of medicinal plants in the study area are herbs followed by shrubs. This could be due to the fact that naturally there are more herbs than woody plants and woody plants are overused because of their diverse use value. The analysis of the data also showed that the majority of medicinal plants in the homegardens are herbs. It might also indicate that the threats that exist on other growth form particularly trees and shrubs. Similar findings were also reported in earlier works in Ethiopia in which herbs are the dominant growth form for human health treatment (Endalew Amenu, 2007).

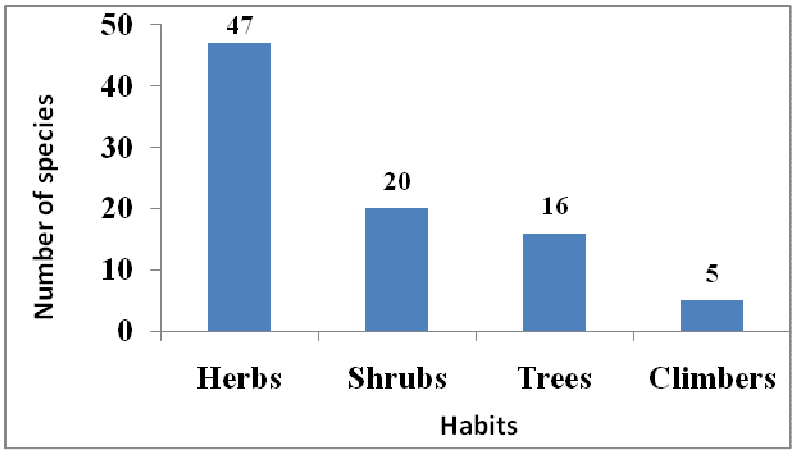

Figure 10 Habits of medicinal plants used for human ailment treatment

5.9.3 Parts used

With regard to the plant parts used for medicinal purposes, different parts of the plants were reported to be used for medicines. The most frequently utilized plant part was leaves 71 (50.35%) of the total recorded human medicinal plants preparations were followed by roots 23 (16.31%), seeds 21 (14.89%), fruit 5(3.54%), sap/latex, 5(3.54%), stem 5(3.54%) and others (Figure 11). Leaves were the most reported plant parts in the preparation of remedies. The preference of leaves to other plant parts could be due to ease of preparation and the chemical constituents of leaf for the treatment of diseases. Remedy preparation that involves roots, rhizomes, bulbs, barks, stems or whole plant have effects that pose a lasting danger to the

continuity of an individual plant compared to leaves. In this study area, the fear of high threat of medicinal plants due to plant parts used for the purpose of medicine is minimal as leaves were the most harvested plant parts used in the area which has little effect on the survival of mother plant. This finding is in line with the results of other ethnomedicinal studies Endalew Amenu (2007); Etana Tolasa (2007); Haile Yineger and Delenasaw Yewhalaw (2007) who reported that leaves were the most cited plant parts used in remedy preparations.

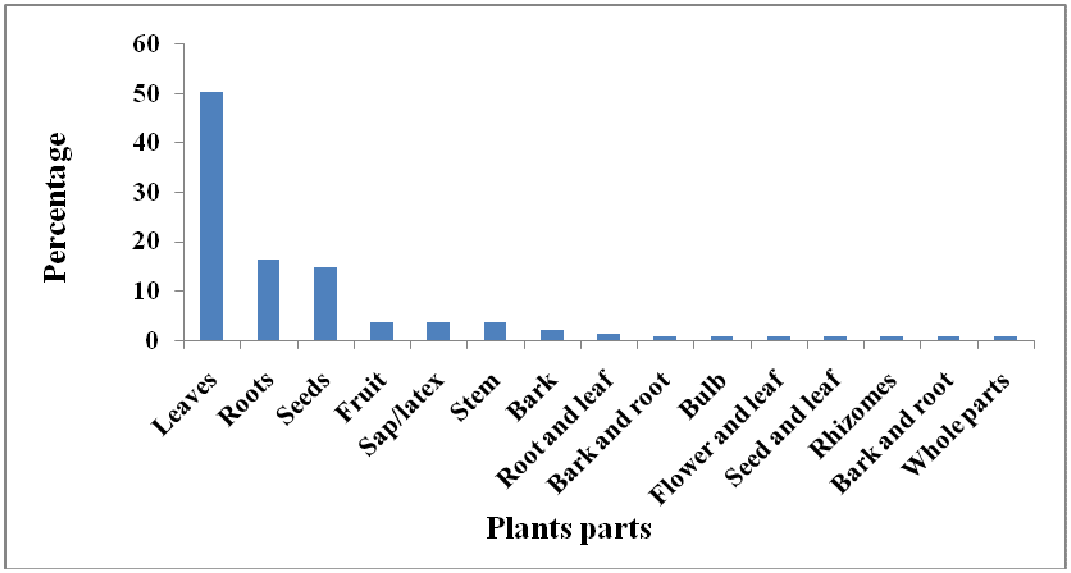

Figure 11 Plant parts used for human ailment treatment

5.9.4 Method of preparation

Regarding the preparation of medicine for human, the local community employs various methods of preparation of traditional medicines for different types of ailments. The preparations vary based on the type of disease treated and the actual site of the ailment. The principal methods of plant parts remedy preparation forms were reported to be through squeezing, which accounts for 33 (22.14%), followed by crushing 24 (16.10%), crushing, powdering and mixing 15 (10.06%), powdering ten (6.71%), powdering, mixing ten (6.71%), chewing seven (4.69%), crushing and mixing six (4.02%), crushing, powdering, mixing and boiled six (4.02%), the remaining proportion is accounted for methods like, boiled, brush/hold, backed, eaten, drying, fumigating, immersed, painting, tie, heated, roasting and the combination of each methods (Table 13).

Table 13 Ways of preparations of only human medicinal plants

Preparation	Percentage
Squeezing	22.14
Crushing	16.10
Crushing, powdering, mixing	10.06
Powdering	6.71
Powdering, mixing	6.71
Chewing	4.69
Crushing, mixing	4.02
Crushing, powdering, mixing, boiled	4.02
Heated	3.35
Painting	3.35
Squeezing , concoction	3.35
Eaten	2.68
Roasting, powdering, mixing	2.68
Fumigating	2.01
Tie	2.01
Boiled	1.34
Brush/hold	1.34
Crushing, roasted	1.34
Crushing, powdering, mixing, backed	0.67
Dry	0.67
Immersed	0.67

5.9.5 Routes of administration

There are various routes of administration of traditional medicinal plants prepared products by the local community. The major routes of administration in the study area are oral, dermal, nasal, and optical. In the study area oral administration is the dominant route with 44.82% of the cases followed by dermal (40 %) and others (Figure 12). Similar results were obtained by Ermias Lulekal (2005) and others that indicated oral administration dominate over others routes of administration.

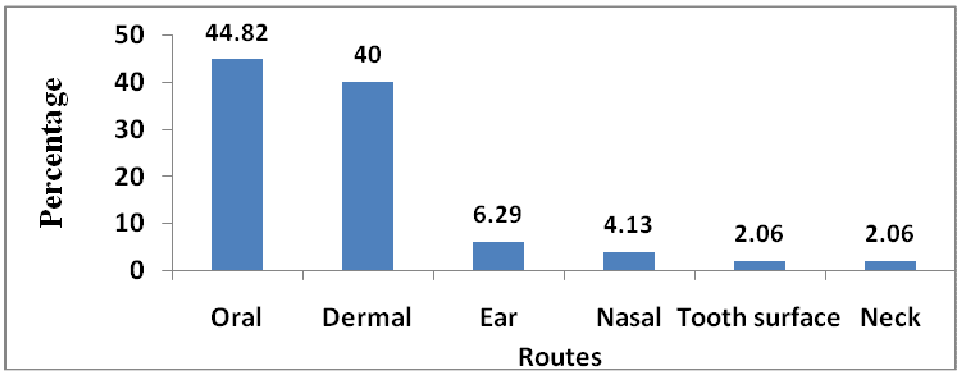

Figure 12 Route of administration of medicinal plants that used for human ailments

5.9.6 Applications

The prepared traditional medicines are applied in a number of methods, drinking accounted for the largest 42 (30%), followed 34 (24.28%) creamed, eating 15 (10.06%) and others (Figure 13). Internal ailments were commonly treated by making the patient drink herbal preparations; tooth infection were treated by crushing and put on the remedial plant part on the tooth surface; skin infections such as ringworm were treated by painting herbal preparations on an infected skin. Some plants do have different applications for different disease types. This preparation is used for different diseases by diverse application techniques. For instance, putting the leaves on tooth surface is used to cure toothache, and to tie on swollen body part is used to cure swelling.

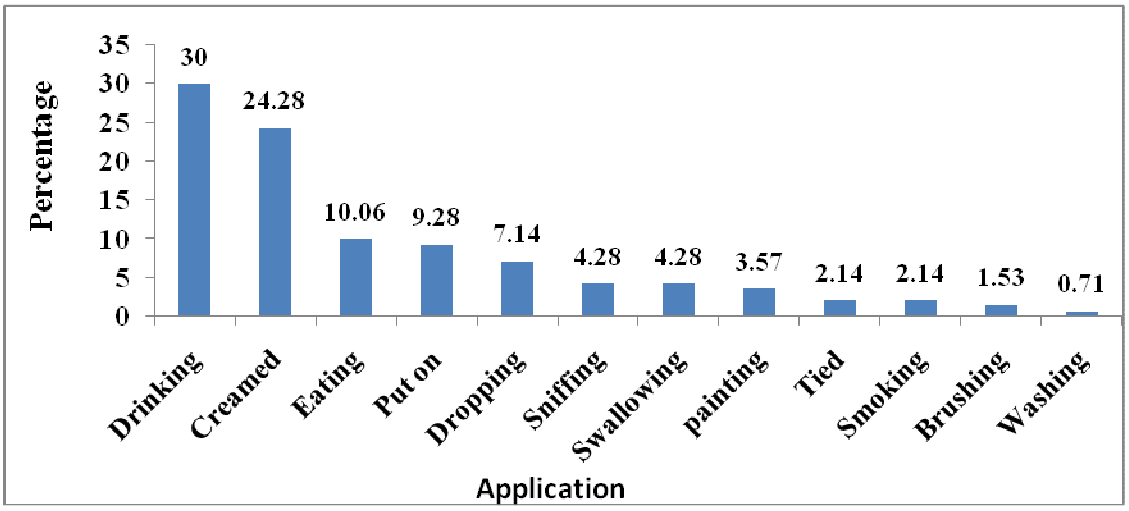

Figure 13 Graph showing ways of application of plant remedies in human ailment treatment

5.9.7 Major human diseases and plant species used by local people

While more than 63 different diseases of humans were recorded as human health problems that are treated by 113 plant species, one species can treat a single disease or a number of diseases. The practitioners of the area commonly diagnose each health problem by an interview and visual inspection of the patient. This shows that large numbers of diseases have got solution by traditional medicine different investigations in Ethiopia. For example, Endalew Amenu (2007) reported 47 human diseases treated by 48 plant species, Etana Tolasa (2007) reported 77 plant species used to treat 49 diseases of humans and Seyoum Getaneh (2009) reported 78 plant species that were used to treat 50 diseases of humans.

According to the informants the largest number of species was used to treat wound, which is treated with 19 (8.71%) species, followed by fibril illness 11 (5.04%), malaria 10 (4.58%),

dandruff and liver disease each of them is treated by 9 (4.12%), ascariasis, body swallowing and stomachache each of them is treated by eight (3.66%), hemorrhoids seven (3.21%), cough, ear disease, "buginge", toothache, ear disease each of them is treated by six (2.75%). In addition to these, the practitioners were also visited more for diseases like evil eye, rh factors, gastritis, diarrhea, rabies and others (Appendix 2).

5.10 Dosage of Medicinal Plants used

People of the study area used various units of measurement and the duration of administration to determine the dosage. Local units such as finger length (e.g., for bark, root, stem,), different measuring materials (e.g., spoon, coffee cup, tea cup and glass cups) and numbers (e.g., for leaves, seeds, fruits, bulbs, rhizomes, flowers and latex) were used to estimate and fix the amount of medicine. But, these measurements are not accurate enough to determine the precise amount. For medicinal plants that are taken topically they do not have clear cut dosage. Sofowora (1982) and Dawit Abebe (1986) have also discussed lack of precision and standardization as one drawback for the recognition of the traditional healthcare system. Until recovery from the disease, disappearance of the symptoms of the diseases, vanishing out of the disease sign and judgment of the healer to stop the treatment were some of the criteria used in determining duration in the administration of the dosage. However, from the interview made during the study, it was found that there was disagreement among the healers concerning the dosage system used. For example, some informants suggested that four or five drops of the latex from *Euphorbia ampliphylla* is used to treat STDs, ascariasis and rabies, while some suggested that only one drop is enough for the same problem. Still some others suggested that they apply the latex randomly without such measuring system or without mentioning a fixed by saying "drop of latex". Although the measurements used to determine the dosages are not standardized and doses given depend on the age, physical appearances and heath conditions; that is, children are given less dose than adults, physically strong individuals take more dose than weak individuals depending on the type of disease. Though such prescription difference was practiced, still the amount prescribed by healers for both children and adults might not conform to the standard prescriptions as in modern medical literature. According to Dawit Abebe and Ahadu Ayehu (1993), the real drawback in traditional medicine system mostly arises from lack of precision in dosage.

The absence of any adverse effects of traditional medicines after administration were also more frequently mentioned by the traditional healers but some of the preparations were reported to have some adverse effects like diarrhea and vomiting. The traditional healers indicated that they use antidotes for the adverse effects of some traditional medicines like eating cooked teff flour and honey drinking boiled coffee, "tella" after taking the medicine. For instance, the use of *Euphorbia ampliphylla* for the treatment of STDs, The drop of latex is collected mixed with "teff" powdered and backed and then eaten before any food for 3 days. During that diarrhea follows, as an antidote the local healers ask the patient to drunk boiled coffee. In addition to the use of *Justicia schimperiana* for the treatment of liver problem, leaves are pounded, powdered, mixed with milk then the filtrate the solution is drunk. During that vomiting follows, as an antidote the local healers ask the patient to drunk boiled coffee.

5.11 Medicinal Plant Species Used to Treat both Livestock and Human Ailments

A total of 24 species of medicinal plants used for the treatment of both human and livestock in the study area. These belong to 18 families and 24 genera health problems are recored. The family Solanaceae was represented by three species followed by Asteraceae, Euphorbiaceae, Fabaceae and Amaranthaceae was represented by two species each and others (Table 14). These plants are reported as treatment for 40 types of human diseases in the study area. This study also showed that eigih species were used as remedy for fibril illness, six species to treat leech, 4 species for rabies three species for wound, two species for ascariasis, gastric and hemorrhoids and one species for diarrhea and caught (Appendix 6). The sources of these are 14 species all of them collected from the wild vegetation and ten species are from homegarden. This result agrees with the work of Endalew Amenu (2007), in which the wild sources of plants for the treatment of livestock and human ailments are took the lead.

