**ADDIS ABABA UNIVERSITY**

**SCHOOL OF GRADUATE STUDIES**

**PLANT BIOLOGY AND BIODIVERSITY MANAGEMENT PROGRAM UNIT**

# AN ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN WONDO GENET NATURAL FOREST AND ADJACENT KEBELES, SIDAMA ZONE, SNNP REGION, ETHIOPIA

BY

**SINTAYEHU TAMENE BEYENE**

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**Addis Ababa**

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**SINTAYEHU TAMENE BEYENE**

***A Thesis Presented to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science***

***In Plant Biology and Biodiversity Management***

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# ABSTRACT

*An ethnobotanical study was conducted in Wondo Genet Wereda between December 01 to 23, 2010 and February 02 to 21, 2011. The objective of this study was to document indigenous medicinal plant utilization, management and the threats affecting them. Information was gathered from 80 people (63 males and 17 females). The informants, except the healers, were selected randomly and no appointment was made prior to the visits. Ethnobotanical data were collected using semi-structured interviews with informants, field observations, guided field walk, group discussion, preference, paired comparison and direct matrix ranking with traditional medicine practitioners. The ethnomedicinal use of 85 plant species was documented in the study area used as cure for 61 ailments. They are distributed across 79 genera and 44 families. Of these, 54 medicinal plants were reported for human ailments treatment, eight for livestock and 23 for both human and livestock ailment treatment. Most of the medicinal species were collected from the wild. The most frequently utilized plant parts were leaves followed by stem bark and roots. The largest number of remedies was used to treat intestinal parasites infections followed by pneumonia and external injuries like body swellings. This probably indicates a high incidence of these types of diseases in the area, possibly due to the poor socio-economic and sanitary conditions of the people. The administration routes are oral, external, ear and nasal. Preference ranking analysis indicates that Solanum incanum ranked first and most effective medicinal plant to cure intestinal problems followed by Phytolacca dodecandra and Vernonia amygdalina in human and for livestock Ranunculus multifidus ranked first and most effective medicinal plant to cure pneumonia. The pair wise comparison showed that Stephania abyssinica ranked first and most effective medicinal plant to cure jaundice in humans as compared to the others. Direct matrix analysis showed that Eucalyptus citriodora ranked first and it is the most preferred plant by local people for various uses. Cordia africana and Podocarpus falcatus scored second and third. This shows that both trees are more preferable or have high utility value for the local community. The medicinal plants that were presumed to be effective in treating a certain disease had higher ICF values. Informant consensus analysis showed that ailments like rabies, poisoning and snake bite scored the highest value (0.98). Evil spirit and evil eye scored the second highest value (0.97). Wound and body swelling (0.83), intestinal parasite (0.75) and pneumonia and jaundice scored the lowest values (0.63) respectively. The principal threatening factors for medicinal plants reported were agricultural expansion and fire. Documenting the eroding plants and associated indigenous knowledge can be used as a basis for developing management plans for conservation and sustainable use of medicinal plants in the area.*



**Key words: Wondo Genet, Medicinal plant, Indigenous knowledge, Informant consensus**

# 1. INTRODUCTION

## 1.1 Background of the study

Natural forest is both an ecosystem and a resource: as an ecosystem it integrates diverse fauna, flora and the physical environment; as a resource it has various economic, ecological and social values. It involves multiple and interrelated factors of people-forest interaction and results in significant environmental and social consequences. People-forest interaction is determined by the interaction in space and over time of biophysical and human factors. A study of such interaction needs to conceptualize the relationship between the driving forces of human induced changes, the processes and activities among them, and human behavior and organization (Guoren, 1998).

Herbal medicine treatment is believed to have been started by early humans. When people started to select their food from plants growing nearby, they must have kept some of those, which they found to cure some of their ailments, or which they thought would cure diseases. Thus, the use must have arisen out of need. Through out the centuries, some of these plants have been used successfully to treat diseases and later on they constituted the basis for many of the modern day drugs like quinine, digitalis, etc. (Jansen, 1981).

According to the World Health Organization (WHO, 2002), the definition of traditional medicine may be summarized as "the sum total of all knowledge and practice, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental or social imbalance, relying exclusively on practical experience and observation handed down from generation to generation whether verbally or in writing".

Ethiopia is rich in medical lore. Much of this lore is indigenous yet, there are strong indications of Hebrew, Egyptian, Greek and Arabic influence (Amare Getahun, 1976). Ethiopia is a home of many languages, cultures and beliefs that in turn have contributed to the high diversity of traditional knowledge and practices of the people, which among others include the use of medicinal plants (Mirutse Giday and Gobena Amani, 2003). It is composed of a number of

specific skills namely; the use of plants, animal products and minerals as well as magic and superstition and the main practice is however based on the use of plants.

Written records in this field are almost absent even though the country has had a written language for over 2000 years. Written records are found mainly from three categories. The first, the "debterras", those persons who compile books of medicinal recipes mainly herbals called "Etse Debdabe" which consists of information on plants with medicinal values and name of diseases (Teferi Gedif and Jurgen, 2003). A debtarra is a person who has church education, can read and write text in Amharic and geez. Often their writings on herbal medicine are composed of medicine and magic or superstition. Also it is rarely that one comes across the names of debterras on Etse debdabes (Teferi Gedif and Jurgen, 2003).

The second category of people involved in compiling information and to some extent also carrying out some studies in traditional medical practices includes primarily French, British and Italian travelers, naturalists, pharmacognosists and plant collectors who visited Ethiopia between about 1830 and 1930. In the third category are found ecologists, taxonomists, ethnobotanist, chemists and pharmacognosists, who work within government ministers, research institutions and educational establishments both within and outside of Ethiopia (Abera Geyid *et al*., 2005). The knowledge is passed by word of month from one generation to the next by priest, with doctor or medicine men (Desalegn Desissa, 2000). Some of the lore is lost at each point of transfer modified and thus became erroneous and dangerous to use. With doctors to safe guard their interest win the respect of the mass, usually compose a long and impressive list of curative herbs for a particular disease, when they know that is one of the listed that cause a cure (Abera Geyid *et al*., 2005).. This is also done to discourage others from becoming herbal doctors if they are forced to tell the secrets. For the same reasons the plants comprising the remedy are selected from different ecological locations such as alpine, highlands or lowlands, thus rendering it move difficult to exactly duplicate the ingredient. These with doctors says that the healing power of the plant loses its curative healing values if not kept secret, the informant is also thought to be subjected to misfonture and bad luck (Abera Geyid *et al*., 2005).

As a result the doctors pass the knowledge only to their first born-sons when they are about to die. If the first son is not found worthy of trust, another member is considered, after having given his solemn oath not to reveal the secrets he is taken to all the places where the plants are known to grow, or he is given verbal directions on the description of the plants and their localities. It is always men who take up the art, though many women pass the knowledge especially those dealing with childbirths (Kokwaro, 1976).

Ethiopia is characterized by a wide range of ecological, edaphic and climate conditions that account for the wide diversity of its biological resources both in terms of flora and fauna wealth. Medicinal plants are distributed all over the country with great concentration in the south and southwestern parts of the country. The woodlands of Ethiopia are the source of most medicinal plants, followed by montane grassland or dry montane forest complex of the plateau; others include the evergreen bush land and rocky (Girma Defar, 1998). This study therefore focused on the local knowledge of medicinal plants including their uses and management.

## 1.2-Research Questions

- What are the medicinally useful plant species used by indigenous peoples of the study area to treat various diseases?
- What types of diseases are treated by these plant species? Is it for treating humans, animals or both?
- What do the habitats and habit distribution of these plant species look like?
- How do the local people obtain and use these plant species to treat various diseases and ailments? What are Methods of preparation? , ways of administration and dosage?
- How do the local people manage and conserve these medicinal plants species through the traditional practices?
- What are the crucial problems facing medicinal plants?
- Are there factors in transfer of indigenous knowledge from generation to generation? If exist what are they?

## 1.3-Objectives

### 1.3.1-General objective

- To identify and document medicinal plant species used by the indigenous people of the study area and to get a brief overview of their taxonomic facet with emphasis on future conservation practice.

### 1.3.2-Specific objectives

- To identify important medicinal plants used in the treatment of health problems for both humans and livestock
- To identify plant parts used to treat health problems
- To know methods of preparation and routes of administration as applied by the local people of the study area
- To assess the role of traditional practices and indigenous knowledge in maintaining medicinally important plant species in study area
- To assess implications on the current status and threat on medicinal plants in the area
- To record uses of the medicinal plant species other than their medicinal value

# 2 LITERATURE REVIEW

## 2.1 Plant and people interaction

Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). This implies that humans are dependent on other organisms for their life. Although various animal and mineral products contribute to human welfare, the plant kingdom is most essential to human well being especially in supplying his basic needs. The indispensable dependency of humans up on plants for thier livelihoods was primarily started by domestication and dates back to 10,000 years (Martin, 1995). Over centuries, indigenous people have developed their own locality specific knowledge on plant use, management and conservation (Cotton, 1996). Plants have been used as a source of traditional medicine in Ethiopia from time immemorial to combat different ailments and human sufferings (Zemede Asfaw *et al*., 1999). Due to its long period of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people (Mirgissa Kaba, 1998). There is a large magnitude of use and interest in medicinal plants in Ethiopia due to acceptability, accessibility and biomedical benefits (Dawit Abebe, 2001).

The continued dependency on herbal medicine along with the side of modern medicine is largely conditioned by economic and cultural factors (Aketch, 1992). In addition to these factors, the fact that modern medical services are inaccessible to the vast majority of the populations due to their costs made herbal medicines more acceptable. Hence, in present-day Africa including Ethiopia, the majority of people lack access to health care and where available the quality is largely below standard (Abbiw, 1996). Indigenous peoples and the local communities' reliance on plant resources account for anything up to 95% of their survival requirements (Archer, 1990). Therefore, herbal remedies are the world's therapeutic means to act against diseases for a large proportion of people of both rural and urban areas in developing countries like Ethiopia (Abbiw, 1996).

Ethiopians have used traditional medicines for many centuries, the use of which has become an integral part of the different cultures in modern Ethiopia. The indigenous peoples of different

localities in the country have developed their own specific knowledge of plant resource uses, management and conservation (Pankhurst, 1965).

Traditional remedies are sometimes the only source of therapeutics for nearly 80% of human population and 90% of livestock in Ethiopia of which 95% are plant origin. The majority of the population that lives in the rural and the poor people in urban areas rely mainly on traditional medicines to meet their primary health care needs (Dawit Abebe, 1986).

In most scenarios, the traditional knowledge in Ethiopia is passed verbally from generation to generation and valuable information can be lost whenever a traditional medical practitioner passes without conveying his traditional medicinal plant knowledge. In addition, the loss of valuable medicinal plants due to population pressure, agricultural expansion and deforestation is widely reported by different workers (Dawit Abebe, 2001). As a result, the need to perform ethnobotanical researches and to document the medicinal plants and the associated indigenous knowledge must be an urgent task.

The studies conducted on the traditional medicinal plants in Ethiopia are limited when compared with the multiethnic cultural diversity and the diverse flora of Ethiopia. Thus, this study was initiated to document the medicinal plants in the natural vegetation in Wondo Genet wereda, which assume that the data could be used as a basis for further studies on medicinal plants in Wondo Genet wereda and for future phytochemical and pharmacological studies.

## 2.2 Origin and development of ethnobotany

John Harshberger in 1895 brought up the term Ethnobotany for the first time. He defined Ethnobotany as “the use of plants by aboriginal people” (Harshberger, 1896; cited in Cotton, 1996). Martin (1996) defined Ethnobotany as the subject dealing with the study of direct interaction between humans and plants. Balick and Cox (1996) included the use of plants as food, medicine, forage and for any other economic purposes within the field of Ethnobotany. According to Cotton (1996), Ethnobotany encompasses all studies that concern the mutual relationships between plants and traditional people.

To achieve more detailed and reliable information of plants and plant use, ethnobotanical study needs involvement of specialists from various disciplines, such as plant taxonomist, ecologist, anthropologist, linguistic, economic botanists, pharmacologist and others. With such interdisciplinary and multidisciplinary approaches, Ethnobotany is aimed at gathering and documenting indigenous botanical knowledge, cultural practice, use and management of botanical resources and discovers benefits from plants. Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of drugs (Martin, 1995).

## 2.3 Indigenous knowledge and medicinal plants

Indigenous knowledge refers to the accumulation of knowledge, rule, standards, skills, and mental set, which are possessed by local people in a particular area (Quanah, 1998). It is the result of many generations' long years' experiences, careful observations and trial and error experiments (Martin, 1995). Traditional people around the world possess unique knowledge of plants resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). Over centuries, indigenous people of different localities have developed their own specific knowledge on plant resource use, management and conservation (Cotton, 1996).

Systematic application of indigenous knowledge is important for sustainable use of resources and development (Thomas, 1995). Various animal and mineral products contribute to human welfare; the plant kingdom is most essential to human well being especially in supplying basic human needs. Since ancient times, human beings used plants for the purpose of disease control and prevention. It was believed to be the result of many generations long years experience, careful observations and trial and error experiments that early humans acquired the knowledge on the utilization of plants for disease prevention and curative purposes (Sofowora, 1982; Martin; 1995). So, the knowledge and application of traditional medicine is one of the widely used indigenous knowledge systems. This implies that humans are dependent on other organisms for their life. This close interaction and dependency of human on plants is studied under the field of Ethnobotany. Such knowledge, known as ethnomedicinal knowledge involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescription to the patients.

Indigenous knowledge on remedies in many countries including Ethiopia passes from one generation to the next verbally with great secrecy. Such secrete makes indigenous knowledge vulnerable to distortion and in most cases; some of the lore is lost at each point of transfer; there is a need for systematic documentation of such useful knowledge through ethnobotanical research.

## 2.4 Medicinal plants in Ethiopia

### 2.4.1 Overview of medicinal plants situation in Ethiopia

Ethiopia is believed to be home for about 6000 species of higher plants with approximately 10% endemism, and hence one of the six plant biodiversity rich countries of Africa (Personal communication with prof. Sebsebe Demissew). The diversity is also considerable in the lower plants but exact estimate of these have to be made. The genetic diversity contained in the various biotic make up is also high thus making the country a critical diversity hot spot for plants (UNEP, 1995). As one of the 12$^{th}$ Vavilovian centers of origin/ diversity for domesticated crops and their wild relatives, it is home of many endemic crops and genetic stocks (Vavilov, 1951; Harlan, 1969; Endashaw Bekele, 1978).

Ethiopia has a significant portion of two of the world's 25 biodiversity rich areas (hot spots) i.e. the Eastern Afromontane Biodiversity Hotspot and the Horn of Africa-Biodiversity Hot Spot. These hotspots house a lot of the useful wild biodiversity, particularly that of medicinal plants. The biodiversity richness of Ethiopia was known since 5000 years ago when ancient Egyptians Greeks and Romans used it as a source of unique commodities like Frankincense, Myrrh and other plant products, which are also used for medicine preparation (Thulin, 2004). French, British and Italian travelers, naturalists, pharmacogonists and plant collectors who visited Ethiopia between about 1830 and 1930 gave lists of plants used medicinally and their conception by the local traditional medicine men (Griaule, 1930). Most Ethiopian traditional medicinal knowledge is kept in strict secrecy; however, it is dynamic in that the practitioners make every effort to widen their scope by reciprocal exchange of limited information with each other or through reading the traditional pharmacopeias (Dawit Abebe, 1986).

Dawit Abebe (1986) gives three treatment features of Ethiopian traditional medicines i.e. curative, prophylactic and preventive. Sometimes, the treatment could have a curative as well as a prophylactic effect and it is occasionally claimed that the prophylaxis could even be genetically fixed and can protect the offspring. Preventive remedies are usually prepared as ornamental, to be borne by the patients against evil spirits or psychosomatic disorders.

Other therapies of preventive nature are employed against snake bites, intestinal worms, and miscarriages. Regulatory drugs are also commonly used to correct the time and the amount of flow of the menstruation cycle of women. Rejuvinative and restorative remedies are also employed to counter the effect of aging, and to overcome impotence, malnutrition, infertility etc. Traditional medicine is an integral part of the local culture and is a major public health system; what we call modern medicine is an offshoot of traditional medicine.

### 2.4.2 Medicinal plant diversity and distribution in Ethiopia

Different vegetation types that are found in the various agroecological zones of Ethiopia accommodate various types of medicinal plants Edwards (2001). She reported that the woodlands, montane vegetation including grasslands and forests and the evergreen scrubs and rocky areas contain more medicinal plants with higher concentrations in the woodlands and observed that the microphylous vegetation of the wood lands listed more medicinal plants species followed by the montane-grassland and riverine vegetation while the afroalpine vegetation ranked last.

The number of different languages spoken in Ethiopia approaches 90 (Maffi, 1999) and each corresponds to its unique sociocultural population thus amounting to the high human cultural diversity. Each of these cultural domains has its own set of written and/or oral pharmacopoeias with the medicinal use of some species being restricted to that given culture. Jansen (1981) asserts that Ethiopia has rich medicinal plant lore and points out that almost all plants of the Ethiopian flora are used somewhere somehow medicinally. Other workers on the other hand estimated about 60% of the flora to be medicinal, and most sources give about 10% of the vascular flora to be medicinal. The list cover plants that are widely used by the local communities in lowlands and highlands for treating human ailments and some of them for

livestock ailments as well as for prevention of pests and vectors. Haile Yineger (2005) indicated that the various parts of medicinal plants have been used such as leaves, roots and barks of the stem. However, leaves are regarded as the most cited plant parts used by healers for the preparation of traditional medicines. The various literature available show the significant role of medicinal plants in primary healthcare delivery in Ethiopia where 70% o of human and 90% of livestock population depend on traditional medicine similar to many developing countries particularly that of Sub-Saharan Africa countries.

### 2.4.3 Role of medicinal plants

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

The antiquity of the traditional use of medicinal plants in Ethiopia could never be disregarded (Pankhurst, 1990 and Mirutse Giday, 1999). Due to accessibility, acceptability and biomedical benefits there is a large magnitude of use and interest of medicinal plants in Ethiopia (Dawit Abebe, 2001). The long history of use of medicinal plants in Ethiopia is reflected in various medico-religious manuscripts produced on parchments and believed to have originated several centuries ago (Fassil Kibebew, 2001). Reviews of medicinal textbooks that have been written in Geez or Arabic between $17^{th}$ and $18^{th}$ centuries indicated that the majority of Ethiopians, with the exceptions of few privileged groups, starting from the time of the Italian occupation, have been depending almost entirely on the traditional medicine (Pankhurst, 1990).

### 2.4.4 Threats to traditional medicinal plants in Ethiopia

Ethiopia's traditional medicine as elsewhere in Africa is faced with problems of continuity and sustainability (Ensermu Kelbessa *et al*., 1992). Nowadays herbal practitioners have to walk greater distance for collection of herbal medicine that once grew in the vicinity of their homes. This is because of availability of plants in general and medicinal plants in particular have been

affected by a dramatic decrease in areas of native vegetation (Cunninghum, 1996). The primary causes of this problem are loss of taxa of medicinal plants, loss of habitats of medicinal plants and loss of indigenous knowledge (Ensermu Kelbessa *et al*., 1992). In support of this Mirutse Giday (1999) found that the practice of using plant remedies by Zay people to treat different ailments has been declining from time to time as a result of continued deforestation in the area. 0

Zemede Asfaw (2001) also argues that medicinal plants are considered to be at conservation risk due to over use and destructive harvesting (roots and bark collections). In addition Tewolde Berhan G/Egziabher (1991) stated that the problem is further compounded by the fact that traditional knowledge on traditional medicine is also being lost at an alarming rate.

The sources of treats to medicinal plants are categoriesed in to two i.e human made and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, invasive species, commercialization, honey harvesting, degradation, agricultural expansion and habitat destruction are human caused threats to medicinal plants. A natural cause includes recurrent drought, disease, pest out breaks and bush fires (Ensermu Kelbessa *et al*., 1992). Mirutse Giday (1999) stated that most of medicinal plants utilized by Ethiopian people are harvested from wild habitats. Hence, this aggravates the rate of loss of taxa with related indigenous knowledge and loss of widely occurring medicinal plant species.

### 2.4.5 Threats to indigenous knowledge on medicinal plants

Traditional herbal practitioners are important custodians of indigenous knowledge on the utilization of medicinal plants. Moreover, as a result of their experience they are skilled botanists and have a great talent for locating the correct plant among the many plant species found around them. But, many are less cooperative to show their knowledge and skill on traditional medicine to others. The knowledge on medicinal plant and method of use circulated mainly among practitioners and the beneficiaries of such practices (Pankhurst, 1990). Because of the impacts of modern education, increase in health coverage and urbanization, indigenous knowledge and usage of medicinal plants are being lost globally at a fast rate (WHO, 2002). This has made the knowledge and skill on traditional medicinal plants and traditional medicine more hidden and less available to the public (Abbink, 1995). The issue is being even more serious in developing

countries where such important information is not recorded in writing but passed on from one generation to next orally; a few are available in written records. To make matters worse, the younger generations of today, unfortunately, often have different ambitions and priorities. As a result, this traditional skill is doomed to be lost even faster than the plants themselves (Sofowora, 1982).

### 2.4.6 Conservation of traditional medicinal plants

There are some conservation actions that have been undertaken around the world designed to protect threatened medicinal plants from further damage (Cunninghum, 1996). This includes in-situ and ex-situ conservation measures. Both in-situ and ex-situ conservation efforts are implemented to capture medicinal plant genetic resources. In-situ conservation is conservation of species in their natural habitats. Some traditional medicinal plants have to be conserved in-situ due to difficulty for domestication and management (Zemede Asfaw, 2001). Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Zemede Asfaw, 2001). This can be possible in place of churches, mosques, graves yards, farm margin, river bank and so on. The second one is ex-situ conservations means conservation outside their natural habitats. This includes gen bank, botanical gardens and others.

## 2.5 The use of traditional medicinal plant in Ethiopia

### 2.5.1 Medicinal plants in human healthcare system

As in any African countries, the use of plants in religious ceremonies as well as for magic and medicinal purposes is common in Ethiopia. This knowledge of traditional medicine has been passed on by word of mouth from one generation to the next by herbalists and knowledgeable elders. About 80% of the Ethiopian population depends on traditional medicine for their health care practices. However, as time goes on, the traditional knowledge is gradually worn away for reasons mainly attributed to environmental degradation and deforestation, which in turn brought about the loss of some species including medicinal plants (Desalegn Desissa, 2000).

Plant diversity remains crucial for human well-being and still provides a significant number of remedies required in healthcare. Medicinal plants played a pivotal role in the treatment of various afflictions in Ethiopia (Fekadu Fullas, 2007). For the role-played by plant derived

products in human and livestock health, systematic scientific investigations are vital (WHO, 1998). Plants play a major role in providing prototype molecules for possible development into conventional drugs by the pharmaceutical industry (Fekadu Fullas, 2007). However, only small fractions of the world's plants have been investigated scientifically so far, but, human kind has already reaped enormous benefits from it (Farnsworth *et al.,* 1985)

### 2.5.2 Traditional medicinal plants in ethnoveternary 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). Pharmacotherapy is one of the most important means of controlling livestock disease, but it is possible only if livestock owners can afford to cover the cost of treatments. Cost of treatment is therefore an important determinant of the usefulness of veterinary drugs. Livestock owners cannot rely on veterinary services for control of various important livestock diseases. A practical solution to this problem is to develop socially acceptable and effective remedies from reasonably inexpensive sources that can complement modern medicine (Ibrahim, 1986). The practice of traditional veterinary medicine provides such a short cut.

In Ethiopia people have used traditional veterinary methods to treat livestock diseases for generations. Plants comprise the largest component of the diverse therapeutic elements of traditional livestock healthcare practices. Herbal medicine is the branch of traditional medical practices that is most amenable to scientific investigation. Plants are also invaluable subject of international development. Knowledge of medicinal plants can empower livestock owners to solve animal health problems.

# 3-DESCRIPTION OF THE STUDY AREA

## 3.1 Geographical location

Wondo Genet, is found in Sidama Zone, SNNPR State, located on the western escarpment of the central rift valley of Ethiopia, that extend between $7^{o}$06' N and $38^{o}$37' E, 1720-2620 m a.s.l., about 272 km south of the capital city, Addis Ababa and about 24 km east of Hawassa Town (WGWA, 2009). The total area of the Wereda is 15,145 ha or 151.45 $km^2$. Sixty four percent of the Wereda is covered by water. Of this 6298.62 ha is for agriculture, 556.11 ha for grazing, 1106.84 ha covered by forest, 350 ha is said to be fertile and 160.2 ha is infertile areas. The topography of the Wereda has mountains and hills are covered 43.5%, flat areas 36.25% and undulating parts covere 20.25% of the wereda. The Wereda is bordered with Oromia Region in the North, Melga Wereda in the East, Habela Tula Kifle Ketema in the South and Oromia in the West (Figure 1). Currently the Wereda comprises of 14 kebeles (WGARDO, 2008).

## 3.2 Geology and soils

The three dominant soil types in the area are clay soil covering 40%, sandy soil 10% and loam soil 50% respectively (WGARDO, 2008). The underlying parent materials in the study area are of alkali trachytes and basalts, often overlain by volcanic ash deposits from the late tertiary period volcanics (Anonymous, 1973). The highland areas bordering the rift valley are characterized by moderately weathered dark-reddish brown soils with a clay-loam texture (Lemenih Mengistu 2004). The soils at the lower elevation range of Wondo Genet are deep, loamy and relatively fertile Mollic Andosols (FAO, 1988).

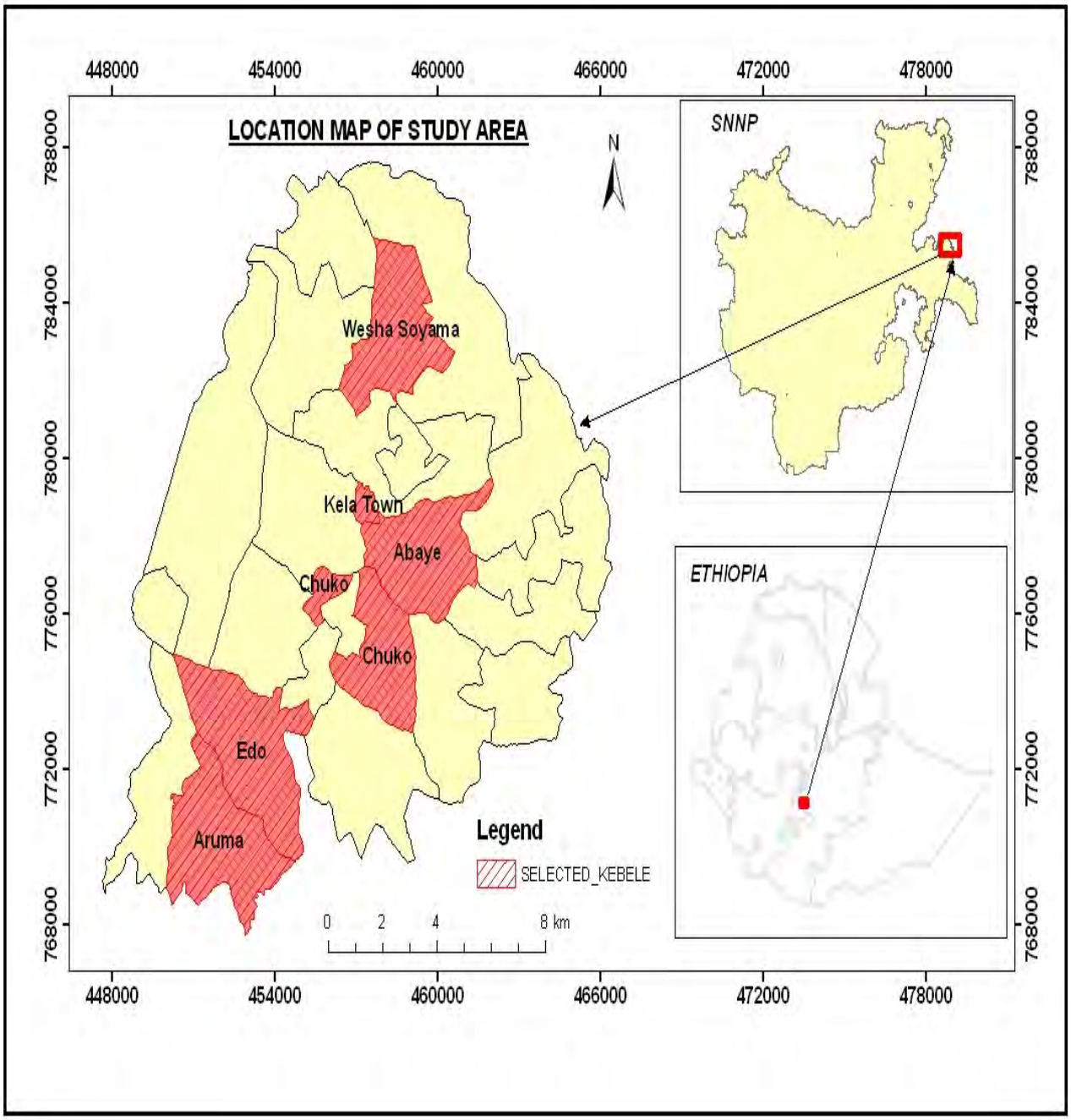


Figure 1. Map of the study area

## 3.3 Climate

The rainfall and the temperature condition of the area was described based on the data collected from 1998-2009 by the National Meteorological Service Agency (NMSA) from Hawassa Station. The result of analysis of data from NMSA showed that the range of mean monthly minimum and maximum temperature of the study area are 10.2 $^{o}$C and 30.1 $^{o}$C in the month of December and February respectively. The hottest month is February with a maximum temperature of 30.1 $^{O}$C and the coldest month is December with a minimum temperature of 10.2 $^{O}$C. The agroecology of the Wereda has 23% humid and 73% sub-humid tropical climate and receives a mean annual rainfall of 1,163 mm per year and show bimodal type of rainy seasons. Short rain season is between March and May accounting for 28% (Belg or spring) of total rainfall, and long rain season between July and October accounting for more than 50% of the total rainfall (Figure 2).