Table 14 Number of taxa and plant families used in the treatment of both livestock and human diseases

Family	Number of genera	Percent	Number of Species	Percent
Solanaceae	3	12.5	3	16.67
Asteraceae	2	8.33	2	11.11
Euphorbiaceae	2	8.33	2	11.11
Fabaceae	2	8.33	2	11.11
Amaranthaceae	2	8.33	2	11.11
Acanthaceae	1	4.17	1	5.56

Alliaceae	1	4.17	1	5.56
Agaveceae	1	4.17	1	5.56
Anacardiaceae	1	4.17	1	5.56
Caryophllaceae	1	4.17	1	5.56
Combretaceae	1	4.17	1	5.56
Lamiaceae	1	4.17	1	5.56
Linaceae	1	4.17	1	5.56
Myrtaceae	1	4.17	1	5.56
Oleaceae	1	4.17	1	5.56
Phytolacaceae	1	4.17	1	5.56
Scrophulariaceae	1	4.17	1	5.56
Rhamnaceae	1	4.17	1	5.56

5.11.1 Habits

The habits of medicinal plants that are harvested for both the treatment of human and livestock ailments are herbs 13 species, shrubs six species, trees four species and climbers one species. This disagrees with the work of Endalew Amenu (2007) in which shrubs take the lead. In this study herbs like *Achyranthes aspera, Allium cepa, Artemisia abyssinicus, Euphorbia ampliphylla, Linum usitatissimum, Lycopersicon esculentum* and *Nicotiana tabacum*; shrubs like *Justicia schimperiana, Otostegia integrifolia, Phytolacca dodecandra, Rhamnus Prinoides, Ricinus communis* and *Solanum dasyphyllum*; trees like *Combretum collinm, Eucalyptus globulus, Pterolobium stellatum* and *Rhus glutinosa* and a climber (*Jasminum abyssinicum).*

5.11.2 Plant parts

The plant parts used for both the treatment of human and livestock treatment in the area are leaves 33 (50.76%), root 14 (21.53%), seed 9 (13.84%) and other (Figure 14). Like that of human medicine leaves are the most harvested plant part of remedy preparation for both livestock and human ailments. This agrees with the report of Endalew Amenu (2007) in which leaves are the major plant part used for both livestock and human ailments remedy preparation, followed by roots and seeds.

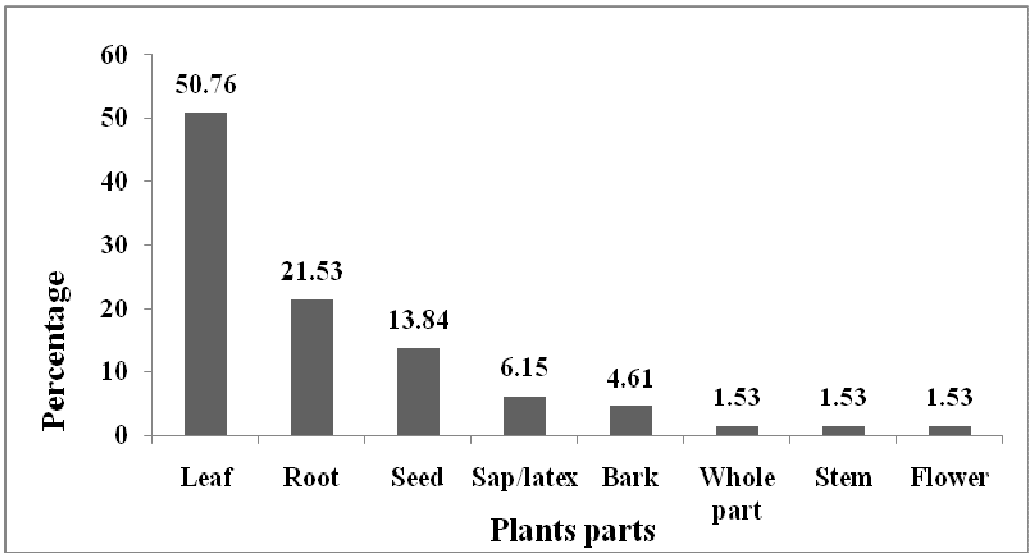

Figure 14 Plant parts used for both livestock and human ailments treatment

5.11.3 Method of preparations, route of administration and applications

The technique of preparations used involved squeezing, crushing, powdered, squeezing, powdered followed by concoction and crushing, followed by concoction and harvesting. For instance, the seed of *Combretum collinum are* with seed of *Solanum dasyphyllum* are crushed together powdered mixed with "tella" and then drunk. This resulting concoction is used to treat the disease known as rabies. The latex of *Euphorbia ampliphylla* is collected mixed with "teff" powdered and backed and then eaten before any food for 3 days. This resulting concoction is used to treat the common disease in the area known as ascariasis. Crushed, the fresh leaf of *Rhus glutinosa* added little solution through nose to cattle is used to relief the animal from a disease known leech. Based on the nature of the ailment the remedies were applied through different routes. Oral route is the major route (36 preparations, 54.54%), followed by dermal (22 preparations, 33.33%), nasal (7 preparations, 10.60%) and the least ear is (1 preparation, 1.51%).

5.11.4 Method of preparation

The local community use different forms of remedy preparations and applications to treat human and livestock diseases. The common forms of preparations are squeezing (26.15%), crushing, powdering and mixing, squeezing and mixing (10.76%) each, fumigating (6.15%) and others (Table 15).

Table 15 Ways of preparations of medicinal plants used to treat both human and livestock

Preparation	Number	Percent
Squeezing	17	26.15
Crushing	7	10.76
Powdering and mixing	7	10.76
Squeezing and mixing	7	10.76
Chewing	5	7.69
Crushing and mixing	5	7.69
Fumigating	4	6.15
Mixing and boiling	3	4.16
Powdering	3	4.16
Collected and mixing	3	4.16
Tie	2	3.07
Filtering	2	3.07
Immersed	1	1.53

5.12 Medicinal Plants Used to Treat Livestock Health Problems

Medicinal plants that are collected and identified in the study area that are used for livestock health problems are ten species. They are grouped in ten genera and eight families. Family Asteraceae and Solanaceae comprise two species each followed by Euphorbiaceae and others (Table 16) and nine disease types are treated. Five species are obtained from the wild and five species from home gardens.

Table 16 Families and number of medicinal plants species to treat livestock ailments

Family	Number of genera	Percent	Number of Species	Percent
Asteraceae	2	20	2	20
Solanaceae	2	20	2	20
Euphorbiaceae	1	10	1	10
Fabaceae	1	10	1	10
Moraceae	1	10	1	10
Myrsinaceae	1	10	1	10
Scrophlariaceae	1	10	1	10
Tilaceae	1	10	1	10

5.12.1 Habits

The habits of medicinal plants that are used for ethnoveterinary health problems are shrubs comprising five species, trees three species and herbs two species. In this study shrub like *Dispcopodium penninervum, Euphorbia tirucalli, Solanecio gigas* and *Solanum macracanthum*; trees like *Ficus vasta, Grewia ferruginea* and *Maesa lanceolata* and herb species like *Anarrhinum forskaorlii* and *Lathyrus sativus* were used for the treatment of only livestock

ailments in the study area. This finding agrees with the work of Endalew Amenu (2007) in which shrubs are the dominant habits for the treatment of livestock ailments.

5.12.2 Plant parts

The plant parts used for livestock health treatment in the area are leaves (72.72%) followed by whole plant (18.18%) and sap/latex (9.09%). Like that of human medicine leaves again are the most harvested plant part for remedy preparation to treat livestock ailments. This disagree with the report of Endalew Amenu (2007) in which roots are the major plant part used for livestock remedy preparation followed by leaf.

5.12.3 Method of preparations and route of administration

The local people use different forms of remedy preparations and applications to treat livestock diseases. The technique of preparations used involved crushing, squeezing, followed by concoction and squeezing followed by concoction, crushing and followed by immersed. For instance, the leaves of *Dispcopodium penninervum* is crushed, mixed with little water and then added through the nose or oral. This concoction is used to treat the common disease in the area known as leech/blood clot. Collected and creamed fresh sap/latex of *Euphorbia tirucalli* is used to treat cattle from for a skin disease (locally known as "alkedele"). Based on the nature of the ailment the remedies were applied through different routes. Oral application of remedies was found to be the highest (45.45%), followed by dermal (27.27%), nasal (18.18%) and ocular application (9.09%) This finding agrees with the work of Teshale Sori *et al*. (2004) and Endalew Amenu (2007) who reported that oral administration is the most common route of administration.

5.12.4 Application

Application of ethnoveternary medicinal plants involves drinking (45.45%) and creamed (27.27%), dropping (27.27%). For example, if a leaf of *Solanum macracanthum* with *Maytenus arbutifolia* is pounded, squeezed and of 3-5 drops and added through the eye it can cure the animal from the eye disease.

5.12.5 Major Livestock Diseases and Number of Plant Species Used by Local People

A total of 20 livestock ailments were identified plants in the area and 34 species Plant are used the treatment that are treated by traditional medicinal Common diseases affecting livestock health's in the study area are leech which is treated by ten (25%) species, fibril illness by five

(12.5%) species, blotting and rabies by four (10%) species each and others (Table 17). This finding related with the work of Endalew Amenu (2007) that reported 27 livestock problems.

Table 17 Frequent livestock diseases and number of plant species used

Disease treated	Total species	Percent
Leech	10	25.00
Fibril illness	5	12.50
Blotting	4	10.00
Rabies	4	10.00
Retained placenta	3	7.50
Eye disease	2	5.00
Blood clot	1	2.50
Insufficient breast milk supply	1	2.50
Caught	1	2.50
Dislocated bone	1	2.50
External parasite “kichame”	1	2.50
Infertility	1	2.50
“lebitir”(Physical damage)	1	2.50
Prevention	1	2.50
Rh factor	1	2.50
Skin disease	1	2.50
Skin disease “alkedele”	1	2.50
Stomachache	1	2.50
Wound	1	2.50
Coccidiosis	1	2.50

5.13 Sources and Transferring of Indigenous knowledge

5.13.1 Sources of traditional knowledge practice

The highest number of traditional medicinal plant knowledge gain from to be 45 (53.57%) father/mother followed by 15 (17.86%) for wife/husband and 12 (14.29%) for sister/brother (Table 18).

Table 18 Sources of knowledge on the practice of traditional medicine

Source of knowledge for traditional healer	Number	Percent of total
Father/ Mother	45	53.57
Wife/Husband	15	17.86
Sister/Brother	12	14.29
Uncle/Aunt	7	8.33
Neighborhood	1	1.19
Other	4	4.76

5.13.2 Transferring knowledge of traditional medicinal plants

The highest number for the ways of transferring knowledge on traditional medicinal plants by elder son who received 23 (27.38%) votes followed by the all children of the family 18 (21.43%), for elder daughter 15 (17.86%), for wife nine (10.71%), for husband seven (8.33) and other (Table 19).

Table 19 Transferring of knowledge of traditional medicinal plants

To whom transferred	Number	Percent of total
Eldest son	23	27.38
All children	18	21.43
Eldest daughter	15	17.86
Wife	9	10.71
Husband	7	8.33
Brother/Sister	5	5.95
Not to all	4	4.76
All members of the family	2	2.38
To all freely	1	1.19
Total	84	100

5.14 Marketed Medicinal Plants

The results obtained from market evaluation of two local markets, Sunday (Dib Bahir) and Saturday (Debark town) markets, showed that most of the medicinal plants are not widely traded for medicinal purposes, but mostly for other different uses. Since the local people prefer either collecting these plants by themselves from the available areas (vegetations) in the Wereda to prepare the medicines or they prefer to go directly to the local healers to get treatments instead of buying the medicinal plants from the market. However, more of the medicinal plants are widely traded and used for many additional purposes other than their medicinal uses (Table 20). This result agreed with the study reports of Etana Tolasa (2007). The medicinal plant material found being marketed in the open markets for medicinal purpose which *Hagenia abyssinica, Lepidium sativum, Lobelia rhynchopetalum* and *Silene macrosolen.* Some fresh collection of *Artemisia absinthim, Boscia angustifolia, Citrus aurantifolia, Embelia schimperi, Allium cepa, Allium sativium* and *Ruta chalepensis* are also marketed in the local community for their aromatic, food, medicinal, spice and food and spice values respectively. Some dry collection of *Capsicum annuum, Hordeum vulgare, Linum usitatissimum* and *Lycopersicone esculentum, Trigonella foenum-graecum* and *Foeniculum vulgare, Lagenaria siceraria, Coffea arabica* are also

marketed in the local community for food, spice house material and stimulant values respectively.

Table 20 Some of the cultivated and wild grown medicinal plants widely traded in the market for different uses other than medicinal values

Scientific Name of the medicinal plant	Local name (Amharic)	Used for
Allium sativium	Nech shinkurt	Spice, Food
Allium cepa	Key shinkurt	Spice, Food
Artemisia absinthium	Rya	Aromatic
Brassica carinata	Gomenzer	Food
Boscia angustifolia	Tedo	Medicinal
Capsicum annuum	Berbere	Food
Cicer arietinum	Shimbra	Food
Citrus limon	Lomye	Food
Coffea arabica	Buna	Stimulant
Cordia africana	Wanze	House hold tools
Embelia schimperi	Kokoko	Food
Eucalyptus globulus	Nech baherzafe	Fuel wood, Construction
Foeniculum vulgare	Ensilal	Spice
Hagenia abyssinica	Kosso	Medicinal
Hordeum vulgare	Gebs	Food
Lepidium sativum	Feto	Food, Medicinal
Lagenaria siceraria	Qel	House material
Linum usitatissimum	Telba	Food
Lycopersicone esculentum	Timatime	Food
Lobelia rhynchopetalum	Jbara	Medicinal
Myrtus communis	Adese	Medicinal, Aromatic
Psidium guajava	Zeytune	Food
Pisum sativum	Ater	Food
Rumex abyssinicus	Momoqo	Medicinal
Silene macrosolen	Wegert	Medicinal

Trigonella foenum-graecum	Abshe	Food
Ocimum basilicum	Zkakba	Spice
Olea europaea	Weyra	Fuelwood, house hold tools
Otostegia integtifolia	Tunjut	Aromatic
Rhamnus prinoides	Gesho	Beverage
Ruta chalepensis	Tenadame	Spice
Vicia faba	Bakela	Food

5.15 Ranking of Most Important Medicinal Plants

5.15.1 Informant consensus

Plants which are popular due to the wide range of diseases that they treat have local names and well known by the local people/healers. Certain species were independently cited by many of the informants for their medicinal uses against human and livestock ailments. The outcome of this study showed that some medicinal plants are popular than and highest informant consensus goes to *Zehneria scabra* which is cited by 52 informants. The popularity of this medicinal plant is due to people preference for the species to treat fibrile illness in the community by collecting it from homegardens of many people. *Verbascum sinaiticum* is cited by 50 informants and 48 informants cited *Rumex nepalensis* species and others (Table 21).

Table 21 List of Medicinal plants and the corresponding informants

Scientific Name	**Local name**	**No. of informants**	**% of informants**
Zehneria scabra	Haregresa	52	61.90
Verbascum sinaiticum	Kutina	50	59.52
Rumex nepalensis	Yewusha lut	48	57.14
Phytolacca dodecandra	Endode	45	53.57
Plantago lanceolata	Wenberet	38	45.23
Achyranthes aspera	Telenge	37	44.04
Malva verticillata	Yesewu lut	36	42.85
Euphorbia ampliphylla	Qulquale	35	41.67
Nicotiana tobaccum	Timbaho	34	40.47
Datura stramonium	Astenager	33	39.28
Solanum dasyphyllum	Embay	33	39.28
Carduus schimperi	Yemder kushele	33	39.28
Rumex nervosus	Embwaco	32	39.28
Dispcopodium penninervum	Alimt	30	37.71
Ocimum lamiifolium	Damakessi	30	37.71
Allium sativum	Nech shenkrt	30	37.71
Citrus aurantifolia	Lomi	30	37.71
Eucalyptus globulus	Nech bahirzaf	29	34.52

Cucumis ficifolius	Yemder embay	27	32.14
Ruta chalepensis	Tene adam	27	32.14
Lepidium sativum	Feto	26	30.95
Justicia schimperiana	Simize	25	29.76
Rumex abyssinicus	Momoqo	25	29.76
Artemisia abyssinicus	Chukun	22	29.76
Kalanchoe petitiana	Endawula	22	26.19
Satureja abyssinica	Tosene	20	23.80
Linum usitatissimum	Telba	15	17.85
Otostegia integrifolia	Tunjut	15	17.85
Cordia africana	Wanze	12	14.28
Kosteletzka begonifolia	Yemegerem	10	11.90
Solanecio gigas	Shekoko gomen	10	11.90
Maesa lanceolata	Sowereya	10	11.90

5.15.2 Preference ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of six medicinal plants that were reported for treating wounded was conducted after selecting ten key informants. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (6) for the medicinal plant which they thought most effective in treating wounded and the lowest number (1) for the least effective plant in treating wounded. *Plantogo lanceolata* scored 44 ranked first indicating that it is the most effective in treating wound followed by *Rumex nervosus* and the least effective was *Euphorbia platyphyllos* (Table 22).