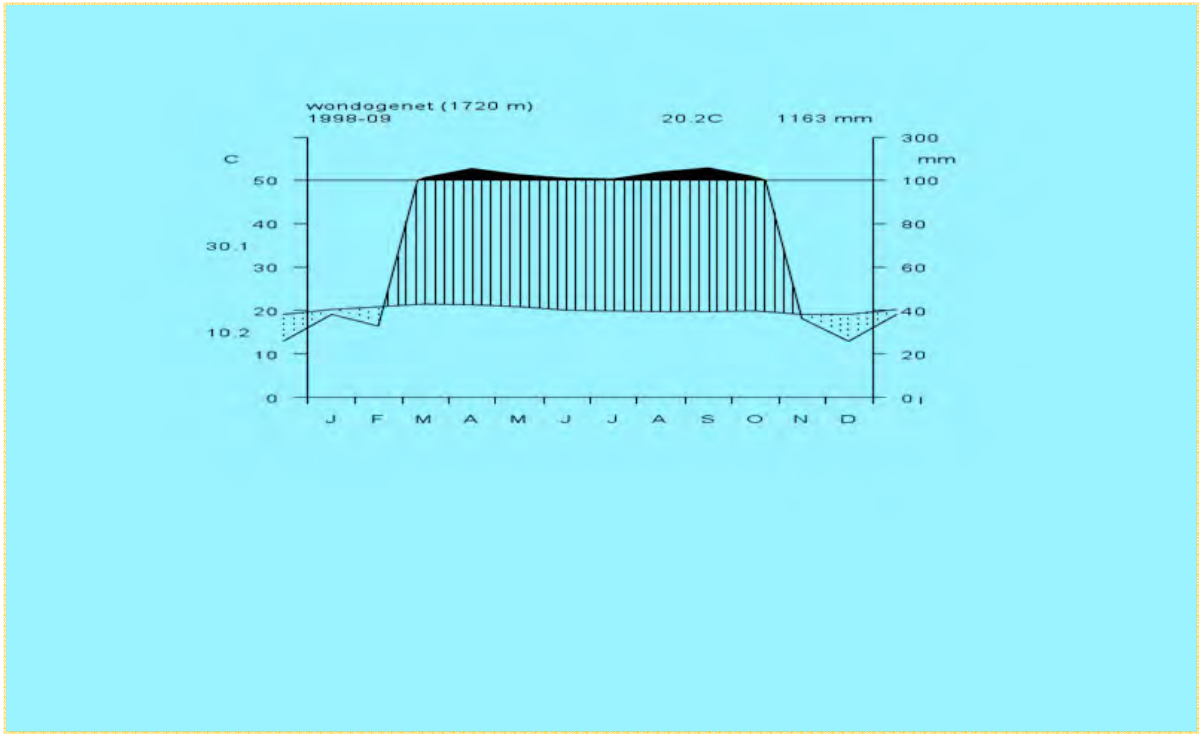


Figure 1. Climadiagram of Wondo Genet (based on 12 years data, 1998-2009), dry periods are dotted and wet periods are blackened.

Data source: National Metrological Service Agency (NMSA)

## 3.4 Vegetation

The remnant forest vegetation at Wondo Genet can be categorized as 'Dry evergrenn Afromontane' forests. Dry evergreen Afromontane forests have been defined as forests with a drought period of about half the year in one or two periods and an annual precipitation between 400-1700 mm. They occur in both the Northwest and Southeast Highlands of Ethiopia, at altitudes from 1500-2700 m, with average annual temperatures of between 14-20 $^{o}$C and annual rainfall between 700 and 1100 mm (Demel Teketay 1999). According to elderly local informants, most of Wondo Genet area was covered with such forests until about the 1920s. However, high deforestation rates through the years have left only highly disturbed remnant forests which are now confined to the mountain slopes. A limited area of plantation forests that belong to Wondo Genet College of Forestry (WGCF) and the former Munessa-Shashemene State Forest Development Project (established in 1969) also exist in similar locations as the natural forests. On the other hand, trees have been often maintained (and sometimes planted) on homesteads, farmlands and farm boundaries and give rise to, what could be described as a 'homestead' and/or 'scattered trees on crop lands' (parkland) type of agroforestry systems. While a variety of fruit trees and shrubs and cash tree crops (*e.g. Mangifera indica*, *Coffea arabica*, *Persea americana*, *Prunus persica*, *Rhamnus prinoides*, *Catha edulis, etc.*) dominate the homesteads, the dominant species in the parklands include *Cordia africana*, *Albizia gummifera*, *Croton macrostachyus*, *Ficus* species, and *Millettia ferruginea*. Maize (*Zea mays* ) sometimes followed by teff (*Eragrostis tef*) is the major grain crop grown on farms, while 'enset' (*Ensete ventricosum*), a staple food in the area and in most of southern Ethiopia, is grown in the homestead along with sugarcane (*Saccharum officinarum*), various root crops and vegetables. The major crops include enset, khat, sugarcane, maize and potatoes (WGARDO 2008).

## 3.4 People and livelihood system

### 3.4.1 Population

The total population of the Wereda was 126,144 in 2007/8. Out of this 61,463 were women and 64,681 were men. Different ethnic groups live in Wondo Genet. The majorities are Sidama, Oromo, Kembata, Wolayta, Amara and Hadiya. The Sidama language was spoken by most people. The population size as well as density of Chuko Kebele is the highest among the Kebeles in the study area. It is about 22,499 people. Kella 01 is the second highly populated kebele in the study area which has a density of 5,403 per $km^2$. Abaye and Wosha Soyama kebeles are the third and forth kebeles with respect to population size and density, which account for 11,369 and 10,694 respectively. The majority of inhabitants follow Protestant and Muslim religions (Wondo Genet Wereda Statistical Report, 2008).

### 3.4.2 Healthcare status

According to the Wondo Genet Wereda Health Office Report 2009, the first ten major diseases in the area are, Malaria, Pneumonia, Intestinal parasite, Casteides, Upper respiratory tract infection, Skin infection, Diarrhea, Ear infection, Typhoid and Helminthes. In the Wereda, there is one health center, six health stations and nine clinics.

### 3.4.3 Livestock

Livestock population is relatively high in Wondo Genet wereda. However, their productivity is not that much. The livestock resources of the wereda have not yet been exploited. Their products (milk, meat, egg, honey and others) and contribution to the regional and national economy is not that much significant due to poor management, inadequate and low quality feed supply and prevalence of various animal diseases.

The number of livestock in the wereda includes: cattle 31,156; sheep 8,521; goat 4,859; horse 1,193; donkey 1,052 and mules 504. In the wereda live as a substantial contribution to the rural economy. As rural farming, transport and source of income.

The most important animal diseases in the wereda include: bacterial infection (anthrax, mastitis, black leg and avian salmonellosis), viral infections (rabies, African horse sickness, foot and mouth disease and lamp skin diseases), ectoparasites (insect flies, lice, ticks and mites), and endoparasites (fascioliasis, strongyliasis and other parasites). (Wondo Genet Wereda Animal health Department personal communication with the head office).

### 3.4.4 Land use and agriculture

The majority of households are engaged in mixed farming characterized by small and fragmented land holdings. The forest lands are essential to this system because they provide products for different uses including house construction materials, fuel wood and various medicinal plants for the local people (Anonymous, 1973).

In the wereda agriculture cover about 85% and the rest are trade and others. Mixed farming is a common practice prevailing in the wereda as a result the livelihood of the rural population is depending on coffee, chat and crop production and livestock rearing. The current land use is predominantly smallholder agriculture with an average landholding size of less than one hectare per household. The major crops include enset, khat, sugarcane, maize and potatoes. Wondo Genet is agriculturally fertile, with irrigation farming dominating in the flat and undulating sites. In Wondo Genet, a dramatic agricultural change is taking place. In this intensively cultivated area a new cash crop, khat, has rapidly become a major source of income. This has profound effects on the livelihoods of the local people as well as on the local environment and its social effect is a matter of concern. Natural forest is an important, but diminishing part of the Wondo Genet environment. This montane forest, which nurtures an extensive biodiversity, is today an isolated remnant of once extensive forests around the south-central rift valley. Today, the forest covers upstream areas and is in proximity to agriculturally productive valleys with a rapidly growing farming population. Extensive deforestation as a result of human intervention is in progress. Khat production may be an important aspect of this process (Anonymous, 1973). The wereda has a total area of 15,145ha (151.45km$^2$) of which 78.48% is under cultivation for growing both annual and perennial crops, 13% covered by forest while 6.56% occupied by grazing and wetland and 1.88% unproductive. The general land uses are given in (Table 1).

Table 1**.** Land resources of Wondo Genet Wereda (in hectares)

| **Land under crops** | | **Cultivated land** | **Uncultivated land** | **Grazing land** | **Wet land** | **Forest** | **settlement** |
|---|---|---|---|---|---|---|---|
| **annual** | **perennial** | | | | | | |
| 6815.25 | 757.52 | 7572.77 | 757.25 | 757.25 | 302.9 | 1106.84 | 4647.99 |
| **Total area** | | | | | | **15,145** | |

**Sources: -** Wondo Genet Agricultural and Rural Development Office (WGARDO, 2008).

In the wereda, there are two agroecological zones (Dega and Weina Dega). The major food crops growing in this Wereda are given in the Table 2 below.

Table 2**.** The major food crops growing in the Wereda

| **Crop categories** | **Scientific name** | **Sidama name** | **Common** |
|---|---|---|---|
| Cereals | *Zea mays* | Badala | Maize |
| | *Hardeum vulgare* | Haixe | Barley |
| | *Triticum aestivum* | Qamade | Wheat |
| Vegetables | *Cucurbita pepo* | Baqula | Pumpkin |
| | *Brassica oleracea* | Shana | Garlic |

Table 2 continued

| | | | |
|---|---|---|---|
| Fruits | *Citrus sinensis* | Burtukane | Orange |
| | *Citrus limon* | Lomee | Lemon |
| | *Musa x paradisiaca* | Muze | Banana |
| | *Mangifera indica* | Mango | Mango |
| | *Carica papaya* | Papayee | Papaya |
| | *Persea americana* | avocato | Avocado |
| Cash crops | *Catha edulis* | Catte | khat |
| | *Coffea arabica* | Buna | coffee |
| | *Saccharum officinarum* | Shonkora | Sugar cane |
| Root crops | *Ipomoea batatus* | Maxaxessa | Sweet potato |
| | *Solanum tuberosum* | Dinicha | Potato |
| | *Daucus carota* | Karotee | Carrot |

**Source**: Wondo Genet Agricultural and Rural Development Office (WGARDO, 2008)

# 4 MATERIALS AND METHODS

## 4.1 Reconnaissance survey and selection of study sites

A reconnaissance survey of the study area to select study sites was conducted from August 02 to 20, 2010. The study was carried out in the natural forest of Wondo Genet mainly in six kebeles two of which have forest. The forest kebeles are Wosha Soyama and Abaye and the other kebeles are Kela 01 and Cukko near to the forest and Edo and Aruma kebeles far from the forest.

## 4.2 Informants Sampling

A total of 80 individuals (63 males and 17 females) between the ages of 18 and above were selected from six kebeles. Out of these, 16 key informants were purposively selected based on recommendations from local authorities (kebele administrators and local guides). The informants, except the key informants, were selected randomly and no appointment was made prior to the visits. They were asked to give their knowledge about the plants they use against a disease, plant parts harvested, method of preparation of the remedy, details of administration and the dosage.

## 4.3 Ethnobotanical Data collection

Ethnobotanical data were collected in two rounds. The first one from December 01 to 23, 2010 and the second round from February 02 to 21, 2011. The techniques employed for data collection were group discussion, field observations, guided field walk and semi-structured interview with informants in Sidama language focusing on indigenous knowledge of the local community on local classification, use, conservation, health and threats of medicinal plants.

## 4.4 Plant specimen collection and identification

At the end of the interview, the reported medicinal plants were collected from natural vegetation and home garden. Sample specimens of the plants cited for their medicinal use were collected, numbered, pressed and dried for identification.

Plant identification was performed both in the field, and at the National Herbarium of AAU. Preliminary identification was done in the field and reconfirmed at the National Herbarium. Identification of other plant specimens with other herbarium workers was done in National Herbarium in February 2011, using the Flora of Ethiopia and Eritrea and also by comparison with authenticated specimens and with the assistance of experts at Addis Ababa University,

National Herbarium. Voucher specimens were deposited in the National Herbarium of Addis Ababa University (ETH).

## 4.5 Data Analysis

### 4.5.1 Descriptive statistics

Descriptive statistical methods such as percentages and frequency were employed to analyze and summarize the data on medicinal plants, use and associated knowledge. The most useful information gathered on medicinal plants reported by local people: medicinal value, application, methods of preparation, routes of administration, disease treated, parts used and habit was analyzed through descriptive statistics. To make simple calculation, to determine proportions and to draw bar graphs MS Excel spread sheet was utilized.

### 4.5.2 Informant consensus

In order to evaluate the reliability of information during the interview, informants were contacted at least two times for the same ideas to check the validity of the information recorded. If the ideas of the informants contradict with the original information, it was rejected since it is considered as unreliable.

Informant consensus factor (ICF) is 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 citation in each category (nur) minus the number of species used (nt), 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.

$$ICF = nur—nt / nur—1$$

Where: ICF: Informant consensus Factor

Nur: number of use citation

Nt: number of species used

### 4.5.3 Preference ranking

Eight key informants have been selected to assess the degree of effectiveness of five medicinal plants for humans and animals against intestinal parasites and pneumonia respectively by following Martin (1995). The medicinal plants believed to be most effective to treat the illness was given the highest value (5), and the least effective got the lowest value (1). 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 most effective medicinal plants used by the community to treat the diseases.

### 4.5.4 Paired comparison

Paired comparisons can be used for evaluating the degree of preference or levels of importance of certain selected plants. This method was used to find out about the efficacy and popularity of five medicinal plants species used to treat jaundice following the procedure as described by Martin (1995). Seven key informants were randomly selected by lottery method to show their responses independently for pairs of five medicinal plants that are noted for treating jaundice. A list of the pairs of selected plants 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. Then their responses were recorded. The total value summed and the rank made based on the total score of the informants.

### 4.5.5 Direct matrix ranking

By following Cotton (1996), direct matrix ranking was conducted in order to compare multipurpose medicinal plants commonly reported by informants. Based on the relative benefits obtained from each plant, six multipurpose tree species were selected out of the total medicinal plants and six use diversities of these plants were listed. Five key informants were chosen to assign use values of each attributes (5=best, 4= very good, 3= good, 2= less, 1= least used). The six use values include medicinal usage, construction, charcoal production, fencing value, firewood value and shede value. Based on data obtained from informants, average value of each use diversity for a species was taken and finally the values of each species summed up and ranked.

# 5 RESULTS AND DISCUSSION

## 5.1 Indigenous knowledge of local community in the study area

The local people of the study area, specially elders and knowledgeable community members have their own knowledge about their environment and surroundings. They are knowledgeable on how to classify the soils, vegetation, land and topographical arrangement of their environment traditionally. Local people of the study area based on topographic arrangenents of land, they classify their land in to five categories. Namely, '**Suwado bato', 'Roge', 'Tullo**, **Ilalla' and 'Laga.'** The local people also based on plant density and composition classify vegetations into five categories (i.e, 'Dubbo'**, 'Qorccishu ula', 'Caffa', 'Hawaddi lelo' and 'Kalloo)'** Knowledgable people in the study area classify soils based on soil characters, color, fertility and its benefits into seven categories. Namely '**Kolisho' 'busha', 'Dumo busha', 'Koticha busha', 'Doru busha', 'Caffu busha', 'Hollimincho busha' and 'Karsso busha.'**Also indigenous local people classify their land based on agricultural importance into three big categories (i.e '**Shaqado bato', 'Galo bato' and 'Caffu bato.'** This knowledge of local society shows that peoples of the study area not only know the uses of medicinal plants but also are knowledgable about their environment.

### 5.1.1 Local topographic classification of land

The local people of the study area classify their land based on their perception of land topographic arrangement and benefits they get from the land.

**I-Suwado bato**: Land form which has plain land suitable for settlement, agriculture and livestock grazing.

**II-Roge**: Land form which has very low elevations suitable for agriculture and after harvesting a product available for grazing.

**III-Tullo**: Land forms which has some elevations than the first one and suitable for agriculture and grazing.

**VI-Ilalla**: Land form which has high elevations or mountains the advantages is for grazing and fire wood collection.

**V-Laga**; Land forms which has found in between elevated land form (Valley).

### 5.1.2 Indigenous categories of vegetation

The local communities categorized the vegetation of the study area into five types based on plant density and composition.

**I-Dubbo**: Refers to densely forested lands composed of trees, shrubs, herbs, climbers and grasses. Now a day this type of vegetation has declined because of agricultural expansion, cash crop expansion, deforestations, fire and urbanization.

**II-Qorccishu ula**: Refers to the heterogeneous mixture of shrubs and grass communities.

**III-Caffa:** Refers to vegetation growing in marshy or water logged areas. Plant species such as *Cyperus* spp. were more frequent.

**IV-Hawaddi lelo**: Refers to a bare land or with poor vegetation cover with some types of herbs and grasses appearing only during the rainy season.