Table 22 Preference ranking of medicinal plants used for treating wounded

List ofmedicinal plants	**R_1**	**R_2**	**R_3**	**R_4**	**R_5**	**R_6**	**R_7**	**R_8**	**R_9**	**R_{10}**	**Total**	**Rank**
Plantogo lanceolata	6	5	5	6	4	2	3	6	5	2	44	1st
Rumex nervosus	4	6	3	5	5	5	4	2	6	6	41	2nd
Malva verticillata	5	4	4	3	2	2	6	5	3	5	39	3rd
Dodonaea angustifolia	3	1	2	1	6	6	2	3	2	4	30	5th
Verbascum sinaiticum	2	3	6	4	3	4	3	4	4	1	34	4th
Euphorbia platyphyllos	1	2	1	2	1	4	1	1	1	3	17	6th

Key: R= Respondents

5.15.3 Direct matrix ranking

Direct matrix ranking was performed to assess the relative importance each of the plant. The result of the direct matrix ranking showed that *Cordia africana* stood first in being the most multipurpose medicinal plant followed by *Eucalyptus globulus, Olea europaea* subsp. *cuspidata*, *Juniperus procera, Acacia abyssinica, Croton macrostachyus* and *Ficus vasta* was the least (Table 23).

Table 23 Direct matrix ranking for seven specie and main use in study area

Main use	**Plant species**						
	Acacia abyssinica	*Croton macrostachyus*	*Eucalyptus globulus*	*Juniperus procera*	*Cordia africana*	*Ficus vasta*	*Olea europaea subsp. cuspidate*
Medicinal	13	28	27	16	25	12	23
Food	9	7	7	7	38	30	7
Fire wood	43	35	49	42	41	36	45
Charcoal	33	31	34	36	28	25	49
Fence	35	16	43	31	32	14	30
Construction	24	20	45	18	23	16	25
Furniture	23	33	26	31	48	14	46
Total	180	170	231	181	235	147	225
Rank	5th	6th	2nd	4th	1st	7th	3rd

5.15.4 Paired comparison

A paired comparison made to determine the most preferred medicinal plants among the five species that were used to treat fibril illness in the study area, the responses of ten key informants, showed that *Zehneria scabra* ranked first followed by *Ocimum lamiifolium* (Table 24). Therefore, this result indicated that *Zehneria scabra* is the most preferred while *Cyathula polycephala* is the least favoured over the other plant species cited in treating fibril illness.

Table 24 Paired comparisons of five medicinal plant species used to treat fibril illness

Plant species	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
Cyathula polycephala	1	1	2	3	3	5	1	1	2	2	21	5th
Carduus schimperi	2	4	3	1	2	1	3	3	1	4	24	4th
Ocimum lamiifolium	4	3	1	4	4	4	5	2	5	1	33	2nd
Eucalyptus globulus	3	2	4	2	5	2	2	5	3	3	31	3rd
Zehneria scabra	5	5	5	5	3	3	3	4	4	5	42	1st

5.15.5 Informant consensus factor (ICF)

The diseases of the study area have been grouped into different categories based on the site of incidence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. The informant consensus factors have been calculated for each category (Table 25).

Table 25 Informant consensus factor (ICF)

Category	Species	Use citation	ICF
Fibril illness	12	85	0.870
Wound	20	130	0.852
Body swallowing, “kuriba”, “buginge”	15	77	0.815
Evil eye, Evil spirit	4	16	0.800
Hypertension, Headache	4	9	0.785
Skin rash “chiffee”, Ring worms “kukucha”	10	40	0.769
Fire burn, Skin cut	5	18	0.764
Gastritis, Stomachache	13	50	0.755
Dandruff	10	37	0.750
Eye problem, Ear problem	11	40	0.743
Hemorrhoids, Herpes	10	35	0.735
Leech, Blotting	14	45	0.723
Rabies, Snake bite	7	22	0.714
Malaria	6	18	0.705
Excessive menstruation, Retained placenta, Sterility, Rh factor	12	30	0.685
Tonsillitis, Toothache	10	30	0.680
Kidney Problem, Liver problem, Heart disease	6	15	0.642
Common cold, Cough, Bronchitis	10	30	0.631
Amoeba, Diarrhea	6	12	0.545
STDs	6	10	0.445
Ascaries, Tape Worm	9	15	0.428
Blood clot, Nasal bleeding, Athletes foot	4	7	0.400
Cancer “lemte”, Tumors “nekersa”, Epilepsy	7	8	0.143

The results of the study showed that diseases that are frequent in the study area have higher informant consensus factor. It is further shown that medicinal plants that are effective in treating certain diseases and well known by community members also have higher ICF values (Table 25) with the ICF values ranging from 0.870 to 0.143 per illness category. Fibril illness had the highest ICF value (0.870) due to the high incidence of the disease in the area whereas; cancer "lemts", tumors "nekersa", epilepsy had the lowest (0.143) may be due to the rare occurrence of these diseases and the fact that most are successfully treated by local healers.

5.15.5.1 Descriptions of the most frequently reported diseases in study area

1. **Fibril illness-** This group had the highest ICF value (0.870) with 12 species reported by 85 use citations. Plant species used in the treatment of such diseases included *Cucumis ficifolius, Ocimum lamiifolium, Urtica simensis, Zehneria scabra, Artemisia abyssinicus*, *Carduus schimperi, Cyathula polycephala, Eucalyptus globulus, Justicia schimperiana, Carduus schimperi* and *Silene macrosolen.* Of these, *Zehneria scabra* (61.90%), *Verbascum sinaiticum* (59.52%), *Carduus schimperi* (39.28%), *Ocimum lamiifolium* (37.71%), *Eucalyptus globulus* (34.52%), *Cucumis ficifolius* (32.14%), have higher informant consensus in the study area.
2. **Wound -** This category had the highest ICF value (0.852) next to the category of fiblil illness. There were 130 use citations for 20 plant species. Medicinal plants reported for those diseases were, *Verbascum sinaiticum, Achyranthes aspera, Brucea antidysenterica, Chenopodium murale, Clematis simensis, Croton macrostachyus, Dodonaea angustifolia, Euphorbia platyphyllos, Hibiscus micranthus, Malva verticillata, Melia azedarach, Nicandria physaloides, Osyris quadripartita, Plantogo lanceolata, Rhus glutinosa, Rumex abyssinicus, Rumex nervosus, Sida schimperi, Ficus vasta* and *Tamarindus indica.* The results of study showed that *Plantogo lanceolata* (45.23%), *Verbascum sinaiticum, Achyranthes aspera* (44.04%), *Malva verticillata* (42.85%), *Rumex nervosus* (39.28%), *Rumex abyssinicus* (29.76%) have higher informant consensus factors.
3. **Body swallowing, "kuriba", "buginge" -** There were 77 use citations for 15 plant species. This category had the highest ICF value (0.815) next to the above category. In this category most diseases were treated by using traditional medicinal plants rather than modern drugs. Plant species used in this category include *Justicia schimperiana, Phytolacca dodecandra,*

Achyranthes aspera, Kalanchoe petitiana, Lagenaria siceraria, Kosteletzka begonifolia, Rumex nepalensis, Stephania abyssinica, Trigonella foenum-graecum, Pisum sativum. Species with higher informant consensus factor were *Rumex nepalensis* (57.14%), *Phytolacca dodecandra* (53.57%), *Achyranthes aspera* (44.04%), *Justicia schimperiana* (29.76%), *Kalanchoe petitiana* (26.19%) and *Kosteletzka begonifolia* (11.90%).

5.16 Threats of Medicinal Plants in the Study Area

5.16.1 Factors threatening medicinal plants

The cause of threats to medicinal plants 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 over exploitation of plants for different uses including charcoal making, fire wood collection, collection of construction woods, overgrazing, cutting and burning of plants to create new agricultural lands. Informants ranked agricultural expansion as the most serious threat to the medicinal plants followed by fire wood and charcoal collection and lower levels of threats by the other factors (Table 26). Similar study by Fisseha Mesfin (2007) in Wonago District showed that, there are different threats in medicinal plants such as agricultural expansion (24.4 %), fire wood collection and others. Furthermore, the negative impact of deforestation on medicinal plants was also reported in Mirutse Giday (1999).

Table 26 Ranking of threats to medicinal plants

Threats	**R_1**	**R_2**	**R_3**	**R_4**	**R_5**	**R_6**	**R_7**	**R_8**	**R_9**	**R_{10}**	**Total**	**Rank**
Drought	5	1	1	2	5	3	3	5	3	2	30	5th
Agricultural expansion	7	3	7	6	4	6	7	7	6	5	58	1st
Fire wood	3	6	5	7	7	4	6	3	7	7	55	2nd
Charcoal	2	7	4	5	6	7	5	4	4	6	50	3rd
Construction	6	2	2	1	2	1	1	1	2	4	22	6th
Urbanization	1	5	3	4	1	2	2	2	1	3	24	7th
Fodder	4	4	6	3	3	6	4	6	5	1	42	4th

5.16.2 Threatened medicinal plants

The ranking of five medicinal plants based on the degree of threats was conducted using 10 key informants. The results (Table 27) indicated that *Olea europaea* supsp. *cuspidata* is the most threatened followed by *Cordia africana* and *Silene macrosolen* and the least threatened one is *Dodonaea angustifolia.*

Table 27 Ranking of threatened plants

Threatened plants	**Informants**											
	R_1	**R_2**	**R_3**	**R_4**	**R_5**	**R_6**	**R_7**	**R_8**	**R_9**	**R_{10}**	Total	Rank
Silene macrosolen	3	3	2	1	2	3	2	3	3	1	23	4th
Cordia africana	4	4	3	5	3	4	5	3	5	2	38	2nd
Dodonaea angustifolia	2	1	1	4	1	1	1	2	1	3	17	5th
Boscia angusifolia	1	2	4	2	5	2	4	5	2	5	32	3rd
Olea europea subsp. *cuspidata*	5	5	5	3	4	5	3	4	3	4	41	1st

5.17 Jaccard`s coefficient of similarity (JCS)

Jaccard`s Coefficient of Similarity (JCS) revealed that the study area has the highest similarity with 45 common species (34.66%) with the study conducted around Wonago Wereda, followed by 40 common species (28%) with Debre Libanos Wereda, followed by 39 common species (21.91) with Chelya Wereda, followed by 30 common species (17.65) similarity with Gimbi Wereda, followed by 23 common species (17.16%) similarity with Zegie. The least similarity was linked with the study conducted on Bale Mountain National Park (Table 28).

Table 28 the Jaccard coefficient of similarity of Debark Wereda with seven other areas with respect to medicinal plant composition

Sample area	**a**	**b**	**c**	**JCS%**	**Sources**
Debark Wereda	122	-	**-**		
Bale Mountains National Park	101	86	15	7.42	Haile Yineger, *et al.,* 2008
Chelya Wereda	89	50	39	21.91	Endalew Amenu, 2007
Derbre Libanos Wereda	90	50	40	22.22	Seyoum Getaneh, 2009
Gimbi Wereda	85	55	30	17.65	Etana Tolessa, 2007
Wonago Wereda	65	20	45	34.66	Fisseha Mesfin, 2007
Zegie Peninsula	67	44	23	17.16	Tilahun Teklehaymanot and Mirutse Giday, 2007

6. CONCLUSIONS

The ethnobotanical study of medicinal plants indicates that the study area is rich in its medicinal plant composition and the associated indigenous knowledge. One hundred twenty two medicinal plants were recorded of which 88 species were noted to treat human ailments while 10 species are documented to treat livestock ailments and 24 species are used to treat both livestock and human ailments. The medicinal plant species collected and identified from the wild vegetation were 72 species and those from homegardens were 50 species. In the study area, 83 ailments were reported (63 for human and 20 for livestock) which are being treated by traditional medicinal plants of the area. Herbal remedies are prepared from fresh materials (54.39 %) and dried plant materials (31.35 %). Herbs are highly utilized (49.58%) for medicinal purpose than trees and shrubs. Leaves (50.27%) are use for medicinal purpose more than other plant parts for preparation of human and livestock remedies. the remedies are taken with different additive and solvents and water is more frequently nused for this purpose. Most of the medicinal plants are administered orally (45.99%). The major threats to medicinal plants and the associated knowledge in the study area are agricultural expansion, firewood collection, charcoal production, drought, uses of plants for construction and grazing in that order. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, unwillingness of young generation to gain the knowledge, unavailability of the species, influence of modern education and awareness factors are the major ones. Therefore, awareness creation campaigns are timely needed to improve local community's knowledge on the importance and management of medicinal plants and awareness raising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use.

7. RECOMMENDATIONS

Based on the findings of the study the following recommendations are forwarded:

- Encourage the people to cultivate medicinal plants in their homegardens and farmlands. In addition to this, local peoples' management and conservation of local resources need to be maintained.
- The local people need supports through awareness raising education on the sustainable utilization and management of plant resources.
- Encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives.
- Encouraging Government officers and NGOs to participate in conservation of medicinal plants, support local medicines and provide incentives to farmers for cultivation of medicinal plants in homegardens.
- Encourage participation of the local people in conservation activities.

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Appendix 1 List of human and livestock diseases which are treated by medicinal plants in the study area

No.	Local Name	English Name
1.	Amoeba	Amoeba
2.	Weba	Malaria
3.	Chebte	Gonorrhea
4.	Yesewnet ebtet	Body swelling
5.	Yehode besheta	Stomach problem
6.	Yejero besheta	Ear problem
7.	Aynebesheta	Eye problem
8.	Yetres kurtemate	Toothache
9.	Yelb beshta	Heart problem
10.	Forefor	Dandruff
11.	Neser	Nasal bleeding
12.	Cheguara	Gastritis
13.	Hode kurtet	Stomachache
14.	Yebabe nekesha	Snake bite
15.	Tonsil	Tonsillitis
16.	Buda	Evil eye
17.	Tekimate	Diarrhea
18.	Kintarote	Hemorrhoids
19.	Kosso	Tapeworm
20.	Wosfat	Ascariasis
21.	Kusel	Wound
22.	Miche	Fibril illness
23.	Yerase mitate	Headache
24.	Sale	Cough
25.	kukucha	Ringworm
26.	Gubet	Liver problems
27.	Gunfane	Common Cold
28.	Wugat	Stabbing pain
29.	Chifee	Skin rash
30.	Yedemgefite	Hyper tension
31.	Yeanjet besheta	Internal parasite
32.	Yehode menifat	Blotting
33.	Yewsh besheta	Rabies
34.	Alekit	Leeches
35.	Almaze balchera	Herpes
36.	Kitegn	Syphilis
37.	Lemte	Cancer
38.	Nekerse	Tumors
39.	Kunkun	Ear parasites
40.	Kurtmat	Rheumatism
41.	Sibrat	Dislocated bone
42.	Mekan	Infertility
43.	Dingetegna	Sudden sickness
44.	Yengdelj sizegey	Retained placenta
45.	Worershign	Epidemic
46.	kuribe	Body swelling
47.	Shotelay	Rh factors

Appendix 2 The Most Frequent Human Diseases and Number of Plant Species used

Disease treated	**Total Species**	**Percent**
Wound	19	8.71
Fibril illness	11	5.04
Malaria	10	4.58
Dandruff	9	4.12
Liver disease	9	4.12
Ascariasis	8	3.66
Body swallowing	8	3.66
Stomachache	8	3.66
Hemorrhoids	7	3.21
Cough	6	2.75
Ear disease	6	2.75
“buginge”	6	2.75
Toothache	6	2.75
Ear disease	6	2.75
Diarrhea	5	2.29
Skin rash “chifee”	5	2.29
Ring warms “kukucha”	5	2.29
Rh factors “shotelay”	5	2.29
Rabies	5	2.29
Common cold	4	1.83
Gastritis	4	1.83
Tonsillitis	4	1.83
Evil eye	3	1.37
Eye disease	3	1.37
Herpes	3	1.37
Hypertension	3	1.37
Tumors ”nekersa”	3	1.37
Amoeba	2	0.91
Athletes foot	2	0.91
Cancer “lemte”	2	0.91
Ear parasites (“kunkun”)	2	0.91
Epilepsy	2	0.91
Fire burn	2	0.91
Gonorrhea	2	0.91
Headache	2	0.91
Lengthy ministration	2	0.91
Retained placenta	2	0.91
Rheumatism	2	0.91
Skin cut	2	0.91
Snake bite	2	0.91
STDs	2	0.91
Stomach problem	2	0.46
Stomach problem	2	0.91

Syphilis	2	0.91
Abortion	1	0.46
Insufficient Breast milk supply	1	0.46
Bronchitis	1	0.46
Diuretic	1	0.46
Epidemic	1	0.46
Evil Spirit	1	0.46
Fertility	1	0.46
Heart disease	1	0.46
Infertility	1	0.46
Intestinal parasites	1	0.46
Kidney disease	1	0.46
“kuribe”	1	0.46
Leech	1	0.46
“lifie”	1	0.46
Nasal bleeding	1	0.46
Stabbing pain	1	0.46
Sterility	1	0.46
Sudden sickness	1	0.46
Tape worm	1	0.46

Appendix 3 Scientific Name, Family, Local Name, Growth form, Source, Geographical Location, Altitude, Status (common, Medium, Rare) and Collection no. of each Medicinal plants species in study area

Scientific Name	**Family**	**Local Name**	**Growth form**	**Source**	**Geographical Location**		**Altitude**	**Status**	**Collection no.**
					Longitude (N)	**Latitude (E)**			
Acacia abyssinica Hochst. ex Benth.	Fabaceae	Grara	Tree	Wild	1449956	378390	2787	Common	EA/62
Achyranthes aspera L.	Amaranthaceae	Telenge	Herb	Home gardens	1449435	378737	2772	Medium	EA/21
Acokanthera schimperi (A. DC.) Schweinf.	Apocynaceae	Meraz	Tree	Wild	1448690	383036	2795	Rare	EA/113
Agave sisalana Perrine ex Engl.	Agavaceae	Beska	Herb	Wild	1448761	383254	2815	Rare	EA/98
Allium sativum L.	Alliaceae	Nech shenkrt	Herb	Home gardens	1448310	383511	2849	Medium	EA/52
Allium cepa L.	Alliaceae	Key shenkrt	Herb	Home gardens	1449186	383036	2808	Medium	EA/46
Aloe percrassa Tod.	Aloaceae	Eret	Herb	Wild	1453913	384115	2825	Rare	EA/100
Anogeissus leiocarpa Guill. and Perr.	Combretaceae	Kerkera	Tree	Wild	1472540	377253	1278	Rare	EA/106
Anarrhinum forskaolii (L.) Vahl	Scrophlariaceae	Abelbalit	Herb	Wild	1449499	382875	2860	Rare	EA/104
Artemisia absinthium L.	Asteraceae	Rya	Herb	Home gardens	1453844	381195	2863	Rare	EA/89
Artemisia abyssinica Sch. Bip. ex Engl.	Asteraceae	Chukun	Herb	Wild	1450635	382167	2823	Rare	EA/51
Arundo donax L.	Poaceae	Shenbeko	Herb	Home gardens	1454656	380499	2873	Common	EA/110
Asparagus africanus Lam.	Asparagaceae	Yeset keset	Climber	Wild	1459028	379933	2692	Rare	EA/05
Barleria argentea Balf. f.	Acanthaceae	Achuch	Herb	Wild	1448786	387979	2781	Rare	EA/45
Brassica carinata A. Br.	Brassicaceae	Gomenzer	Herb	Home gardens	1454314	380615	2845	Medium	EA/36
Brucea antidysenterica I. F. Mill	Simaroubaceae	Waginose	Shrub	Wild	1459006	379645	2706	Common	EA/08
Boscia angustifolia A. Rich	Capparidaceae	Tedo	Shrub	Home gardens	1454935	380677	2888	Rare	EA/109
Buddleja polystachya Fresen.	Loganiceae	Anfar	Shrub	Wild	1458656	377948	2777	Common	EA/82
Calotropis procera (Ait) Ait. f.	Asclepindaceae	Tobiye	Shrub	Wild	1472208	375558	1305	Rare	EA/105
Calpurnia aurea (Ait.) Benth.	Fabaceae	Zketha	Shrub	Wild	1459006	379645	2706	Rare	EA/16
Capsicum annum L.	Solanaceae	Berbere	Herb	Home gardens	1464762	379915	2141	Common	EA/69
Carduus schimperi Sch. Bip. ex A. Rich.	Asteraceae	Yemder kushele	Herb	Wild	1450373	381819	2813	Common	EA/80
Carissa spinarum L.	Apocynaceae	Agam	Shrub	Wild	1462977	379677	2151	Common	EA/67
Chenopodium murale L.	Chenopodiaceae	Amedmado	Herb	Wild	1449133	373947	2783	Rare	EA/38
Cicer arietinum L.	Fabaceae	Shenbere	Herb	Home gardens	1449134	383050	2809	Rare	EA/120
Cirsium englerianum O. Hoffm.	Asteraceae	Kusheshele	Herb	Wild	149096	379370	2681	Rare	EA/09

Citrus aurantifllia (L.) Burm. f.	Rutaceae	Lomi	Shrub	Home gardens	1463758	379910	2136	Rare	EA/74
Clausena anisata (Willd.) J. Hk. ex Benth.	Rutaceae	Lemeche	Tree	Wild	1459100	379372	2680	Common	EA/121
Clematis simensis Perr. and Guill.	Ranunculaceae	Yaezo hareg	Climber	Wild	1459021	379322	2689	Common	EA/03
Clutia abyssinica Jaub. and Spach	Euphorbiaceae	Fyele feg	Herb	Wild	1459044	37413	2692	Common	EA/11
Coffea arabica L.	Rubiaceae	Buna	Shrub	Home gardens	1463761	379909	2138	Medium	EA/72
Combretum collinum Fresen.	Combretaceae	Abalo	Tree	Wild	1454610	382082	2893	Rare	EA/116
Cordia africana Lam.	Boraginaceae	Wanze	Tree	Wild	1463250	379843	2113	Rare	EA/64
Crinum abyssinicum Hochst. ex A. Rich.	Amaryllidaceae	Yejib shenkrt	Herb	Wild	1453171	382584	2845	Rare	EA/97
Croton macrostachyus Del.	Euphorbiaceae	Bisana	Tree	Wild	1458588	379674	2870	Rare	EA/26
Cucumis ficifolius A. Rich.	Cucurbitaceae	Yemder embay	Herb	Wild	1470816	371340	1664	Rare	EA/92
Cupresses lusitanica Mill.	Cupressaceae	Yeferenge tid	Tree	Wild	1448310	0383511	2849	Common	EA/124
Cyathula polycephala Bak.	Amaranthaceae	Chegogot	Herb	Wild	1450030	385466	2783	Medium	EA/75
Datura stramonium L.	Solanaceae	Astenager	Herb	Wild	1449950	378390	2787	Rare	EA/50
Dispcopodium penninervum Hochst.	Solanaceae	Alimt	Shrub	Wild	1459028	379355	2688	Common	EA/18
Dodonaea angustifolia L. f	Sapidaceae	Kitkita	Tree	Wild	1453545	381189	2842	Rare	EA/88
Dombeya torrida (J. F. Gmel.) P.Bamps	Sterculiaceae	Wulkefa	Tree	Wild	1463238	379777	2136	Common	EA/63
Dovyalis abyssinica (A. Rich.) Warb.	Flacourtiaceae	Koshime	Shrub	Wild	1458628	379478	2789	Rare	EA/20
Embelia schimperi Vatke	Myrsinaceae	Kokoko	Tree	Wild	1453814	380372	2828	Medium	EA/33
Erica arborea L.	Ericaceae	Wuchene	Shrub	Wild	1470476	391047	3600	Medium	EA/125
Eucalyptus globulus Labill.	Myrtaceae	Nech bahirzaf	Tree	Home gardens	1453479	380456	2846	Common	EA/32
Euphorbia ampliphylla Pax	Euphorbiaceae	Qulquale	Herb	Wild	1470515	370639	1760	Rare	EA/53
Euphorbia platyphyllos L.	Euphorbiaceae	Yekebero wetet	Herb	Wild	1462868	398833	3222	Rare	EA/43
Euphorbia tirucalli L.	Euphorbiaceae	Knchb	Shrub	Wild	1470515	370638	1757	Rare	EA/93
Ficus sur Forssk.	Moraceae	Shole	Tree	Wild	1450740	387024	2871	Medium	EA/123
Ficus thonningii Blume	Moraceae	Chbaha	Tree	Wild	1463832	380363	2840	Medium	EA/126
Ficus vasta Fossk.	Moraceae	Warka	Tree	Wild	146950	367272	1523	Rare	EA/49
Foeniculum vulgare Mill.	Apiaceae	Ensilale	Herb	Home gardens	1449303	383081	2811	Medium	EA/83
Grewia ferruginea Hochst. ex A. Rich.	Tilaceae	Lankete	Tree	Wild	1463027	309716	2140	Common	EA/68
Hagenia abyssinica (Brace) J. F. Gmel.	Rosaceae	Kosso	Tree	Wild	1458729	379642	2918	Common	EA/25
Hibiscus micranthus Lif	Malvaceae	Yebeklo	Herb	Wild	1463047	309731	2137	Medium	EA/59

		chenger							
Hordeum vulgare L.	Poaceae	Gebs	Herb	Home gardens	1457275	38014	2892	Medium	EA/27
Impatiens tinctoria A. Rich.	Balsaminaceae	Gurshet	Herb	Home gardens	1448914	378751	2788	Rare	EA/76
Jasminum abyssinicum Hochst. ex *DC.*	Oleaceae	Tenbelel	Climber	Wild		038827	2854	Rare	EA/102
Juniperus procera Hochst. ex Endl.	Cuppressaceae	Tsed	Tree	Wild	1458566	379759	2882	Rare	EA/24
Justicia schimperiana (Hochst. ex Nees) T. Anders.	Acanthaceae	Simize	Shrub	Home gardens	1453575	380502	2849	Common	EA/22
Kalanchoe petitiana A. Rich.	Euphorbiaceae	Endawula	Herb	Wild	1459020	379610	2700	Rare	EA/13
Kosteletzka begonifolia (Ulbr.) Ulbr.	Malvaceae	Yemegerem	Herb	Wild	1463025	379843	2132	Rare	EA/79
Lagenaria siceraria (Mol.) Standl.	Cucurbitaceae	Qel	Climber	Home gardens	1454017	384327	2819	Rare	EA/86
Laggera crispata (Vahl) Hepper and Wood	Asteraceae	Yegeda tle	Herb	Home gardens	1440310	383511	2849	Common	EA/55
Lathyrus sativus L.	Fabaceae	Guye	Herb	Home gardens	1448790	378788	2783	Medium	EA/27
Lepidium sativum L.	Brassicaceae	Feto	Herb	Wild	1456315	380286	2886	Medium	EA/29
Linum usitatissimum L.	Linaceae	Telba	Herb	Wild	1456324	380290	2888	Medium	EA/28
Maesa lanceolata Forssk.	Myrsinaceae	Sowereya	Tree	Wild	1463638	379880	2198	Medium	EA/66
Lobelia rhynchopetalum Hemsl.	Lobeliaceae	Jbara	Herb	Wild	1464032	407098	3784	Medium	EA/44
Lycopersicon esculentum Mill.	Solanaceae	Timatim	Herb	Home gardens	1463756	379909	2138	Medium	EA/73
Malva verticillata L.	Malvaceae	Yesewu lut	Herb	Home gardens	1449644	373704	2785	Common	EA/17
Maytenus arbutifolia (A. Rich.) Wilczek	Celostracea	Atat	Shrub	Wild	1459011	373166	2686	Common	EA/01
Melia azedarach L.	Meliaceae	Mimi	Tree	Home gardens	1463718	379827	2111	Rare	EA/118
Myrtus communis L.	Myrtaceae	Adese	Shrub	Home gardens	1450968	381788	2843	Rare	EA/115
Nicandria physaloides (L.) Gaertn	Solanaceae	Yewushe ageda	Herb	Home gardens	1454072	383425	2796	Medium	EA/58
Nicotiana tabacum L.	Solanaceae	Timbaho	Herb	Home gardens	1454168	378041	2852	Rare	EA/34
Nuxia congesta R. Br. ex Fresen.	Loganiaceae	Atquar	Shrub	Wild	1459057	370793	2991	Common	EA/10
Ocimum basilicum L.var. basilicum	Lamiaceae	Zqaqeb	Herb	Home gardens	1453829	300276	2711	Medium	EA/90
Ocimum lamiifolium Hochst. ex Benth.	Lamiaceae	Damakessi	Shrub	Home gardens	1471004	372750	1523	Medium	EA/111
Olea europaea subsp. *cuspidata* (Wall. Ex G. Don) Cif.	Oleaceae	Weyra	Tree	Wild	1453727	379648	2901	Rare	EA/26
Opuntia ficus-indica (L.) Mill.	Cactaceae	Yeashewa kulkel	Herb	Wild	1454675	384324	2822	Rare	EA/87
Osyris quadripartita Decn.	Santalaceae	Kerti	Shrub	Wild	145907	379369	2681	Common	EA/07
Otostegia integrifolia Decn.	Lamiaceae	Tungut	Shrub	Wild	1448069	383478	2833	Medium	EA/95
Phytolacca dodecandra L. Herit	Phytolacaceae	Endode	Shrub	Home gardens	1453541	380478	2842	Common	EA/42