**V-Kalloo**: Refers grass communities which are above 1m in height, grow in rainy seasons, used for live stock feeds.

### 5.1.3 Soil classification by indigenous people

The people of the study area classify soils into its categories based on soil characteristics like color, fertility and its benefits to the people. These are:

**I-Kolisho busha**: That refers to black soils that are very fertile, better for crop and vegetables production. People use this soil to grow crops like maize, wheat, etc., vegetables like enset, cabbage and carrot.

**II-Dumo busha**: That refers to red soil which is not fertile like in I. It needs more careful work and additional fertilizers like DAP, UREA, animal dung, compost and others.

**III- Koticha busha**: That refers to deep red soil which is not for agriculture. This soil type is sometimes used for construction.

**IV- Doru busha**: That refers to reddish soil which is fertile but need fertilizer. The local people used this soil to cultivate enset, sugarcane, chat and maize, additionally used to make equipment like pot, mitad, etc.

**V- Caffu busha**: Refers to whitish soil which is poor in fertility. Used mainly to cultivate *Eucalyptus* species.

**VI- Hollimincho busha**: Refers to deep black soil smilt up to the ground by termites, which is hard soil but very fertile and high nutrient content. The local people reported that one can grow varied crops on it.

**VII- Karsso busha**: Refers to mixed soils which contain sand. The soil is fertile and the local people used this soil to cultivate teff, wheat, barley and maize.

### 5.1.4 Land use classification by indigenous people

The indigenous local people classify their land based on agricultural importance. Three landuse types are recognized.

**I-Shaqado bato**: Refers to agricultural land which is very suitable for crop and vegetable production.

**I-Galo bato**; Refers to agricultural land which is not that much productive as the above one.

**III- Caffu bato**: That refers to agricultural land which is marshland suitable for only some agricultural activities but mainly for livestock grazing.

## 5.2 Medicinal plant resources of the study area

Eighty five plant species distributed into 79 genera and 44 families were documented as having medicinal value in the study area (Table 3). About 70 (82.35%) of the medicinal plants were collected from the wild and 15 (17.65%) from homegardens. The leading family was Fabaceae with seven species, followed by Lamiaceae with six species, Asteraceae, Cucurbitaceae, Euphorbiaceae and Solanaceae each with five species and the others are listed in (Table 3). The family Fabaceae contributes higher number of plant species than others in the study area used for medicine. This work is agree with the work of Haile Yineger and Dilnessaw Yewhalaw (2007), Endale Amenu (2007), Ermias Lulekal *et al*. (2008) and Tesfaye Hailemariam *et al*. (2009) on their ethnobotanical investigations they found that family Fabaceae contribute highest number of plant species. Of these 54 plant species (63.53%) were used as human medicines (Appendix 1),

eight plant species (9.41%) as livestock medicines (Appendix 2) and 23 plant species (27.06%) were used for treating both human and livestock diseases (Appendix 3).

Table 3**.** Distribution of sampled species in different families.

| **Family** | **Number of species** | **%** |
|---|---|---|
| Fabaceae | 7 | 8.24 |
| Lamiaceae | 6 | 7.06 |
| Asteraceae | 5 | 5.88 |
| Cucurbitaceae | 5 | 5.88 |
| Euphorbiaceae | 5 | 5.88 |
| Solanaceae | 5 | 5.88 |
| Rutaceae | 4 | 4.71 |
| Boraginaceae | 3 | 3.53 |
| Acanthaceae | 2 | 2.35 |
| Flacourtaceae | 2 | 2.35 |
| Malvaceae | 2 | 2.35 |
| Melianthaceae | 2 | 2.35 |
| Moraceae | 2 | 2.35 |
| Polygonaceae | 2 | 2.35 |
| Ranunculaceae | 2 | 2.35 |
| Rosaceae | 2 | 2.35 |
| Rubiaceae | 2 | 2.35 |
| Alliaceae | 1 | 1.18 |
| Alloaceae | 1 | 1.18 |
| Amaranthaceae | 1 | 1.18 |
| Anacardiaceae | 1 | 1.18 |
| Apocynaceae | 1 | 1.18 |
| Caricaceae | 1 | 1.18 |
| Celastraceae | 1 | 1.18 |
| Cuppresaceae | 1 | 1.18 |

Table 3 continued

| | | |
|---|---|---|
| Commelinaceae | 1 | 1.18 |
| Crassulaceae | 1 | 1.18 |
| Loganiaceae | 1 | 1.18 |
| Menispermaceae | 1 | 1.18 |
| Oleaceae | 1 | 1.18 |
| Orobanchaceae | 1 | 1.18 |
| Papaveraceae | 1 | 1.18 |
| Pittosporaceae | 1 | 1.18 |
| Podocarpaceae | 1 | 1.18 |
| Poaceae | 1 | 1.18 |
| Phytolaccaceae | 1 | 1.18 |
| Rhamnaceae | 1 | 1.18 |
| Morignaceae | 1 | 1.18 |
| Meliaceae | 1 | 1.18 |
| Myrsinaceae | 1 | 1.18 |
| Myrtaceae | 1 | 1.18 |
| Sapindaceae | 1 | 1.18 |
| Urticaceae | 1 | 1.18 |
| Zingiberaceae | 1 | 1.18 |

Regarding with the habit diversity 22 plant species (25.88%) were trees, 32 (37.65%) were shrubs, 24 (28.24%) were herbs, seven (8.24%) were climbers (Figure 3). Shrubs were the most harvested forms as source of medicines. They were relatively common in the study area compared to medicinal herb, tree and climber species. This could be associated with the abundance and year round availability of shrub species in the area. This shows that shrubs were the most harvested forms for medicinal purpose followed by herbs, trees and climbers. This finding agrees with the findings of Fisseha Mesfin *et al.* (2009), Bayafers Tamane (2000), Mirutse Giday and Gobana Amani (2003), Ermias Luelkal (2005), Ermias Lulekal *et al.* (2008), Alemayehu Kefyalew (2010) and Debela Hunde *et al*. (2004) indicating that shrubs were the most harvested forms for medicinal purpose in their ethnobotanical investigations. However, the

finding of Tizazu Gebre (2005), Debela Hundie (2001) and Endalew Amenu (2007) indicates that herbs were mostly harvested forms for medicinal purposes.

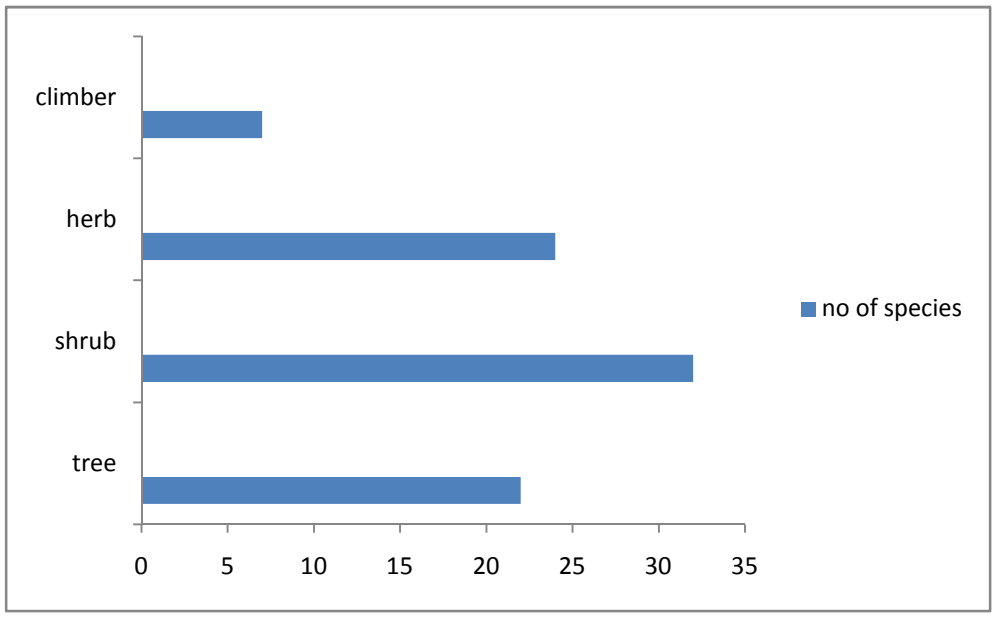


Figure 3. Habits and number species of plants in the study area.

## 5.3 Distribution of medicinal plants in the study area and sites

### 5.3.1 Distribution of medicinal plants in the study area

Most of the plants were collected from natural vegetation. The tree species were found mainly in the forests and fences; shrubs from woodlands, rocky surfaces and secondary forests; herbs were mostly found in forest and on the river side and climbers from home gardens and forest. Medicinal plants like *Allium sativum*, *Artemisia abyssinica*, *Nicotiana tabacum*, *Ocimum lamiifolium*, *Zingiber officinale, Momordica boivinii, Momordica foetida, Cucurbita pepo, Catha edulis, Ruta chalepensis*, *Citrus sinensis, Citrus limon, Rhamnus prinoides, Coffea arabica,* and *Carica papaya* were restricted to farmlands and homegardens.

### 5.3.2 Distribution of medicinal plants in the study sites

Out of the 85 medicinal plants collected in six sites, the highest number recorded in Wosha Soyama and the least in Aruma (Table 4).

Table 4 Number and percentage of medicinal plants in each study site

| **Study site** | **No. of medicinal plants** | **%** |
|---|---|---|
| Wosha soyama | 71 | 83.53 |
| Abaye | 63 | 74.12 |
| Chuko | 31 | 36.47 |
| Kela 01 | 22 | 25.88 |
| Edo | 14 | 16.47 |
| Aruma | 9 | 10.59 |

As the table indicated large numbers of medicinal plants are recorded in the study area, despite the very fast degradation of natural vegetation due to population pressure and deforestation. Wondo Genet natural forest is found in two kebeles (i.e Washa Soyama and Abaye). The result also indicates that large number of medicinal plants was collected from those forests when compared with adjacent kebeles. In Chuko Kebele I observed that there is reminant forest compared with Aruma, Edo and Kela 01 kebeles and the Cuko kebele is relatively rich with medicinal plants (Table 4). The knowledge of the society on homegarden practicing is very low. Even the peoples found far from the forest (i.e Aruma and Edo Kebeles) collect medicinal plants from the wild by traveling long distance. From this, it can be said that in the study area there is less practice of cultivating medicinal plants in the homegarden. This is agreing with the finding of Zemede Asfaw (1997), which also indicated that medicinal plants cultivated in home gardens were few, about 6%.

## 5.4 Comparison of wild and home garden medicinal plants

Seventy (82.35%) plant species were collected from the natural vegetation, which belongs to 66 genera and 35 families. The leading family was Fabaceae with seven species, followed by Lamiaceae and Euphorbiaceae each with five species, Solanaceae and Asteraceae each with four

species, Boraginaceae with three species, Acanthaceae, Flacourtaceae, Malvaceae, Melianthaceae, Moraceae, Polyganaceae, Cucurbitaceae, Rananculaceae and Rosaceae each with two species and the remaining 24 families were each with one species. Fifteen (17.65%) plant species were collected from homegardens and belong to 13 genera and 11 families. Cucurbitaceae and Rutaceae were the leading families by contributing three species each followed by Alliaceae, Rhamnaceae, Rubiaceae, Lamiaceae, Caricaceae, Celastraceae, Asteraceae, Solanaceae and Zingeberaceae each with one species.

In this study, the number of medicinal plants collected from the natural vegetation is more than in the homegardens. This result indicates practitioners depend on the wild source or the natural environment rather than homegardens to obtain the medicinal plants and the activity of cultivating medicinal plants is very poor. It also indicates that the natural forest of Wondo Genet is being over exploited by traditional practitioners for its medicinal plants composition. This is in agreement with the work of Ermias Lulekal *et al*. (2008), Etana Tolosa (2007), and Haile Yineger and Delenasaw Yewhalaw (2007).

Some of the medicinal plants cultivated in the home gardens provided a number of additional services to the local people as food, stimulant, firewood and cash income (Table 5).

Table 5 Service categories of home garden plants in the study area

| **Service categories** | **Plant species** | **%** |
|---|---|---|
| Only medicinal | *Momordica foetida, Momordica boivinii, Ocimum urticifolium, Nicotiana tabacum and Zingiber officinale* | 33.33 |
| Medicinal, fire wood, stimulant and cash income | *Catha edulis and Coffea arabica* | 13.33 |
| Medicinal and cash income | *Cucurbita pepo, Citrus limon and Rhamnus prinoides* | 20 |
| Medicine and ornamental | *Artemisia abyssinica And Ruta chalepensis* | 13.33 |
| Medicine, cash income and food | *Allium sativum, Carica papaya and Citrus sinensis* | 20 |

In this study only five plant species (33.33%) have medicinal value; two species (13.33%) home for medicinal, fire wood, stimulant and cash income; three species (20%) have medicinal and cash income; two specie (13.33%) have medicine and ornamental value and three species (20%) have medicine, cash income and food value.

The medicinal plant species recorded in Wondo Genet are also used as remedies in other parts of Ethiopia. Among a total of 85 medicinal plant species investigated in this study, 23 species are mentioned in Tilahun Teklehaymanot and Miruste Giday (2007), 33 species in Fisseha Mesfin *et al.* (2009), 24 species in Fekadu Fullas (2007), 31 species in Ermias Lulekal *et al.* (2008), 11 species in Teferi Gedif (2003) and 32 species in Tesfaye Awas and Sebsebe Demissew (2009). Such widespread report on the uses of these plants by different groups of people in different areas could be attributed to different cultural groups which could validate the medicinal properties of these species. So, in our country Ethiopia the indigenous people have the tendency to use the same medicinal plants in different parts of the country as result of the wider distributions of medicinal plants in the country.

## 5.5 Medicinal plants used to treat human, livestock and both human and livestock diseases treatment

### 5.5.1 Medicinal plants used to treat human ailments only

A number of medicinally important plants species that are used to treat human ailments were collected from six kebeles in Wondo Genet Wered, a total of 54 species which belong to 49 genera and 34 families. The families Asteraceae, Cucurbitaceae and Fabaceae leading by contribute four species each and the rest are listed in (Table 6). The dominance of the family Asteraceae in human health treatment has also been reported by Seyoum Getaneh (2009) and Endalew Amenu (2007) (Appendix 1). The medicinal plant species used to treat human ailments are also used as remedies in other parts of Ethiopia. Among the total 54 medicinal plant species investigated in this study, 14 species are mentioned in Tilahun Teklehaymanot and Miruste Giday (2007), 22 species in Ermias Lulekal *et al*. (2008), seven species in Tesfaye Awas and Sebsebe Demissew (2009) and six species in Teferi Gedif and Hahn, (2003).

Table 6 Families of medicinal plant species used to treat human ailments only with the number of species

| **Family** | **Number of species** | **Percent** |
|---|---|---|
| Asteraceae | 4 | 7.41 |
| Cucurbitaceae | 4 | 7.41 |
| Fabaceae | 4 | 7.41 |
| Euphorbiacece | 3 | 5.55 |
| Lamiaceae | 3 | 5.55 |
| Solanaceae | 3 | 5.55 |
| Rutaceae | 3 | 5.55 |
| Boraginaceae | 2 | 3.70 |
| Flacourtaceae | 2 | 3.70 |
| Polygonaceae | 2 | 3.70 |
| Acanthaceae | 1 | 1.85 |
| Alloaceae | 1 | 1.85 |
| Anacardiaceae | 1 | 1.85 |
| Apocynaceae | 1 | 1.85 |
| Caricaceae | 1 | 1.85 |
| Celastraceae | 1 | 1.85 |
| Commelinaceae | 1 | 1.85 |
| Crassulaceae | 1 | 1.85 |
| Malvaceae | 1 | 1.85 |
| Meliaceae | 1 | 1.85 |
| Melianthaceae | 1 | 1.85 |
| Menispermaceae | 1 | 1.85 |
| Moraceae | 1 | 1.85 |
| Morignaceae | 1 | 1.85 |
| Myrtaceae | 1 | 1.85 |
| Oleaceae | 1 | 1.85 |

Table 6 continued

| | | |
|---|---|---|
| Orobanchaceae | 1 | 1.85 |
| Papaveraceae | 1 | 1.85 |
| Pittosporaceae | 1 | 1.85 |
| Poaceae | 1 | 1.85 |
| Podocarpaceae | 1 | 1.85 |
| Rhamnaceae | 1 | 1.85 |
| Rosaceae | 1 | 1.85 |
| Rubiaceae | 1 | 1.85 |

### 5.5.2 Medicinal plants used to treat livestock ailments only

A total of eight medicinal plant species that belongs to eight genera and eight families were collected and identified to treat livestock ailments only in the study area (Table 8), each family contributing one species (i.e. Acanthaceae, Amaranthaceae, Boraginaceae, Fabaceae, Loganiaceae, Malvaceae, Moraceae and Sapindaceae). All medicinal plants were gathered from the wild. The use of medicinal plants to treat human diseases is more than livestock. This indicated that local society of the study area seek traditional medicine for his ailments first and then try to search for his livestock ailments. As a result, they could acquire low knowledge of medicinal plants to treat livestock ailments. Some informants indicate that they use modern medicines from veterinary clinics than gathering medicinal plants from the wild. They gather medicinal plants from the forest and mountain areas. The medicinal plant species used to treat livestock ailments are also used as remedies in other parts of Ethiopia. Three species are mentioned in Ermias Lulekal *et al*. (2008), two species in Tesfaye Awas and Sebsebe Demissew (2009) and one species in Tilahun Teklehaymanot and Miruste Giday (2007) (Appendix 2).

### 5.5.3 Medicinal plants used to treat both human and livestock ailments

The medicinal plants used to treat both human and livestock ailments were collected and recorded from the study area. A total of 23 plant species which belongs to 23 genera and 17 families were collected and recorded (Table 7). Family Lamiaceae contributies three species followed by Euphorbiaceae, Fabaceae, Ranunculaceae and Solanaceae contribute two species each and the rest of the 12 families contribute one species each. 19 plant species were gathered

from the wild and 4 plant species from home gardens. This is in agreement with the work of Endale Amenu (2007), in which wild sources of medicinal plants were used for the treatment both human and livestock ailments than home gardens. Those medicinal plants also used as remedies in other parts of Ethiopia. Of this six species are mentioned in Tilahun Teklehaymanot and Miruste Giday (2007), four species in Ensermu Kelbessa *et al.* (2008) and eight species in Tesfaye Awas and Sebsebe Demissew (2009)

(Table 7). Families of medicinal plant species used to treat both human and livestock ailments with the number of species (See appendix 3).

| **Family** | **Number of species** |
|---|---|
| Lamiaceae | 3 |
| Euphorbiaceae | 2 |
| Fabaceae | 2 |
| Ranunculaceae | 2 |
| Solanaceae | 2 |
| Alliaceae | 1 |
| Asteraceae | 1 |
| Cucurbitaceae | 1 |
| Cuppresaceae | 1 |
| Melianthaceae | 1 |
| Myrsinaceae | 1 |
| Phytolaccaceae | 1 |
| Rosaceae | 1 |
| Rubiaceae | 1 |
| Rutaceae | 1 |
| Urticaceae | 1 |
| Zingiberaceae | 1 |

### 5.5.4 Major human diseases and plant species used

In this study, more than 40 different human ailments were recorded that were reported by informants as human health problems. The major and most widespread diseases according to the

informants include malaria, jaundice, pneumonia, skin infections, head infections, evil eye and intestinal parasites. The rest are listed in (Table 8). These diseases were treated by 77 plant species (54 plant species used to treat human ailments only and 23 plant species common to both human and livestock ailment treatment). The use of medicinal plants to treat more human diseases than livestock ailments by local people indicated that local community of the study area seek traditional medicine for his ailments first and then try to search for his livestock ailments.

Diagnosis and treatment methods depend on the type of the ailment. The practitioners commonly diagnose each health problem by an interview and visual inspection of the patient. The patients are commonly interviewed for symptoms observed and the duration of the health problem, changes in eye, tongue and throat regions, body temperature and status of sores are all visually inspected by the practitioner and the remedy is prescribed. This indicates that in the study area the people have got solutions to their health problems through traditional medicinal plants.

Table 8 Human diseases and number of plant species used

| **Diseases treated** | **Sidama name** | **Plant species used in number** |
|---|---|---|
| Intestinal parasites | Godowu dhiba | 19 |
| Body swelling | Gamitoke or Fulaticho | 11 |
| Pneumonia | Balamo | 10 |
| Headache | Umu damumme | 8 |
| Wound | Madate dhiba | 8 |
| Malaria | Shekerre | 7 |
| Skin infection | Gogu dhiba | 7 |
| Jaundice | Magarto | 5 |
| Amoeba | Shufuro | 5 |
| Teeth problems | Hinkote dhiba | 5 |
| Gonorrhea | Cebxxe | 5 |
| Common cold | Ganshsho | 4 |
| Fibril illness | Miche | 3 |
| Vomiting | Tushisha dhiba | 3 |
| Blood clot | Mundee | 3 |

Table 8 continued

| | | |
|---|---|---|
| Evil eye | Dudate | 3 |
| Diabetes | Sukarete dhiba | 3 |
| Gastritis | Gagasu dhiba | 3 |
| Head infections | Borosho | 3 |
| Tonsillitis | Kokete dhiba | 2 |
| Glandular swelling | Mujete dhiba | 2 |
| Snake bite | Hamashu idda | 2 |
| Nasal blooding | Sananootee | 2 |
| Cancer | Cancerete dhiba | 2 |
| Sudden sickness | Magaynaho | 2 |
| Skin cancer | Bijajo or qunture | 2 |
| Cough | Busano | 2 |
| Tetanus | Tetenoseete | 2 |
| Ascaries | Godawu hamash | 1 |
| Goiter | Gogoxxo | 1 |
| Typhoid | Typhode | 1 |
| Eye problems | Illete dhiba | 1 |
| Poisoning | Hadho | 1 |
| Rabies | Woshu dhiba | 1 |
| Blood pressure | Sukarete dhiba | 1 |
| Stop pregnancy | Illa urisa | 1 |
| Anemia | Mundete anje | 1 |
| Vitamin deficiency | Vitaminete anje | 1 |
| Bilharzias | Gamme | 1 |
| Breast cancer | Ununuu cancere | 1 |
| Evil sprit | Shexane | 1 |
| Ear problem | Maccate dhiba | 1 |
| Asthma | Asmme | 1 |
| Tape worm | Soicho | 1 |

The table shown, the largest number of plant species (19 plant species) used to treat intestinal parasites following by body swelling which was treated by 11 plant species (Table 7). For disease like fibril illness, evil eye and Jaundice, the local people prefer traditional healers for treatment.

Some of the medicinal plants in this study were used to treat specific diseases: *Vernonia amygdalina*, *Solanum incanum*, *Croton macrostachyus, Carica papaya, Arundo donax* and *Momordica boivinii* are used as treatment for intestinal parasites and associated illness in the study area. *Datura stramonium* and *Vernonia auriculifera were* used as treatment of head infection. *Allium sativum*, *Vernonia amygdalina*, *Zingiber officinale, Artemisia abyssinica* and *Melia azedarach* were used as the treatment for malaria (Appendies 1 and 3).

### 5.5.5 Major livestock diseases and plant species used

In comparison to human diseases, livestock diseases are treated with a few numbers of plants. A total of 17 diseases were treated by 31 species of plants in the study area (eight plant species used to treat livestock ailments only and 23 plant species common to both human and livestock ailment treatment). Common diseases which affect animals in the study area are associated with pneumonia which is treated by eight plant species, stomach problems which is treated by five plant species and evil eye treated by three plant species and the rest are given in (Table 9).

Table 9 Livestock diseases and number of plant species used

| **Disease treated** | **Sidama name** | **No of plant pecies used** |
|---|---|---|
| Pneumonia | Balamo | 8 |
| Stomach problem | Fugo or deoo | 5 |
| Common cold | Gansho | 3 |
| Constpation in cattle | Worantote dhiba | 3 |
| Evil eye | Budda | 2 |
| Rabies | Woshu dhiba | 2 |
| Milk reduction in caw | Gadansu dhiba | 2 |
| Ecto-parasite | Cinne, derree | 4 |

Table 9 continued

| | | |
|---|---|---|
| Leeches | Ulaulee | 1 |
| Wound | Mada | 1 |
| Mastitis | Ununuu dhiba | 1 |
| Black leg | Aba gorba | 1 |
| Anthrax | Aba senga | 1 |
| Cadrosis | Goroorsa | 1 |
| African horse sickness | Faradu dhiba | 1 |
| Cough | Busano | 1 |
| Breast cancer | Ununuu cancere | 1 |

## 5.6 Sources of medicinal plants for human, livestock and both human and livestock ailment treatment

From the medicinal plants used to treat human ailments (i.e. 54 plant species), 45 species (83.33%) were collected from the wild and nine species (16.67%) from the homegardens. For livestocks ailment treatment all are collected from the wild and for both human and livestock ailment treatment 19 plant species were gathered from the wild and 4 plant species from home gardens. The findings indicate that the local people obtain more medicinal plants from the wild vegetations than homegardens for treating human ailments. The informants reported that the medicinal plants are found far from their homes. The informants said that they tried to cultivate the plants, but they do not survive the climate conditions and soil types because the plants grew on the side of mountains and shedded areas. This agrees with previous studies of most investigations in Ethiopia that documented medicinal plants were more harvested in the wild than home garden Ermias Lulekal *et al*. (2008) and Etana Tolosa (2007).

## 5.7 Habits of human, livestock and both human and livestock medicinal plants

The findings showed that medicinal plants used to treat human ailments constitute 22 shrub species (40.74%), 16 herb species (29.63%), 11 tree species (20.37%), and five climber species (9.26%). This displays that the most represented life forms of medicinal plants in the study area are shrubs followed by herbs, trees and climbers (Figure 4). This could be associated with the abundance and year round availability of shrub species in the area.

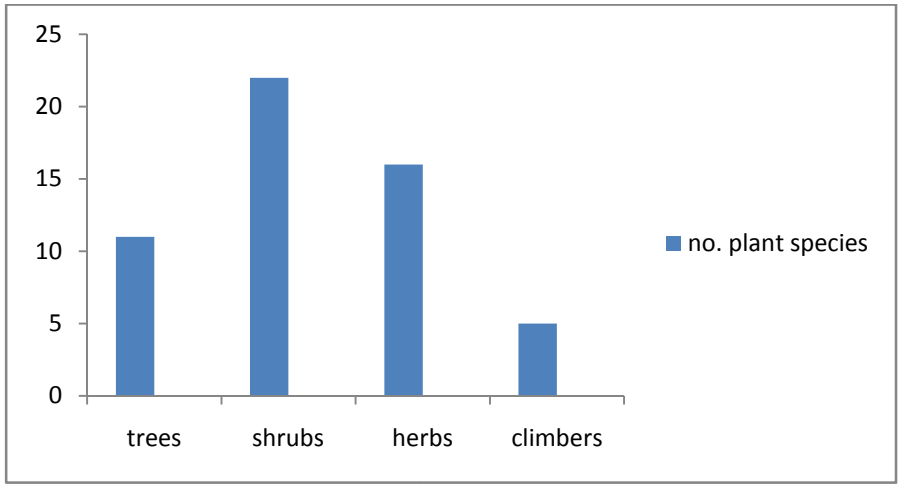


Figure 4 Habits of medicinal plants used for human diseases treatment.

Trees and herbs are used for the treatment of livestock ailments. There are five tree species (62.5%) and three herb species (37.5%) (Figure 5). The difference from medicinal plants used to treat human ailments was that shrubs were dominant in human ailment treatment but in livestock ailment treatment trees are the common ones. Trees like *Ehretia cymosa, Millettia ferruginea* and *Nuxia congesta;* herbs like *Hibiscus crassinervius, Achyranthes aspera* and *Hypoestes forskaolii* were used for the treatment of livestock ailments only.This finding agrees with the work of Endale Amenu (2007) in which trees are dominant habits for the treatment of livestock ailments.

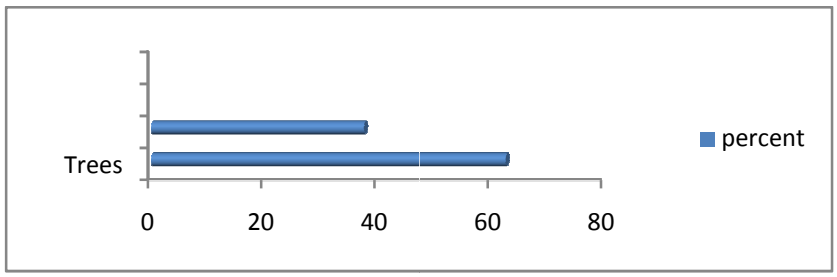


Figure 5 Habits of livestock medicinal plants.

Among the medicinal plants in the treatment of both human and livestock diseases the dominant were shrubs with ten plant species (43.48%), followed by trees with six plant species (26.09%), herbs with five plants species (21.74%) and climber with two plant species (8.69%) (Figure 5). This finding agrees with the work of Endale Amenu (2007) in which shrubs take the leading habits harvested to treat both human and livestock ailments.

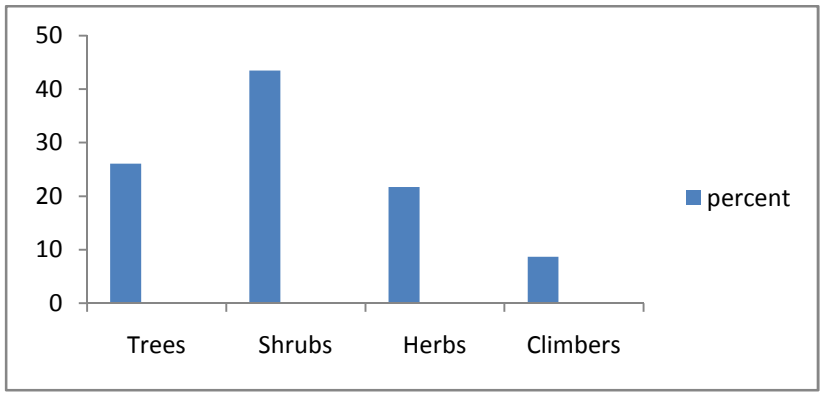


Figure 6 Habits of both human and livestock medicinal plant

## 5.8 Parts of medicinal plants used

During the study different parts of medicinal plants were reported by informants to be used for medicines. The most frequently utilized plant part was leaf with 38 (45.78%) species of the total of recorded human medicinal plant preparation, root account for 16 (19.28%), bark for ten (12.05%), seed for five (6.02%) and the rest are shown in (Figure 7). Leaves, stem bark and roots were the most reported plant parts in the preparations of remedies. Such wide harvesting of barks and roots, which are important for the survival of plants has a negative influence on the survival and continuity of useful medicinal plants and hence affects sustainable utilization of the plants. Large proportion of herbal preparation from leafs was also reported by Endalew Amenu (2007), Bayafers Tamene (2000), Mirutse Giday and Gobana Amani (2003) and Tesfaye Hailemariam *et al.*(2009), from root sources was reported by Ermias Lulekal *et al.* (2008), Alemayehu Kefyalew (2010) and Mirutse Gidey (2007). The preference of leaves to other plant parts may be due to the easy to preparations compaired to remedy preparations from roots, stem barks, whole plants and seeds. In this study, leaves were found to be the most harvested forms for medicinal purposes. So, remedy preparations from leaves do not have that much effect on the survival of mother plants compaired with roots and stem barks.