Pisum sativum L.	Fabacea	Ater	Herb	Home gardens	1453868	382235	2827	Medium	EA/81
Plantogo lanceolata L.	Plantaginaceae	Wenberet	Herb	Home gardens	1454315	380616	2846	Common	EA/55
Pluclea ovalis (Pers.) DC.	Asteraceae	Shutes	Tree	Wild	1459021	379326	2690	Common	EA/04
Psidium guajava L.	Myrtaceae	Zeytune	Tree	Home gardens	1453673	382165	2864	Medium	EA/119
Podocarpus falcatus (Thunb) Mirb.	Podocapaceae	Zegba	Tree	Home gardens	1454610	382082	2893	Rare	EA/61
Pterolobium stellatum (Forssk.) Brenan	Fabaceae	Terem	Tree	Wild	1472557	387567	1282	Rare	EA/107
Rhamnus Prinoides L. Herit.	Rhamnaceae	Gesho	Shrub	Home gardens	143763	379922	2131	Common	EA/65
Rhus glutinosa A. Rich	Anacrdiaceae	Emebsa	Tree	Wild	1458669	377949	2715	Common	EA/19
Ricinus communis L.	Euphorbiaceae	Bulka	Shrub	Home gardens	1463767	379911	2132	Common	EA/71
Rosa abyssinica Lindley	Rosaceae	Kego	Shrub	Wild	1459030	379137	2680	Common	EA/02
Rubus steudneri Schweinf.	Rosaceae	Enzoriye	Shrub	Wild	1459109	379371	2679	Common	EA/06
Rumex abyssinicus Jacq.	Polygonaceae	Momoqo	Herb	Home gardens	1463764	399166	2127	Rare	EA/66
Rumex nepalensis Spreng.	Polygonaceae	Yewusha lut	Herb	Home gardens	1456322	380282	2890	Common	EA/30
Rumex nervosus Vahl	Polygonaceae	Embwaco	Herb	Wild	1458993	379465	2686	Common	EA/13
Ruta chalepensis L.	Rutaceae	Tene adam	Herb	Home gardens	1454932	380685	2889	Common	EA/40
Salix mucronata L.	Salicaceae	Haye	Tree	Wild	1454797	380836	2866	Rare	EA/48
Salvia schimperi Benth.	Lamiaceae	Bul	Herb	Wild	1450614	382881	2835	Rare	EA/103
Satureja abyssinica (Benth.) Briq	Lamiaceae	Tosene	Herb	Wild	1458557	377969	2866	Rare	EA/23
Schinus molle L.	Anacerdiaceae	Kundo berbere	Tree	Home gardens	1463742	378213	2110	Rare	EA/56
Senna septemtrionalis (Viv.) Irwin and Barneby	Fabaceae	Senafet	Herb	Wild	1448761	383256	2817	Rare	EA/101
Sida schimperi Hochst. ex. A. Rich.	Malvaceae	Chifreg	Herb	Wild	1450614	382881	2835	Rare	EA/94
Silene macrosolen A. Rich.	Caryophyllaceae	Wegert	Herb	Wild	1453554	383356	2762	Rare	EA/114
Solanecio gigas (Vatke) C. Jeffrey	Asteraceae	Shekoko gomen	Shrub	Home gardens	1453728	383752	2792	Medium	EA/54
Solanum dasyphyllum Schumach.	Solanaceae	Embay	Shrub	Wild	1459001	379452	2701	Common	EA/14
Solanum macracanthum A. Rich	Solanaceae	Dikake embay	Shrub	Wild	1450458	381740	2826	Rare	EA/112
Solanum nigrum L.	Solanaceae	Tkur awut	Herb	Home gardens	1453861	380359	2883	Rare	EA/31
Stephania abyssinica (Dillon and A. Rich.) Walp	Menispermaceae	Aret hareg	Climber	Wild	1458956	379522	2712	Rare	EA/15
Tamarindus indica L.	Fabaceae	Mserech	Tree	Home gardens	1450401	380340	2840	Rare	EA/91
Tanacetum cinerariifolium (Trev). Sch. Bip.	Asteraceae	Kaba	Herb	Home gardens	1452154	380933	2799	Rare	EA/99

Tagetes minuta L.	Asteraceae	Yeferenj sheto	Herb	Home gardens	1454039	383310	2782	Medium	EA/57
Taraxacum spp.	Asteraceae	Nechilo	Herb	Home gardens	1453872	384006	2809	Common	EA/37
Thlictrum rhycocarpum Tourn. ex L.	Ranunculaceae	Ser bzu	Herb	Home gardens	1463638	379880	2198	Medium	EA/60
Trigonella foenum- graecum J. M. Suttie	Fabaceae	Abshe	Herb	Home gardens	1448911	378785	2780	Rare	EA/77
Urtica simensis Steudel	Urticaceae	Sama	Herb	Wild	1459008	379431	2699	Common	EA/12
Verbascum rueppellii Sch. Bip. ex. Walp	Asteraceae	Yenbosa chenber	Shrub	Home gardens	1453679	382662	2853	Rare	EA/84
Verbascum sinaiticum Benth.	Scrophulariaceae	Kutina	Herb	Wild	1470523	376080	1756	Rare	EA/85
Vernonia amygdalina Del.	Asteraceae	Grawe	Shrub	Wild	1463756	379892	2130	Common	EA/70
Vicia faba L.	Fabaceae	Bakela	Herb	Home gardens	1448762	378761	2778	Medium	EA/78
Zehneria scabra (Linn.f.) Sond.	Cucurbitaceae	Haregresa	Climber	Home gardens	1454429	380409	2865	Common	EA/39
Zizlphus spina- christi (L.) Desf.	Rhamnaceae	Gaba	Shrub	Wild	1471772	374900	1320	Rare	EA/108

Appendix 4 Number of Medicinal Plant Species in each Family

Number	Family	Number of genera	Number of plant species	Percentage of plant species (%)
1.	Acanthaceae	2	2	1.59
2.	Agavaceae	1	1	0.79
3.	Alliaceae	1	2	1.59
4.	Aloaceae	1	1	0.79
5.	Amaranthaceae	2	2	1.59
6.	Amaryllidaceae	1	1	0.79
7.	Anacardiaceae	2	2	1.59
8.	Apiaceae	1	1	0.79
9.	Apocynaceae	2	2	1.59
10.	Asclepindaceae	1	1	0.79
11.	Asparagaceae	1	1	0.79
12.	Asteraceae	10	12	9.52
13.	Balsaminaceae	1	1	0.79
14.	Boraginaceae	1	1	0.79
15.	Brassicaceae	2	2	1.59
16.	Cactaceae	1	1	0.79
17.	Capparidaceae	1	1	0.79
18.	Caryophyllaceae	1	1	0.79
19.	Celostracea	1	1	0.79
20.	Chenopodiaceae	1	1	0.79
21.	Combretaceae	2	2	1.59
22.	Cucurbitaceae	3	3	2.38
23.	Cuppressaceae	2	2	1.59
24.	Ericaceae	1	1	0.79
25.	Euphorbiaceae	5	7	5.56
26.	Fabaceae	11	11	8.73
27.	Flacourtiaceae	1	1	0.79
28.	Lamiaceae	4	5	3.97
29.	Linaceae	1	1	0.79
30.	Lobeliaceae	1	1	0.79
31.	Loganiaceae	2	2	1.59
32.	Malvaceae	4	4	2.38
33.	Meliaceae	1	1	0.79
34.	Menispermaceae	1	1	0.79
35.	Moraceae	1	3	2.38
36.	Myrsinaceae	2	2	1.59
37.	Myrtaceae	3	3	2.38
38.	Oleaceae	2	2	1.59
39.	Phytolacaceae	1	1	0.79
40.	Plantaginaceae	1	1	0.79
41.	Poaceae	2	2	1.59

42.	Podocapaceae	1	1	0.79
43.	Polygonaceae	1	3	2.38
44.	Ranunculaceae	2	2	1.59
45.	Rhamnaceae	2	2	1.59
46.	Rosaceae	3	3	2.38
47.	Rubiaceae	1	1	0.79
48.	Rutaceae	3	3	2.38
49.	Salicaceae	1	1	0.79
50.	Santalaceae	1	1	0.79
51.	Sapidaceae	1	1	0.79
52.	Scrophulariaceae	2	2	1.59
53.	Simaroubaceae	1	1	0.79
54.	Solanaceae	7	9	7.14
55.	Sterculiaceae	1	1	0.79
56.	Tilaceae	1	1	0.79
57.	Urticaceae	1	1	0.79
	Total	114	126	100

Appendix 5 List of medicinal plants used for treating only human ailments in the study area; with scientific name, family, local name, growth form, habitat, source, condition of preparation(fresh/F and dry/D), parts used, disease treated, methods of preparations, application dosage used and rout of administration and collection no.

Scientific Name	Family	Local Name	Growth form	Source	Cp	Parts used	Disease Treated	Mode of Preparation	Route	Collecti-on no.
Acacia abyssinica	Fabaceae	Grara	Tree	Wild	D	Seed	STDs	The seed of *Acacia abyssinica* is crushed, powdered, mixed with little water and drunk	Oral	EA/62
Acokanthera schimperi	Apocynaceae	Meraz	Tree	Wild	D	Leaf	Liver Problem	The leaf of *Acokanthera schimperi* is crushed, powdered, mixed with honey and then eaten for 3 days before food	Oral	EA/113
Allium sativum	Alliaceae	Nech shenkrut	Herb	Home gardens	D	Bulb	Malaria	The bulb of *Allium sativum,* root of *Solanum dasyphyllum,* seed of *Lepidium sativum, Withania somnifera, Schinus molle, Sida schimperi* are together crushed, powdered, mixed with little water and drunk	Oral	EA/52
					D	Bulb	Malaria	The bulb of *Allium sativum* with *Lepidium sativum* is pounded, powdered and mixed with little water or eaten by injera	Oral	
Aloe percrassa	Aloaceae	Eret	Herb	Wild	D	Root	Caught	The root of *Aloe percrassa* is crushed, powdered, mixed with honey then boiled and drunk the solution for 3 days	Oral	EA/100
					F	Sap	Hemorrhoids	The fresh leaf latex *Aloe*	Dermal	

								percrassa is applied on the affected part		
Anogeissus leiocarpa	Combretace	Kerkera	Tree	Wild	F	Root	Stomachache	The root of *Anogeissus leiocarpa* is chewing and swallowing	Oral	EA/106
Artemisia absinthium	Asteraceae	Rya	Herb	Home gardens	F	Whole parts	Syphilis	The whole parts of *Artemisia absinthium* is crushed, mixed with little water and drunk	Oral	EA/89
					F/ D	Leaf	Common cold	The leaf of *Artemisia absinthium* is sniffed	Nasal	
Arundo donax	Poaceae	Shenbeko	Herb	Home gardens	F	Root	Rh factors "shotelay"	the root of *Arundo donax* is tie on neck part of the body	Neck	EA/110
Asparagus africanus	Asparagaceae	Yeset keset	Climber	Wild	D	Leaf	Epidemic	The leaf of *Asparagus africanus* is pounded, powdered and place on fire and fumigated by its smoke	Dermal	EA/05
Barleria argentea	Acanthaceae	Achuch	Herb	Wild	F	Root	Tonsillitis	The root of *Barleria argentea* is pounded, mixed with little water and then only the pure solution is drunk	Oral	EA/45
Brassica carinata	Brassicaceae	Gomenzer	Herb	Home gardens	D	Seed	Cancer ("lemte")	The seed of *Brassica carinata* with seed and leaf of "galo" is crushed, powdered and mixed with honey and then creamed affected part	Dermal	EA/36
Brucea antidysenterica	Simaroubaceae	Waginose	Shrub	Wild	F	Leaf	Wound	The leaf of *Brucea antidysenterica* is pounded, squeezed and then creamed affected part until recovery	Dermal	EA/08
Boscia angustifolia	Capparidaceae	Tedo	Shrub	Home gardens	F	Leaf	Evil Spirit	The leaf of *Boscia angusifolia* is pounded and immersed in the	Dermal	EA/109

								water and washed seven days every morning		
Buddleja Polystachya	Loganiceae	Anfar	Shrub	Wild	D/F	Leaf	Wound	The leaf of *Buddleja Polystachya* is pounded, powdered and applied on wound	Dermal	EA/82
Calotropis procera	Asclepindaceae	Tobiye	Shrub	Wild	F	Leaf	Hemorrhoids	The affected area is covered by latex of young leaf and repeating every 2 days until recovery	Dermal	EA/105
					F	Root	Snake bite	The root of *Calotropis procera* is chewing and swallowing it	Oral	
Calpurnia aurea	Fabaceae	Zketha	Shrub	Wild	F/D	Leaf	Diarrhea	The leaf of *Calpurnia aurea* is squeezed and then drunk before food	Oral	EA/16
Capsicum annuum	Solanaceae	Berbere	Herb	Home gardens	D	Seed	Skin rach (“chifee”)	The seed of *Capsicum annuum* is pounded, powdered, mixed butter and creamed the infected parts	Dermal	EA/69
					D	Seed	Tonsillitis	The seed of *Capsicum annuum* is pounded, powdered, mixed oil and roasted and drunk	Oral	
Carissa spinarum	Apocynaceae	Agam	Shrub	Wild	D	Leaf	Diarrhea	The leaf of *Carissa spinarum* is powdered, mixed with *Coffea arabica* and drunk	Oral	EA/67
Chenopodium murale	Chenopodiaceae	Amedmado	Herb	Wild	F	Leaf	Wound and dandruff	Its leaf are pounded, squeezed and creamed the infected parts	Dermal	EA/38
Cicer arietinum	Fabaceae	Shenbere	Herb	Home gardens	D	Seed	Ascariasis	The seed of *Cicer arietinum* with root of *Kalanchoe petitiana* is boiled, filtered and drunk the solution and seed of	Oral	EA/120

								Cicer arietinum is eaten		
Citrus limon	Rutaceae	Lomi	Shrub	Home gardens	F	Fruit	Athletes foot	The fruit of *Citrus limon* is squeezed and creamed on affected for continuous days	Dermal	EA/74
					D	Leaf	Cough	The leaf of *Citrus limon* is pounded, powdered, mixed with milk and boiled and added sugar then drink pure liquid during feeling pain	Oral	
Cirsium englerianum	Asteraceae	Kusheshele	Herb	Wild	D/ F	Root	Ascariasis	The root of *Cirsium englerianum* is pounded, powdered, mixed with water and drunk	Oral	EA/09
Clausena anisata	Rutaceae	Lemeche	Tree	Wild	F	Root	Evil eye	The fresh root of *Clausena anisata* is crushed and mixed with water and drunk	Oral	EA/122
Clutia abyssinica	Euphorbiaceae	Fyele feg	Herb	Wild	F	Leaf	Ear disease	The leaf of *Clutia abyssinica* is pounded, squeezed and then its drop through ear	Ear	EA/11
					F	Leaf	Dandruff	The leaf of *Clutia abyssinica* is pounded, squeezed and creamed affected part until recovery	Dermal	
Clematis simensis	Ranunculaceae	Yaezo hareg	Climber	Wild	D	Root and leaf	Wound	The root and leaf of *Clematis simensis* is pounded, powdered and mixed with butter and creamed affected part until recovery	Dermal	EA/03
					F	Stem	Toothache	The stem of *Clematis simensis* is brush the teeth or hold by the affected teeth during feeling of	Tooth surface	

								ache		
Coffea arabica	Rubiaceae	Buna	Shrub	Home gardens	D	Seed	Diarrhea	Its seed of *Coffea arabica* is roasted, crushed, powdered, boiled and the filtrate one cup of tea, mixed with few drop of oil then drunk	Oral	EA/72
					D	Seed	Fire burn	Its seed of *Coffea arabica* is roasted, crushed, powdered and applied on wounded	Dermal	
Cordia africana	Boraginaceae	Wanze	Tree	Wild	D	Bark	Tumors (”nekerse”)	The bark *Cordia africana* with the root of *Plumbago zeylanica* is powdered, mixed with butter and then creamed affected part until recovery	Dermal	EA/64
					D	Leaf	Fire burn and dandruff	The leaf of *Cordia africana* is roasted, powdered and mixed with butter and creamed affected part until recovery	Dermal	
Croton macrostachyus	Euphorbiaceae	Bisana	Tree	Wild	D	Bark	Ascariasis	The 1/3 bark of *Croton macrostachyus* is crushed, powdered, mixed with *Cicer arietinum* powdered, water and backed than eaten before any food for 3 days	Oral	EA/26
					D/F	Leaf	Liver problem	The seven pieces of immature leaves are pounded, powdered and mixed with milk or “awez” without spices and *Allium sativum* and then eaten by injera or drunk	Oral	
					F	Sap	Wound	The fresh latex is applied on the	Dermal	

								infected part		
Cucumis ficifolius	Cucurbitaceae	Yemder embay	Herb	Wild	D	Root	Stomachache	The root of *Cucumis ficifolius* is chewing and swallowing during the feeling of ache	Oral	EA/92
					D	Leaf	Cough	The leaf of *Cucumis ficifolius* is pounded, powdered and mixed with honey and then drunk for 3 days	Oral	
Datura stramonium	Solanaceae	Astenager	Herb	Wild	F	Leaf	Ear disease	The leaf of *Datura stramonium* with leaf of *Vicia fabe* is crushed, mixed with little water and then added few solution through ear	Ear	EA/50
					F	Leaf	Dandruff	The fresh leaf of *Datura stramonium* is squeezed and creamed affected part until recovery	Dermal	
					F	Leaf	Ear parasites (“kunkun”)	The leaf of *Datura stramonium* with leaf of *Nicotiana tobaccum* is squeezed and then added few solution through ear	Ear	
					D	Seed	Toothache	The seed of *Datura stramonium* is placed on fire, roasted and fumigated by it smoke	Tooth surface	
Dodonaea angustifolia	Sapidaceae	Kitkita	Tree	Wild	D	Leaf	Skin rash (“chiffee”)	The leaf of *Dodonaea angustifolia* is roasted, pounded, powdered and mixed with butter and creamed the affected part	Dermal	EA/88
					D/F	Leaf	Wound	The leaf of *Dodonaea angustifolia* is pounded,	Dermal	

								powdered and applied on wounded part		
Dombeya torrida	Sterculiaceae	Wulkefa	Tree	Wild	F	Leaf	Fire burn	The fresh leaf of *Dombeya torrida* is squeezed and creamed the affected part	Dermal	EA/63
Dovyalis abyssinica	Flacourtiaceae	Koshime	Shrub	Wild	F	Fruit	Intestinal parasites	Its fruit is eaten as food for the case of intestinal parasite before breakfast every morning	Oral	EA/20
Embelia schimperi	Myrsinaceae	Kokoko	Tree	Wild	D	Fruit	Epilepsy	The fruit of *Embelia schimperi* with seed of *Guizotia abyssinica* crushed, powdered, mixed with local alcoholic "tej" and drunk	Oral	EA/33
Euphorbia platyphyllos	Euphorbiaceae	Yekebero wetet	Herb	Wild	F	Sap/ latex	Wound and dandruff	The fresh latex of *Euphorbia platyphyllos* is creamed affected part	Dermal	EA/43
Crinum abyssinicum	Amaryllidaceae	Yejib shenkrt	Herb	Wild	F	Root	Ear disease	The root of *Crinum abyssinicum* is pounded, squeezed and then its drop is through ear	Ear	EA/97
Foeniculum vulgare	Apiaceae	Ensilale	Herb	Home gardens	D	Leaf	Diuretic	the leaf of *Foeniculum vulgare* with leaf of *Lycopersicon esculentum* is pounded, powdered mixed with *Coffea arabica* and boiled and drink	Oral	EA/83
Hagenia abyssinica	Rosaceae	Kosso	Tree	Wild	D	Seed	Tape worm	The seed of *Hagenia abyssinica* is crushed, powdered mixed with milk and boiled and drink for 5 days	Oral	EA/25

Hibiscus micranthus	Malvaceae	Yebeklo chenger	Herb	Wild	D	Leaf	Wound	The leaf of *Hibiscus micranthus* is powdered and mixed with butter and then creamed affected part	Dermal	EA/59
Hordeum vulgare	Poaceae	Gebs	Herb	Home gardens	F	Seed	Dandruff	The seven seed of *Hordeum vulgare* is crushed and then creamed affected part	Dermal	EA/27
Impatiens tinctoria	Balsaminaceae	Gurshet	Herb	Home gardens	F	Rhizome	Rheumatism	The rhizome of *Impatiens tinctoria* is crushed, roasted and creamed affected part	Dermal	EA/76
Juniperus procera	Cuppressaceae	Tsed	Tree	Wild	D/ F	Seed	Ear disease	The seed of *Juniperus procera* with seed of *Sesamum oriontale* is crushed mixed with little water then filtrate the solution and added 3-7 drops through ear	Ear	EA/24
Kalanchoe petitiana	Euphorbiaceae	Endawula	Herb	Wild	F	Root	Ear disease	The root *Kalanchoe petitiana* is squeezed and added few drops through ear	Ear	EA/13
					F	Leaf	Body swelling	The leaf of *Kalanchoe petitiana* is first heated put on affected part	Dermal	
					F	Root	Ascariasis	The root of *Kalanchoe petitiana* with seed of *Cicer arietinum* is boiled, filtered and drunk and seed of *Cicer arietinum* is eaten	Oral	
Kosteletzka begonifolia	Malvaceae	Yemegerem	Herb	Wild	F	Leaf	Body swelling	The leaf *Kosteletzka begonifolia* is pounded, squeezed and mixed with “tella” and drunk	Oral	EA/79

Lagenaria siceraria	Cucurbitaceae	Qel	Climber	Home gardens	D	Fruit	Body swelling	The fruit of *Lagenaria siceraria* is first heated and then put on infected part of body	Dermal	EA/86
					F	Leaf	Ear disease	The leaf of *Lagenaria siceraria* is squeezed and added though ear	Ear	
Laggera crispata	Asteraceae	Yegeda tle	Herb	Home gardens	F	Stem	Lengthy ministration	The stem of *Laggera crispate* is tie on abdominal pain	Dermal	EA/55
Lepidium sativum	Brassicaceae	Feto	Herb	Home gardens	D	Seed	Diarrhea with blood	The seed of *Lepidium sativum* is crushed, mixed milk then filtrate the solution and drunk	Oral	EA/29
					F	Stem	Hemorrhoids	The stem of *Lepidium sativum* is first heated and then put on the infected part of the body until recovery	Dermal	
Lobelia rhynchopetalum	Lobeliaceae	Jbara	Herb	Wild	D/ F	Bark and root	Evil eye	The bark and root of *Lobelia rhynchopetalum* is crushed, mixed little water and sniffed at the sickness time	Nasal	EA/44
					D	Seed	Heart problem	The seed of *Lobelia rhynchopetalum is* crushed, powdered, mixed little water and drunk	Oral	
Malva verticillata	Malvaceae	Yesewu lut	Herb	Home gardens	F	Root	Wound and Ring worms (“kukucha”)	The root of *Malva vertecelata* is pounded, squeezed and creamed on affected part.	Dermal	EA/17
Maytenus arbutifolia	Celostracea	Atat	Shrub	Wild	F	Root	Kidney problem	The root of *Maytenus arbutifolia* with *Croton macrostachyus* are crushed, powdered, mixed with water and one sine drunk every	Oral	EA/01

								morning until recovery		
					F	Leaf	Tonsillitis	The leaf of *Maytenus arbutifolia* is squeezed and drunk	Oral	
Melia azedarach	Meliaceae	Mimi	Tree	Home gardens	F/D	Leaf	Skin worms (“kukucha”)	The leaf of *Melia azedarach* is squeezed and creamed on affected part	Dermal	EA/118
					F	Leaf	Toothache	The leaf of *Melia azedarach* is hold by the infected teeth during the feeling of ache	Tooth surface	
					F	Leaf	Rheumatism	The leaf of *Melia azedarach* is chopped and boil with water and immersed affected part	Dermal	
					F	Leaf	Wound	The leaf of *Melia azedarach* is squeezed and then creamed on affected part	Dermal	
Myrtus communis	Myrtaceae	Adese	Shrub	Home gardens	D	Leaf	Dandruff	The leaf of *Myrtus communis* is powdered, mixed with butter and creamed on affected part	Dermal	EA/115
Nicandria physaloides	Solanaceae	Yewushe ageda	Herb	Home gardens	F	Seed	Wound	The fresh seed of *Nicandria physoloides* is pounded and mixed with little water and squeezed and creamed on wounded part	Dermal	EA/58
Nuxia congesta	Loganiceae	Atquar	Shrub	Wild	F	Leaf	Tonsillitis	The leaf of *Nuxia congesta* is squeezed and only a pure solution is drunk	Oral	EA/10
Ocimum basilicum	Lamiaceae	Zqaqeb	Herb	Home gardens	F	Leaf	Sudden sickness	The fresh leaf of *Ocimum basilicum* is chewing and swallowing during feeling pain	Oral	EA/90

Ocimum lamiifolium	Lamiaceae	Damakessi	Shrub	Home gardens	F	Leaf	Fibril illness	The fresh leaf of *Ocimum lamiifolium* is squeezed and added in tea or coffee and drunk	Oral	EA/111
					F	Leaf	Fibril illness	The fresh leaf of *Ocimum lamiifolium* is squeezed and drunk	Oral	
Olea europaea subsp. *cuspidata*	Oleaceae	Weyra	Tree	Wild	D	Leaf	Caught	The leaf of *Olea europaea* subsp. *cuspidate* is pounded, powdered mixed with eggs and seed of *Linum usitatissimum* and mixed little water and then drunk for 7 days	Oral	EA/26
Opuntia ficus-indica	Cactaceae	Yeashewa kulkel	Herb	Wild	F	Leaf	Epilepsy	The leaf of *Opuntia ficus-indica* is crushed, squeezed and creamed on wounded part	Dermal	EA/87
					F	Leaf	Ear disease	The leaf of *Opuntia ficus-indica* is crushed, squeezed and the pure liquid is through the era during feeling of ache	Ear	
					D	Latex	Amoeba	The latex of *Opuntia ficus-indica* is collected, dry and eaten for 3 days	Oral	
					F	Seed	Stomachache	The seed of *Opuntia ficus-indica* is chewing and swallowing during the feeling of ache	Oral	
Osyris quadripartita	Santalaceae	Kerti	Shrub	Wild	D/F	Leaf	Wound	The leaf *Osyris quadripartite* is crushed, powdered and then applied on the wound part	Dermal	EA/07
Pisum sativum	Fabacea	Ater	Herb	Home	D	Seed	"buginge"	The seed of *Pisum sativum* is	Dermal	EA/81

				gardens				crushed and then placed on the wound until disappearance of the swelling		
Plantogo lanceolata	Plantaginaceae	Wenberet	Herb	Home gardens	D/F	Leaf	Wound	The leaf *Plantogo lanceolata* is pounded, powdered and applied on the wound part	Dermal	EA/55
					F/D	Leaf	Ring worms "kukucha" and skin cut	The leaf *Plantogo lanceolate* is pounded, powdered and mixed with kerosene and then applied on the wound part	Dermal	
					F	Leaf	Ear disease	The leaf *Plantogo lanceolata* is crushed, squeezed and then through ear	Ear	
Plucrea ovalis	Asteraceae	Shutes	Tree	Wild	D	Bark	Headache	The bark of *Plucrea ovalis* is crushed and sniffed at the sickness time	Nasal	EA/04
Podocarpus falcatus	Podocapaceae	Zegba	Tree	Wild	F	Leaf	Sudden sickness	The leaf *Podocarpus falcatus* is squeezed and drunk	Oral	EA/61
Psidium guajava	Myrtaceae	Zeytune	Tree	Home gardens	F	Fruit	Amoeba	The seed of *Psidium guajava* is eaten	Oral	EA/119
Rosa abyssinica	Rosaceae	Kego	Shrub	Wild	F	Flower and leaf	Rh factors "shotelay"	The flower and leaf of *Rosa abyssinica* is eaten	Oral	EA/02
					F	Seed	Ascariasis and stomachache	The raw seed of *Rosa abyssinica* is eaten	Oral	
Rubus steudneri	Rosaceae	Enzoriye	Shrub	Wild	F	Seed	Stomachache	The raw seed of *Rosa Rubus steudneri* is eaten	Oral	EA/06
Rumex abyssinicus	Polygonaceae	Momoqo	Herb	Home gardens	D	Root	Ring worms	The root of *Rumex abyssinicus* with root of *Rumex nepalensis* is pounded, powdered, mixed with solution of *Citrus limon*	Dermal	EA/66

								and creamed on affected part		
					D	Root	Hypertension and common cold and stomachache	The root of *Rumex abyssinicus* is crushed, mixed with water and added sugar boiled and then drink	Oral	
					D	Leaf	Malaria	The leaf of *Rumex abyssinicus* with leaf of *Zehneria scabra* is pounded, powdered, mixed with milk and boiled and then drunk is cooled	Oral	
					F/D	Leaf	Wound	The leaf of *Rumex abyssinicus* is pounded, squeezed and then creamed on wounded part	Dermal	
Rumex nervosus	Polygonaceae	Embwaco	Herb	Wild	F	Leaf	Snake bite	The leaf of *Rumex nervosus* is chewing and swallowing the solution during time bite	Oral	EA/13
					F	Leaf	Wound	The leaf of *Rumex nervosus* is pounded, squeezed and then creamed on wounded part	Dermal	
					F	Leaf	Eye disease	The leaf of *Rumex nervosus* is pounded, squeezed and added 3-5 drops through eye	Ocular	
Rumex nepalensis	Polygonaceae	Yewusha lut	Herb	Home gardens	F/D	Leaf	Skin worms (“kukucha”) and skin cut	The leaf of *Melia azedarach* is pounded, squeezed, creamed on affected part and tie on	Dermal	EA/30
					F	Root	Stomachache	Chewed and swallowing root of *Rumex nepalensis* during the feeling of ache	Oral	
					F/D	Root	Ascariasis	The root of *Rumex nepalensis* is dig by using sliver ring and pounded, squeezed, added little	Oral	

								water and then drunk before food and Friday		
					F	Root	Body swelling	The root of *Rumex nepalensis* with leaf of *Vicia faba* is pounded, squeezed and drunk	Oral	
Ruta chalepensis	Rutaceae	Tene adam	Herb	Home gardens	D/F	Seed	Evil eye	The seed of *Ruta chalepensis* with *Allium sativum* and mixed with hyena liver are finely crushed together and sniffed at the sickness time	Nasal	EA/40
					F	Leaf	Stomachache	Squeezed and drunk the juice during ache	Oral	
					D	Seed and leaf	Nasal bleeding	The seed and leaf of *Ruta chalepensis* is crushed and sniffed	Nasal	
Salix mucronate	Salicaceae	Haye	Tree	Wild	F/D	Leaf	"buginge"	The leaf of *Salix mucronate* is pounded and place on wounded part	Dermal	EA/48
Salvia schimperi	Lamiaceae	Bul	Herb	Wild	F	Leaf	Fibril illness	The leaf of *Salvia schimperi* is squeezed and creamed on the body part	Oral	EA/103
Satureja abyssinica	Lamiaceae	Tosene	Herb	Wild	D	Leaf	Cough	The leaf of *Satureja abyssinica* is pounded, powdered, mixed with milk and added boiled and then drink	Oral	EA/23
Schinus molle	Anacerdiaceae	Kundo berbere	Tree	Home gardens	D	Seed	Tonsillitis	The seed of *Schinus molle* is pounded, powdered, mixed with honey and then drink	Oral	EA/56
Sida schimperi	Malvaceae	Chifreg	Herb	Wild	D	Leaf and root	Wound and Tumors ("nekersa")	The leaf and root of *Sida schimperi* is pounded, powdered and then applied on	Dermal	EA/94

								affected part		
Solanum nigrum	Solanaceae	Tkur awut	Herb	Home gardens	F	Leaf	Fire burn	The leaf of *Solanum nigrum* is squeezed and then creamed on affected part	Dermal	EA/31
Stephania abyssinica	Menispermaceae	Aret hareg	Climber	Wild	D	Root	Herpes	The root of *Stephania abyssinica* is roasted, pounded, powdered, mixed with little oil and creamed on affected part	Dermal	EA/15
					F	Leaf	Syphilis	Its leaf of *Stephania abyssinica* is squeezed and drunk	Oral	
					F	Root	Body swelling	Its root of *Stephania abyssinica* is crushed, squeezed and then creamed on affected part	Dermal	
					F/ D	Root	"kuribe"	The root of *Stephania abyssinica* is pounded, powdered and mixed with "tella" and drunk the	Oral	
Tagetes minuta	Asteraceae	Yeferenj sheto	Herb	Home gardens	F	Leaf	Common cold	The leaf of *Tagetes minuta* is pounded and holding clean cloth and sniffed	Nasal	EA/57
Tamarindus indica	Fabaceae	Mserech	Tree	Home gardens	D/ F	Leaf	Wound	The leaf of *Tamarindus indica* with *Croton macrostachyus* is pounded, powdered and applied on the wounded parts	Dermal	EA/91
Taraxacum spp.	Asteraceae	Nechilo	Herb	Home gardens	F	Leaf	Headache	The leaf of *Taraxacum* spp. is crushed and sniffed at the sickness time	Nasal	EA/37
Thilictrum rhycocarpum	Ranunculaceae	Ser bzu	Herb	Home gardens	F	Stem	Stabbing pain	The stem of *Thlictrum rhycocarpum* is tie on neck part of the body	Neck	EA/60
Trigonella	Fabaceae	Abshe	Herb	Home	D	Seed	Body	The seed of *Trigonella foenum-*	Oral	EA/77