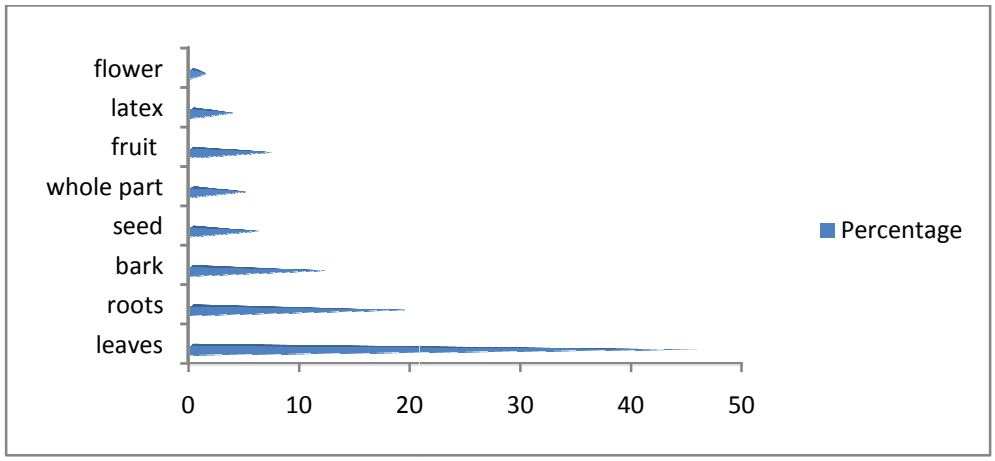


Figure 7 Plant parts used for remedy preparation for human ailment treatment

The some to livestock, leaves and stem barks are the dominant plant parts used in the remedy preparations from plant parts accounting to (37.5%) each, followed by whole plant parts (12.5%) and roots (12.5%) respectively (Figure 8). Like human medicinal plants, leaves are the most harvested forms in remedy preparation. Remedy preparations from roots, stem barks and whole plants are very risk to plant survival. So, the local people must adapt alternative ways of conservations of medicinal plants in their home gardens.

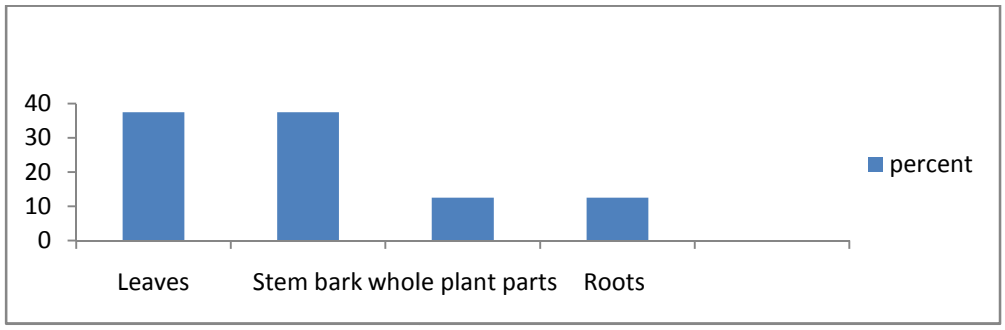


Figure 8 Parts of medicinal plants used in ethnoveternary medicine

In the remedy preparation, a part of medicinal plants used to treat different ailments depends on the different parts of the plants. Like human and livestock applications, leaves are more harvested parts of the plants. Leaves stood first (38.71%) followed by bark (20.97%), seed, (16.13%), root (14.52%), whole plant (4.84%), fruits (3.23%) and latex (1.61%) of the remedy preparations (Figure 9). The most commonly used plant parts for herbal preparations in the area

were leaves, seeds, barks and roots. Such wide harvesting of seeds, barks and roots, which are important for survival of plants has a negative influence on the survival and continuity of useful medicinal plants and hence affects sustainable utilization of the plants.

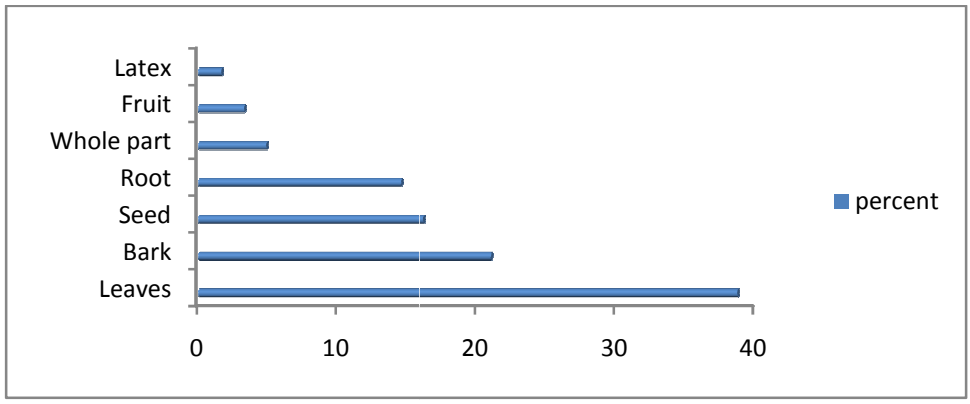


Figure 9 Parts of both human and livestock medicinal plant

## 5.9 Methods of preparation and forms used

People in the study area employ various methods of preparations of traditional medicines for human ailment treatments. The methods of preparations depend on the types of disease treated. The principal methods of remedy preparation forms are chewing (24.69%), followed by pounding (19.75%), crushing and pounding (14.81%), rubbing (12.35) and the rest are shown in (Figure 10).

The skills of interviewed people are vary from individual to individual. The highest medicinal plant knowledge acquisition by the healers in this study area was from parents or close relatives. They have only oral transmission of knowledge. The healers have a very high intention to keep their traditional knowledge secret. Indigenous peoples have indigenous knowledge on the preparations of medicines from medicinal plants. Some of the remedies are taken with different additives, like butter, honey, sugar, tea, salt, food, water, coffee and milk. The additives are important to minimize the power of the medicines, improve the taste and minimize the discomfort of the medicines. Some informants argue that mixing and using some medicinal plants taken with foods is better than taking alone. For example, Dry fruits of *Ficus sur* pounded, powdered and then mixed with honey and taken orally as food are used to treat malaria.

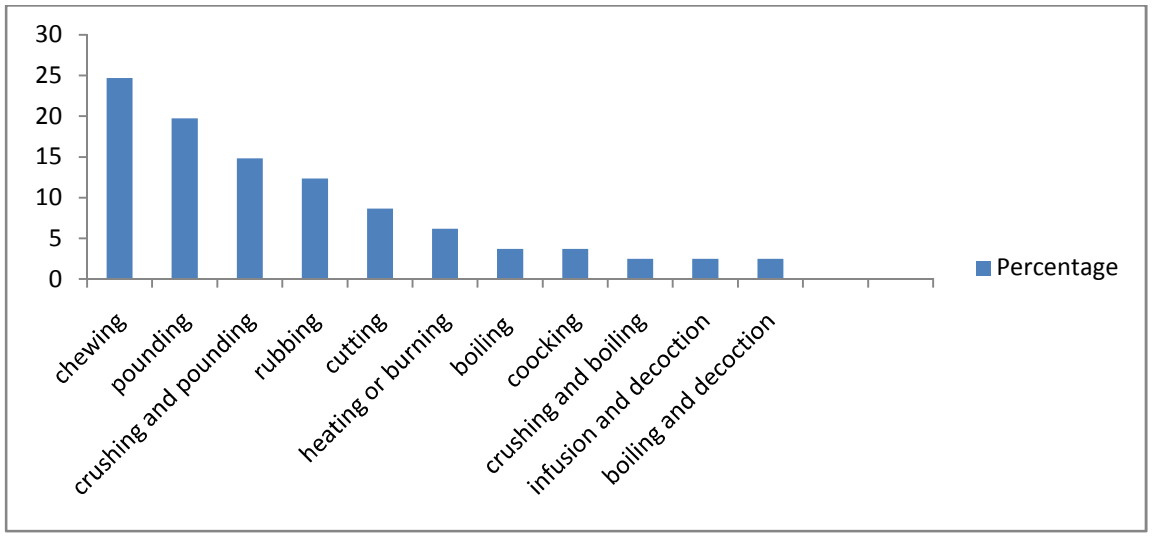


Figure 10 Methods of preparations of medicinal plants used to treat human ailments

The local indigenous people use different forms for remedy preparation to treat livestock disease. The techniques involved in the preparations are crushing and pounding, pounding and powdering and pounding. Crushing and pounding cover (50%), pounding (37.5%) and powdering (12.5%). (Figure 11). For example, in the preparations of remedies leaves of *Vernonia amygdalina* and *Croton macrostachyus* crushed, pounded and mixed to treat intestinal parasites and leaves of *Maesa lanceolata, Croton macrostachyus* and *Vernonia amygdalina* powderd and mixed to treat milk production shortages of the livestock.

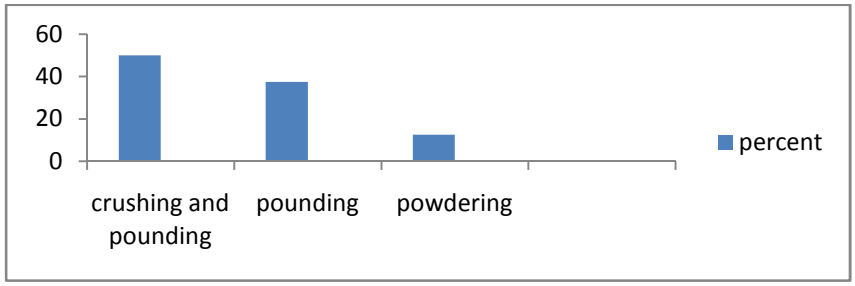


Figure 11 Methods of preparations of medicinal plants in ethnoveternary medicine

The local people apply different methods of remedy preparations to treat the ailments of both human and livestock. The forms of preparations are pounding (22.54%) followed by chewing (19.72%), crushing and pounding (19.72 %) and the rest are indicated in (Figure 12). The result indicated that the common methods of preparations are pounding, chewing and crushing and pounding.

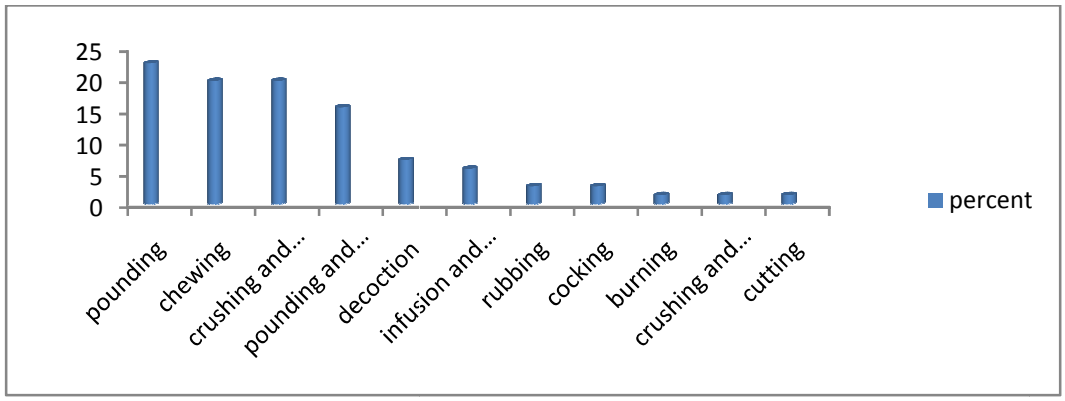


Figure 12 Methods of preparations of both human and livestock medicinal plants

In the collection of data concerning the preparation of medicine for human ailment treatment, informants have reported various skills associated with herbal preparation. These include plant composition (whether single or combined), condition of plant material used (fresh or dry) and methods of preparation. The result showed, most remedies were prepared from a single plant (88.77% %) and preparation from combined plant species was about 11.23% (Figure 13). The result is in agreement with the findings of Dawit Abebe (1986) and Debela Hundie (2001) in which the single plant preparation were reported to be high and disagrees with the work of Mirutse Giday (1999) in which the combined plant materials were reported to have high proportion in herbal preparation.

The findings in the forms of medicinal plants used indicate that medicinal plants used in fresh forms account for 74.52% of the total plants and 25.48% were used in dry forms (Figure 13). The results show that the local people used the fresh forms of medicinal plants than the dried one. The remedies in the fresh form are considered more powerfull than dried one as informants said. Harvesting the fresh plant parts minimizes the chances of preservation for later use.

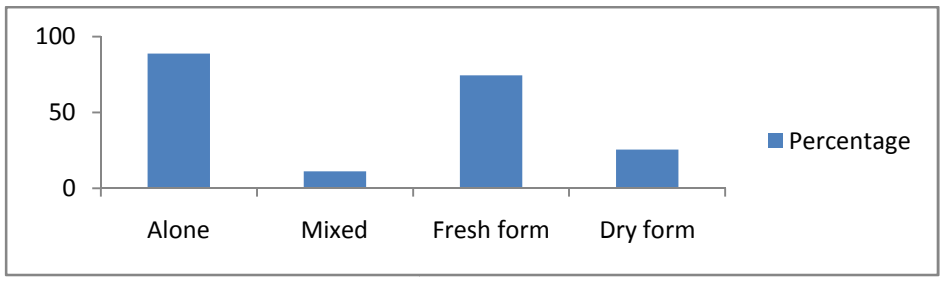


Figure 13 Forms of use and methods of preparation of human medicinal plant

Forms of applications of the ethnoveternary medicines also like that of humans the fresh forms of remedy preparation is dominant one (88.89%) followed by dry forms (11.11%). For example leaves of *Vernonia amygdalina* crushing and painting on the body of animals are used to treat parasitic ticks on the skin of animals.

The fresh forms of harvesting medicinal plants for remedy preparations are the same to that of human and livestock which cover 72.09% and dry forms (27.91%). In the preparations of remedy the medicine prepared without mixing (alone) is also the same to that of human and livestock remedy preparations which covers 80.95% and prepared by mixing is 19.05% (Figure 14).

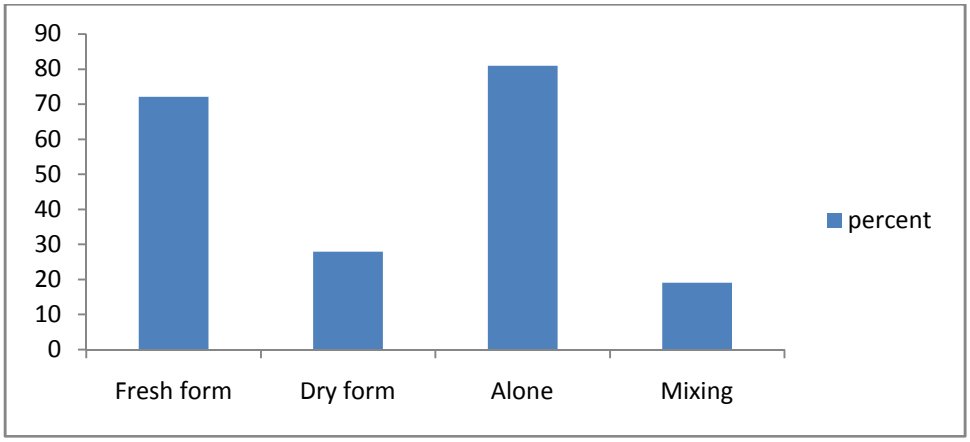


Figure 14 Forms and preparation of both human and livestock medicinal plant

## 5.10 Routes of administration

In the study area, medicinal plants are applied through different routes of administration. Oral administration covers 53%, nasal 6%, dermal application 40% and through ear 1.26% (Figure 15). Oral administration covers the largest percentage followed by dermal application. These findings agree with the findings of Etana Tolosa (2007), Ermias Lulekal (2005) and Endale Amenu (2007). That indicated oral administration is common one.

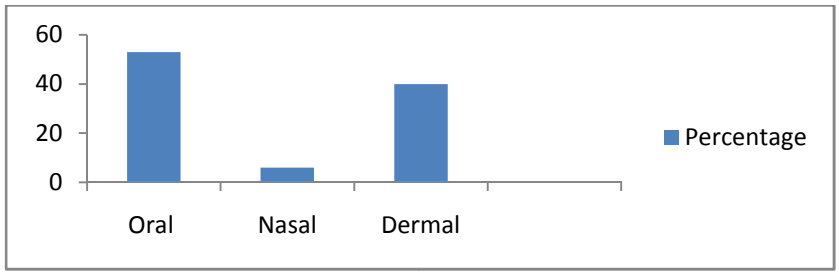


Figure 15 Routes of administrations of medicinal plants used to treat human ailments

Based on the nature of ailments, the local people applied different methods of remedy through different routes of administrations. Internal applications provided through oral administrations. Allowing the animals to swallow is the preffer method cover about (80%) drunk followed by dermal (20%) painting application. External application is provided by painting on the body of animals (Figure 16).

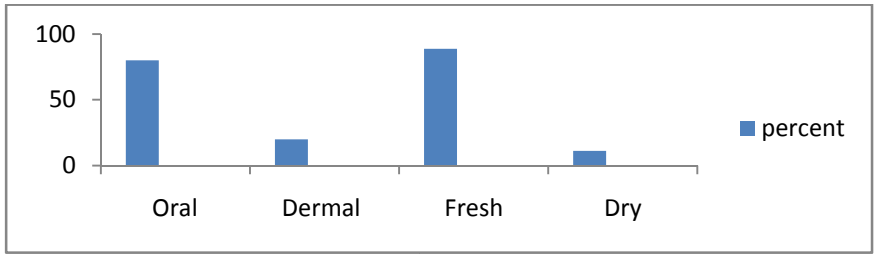


Figure 16 Routes of Administrations and forms used in ethnoveternary medicines

Oral applications is the dominant mode of administrations in all cases of medicinal plant use to treat diseases accounting for 71.43% followed by dermal (20.63%) and nosal (7.94%) (Figure 16).

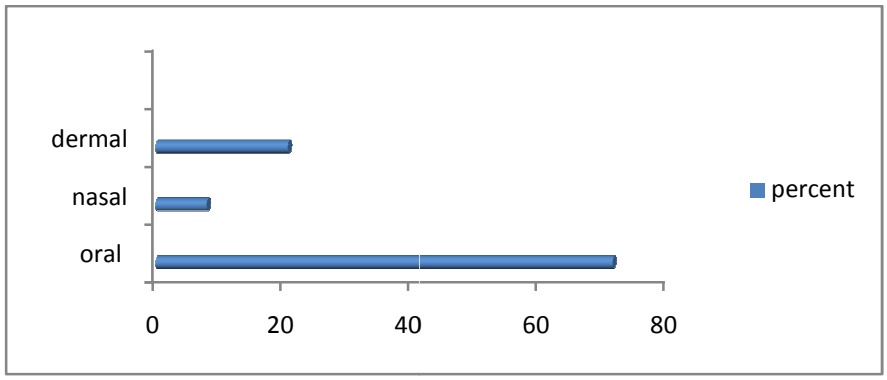


Figure 17 Routes of administrations of both human and livestock medicinal plants.

## 5.11 Dosage used

The local healers used various units of measurement such as finger length for root and stem bark, pinch for powdered plant parts, numbers for leaves, seeds, fruits and flowers, cup for decoction and infusion for plant parts, were used to estimate and fix the dosage of the medicine. The healers believe the effectiveness of the traditional medicines but the measurements used to determine the dosages are not standardized and doses given depend on the age, physical fitness, stage of illness, pregnancy and presence or absence of any disease other than the disease to be treated. If the dosage is more than the treated person can handle milk is added to minimize the power of the medicine. The absence of adverse effects of traditional medicines was frequently mentioned by the healers. The traditional healers indicated that they use antidotes for any adverse effect caused by some medicinal preparation.

## 5.12 Applications of medicinal plants

The traditional healers prepared medicinal plants in different ways and applied it in different methods to the patients. Drinking accounts for 29.76%, painting for 26.19%, chewing and swallowing for 20.24%, put on for 10.71%, smelling for 5.95%, smoking for 2.38% and tied on for 4.76 %. The findings show that internal ailments were commonly treated by drinking, chewing and swallowing. Skin infections like snake bite were treated by rubbing and painting on the infected parts. Ailments like jaundice and pneumonia were treated by crushing and pounding, decoction and infution applied through oral administration. Headache was treated through nasal smell and evil eye through oral administration and different methods were used to the other ailments. For example, stems and roots of *Bersama abyssinica* are chewed or powders drunk against intestinal parasites. The local healer believed that one medicinal plant can treat many diseases by applying same or different parts of the plant (i.e. *Croton macrostachyus* and *Phytolacca dodecondra*) applied through drinking, dropping, put on, and chewing of leaves, root and stem bark to treat ailments like diarrhea, intestinal parasites, blood cloth and gonorrhea. In all cases, application through mouth in dominant.

## 5.13 Importance of medicinal plants

### 5.13.1 Informant consensus

In the study area some medicinal plants are more known by member of the community than others. For example, *Datura stramonium, Ocimum urticifolium*, *Prunus africana*, *Allium sativum, Phytolacca dodecondra, Dovyalis caffra, Catha edulis* and *Solanum incanum* cited by 59, 59, 51, 49, 49, 41, 41 and 41 informants respectively (Table 10). The popularity of these medicinal plants is due to the effectiveness of the species treating heah infection, wound, fibrile illness, typhoid, intestinal parasites and amoeba by traditional medicine than modern medicine.

Table 10 Medicinal plants cited by greater than 40% of the informants

| **Plant species** | **Number of informants** | **Percent** |
|---|---|---|
| *Datura stramonium* | 59 | 73.75 |
| *Ocimum urticifolium* | 59 | 73.75 |
| *Prunus africana* | 51 | 63.75 |
| *Allium sativum* | 49 | 61.25 |
| *Phytolacca dodecandra* | 49 | 61.25 |
| *Dovyalis caffra* | 41 | 51.25 |
| *Catha edulis* | 41 | 51.25 |
| *Solanum incanum* | 41 | 51.25 |
| *Ocimum jamesii* | 39 | 48.75 |
| *Flacourtia indica* | 39 | 48.75 |
| *Juniperus procera* | 38 | 47.5 |
| *Rumex nepalensis* | 37 | 47.5 |
| *Eucalyptus citriodora* | 37 | 47.5 |
| *Orobanche ramosa* | 37 | 47.5 |
| *Acokanthera schimperi* | 35 | 43.75 |
| *Cucurbita pepo* | 35 | 43.75 |
| *Zingiber officinale* | 35 | 43.75 |
| *Momordica boivinii* | 35 | 43.75 |
| *Stephania abyssinica* | 34 | 42.5 |
| *Ficus sur* | 34 | 42.5 |

As shown in table 10, *Datura stramonium* and *Ocimum urticifolium* were cited by 59 informants to treat head infection and fibrill illness, *Juniperus procera* was cited by 38 informants to treat pneumonia and nasal problems and, also *Dovyalis caffra* and *Solanum incanum* cited by 41 informants for the treatment of snake bite are the most conspicouse medicinal plant species. The popularity of medicinal plants in the area is based on the effectiveness of the species to treat the ailments and due to the abundance of the plant in the area for easy access. Even if some local people have similar knowledge towards the medicinal values of some plants, some of them have limited knowledge. That is why some of the medicinal plants were relatively identified by fewer informants like (eg. *Vernonia amygdalina*, *Stephania abyssinica, Withania somnifera* and *Arundo donax)* having informant consensus of 37.5%, 42.5%, 18.75, and 21.25% respectively (Appendix 5). When it is compared with *Datura stramonium and Ocimum urticifolium* which are familiar to most of the informants (73.75%) have less medicinal value for the local people than others having high informant consensus value. But, it does not mean that it was not used by the local people rather still given by traditional healers.

## 5.13.2 Informant consensus factors

The diseases in the study area have been grouped in to different categories based on the conditions of the disease and treatment resemblance. The medicinal plants that were presumed to be effective in treating a certain disease had higher ICF values, which indicated that these diseases were more common than those with low ICF (Table 11).

Table 11 Informant consensus factor by categories of diseases in the study area

| **Category** | **Species** | **Use citations** | **ICF** |
|---|---|---|---|
| Rabies, poisoning and snake bite | 5 | 166 | 0.98 |
| Evil spirit and evil eye | 4 | 112 | 0.97 |
| Skin and head infections | 10 | 121 | 0.93 |
| Common cold, asthma, nasal blooding and fibril illness | 10 | 119 | 0.92 |
| Malaria, vomiting and typhoid | 11 | 82 | 0.88 |
| Wound and body swelling | 19 | 109 | 0.83 |
| Intestinal parasite | 19 | 72 | 0.75 |
| Pneumonia and jaundice | 15 | 39 | 0.63 |

The ailments rabies, poisoning and snake bite scored the highest value (0.98) followed by evil spirit and evil eye where scored the second highest value (0.97) and skin and head infections scored the third highest value (0.93) (Table 11). This indicates that informants use relatively few taxa to manage specific disease conditions as well as consistency in the use of plant species. Medicinal plants used to treat those ailments were more popular and effective to cure the ailments and the ailments are more common than the others in the area. Informants reported that, they would not need modern medicine for those diseases treatment rather they used traditional medicinal plants. Low value of ICF indicates that the informants disagree on taxa to be used in the treatment within a category of illness. In this study the lower ICF value scored for the category of diseases like Pneumonia and jaundice scored the lowest value (0.63). This category may be indicative for lack of consistency in the use of plant species in the study area and those medicinal plants are less popular and known by specific healers and rare occurrence of the disease and the disease are treated mainly by healers.

### 5.13.3 Preference Ranking

#### 5.13.3.1 Human and Livestock

Some medicinal plants are more popular than the others. Different species prescribed to protect some diseases and people show preference of one medicinal plant over the other. Based on the information obtained from the informants, preference ranking of 5 medicinal plants that were reported or indicated for treating intestinal parasites (Godowu game) of human beings and pneumonia (Shombu naqarssa) of livestock was conducted after selecting of 8 key informants. The informants were asked to compare the given medicinal plants based on their knowledge of the medicinal plants to treat the illness and to indicate the effectiveness of medicinal plants in treating stomach problems by giving 5 for the most effective medicinal plant and 1 for the least effective medicinal plant (Table 12).

Table 12 Preference ranking of medicinal plants used to treating intestinal parasites in human

| **Informants labelled 1-8** | **Medicinal plants** | | | | |
|---|---|---|---|---|---|
| | *Vernonia amygdalina* | *Solanum incanum* | *Rumex nepalensis* | *Phytolacca dodecandra* | *Croton macrostachyus* |
| **$I_1$** | 4 | 3 | 1 | 5 | 2 |
| **$I_2$** | 2 | 5 | 3 | 1 | 4 |
| **$I_3$** | 5 | 2 | 3 | 4 | 1 |
| **I4** | 5 | 4 | 1 | 3 | 2 |
| **$I_5$** | 2 | 5 | 2 | 3 | 1 |
| **$I_6$** | 2 | 3 | 1 | 5 | 4 |
| **$I_7$** | 5 | 3 | 2 | 4 | 1 |
| **$I_8$** | 2 | 4 | 1 | 3 | 2 |
| **Total** | 27 | 29 | 14 | 28 | 17 |
| **Rank** | 3rd | 1st | 5th | 2nd | 4th |

The findings indicated that *Solanum incanum* ranked first and most effective medicinal plant to cure intestina parasites. *Phytolacca dodecandra* and *Vernonia amygdalina* ranked second and third most preferable medicinal plants in treating intestinal parasites of humans according to the informants. Fourth and fifth ranked medicinal plants (*Croton macrostachyus* and *Rumex nepalensis*) are least effective for treating the disease when compared with the others.

Table 13 Preference ranking of medicinal plants used to treating pneumonia in livestocks

| **Informants labelled 1-8** | **Medicinal plants** | | | | |
|---|---|---|---|---|---|
| | *Ranunculus multifidus* | *Clerodendrum myricoides* | *Ricinus communis* | *Withania somnifera* | *Cucumis prophetarum* |
| **$I_1$** | 5 | 2 | 3 | 4 | 1 |
| **$I_2$** | 3 | 2 | 1 | 5 | 4 |
| **$I_3$** | 4 | 3 | 1 | 2 | 5 |
| **$I_4$** | 5 | 1 | 4 | 4 | 3 |
| **$I_5$** | 2 | 3 | 4 | 5 | 1 |
| **$I_6$** | 5 | 1 | 2 | 4 | 3 |
| **$I_7$** | 4 | 2 | 3 | 5 | 1 |
| **$I_8$** | 5 | 4 | 4 | 3 | 1 |
| **Total** | **33** | **18** | **22** | **32** | **19** |
| **Rank** | **1st** | **5th** | **3rd** | **2nd** | **4th** |

The finding indicated that *Ranunculus multifidus* ranked first as the most effective medicinal plant to cure pneumonia in livestock. *Withania somnifera* and *Ricinus communis* ranked second and third respectively as the most preferable medicinal plants in treating illness. *Cucumis prophetarum* and *Clerodendrum myricoides* ranked 4th and 5th respectively.

## 5.13.4 Paired Comparison

Jaundice (Magarto) a disease for which patients visited the traditional medicine practitioner rather than modern medicine. Seven key informants were selected to carryout pairwise comparisons of five medicinal plants and asked them to compare the given medicinal plants based on their knowledge to treat the illness and the value is summarized. It was found that *Stephania abyssinica* ranked first and most effective medicinal plant to cure the illness as compare with the others. The medicinal plants scored **2nd and 3rd** (*Albizia gummifera* and

*Podocarpus falcatus)* are better to treat the disease than those that of scored 4th and 5th (*Logenaria siceraria and Vernonia amygdalina)* (Table 14).

Table 14 Paired wise comparison of medicinal plants used to treating Jaundice.

| **Informants labelled 1-7** | **Medicinal plants** | | | | |
|---|---|---|---|---|---|
| | *Lagenaria siceraria* | *Podocarpus falcatus* | *Albizia gummifera* | *Stephania abyssinica* | *Vernonia amygdalina* |
| **$I_1$** | 1 | 2 | 3 | 4 | 1 |
| **$I_2$** | 1 | 1 | 2 | 4 | 0 |
| **$I_3$** | 2 | 2 | 2 | 3 | 2 |
| **$I_4$** | 0 | 3 | 1 | 4 | 1 |
| **$I_5$** | 3 | 0 | 2 | 4 | 1 |
| **$I_5$** | 3 | 1 | 4 | 3 | 2 |
| **$I_7$** | 2 | 1 | 2 | 3 | 1 |
| **Total** | 9 | 10 | 16 | 25 | 8 |
| **Rank** | **4th** | **3rd** | **2nd** | **1st** | **5th** |

## 5.13.5 Direct Matrix Ranking

People in the study area largely depend on the forests for various purposes such as medicinal, construction, charcoal production, fencing, shede, fire wood. To assess the relative importance and to check the popularity of these multifunctional plants, Direct Matrix Ranking was employed. During the study medicinal plants were found to be multipurpose in addition to medicinal values. In the ranking, six commonly reported multifunctional plant species and six use categories were involved with five informants. The informants evaluate the functionality of those multifunctional medicinal plants to the local people and indicated their scores for each medicinal plants with each other (5 best, 4 very good, 3 good, 2 less, 1 least used). Finally the function of the plants by each category summed up, evaluated and ranking takes place (Table 15).