foenum-graecum				gardens			swelling	*graecum* is crushed, powdered, mixed with honey and little water then boiled like "porage" and eaten		
Tanacetum cinerariifolium	Asteraceae	Kaba	Herb	Home gardens	F	Leaf	Fibril illness	The leaf of *Tanacetum cineratiifolium* is squeezed and drunk	Oral	EA/99
Urtica simensis	Urticaceae	Sama	Herb	Wild	D	Root and leaf	Gonorrhea	The root and leaves of *Urtica simensis* with the bark of C*roton macrostachyhus* are pounded, powdered, mixed with little water ,filtered, then a cup of filtrate is drunk for 5 days in every morning	Oral	EA/12
					F	Leaf	Hemorrhoids	The leaf of *Urtica simensis* is pounded, squeezed and then creamed on affected part	Dermal	
					F	Leaf	Fibril illness	The leaf of *Urtica simensis* with the leaf of *Zehneria scabra* is pounded, powdered and placed on fire and fumigating the smoke	Dermal	
					F	Leaf	Gastritis	The fresh leaf of *Urtica simensis* is collected and roasted like "wot" and eaten by injera	Oral	
Vernonia amygdalina	Asteraceae	Grawe	Shrub	Wild	D	Leaf	Herpes	The leaf of *Vernonia amygdalina* is pounded, powdered and applied on affected area	Dermal	EA/70
					F	Leaf	Athletes foot	The leaf of *Vernonia*	Dermal	

								amygdalina is crushed, squeezed and creamed on affected part for continuous days		
Vicia faba	Fabaceae	Bakela	Herb	Home gardens	D	Seed	"buginge"	The seed of *Vicia faba* with seed of *Lepidium sativum* is crushed, mixing with salt and then placed on the wound until disappearance of the swelling	Dermal	EA/78
Zehneria scabra	Cucurbitaceae	Haregresa	Climber	Home gardens	D	Leaf	Stomach problem	The leaf of *Zehneria scabra* is pounded, powdered mixed with honey than eaten	Oral	EA/39
					D	Stem	Hemorrhoids	The stem of *Zehneria scabra* is heated or warmed by charcoal and the warmed stem pot on the affected part until recovery	Dermal	
					F	Leaf	Fibril illness	The leaf of *Zehneria scabra* is pounded, squeezed and mixed with sugar and drunk	Oral	
					F	Leaf	Fibril illness	The leaf of *Zehneria scabra* is crushed and creamed the body	Dermal	
					F	Leaf	Dandruff	The fresh leaf is squeezed to made juice and creamed affected parts	Dermal	
Zizlphus spina-christi	Rhamnaceae	Gaba	Shrub	Wild	D	Leaf	Dandruff	The leaf of *Zizlphs spina-christi* is pounded, powdered, mixed with butter than creamed on affected part	Dermal	EA/108

Appendix 6 List of medicinal plants used for treating both human and live stocks in the study ailments in the study area; with scientific name, family, local name, growth form, source, use (Hu- Human, Livestock-Ls), condition of preparation (CP); (fresh/F and dry/D), parts used, disease treated, methods of preparations, application dosage used and rout of administration and collection no.

Scientific Name	Family	Local Name	Growth form	Source	CP	Use	Parts used	Disease Treated	Mode of Preparation	Route	Collection no.
Achyranthes aspera	Amaranthaceae	Telenga	Herb	Home gardens	F	Hu	Root	Stomachache	The root *Achyranthes aspera* is chewing and swallowing during feeling of ache	Oral	EA/21
					F	Hu	Leaf	Wound and skin cut	The leaf of *Achyranthes aspera* is pounded and then creamed affected part and tie on hand by clean cloth	Dermal	
					D	Hu	Leaf	Body swelling	The leaf of *Achyranthes aspera* is pounded, squeezed, powdered, mixed with butter and then creamed affected part until recovery	Dermal	
					F	Hu	Leaf	Hemorrhoids	The leaf of *Achyranthes aspera* is pounded, squeezed and then creamed affected part	Dermal	
					F	Hu & Ls	Root	Excessive menstruation and retained placenta	The root of *Achyranthes aspera* is crushed and tie on abdominal part the body	Dermal	
					D	Hu	Root	Sterility	The root of *Achyranthes aspera* is pounded, powdered and fumigating with mule tail	Dermal	
Allium cepa	Alliaceae	Key shenkrt	Herb	Home gardens	F	Hu	Seed	Hypertension	The seed *Allium cepa* is crushed and immersed in little water for 1 day and then filtrated by clean cloth and	Oral	EA/46

									drunk before food		
					F	Ls	Whole parts	Blotting	The whole parts of *Allium cepa* is pounded, mixed with little water and then only the pure solution is drunk	Oral	
Agave sisalana	Agaveceae	Beska	Herb	Wild	F	Hu & Ls	Root	Rh factor ‘‘shotelay”	The root of *Agave sisalana* is crushed and tie on abdominal after 4 month	Dermal	EA/98
Artemisia abyssinicus	Asteraceae	Chukun	Herb	Wild	F	Hu	Leaf	Common cold	The leaf of *Artemisia abyssinicus* is pounded and sniffed	Nasal	EA/51
					F/ D	Hu	Root	Caught	The root of *Artemisia abyssinicus* is pounded, mixed with sour milk or “ergo” and boiled and then drink	Oral	
					F/ D	Hu & Ls	Root	Fibril illness	The root of *Artemisia abyssinicus* with root of *Verbascum sinaiticum* is pounded and drunk	Nasal	
Carduus schimperi	Asteraceae	Yemder kushele	Herb	Home gardens	F	Hu & Ls	Root	Fibril illness	The root of *Carduus schimperi* is pounded, squeezed and drunk	Oral	EA/80
Combretum collinum	Combretaceae	Abalo	Tree	Wild	D	Hu	Seed	Skin rash (“chiffee”)	Its seed of *Combretum collinum* is crushed, powdered and mixed with butter and creamed affected part until recovery	Dermal	EA/116
					D/ F	Hu	Leaf	Tumors (”nekerse”)	The leaves of *Combretum Collinum* are pounded, powdered and applied on wound	Dermal	

					D	Hu	Seed	Rabies	The seed of *Combretum collinum* with seed of *Solanum dasyphyllum* are crushed together powdered, mixed with "tella" and drunk for 3 days	Oral	
					D	Ls	Leaf	External parasite "kichame"	The leaf of *Combretum collinum* is pounded mixed with kerosene and urine then creamed affected part until recovery	Dermal	
Cyathula polycephala	Amaranthaceae	Chegogot	Herb	Wild	F	Hu	Leaf	Skin rash ("chiffee")	The leaf of *Cyathula polycephala* is crushed, squeezed and the pure solution is applied on affected body part until recovery	Dermal	EA/75
					F	Hu & Ls	Leaf	Fibril illness	The root of *Cyathula polycephala* is pounded, squeezed and drunk	Oral	
Eucalyptus globulus	Myrtaceae	Nech bahirzaf	Tree	Home gardens	F	Hu	Leaf	Fibril illness and bronchitis	The leaf of *Eucalyptus globulus* is chopped and boil with water and inhale repeatedly the vapor, while boiling steam bath is taken by human in closed door and window	Dermal	EA/32
					F	Ls	Stem	Dislocated bone	The stem of *Eucalyptus globulus* with leaf of *Ricinus communis* is tie on the dislocated bone	Dermal	
Euphorbia	Euphorbiaceae	Qulquale	Herb	Wild	F/	Hu	Sap/	STDs	The drop of latex is collected,	Oral	EA/53

ampliphylla					D		latex		mixed with "teff" powdered and backed and then eaten before any food for 3 days		
						Hu	Sap/ latex	Stomach problem and ascariasis	The drop of latex is collected, mixed with "teff" powdered or honey and backed and then eaten before any food	Oral	
					F/ D	Hu	Sap/ latex	Hemorrhoids	The fresh leaf of *Euphorbia ampliphylla* is applied on the infected part	Dermal	
					D	Hu	Flower	Cancer ("lemte")	The flower of *Euphorbia ampliphylla* is pounded, powdered and mixed with honey and then creamed affected part	Dermal	
					F	Hu & Ls	Sap/ latex	Rabies	The drop of latex is collected, mixed with "teff" powdered and backed and then eaten 1/3 of it	Oral	
					D	Ls	Bark	Caught	The bark of *Euphorbia ampliphylla is* put on fire and fumigating	Dermal	
Jasminum abyssinicum	Oleaceae	Tenbelel	Climber	Wild	F	Hu & Ls	Leaf	Infertility	The leaf *Jasminum abyssinicum* is pounded, squeezed and drunk the pure liquid for 7 days	Oral	EA/102
Justicia schimperiana	Acanthaceae	Simize	Shrub	Home gardens	F	Hu	Leaf	Dandruff and "kuriba"	The leaf *Justicia schimperiana* is pounded, squeezed and then creamed affected part	Dermal	EA/22
					F	Hu &	Leaf	Malaria and prevention	The leaf *Justicia schimperiana* is pounded, squeezed and	Oral	

						Ls			mixed with milk and drunk for 3 days		
					D	Hu	Leaf	Liver problem	The leaf of *Justicia schimperiana* is pounded, powdered, mixed with milk then filtrate the solution and then drunk	Oral	
					F	Hu	Leaf	Fibril illness	The leaves of *Justicia schimperiana* is chopped and boil with water and inhale repeatedly the vapor	Dermal	
					F	Hu	Leaf	Rheumatism	The leaf of *Justicia schimperiana* is chopped and boil with water and immersed affected part	Dermal	
Linum usitatissimum	Linaceae	Telba	Herb	Home gardens	D	Hu	Seed	Gastric	The seed of *Linum usitatissimum* is crushed, powdered, mixed water and sugar and then drunk during feeling pain	Oral	EA/28
					D	Ls	Seed	Retained placenta	The seed of *Linum usitatissimum* is mixed water and boiled and then drunk the solution is cooled	Oral	
					D	Hu	Seed	Diarrhea	The seed of *Linum usitatissimum* is immersed in water for one day and drunk	Oral	
Lycopersicon esculentum	Solanaceae	Timatim	Herb	Home gardens	F	Hu	Seed	Eye disease	The seed of *Lycopersicon esculentum* is eaten	Oral	EA/73
					F	Ls	Leaf	Leech	The leaf of *Lycopersicon esculentum* is pounded,	Nasal	

									squeezed and added though nose		
Nicotiana tabacum	Solanaceae	Timbaho	Herb	Home gardens	F	Hu	Leaf	Toothache	The leaf of *Nicotiana tabacum* is chewed and hold by the infected teeth during the feeling of ache	Oral	EA/34
					F	Hu	Leaf	Ear parasites ("kunkun")	The leaf of *Nicotiana tabacum* with leaf of *Datura stramonium* is pounded, squeezed and added though ear	Ear	
					F	Ls	Leaf	Leech	The leaf of *Nicotiana tabacum* is pounded, squeezed and drunk	Oral	
Otostegia integrifolia	Lamiaceae	Tungut	Shrub	Wild	F	Hu	Leaf	Stomachache	Squeezed and drunk the juice	Oral	EA/95
					D	Hu	Leaf	Ascariasis	The leaf of *Otostegia integrifolia* is pounded, powdered, mixed with milk and boiled and then drunk is cooled	Oral	
					D	Hu	Root	Rh factor "shotelay"	The root of *Otostegia integrifolia* is tie on neck	Neck	
					F	Hu & Ls	Leaf	Rabies	The leaf of *Otostegia integrifolia* is pounded mixed with milk and drunk	Oral	
Phytolacca dodecandra	Phytolacaceae	Endode	Shrub	Home gardens	F	Hu & Ls	Leaf	Rabies	The leaf of *Phytolacca dodecandra* is pounded mixed with *Linum usitatissimum* or *Coffea arabica* and drunk a tea cup every morning for evening	Oral	EA/42

									until recovery		
					F	Hu	Root	Body swelling ("kuriba")	The root *Phytolacca dodecandra* is crushed, squeezed and mixed with little and drunk	Oral	
					F	Hu	Leaf	Abortion	The leaf of *Phytolacca dodecandra* is squeezed and drunk the juice	Oral	
					F/D	Hu & Ls	Root	Rabies	The root of *Phytolacca dodecandra* with *Rumex nepalensis* and *Solanum dasyphyllum* is crushed, mixed with milk (meat) and drunk	Oral	
Pterolobium stellatum	Fabaceae	Terem	Tree	Wild	F	Hu	Bark	Toothache	The bark *Pterolobium stellatum* is chewed or hold b/n teeth	Oral	EA/107
					F	Hu & Ls	Bark	Eye disease	The bark *Pterolobium stellatum* is pounded and then creamed on affected part	Dermal	
Rhamnus Prinoides	Rhamnaceae	Gesho	Shrub	Home gardens	F	Hu	Leaf	Liver Problem	The leaf of *Rhamnus Prinoides* is pounded, powdered, mixed with honey and then eaten for 3 days before food	Oral	EA/65
					F	Hu	Leaf	Toothache	The leaf of *Rhamnus Prinoides* is hold by the infected teeth during the feeling of ache	Oral	
					F	Ls	Leaf	Leech	The fresh leaf of *Rhamnus Prinoides* is pounded, squeezed and added few	Oral	

									solution through nose		
Rhus glutinosa	Anacardiacear	Emebsa	Tree	Wild	D/F	Hu	Bark	Wound	The bark of *Rhus glutinosa* is crushed, powdered and applied on wounded area	Dermal	EA/19
					F	Ls	Leaf	Leech	The fresh leaf of *Rhus glutinosa* is pounded, squeezed and added few solution through nose	Nasal	
Ricinus communis	Euphorbiaceae	Bulka	Shrub	Home gardens	F	Hu	Leaf	Fibril illness	The leaf of *Ricinus communis* with leaf of *Rumex nepalensis* is pounded, squeezed and added though nose	Nasal	EA/71
					F	Ls	Seed	Blotting	The seed of *Ricinus communis* is pounded and mixed with water and then drunk the solution only	Oral	
					F	Ls	Leaf	Leech	The leaf of *Ricinus communis* with leaf of *Lycopersicon esculentum* is pounded, squeezed and added though nose	Oral	
Senna septemtrionalis	Fabaceae	Senafet	Herb	Wild	D	Hu & Ls	Leaf	Insufficient breast milk supply	The leaf of *Senna septemtrion* is pounded, squeezed and mixed with honey and water then drunk the solution for 5 days	Oral	EA/101
Silene macrosolen	Caryophllaceae	Wegert	Herb	Wild	D	Hu	Root	Malaria and fibril illness	The root of *Silene macrosolen* with root of *Echinops kebericho* is pounded, powdered and placed on fire and fumigating the smoke	Dermal	EA/114

Solanum dasyphyllum	Solanaceae	Embay	Shrub	Wild	F	Hu & Ls	Seed	Leech	The seed of *Solanum dasyphyllum* is pounded squeezed and added through nose	Nasal	EA/14
					F	Hu	Seed	"lifie"	Crushed and tied at the finger tip with a piece of cloth	Dermal	
					D	Hu	Leaf	Skin disease	The leaf of *Solanum dasyphyllum* is pounded powdered and mixed with honey and then creamed on affected part	Dermal	
					F	Ls	Root	'lebitir' (Physical damage)	The root of *Solanum dasyphyllum* is crushed, squeezed and drunk	Oral	
Verbascum sinaiticum	Scrophulariaceae	Kutina	Herb	Wild	D/ F	Hu	Root	Wound	The root of *Verbascum sinaiticum* is crushed, powdered, mixed with butter and creamed on affected part	Dermal	EA/85
					D	Hu & Ls	Root	Lengthy menstruation and leech	The root of *Verbascum sinaiticum* is crushed and mixed with little water and drunk/through nose	Oral, nasal	
					F	Hu	Root	Gastric	The root of *Verbascum sinaiticum* is chewing and swallowing it	Oral	
					F	Hu & Ls	Root	Fibril illness	The root of *Verbascum sinaiticum* is crushed and mixed with little water and then through nose	Nasal	

Appendix 7 List of medicinal plants used for treating only livestock ailments in the study area; with scientific name, family, local name, growth form, source, condition of preparations (fresh/F and dry/D), parts used, disease treated, methods of preparations, application dosage used rout of administration, status and collection no.

Scientific Name	Family	Local Name	Growth form	Source	C P	Parts used	Disease Treated	Mode of Preparation	Route	Status	Collection no.
Anarrhinum forskaorlii	Scrophlariaceae	Abelbalit	Herb	Wild	F	Whole parts	Coccidiosis	The whole parts *Anarrhinum forskaorlii* expect roots with *Allium sativum* is pounded and immersed for 1 days and drunk	Oral	Rare	EA/104
Dispcopodium penninervum	Solanaceae	Alimt	Shrub	Wild	F	Leaf	Leech and blood clot	The leaf of *Dispcopodium penninervum* is pounded, mixed with little water and then drunk	Oral	Common	EA/18
					F	Leaf	Blotting	The fresh leaf of *Dispcopodium penninervum* is pounded, squeezed and drunk	Oral	Common	
Euphorbia tirucalli	Euphorbiaceae	Knchb	Shrub	Wild	F	Sap/ latex	Skin disease “alkedele”	The fresh sap/latex of *Euphorbia tirucalli* is collected and creamed the all body	Dermal	Rare	EA/93
Ficus vasta	Moraceae	Warka	Tree	Wild	F/ D	Leaf	Wound	The fresh leaf of *Ficus vasta* is pounded, squeezed and creamed the affected part	Dermal	Rare	EA/49
Grewia ferruginea	Tilaceae	Lankete	Tree	Wild	F	Leaf	Retained placenta	The fresh leaf of *Grewia ferruginea* is pounded, squeezed and drunk	Oral	Medium	EA/68
Lathyrus sativus	Fabaceae	Guye	Herb	Home gardens	F	Whole parts	Skin disease	The whole parts of *Lathyrus sativus* is pounded, squeezed	Dermal	Medium	EA/27

								and added little water and then creamed affected part			
Maesa lanceolata	Myrsinaceae	Sowereya	Tree	Home gardens	F	Leaf	Leech	The leaf of *Maesa lanceolata* is pounded, squeezed and drunk	Oral	Rare	EA/66
Solanecio gigas	Asteraceae	Shekoko gomen	Shrub	Home gardens	F	Leaf	Blotting	The leaf of *Solanecio gigas* is pounded squeezed and added through nose	Nasal	Medium	EA/54
Solanum macracanthum	Solanaceae	Dikake embay	Shrub	Home gardens	F	Leaf	Eye disease	The leaf of *Solanum macracanthum* with *Maytenus arbutifolia* is pounded squeezed and added 3-5 drops through eye	Ocular	Rare	EA/112
Verbascum rueppellii	Asteraceae	Yenbosa chenber	Shrub	Home gardens	F	Leaf	Leech	The leaf of *Verbascum rueppellii* is pounded, squeezed and added though nose	Nasal	Rare	EA/84

Appendix 8 List of Informants in the Study Area (Key; with* are key Informants)

No.	Name	Sex	Age	Marital status	Education Status	Residence kebeles	Occupation
1	Abdelkrim Nure	M	40	Married	Read and write	Kirar Zebzabe	Merchant
3	Abebu Tilahun	F	34	Married	Illiterate	03	Merchant
4	Abera Teklu	M	52	Married	Illiterate	Zebzabe	Farmer
5	Addis Getachew	M	36	Married	Illiterate	Jirosern	Farmer
6	Alemayehu Tezera	M	24	Married	>12	01	Teacher
7	Alemayehu Gerem*	M	61	Married	Illiterate	Kirar Zebzabe	Farmer
8	Amaro Tamiru	F	42	Married	Read and write	02	House wife
9	Amarech Ayele	F	66	Divorced	Illiterate	Gomya	House wife
10	Amelewerk Tsega	F	28	Married	>12	Kino	Teacher
11	Amsal Belay	F	16	Single	9	Jirosern	Student
12	Amsalu Abebe*	M	44	Married	Read and write	01	Merchant
13	Aragaw Chekole*	M	49	Married	Read and write	Jirosern	Farmer
14	Aregash Mesele	F	65	Divorced	Illiterate	03	House wife
15	Asefa Amsalu	M	35	Married	Read and write	03	Farmer
16	Asfaw Abebaw*	M	49	Married	Illiterate	Gomya	Farmer
17	Askale Birhan	F	38	Single	Read and write	Debir	Merchant
18	Asnakech Tadesse*	F	49	Married	Illiterate	Kino	Farmer
2	Awoke Tadesse*	M	50	Married	Read and write	Dib Bahir	Farmer
19	Ayantu Birhanu	F	43	Married	Illiterate	02	Teacher
20	Azmeraw Alemu	M	56	Married	Read and write	Kino	Farmer
21	Baye Tezera	M	56	Married	Illiterate	Dib Bahir	Farmer
22	Belaynesh Alemu*	F	55	Divorced	Illiterate	Kirar Zebzabe	Farmer
23	Berihun Hagos*	M	43	Married	Read and write	02	Merchant
24	Bezu Ayele	F	21	Single	>12	03	Teacher
25	Birhanu Tesema*	M	42	Married	Illiterate	Mikora	Farmer
26	Bogale Negash*	M	80	Married	Illiterate	Kino	Farmer
27	Busha Birhanu	F	53	Married	Illiterate	Kirar Zebzabe	Teacher

28	Demek Abebaw	M	42	Married	Illiterate	Kino	Farmer
35	Demek Abebe*	M	87	Married	Illiterate	02	Merchant
29	Demeku Getachew*	F	56	Married	Illiterate	Argin Jera	House wife
30	Desalegn Teshome	M	50	Married	Illiterate	Gomya	Farmer
31	Dessalegn Moges*	M	37	Married	Read and write	03	Farmer
32	Dessie Zerihun	M	17	Single	10	Mikora	Student
33	Destaw Abera	F	50	Married	Illiterate	Kirar Zebzabe	Farmer
34	Endashaw Beyene	M	55	Married	Read and write	Zebena	Farmer
36	Etenesh knife	F	31	Married	Illiterate	01	House wife
37	Fantahun Mequaninnit*	M	45	Married	Read and write	Mikora	Farmer
38	Fentanesh Abebaw	F	82	Divorced	Illiterate	Gomya	Farmer
39	Fentanesh Kassa	F	39	Married	Illiterate	Dib Bahir	Farmer
40	Fikadu Abdisa	F	45	Married	Illiterate	Kino	Farmer
41	Gebeya Tsega	M	40	Married	Illiterate	Argin Jera	Farmer
42	Genet Alemu	F	33	Married	Read and write	Dib Bahir	House wife
43	Getachew Belete *	M	46	Married	Illiterate	Argin Jera	Farmer
44	Habtamu Tadesse	M	50	Married	Illiterate	Jirosern	Farmer
45	Hailu Chekole	M	48	Married	Read and write	Mikora	Merchant
46	Hisene Ail	M	40	Married	>12	02	Merchant
47	Kindu Hadish	M	27	Divorced	>12	01	Teacher
48	Kiros Terefe*	M	47	Married	Illiterate	Jirosern	Farmer
49	Lakew yilma*	M	57	Married	Illiterate	Debir	Farmer
50	Maleefye Chekole	F	57	Married	Read and write	Zebena	Farmer
51	Mamiet Ayele	F	54	Married	Illiterate	Argin Jera	Farmer
52	Mekonnen Tsegaye	M	45	Married	Illiterate	Kirar Zebzabe	Farmer
53	Mengistu Aragie	M	58	Married	Read and write	Zebena	Farmer
54	Mequaninnit Molla	M	58	Married	Illiterate	Mikora	Farmer
55	Mesfine Asmaru	M	59	Married	Illiterate	Mikora	Farmer
56	Meskerem Addisw	F	17	Single	10	01	Student

57	Minase Terefe	F	79	Married	Illiterate	Jirosern	Farmer
58	Misganaw Bezabih	M	40	Married	Illiterate	Zebena	Farmer
59	Misganew Kebede	M	59	Married	Illiterate	Argin Jera	Farmer
60	Mitike Alemayehu	M	20	Married	12	Zebena	Farmer
61	Moges Hilu	F	62	Married	>12	01	Teacher
62	Mulgeta Addis	M	30	Single	Read and write	03	Merchant
63	Mulgeta Negash	M	39	Married	Illiterate	Mikora	Farmer
64	Mullu Lemma*	F	65	Married	Read and write	Debir	Farmer
65	Muselu Temesgen	F	44	Married	Read and write	Debir	Farmer
66	Nigussie Molla	M	48	Married	Illiterate	Argin Jera	Farmer
67	Sahele Gusoy	M	22	Married	>12	Dib Bahir	Teacher
68	Silashi Tafari	F	18	Single	11	Kino	Student
69	Seyoum Gebremariam*	M	53	Single	Read and write	03	Merchant
70	Tadela Birhan	F	60	Married	Illiterate	Debir	Farmer
71	Tadesse Wuibe*	M	44	Married	Illiterate	Gomya	Farmer
72	Tazebu Abebe*	F	54	Married	Read and write	Zebena	Farmer
73	Temesgen Abebe	M	27	Married	Illiterate	Dib Bahir	Teacher
74	Terfa Feleku	F	68	Married	Illiterate	Argin Jera	Farmer
75	Tigiste Alemu*	F	60	Married	Read and write	Zebena	House wife
76	Tsegaye Woundemagegn	M	19	Single	11	Debir	Student
77	Wassie Abebe	M	46	Divorced	Read and write	02	Merchant
78	Werkinesh Alem	F	55	Married	Illiterate	Debir	House wife
79	Wondewosen	M	52	Married	Illiterate	Gomya	Farmer
80	Worku Birhan	M	69	Married	Illiterate	Gomya	Farmer
81	Yeshworke Tessema	F	47	Married	Illiterate	Jirosern	House wife
82	Zamzam Aburrhiman*	F	61	Married	Illiterate	Dib Bahir	Farmer
83	Zenebu Mekonen*	F	32	Single	Read and write	01	House wife
84	Zewdey Shiferawe	F	23	Single	>12	02	Student

Appendix 9 Checklist of Semi-structured Interview Question for Collecting Ethnobotanical data

I. General information

1. Information on respondents:

Date of interview_____ Kebele _____ Name of interviewer_____

Name of respondent_____

Gender: M _____ F_____ Age _____Ethnicity _____

Religion: Orthodox _____ Muslim_____ Protestant_____ other_____

Educational level_____

Marital status _____ For how long have you lived in the area? _____

II. Ethnobotanical Data

2. What are the most common diseases of humans in your area?

3. What are the most common diseases of animals in your area?

4. List plant species used to treat a given disease in your area?

4.1. Plants used to treat human diseases

Local name of the plant	Disease treated	Parts used	Habit	Habitat	Preparation	Application	Dosage (Vary age Sex group)	Side effects & antidotes	Route of administration	Collection no.

4.2. Plants used to treat animal diseases

Local name of the plant	Disease treated	Parts used	Habit	Habitat	Preparation	Application	Dosage (Vary age Sex group)	Side effects & antidotes	Route of administration	Collection no.

4.3. Plants used to treat both human diseases and animal diseases

Local name of the plant	Disease treated	Parts used	Habit	Habitat	Preparation	Application	Dosage (Vary age Sex group)	Side effects & antidotes	Route of administration	Collection no.

5. List traditional way of classifying vegetation, soil types and landscapes in your area? 1. Vegetation_____2. Soil types _____3. Landscapes_____

6. Are there members of the community who frequently use the traditional medicinal plant as compared to modern medicine? Why?

7. How is the knowledge of traditional medicine passed to a family member/younger generation?

8. Are there restrictions /taboos in collecting medicinal plants? Are there taboos in the utilization of some medicinal plants in the locality?

9. Is there any interfere modernizations with traditional medicine application and use?

10. Are medicinal plants marketable?

11. Which Season of preferred for collection of medicinal plants in your area? Wet season_____, Dry season_____, All-the-year round _____

12. Where do the medicinal plants grow? (Place of collection?) In home gardens _____, Followed land _____, Arable land_____, In the forest _____.

13. Availability of medicinal plants as compared to the past: More_____, Same_____, and Less_____

14. What are threatening factors of medicinal plants in your area? For medicinal _____, Food_____, Firewood_____, Charcoal_____, Fence_____, Construction_____, Furniture_____, Edible fruit_____

15. Which medicinal plants species is commonly threatened in study area? _____

16. How do the local people manage and conserve these medicinal plant species through their traditional indigenous knowledge?

Appendix 10 Checklist of Semi-structured Interview Question or Items Collecting from Key Informants

1. Which of the following medicinal plants are the most preferred in your area?

No	Plant species	Respondents leveled									Total	Rank
		R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	

Key: R=Represented respondents

2. Which of the following medicinal plants are uses for multiple uses of medicinal plants or several attribute (food, medicinal, fire wood, building, charcoal and fence)?

No	Use	Plants species	Total	Rank

Key: R=Represented respondents

3. Which one of the following of medicinal plants, the pair is most preferred in your area?

Pair	Respondents leveled										Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}		

Key: R=Represented respondents

5. Which of the following threaten factors to those medicinal plants in your area?

No	Threaten factors	Respondents leveled										Total	Rank
		R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}		

4.2. Which of the following threatened medicinal plants in your area?

No	Threatened plants species	Respondents leveled										Total	Rank
		R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}		

Key: R=Represented respondents

Appendix 11 Checklist of Semi-structured Interview Question for Collecting Ethnobotanical Data from Market place

I. General information

1. Information on vendor:

Date of interview_____ Kebele _____

Location of market place_____

Name of interviewer_____

Name of respondent_____

Gender: M _____ F_____, Age _____, Ethnicity _____

Religion: Orthodox _____ Muslim_____ Protestant_____ other_____

Educational level_____, Marital status _____

Type of vendor_____, Permanent_____, Temporary_____

How often do they sell here? _____

II. Ethnobotanical Data

2. Which medicinal plants species is commonly use to treats for both human diseases and animal diseases in study area? _____

3. Local name of medicinal plants _____

4. Where do plants grow? In wild_____, In home gardens_____

5. Plant part used_____

6. Number of medicinal plants species of collection in market place: Single_____, Mixture of other plants_____

7. Condition of medicinal plants: In Fresh _____, Dried _____, Powdered_____

8. Estimated quantity: Vendor_____, Whole market_____

9. Availability of medicinal plants species: In Sep_____ Oct_____ Nov____ Dec____ Jan____ Feb____ Mar_____ Apr_____ May____ Jan_____ Jul_____ Aug_____

10. How much sold now compared to in past: More_____, Some_____, Less_____