Table 15 Direct Matrix Ranking of 6 plant species by 5 informants based on six use categories. Values indicate total score for 5 informants.

| **Use categories** | **Medicinal plants** | | | | | |
|---|---|---|---|---|---|---|
| | *Eucalyptus citriodora* ($I_1$-$I_5$) | *Croton macrostachyus* ($I_1$-$I_5$) | *Dodonaea angustifolia* ($I_1$-$I_5$) | *Juniperus* procera ($I_1$-$I_5$) | *Cordia Africana* ($I_1$-$I_5$) | *Podocarpus falcatus* ($I_1$-$I_5$) |
| Construction | 22 | 6 | 10 | 24 | 24 | 19 |
| Charcoal | 26 | 7 | 17 | 12 | 18 | 25 |
| Fencing | 25 | 10 | 9 | 23 | 22 | 14 |
| Firewood | 29 | 6 | 26 | 15 | 19 | 10 |
| Medicinal | 19 | 30 | 13 | 6 | 19 | 18 |
| Shede | 19 | 19 | 5 | 13 | 21 | 28 |
| Total | 140 | 78 | 80 | 93 | 123 | 114 |
| Rank | **1st** | **6th** | **5th** | **4th** | **2nd** | **3rd** |

The finding indicated that *Eucalyptus citriodora* ranked first and it is the most preferred plant by local people for various uses. *Cordia africana and Podocarpus falcatus* scored second and third. This shows that the three trees are more preferable than *Juniperus procera, Dodonaea angustifolia and Croton macrostachyus. Cordia africana* was more threatend than the others in the study area due to over harvesting problems but some trees are protected under WGCF. *Podocarpus falcatus, Juniperus* procera and *Eucalyptus* species cultivated and protected under this college. But all of the species, their long term survival is under questions, because the livelihood of the society totally dependent the species for the above usages.

## 5.14 Knowledge of local community on traditional medicinal plants

Sixty seven informants (84%) reported remedies for 61 ailments. Of them 57 (85%) are males and ten (15%) are females, which indicated that most people continue to use traditional systems of health care. However, in many cases, it is also attributable to the widespread belief in the effectiveness of many traditional therapies. The female informants reported remedies to diseases associated to children such as 'miche', Fibril illness 'Godowu dhiba' (stomach disorder), tonsillitis and babies' sickness (loss of appetite). The male informants reported more number of remedies than the females. This is because the traditional knowledge in the family is passed from male parent to his first-born son according to the informants. I observed that female's medicinal plant knowledge was limited to the home garden medicinal plants because obviously those females were not allowed to go out of home and secrecy to transfer knowledge to females.

### 5.14.1 Traditional knowledge with respect to age

Table 16 Ages of informants in the study area.

| **Ages of informants** | **Informants number** | **Total medicinal plants reported** | **Average** |
|---|---|---|---|
| 18-37 ($1^{st}$ age group) | 19 | 53 | 3 |
| 38-57 ($2^{nd}$ age group) | 23 | 119 | 5 |
| 58-77 ($3^{rd}$ age group) | 26 | 273 | 11 |
| 78-97 ($4^{th}$ age group) | 12 | 73 | 6 |

The distribution of informants with respect to age classes in the study area shows that, the majority of knowledgeable people are found between the ages of 58-77 or $3^{rd}$ age group. Of them 23 were male and 3 were female. The numbers of medicinal plants reported by them are more than from the first, second and fourth age groups (Table 16). They also reported combination of multiple medicinal plants to treat an illness. This indicates that, they are more knowledgeable on traditional medicinal plants. This could have contributed for the identification of more medicinal plants and the associated medicinal plants use knowledge. This shows that the elders are rich with indigenous knowledge or more knowledgeable on traditional medicine practice. This finding is the same to that of Mirutse Giday (2001). I tried to ask some informants, why youngsters are not knowledgeable on traditional medicinal practices? The informants responded

that since live in a modern world, traditional medicines have more negative sides than modern medicine so we used modern medicine than traditional medicine. This confirms that young people do not have much knowledge compared with elders. That is an indication of decline of the knowledge of traditional medicine in addition to secrecy. This might be related to the disinterest of young generation on traditional medicine. The same result was documented in different parts of Ethiopia such as Debela Hunde *et al*. (2004), Teferi Gedif (2003), Tewolde Berhan G/Egziabher (1991 and Tizazu Gebre (2005) reported that the transfer of medicinal plant knowledge has been affected by modernization like access to modern education and health services.

### 5.14.2 Traditional knowledge with respect to education

Table 17 Education status of the informants in the study area

| **Education status** | **Number of informants** | **percent** |
|---|---|---|
| No formal education | 18 | 22.5 |
| 1-4 | 25 | 31.25 |
| 5-8 | 19 | 23.75 |
| 8-12 | 10 | 12.5 |
| >12 | 8 | 10 |

According to the data obtained from the study, more informants were not well educated (the largest percent from the total informants (53.75%). This indicates that non-educated informants handle much knowledge of traditional medicine than educated informants. This confirms that modern education limits the knowledge on traditional medicine.

### 5.14.3 Traditional knowledge transfer to the young

As the findings indicates that the highest ways of gaining knowledge on traditional medicinal plant is father (50%) followed by mother (12.5%) and brother (11.25%). The others contribute a little on knowledge of medicinal plant (Table 18). Informants siad that, boys have greater chance to gather knowledge on medicinal plants than girls because fathers have high interest to give their talent to their sons.

Table 18 Sources of knowledge on practicing of traditional medicine in the study area

| Sources | Number of informants | percent |
|---|---|---|
| Father | 40 | 50 |
| Mother | 10 | 12.5 |
| Brother | 9 | 11.25 |
| Sister | 5 | 6.25 |
| Friends | 7 | 8.75 |
| Other | 9 | 11.25 |

## 5.15 Conservation and threats to medicinal plants

### 5.15.1 Threats to medicinal plants

People-forest interaction is determined by the interaction in space and over time of biophysical and human factors. A study of such interaction needs to conceptualize the relationship between the driving forces of human induced changes, the processes and activities among them, and human behavior and organization (Guoren, 1998). In Wondo Genet wereda, according to interviewed result from the informants, human driving factors were recorded as the main threats to plant species in general and medicinal plants in particular. The main factors to loss of plant species in the study area are agricultural expansion in relation to population growth, fire, deforestation caused by boundary conflict between Sidama and Gujji people, firewood, charcoal, construction materials and cash crop expansions like *Catha edulis* and sugar cane (*Saccharum officinalum*) are considered as the major causes of loss of flora diversity.

According to elderly local informants, most of Wondo Genet area was covered with forests until about the 1920s. However, high deforestation rates over the years have left only highly disturbed remnant forests which are now confined to the mountain slopes. A limited area of plantation forests that belong to Wondo Genet Collage of Forestery (WGCF) and the former Munessa-Shashemene State Forest Development Project (established in 1969) also exist in similar locations as natural forests. On the other hand, trees have been often maintained (and sometimes planted) on farmlands and farm boundaries. Scattered trees are found on crop lands and parkland type of agroforestry systems. While a variety of fruit trees and shrubs and cash tree crops (*e.g. Mangifera indica*, *Coffea arabica*, *Persea americana*, *Prunus persica*, *Rhamnus prinoides*, *and*

*Catha edulis*) found around the homegardes, the dominant species in the parklands include *Cordia africana*, *Albizia gummifera*, *Croton macrostachyus*, *Ficus* spp. and *Milletia ferruginea* (WGARDO, 2008).

During field observations, it was observed that people collect fire wood from the forest by cutting shrubs and trees from the forest and the considerations of the people to the floral diversity is low. The loss of floral diversity in Wondo Genet Wereda still takes place; the Wereda administration must take care by collaboration works with WGCF. According to the traditional healers, nowadays agricultural expansion in relation to population growth, deforestation caused by boundary conflict between Sidama and Gujji Oromo people, cash crop expansion and fire are the main causes of loss of plant diversities in the area and this makes difficult to collect medicinal plants in the area and it subjecte the local people to travel long distance to search medicinal plants.

Informants considered the most threating factors to be, agricultural expansions in relation to population growth (24.76%), firewood (19.94%), deforestation caused by boundary conflict between Sidama and Gujji Oromo people (18.65%) and cash crop expansions (16.39%), collection of construction materials (13.83%) and charcoal production (7.07%) (Figure 19).

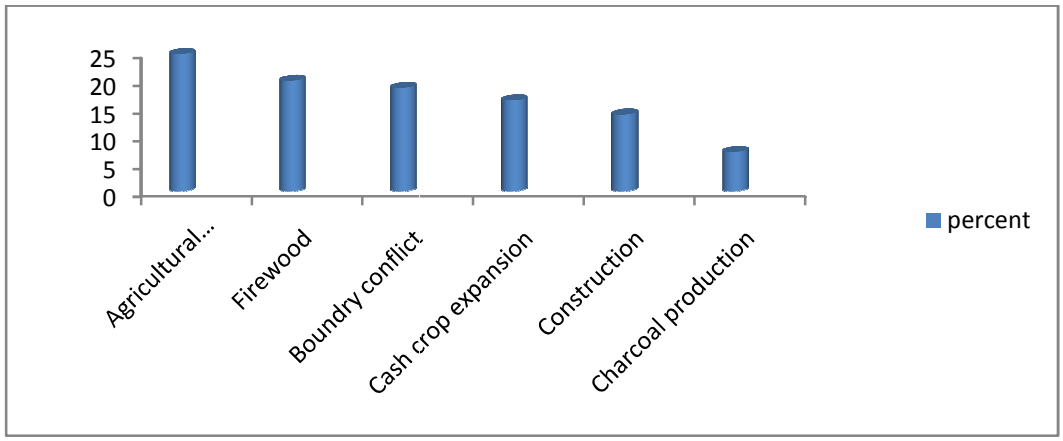


Figure 18 Threats to medicinal plants in the wereda

In general, the knowledge on medicinal plants become shrinking due to its secrecy, oral based knowledge transfer to close relatives, unwillingness of young generations and influence of modern educations. As a result gradual loss of indigenous knowledge on medicinal plants and

loss of floral diversity is takes place in the study area. All the above factors are happening due to lack of awareness on medicinal plants in the study area.

### 5.15.2 Conservation of medicinal plants

The conservation of traditional medicinal plants in the study area is limited except in areas dominated by *Juniperous- Eucalyptus and Podocarpous-Cordia* plantation, which were the only protected areas in Wosha Soyama and Abaye kebeles. Some traditional practitioners had started to conserve medicinal plants by growing them in homegardens. Included in this catecory were *Allium sativum*, *Artemisia abyssinica*, *Nicotiana tabacum*, *Ocimum lamiifolium*, *Ruta chalepensis*, *Zingiber officinale, Cucurbita pepo, Momordica boivinii, Momordica foetida, Catha edulis, Citrus limon, Rhamnus prinoides, Coffea arabica, Citrus sinensis* and *Carica papaya.*

The other conservation mechanism of medicinal plants in the study area is Wondo Genet Essential Oil Research Center (WGEORC). Currently the center is under Ethiopian Agricultural Research Organization (EARO). It owns over 80 hectares of land which was about four hectares when it was started 50 years ago.

The total land of the organization is 80 hectares, of this plantation forest covers 48.26 ha dominated by *Eucalyptus* spp. (i.e. *E. globulus* and *E. citriodora*) constitute 43.76 and 4.5 ha respectively. Fourteen hactare of land covered by three species of grasses (*Cymbopogon wintranus, Cymbopogon citratus* (lemon grass) and *Cymbopogon martinii* (palmaroza). The center has also given 2.6 ha of land to the Ethiopian Traditional Medicine Project under the Institute of Biodiversity Conservation (IBC) on which they plant and protect different plant species with medicinal values collected from different parts of the country. The center intends to cover eight ha lands with indigenous tree species of *Podocarpus falcatus, Hagenia abyssinica* and *Olea europia* subsp. *cuspidata* among others for which it is preparing seedlings currently (WGEORC head office personal communication).

# 6 CONCLUSION

Eight five medicinal plants species were collected and recorded from Wendo Genet Wereda. The Wereda is relatively rich in medicinal plant diversity. The medicinal plants are distributed in 79 genera and 44 families. Of these, 54 plant species were noted to treat human ailments, eight plant species for livestock ailment treatment and 23 plant species for both human and livestock health treatment. In the study area, 44 different human ailments and 18 livestock ailments were recorded that were reported by informants as human and livestock health problems. From the collected and identified medicinal plants, 70 plant species were collected from the wild and 15 plant species from the homegardens. Some medicinal plants are more preferable than the others in the study area to cure the ailments like pneumonia, jaundice, rabies, skin infection, snake bite, evil eye, malaria, fibril illness, intestinal parasites and typhoid.

Shrubs were found to be dominant traditional medicinal plant remedies in the study area followed by herbs, trees and climbers. Leaves were also found to be the most harvested plant parts for the preparation of the remedies followed by bark and roots. In the preparation of medicines single plants were used to prepare the medicines to cure the diseases rather than mixing with each other. The routes of administration are mainly internal in which oral administration is the common one.

Like in other parts of Ethiopia, in Wondo Genet Wereda medicinal plants were threatened by different factors. Human driving factors were recorded as the main threats to plant species in general and medicinal plants in particular. The main factors to loss of plant species in the study area are agricultural expansion in relation to population growth, fire, deforestation caused by boundary conflict between Sidama and Gujji Oromo people, firewood, charcoal, construction materials and cash crop expansions like *Catha edulis* and sugar cane (*Saccharum officinarum*), are considered the major causes of loss of flora diversity. Other problems threatening medicinal plants are lack of awareness, secrecy, oral based knowledge transfer, unwillingness of young generation and influence of modern educations.

# 7 RECOMMENDATIONS

**Based on the research findings, the following recommendations are given:**

- Local people harvest plants from the forest for different purposes with little awareness of its threat, so awareness creation among the society must be done by agricultural workers in the wereda to ensure sustainable harvesting be practiced.
- The local communities of the study area need to involve in conservation and management of plants in general and medicinal plants in particular.
- The Wereda administration must involve in awareness creations on traditional healers to transfer their knowledge to the next generation without secrecy.
- The Wereda agricultural workers must involve in identifying medicinal plants and encouraging the local people to the cultivate medicinal plants in their homegardens.
- There is needed coordination of traditional healers at Wereda level that popularize their indigenous knowledge on medicinal plants and creat awareness on conservation.
- There is loss of indigenous knowledge in the Wereda, some traditional healers give much attention to the indigenous knowledge transfer and the others have little concern regarding the value of indigenous knowledge, so the Wereda administration must encourage the traditional healers by participating in awareness arising for the healers to minimize the loss of indigenous knowledge.
- Establishing Traditional Healers Associations by providing supports like land, fund and assistances for cultivations of medicinal plants in the Wereda would helps to conserve medicinal plants.
- Deforestation in Wondo Genet natural forests still takes place. So, the administrative body must take care.
- The concerned administrative body must involve in controlling of cash crop expansion.
- Wondo Genet has a wealth of medicinal plants for treatment of different diseases ranging from simple to fatal. All people are responsible for the protection and conservation of medicinal plants in particular and our flora in general.

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## Appendices

**Appendix 1** List of medicinal plants for treating human diseases, Habit: T-tree, Sh-shrub, H-herb, and Cl-climber.

| Scientific name | Family | Sidama name | Habit | Preparation and application | Diseases treated | Voucher Number |
|---|---|---|---|---|---|---|
| *Acokanthera schimperi* (A.DC.) Schweinf. | Apocynaceae | Qararo | Sh | Fresh leaves/stem barks crushed and pounded with water, filtered and drunk until recovery<br>Dry seeds tied on the neck for children | Gonorrhea<br>Amoeba<br>Evil eye | **St 34** |
| *Aloe* sp. | Aloaceae | Argissa | H | Fresh leaf latex taken orally | Intestinal parasites | **St 81** |
| *Artemisia abyssinica* Sch.Bip. | Asteraceae | Sunado hayiso | H | Fresh leaf crushed and pounded with water, filtered and drunk until recovery made | Malaria | **St 82** |
| *Argemone mexicana* L. | Papaveraceae | Wajo uta | H | Dry/fresh leaves crushed, pounded and filtered then infusion drunk in the middle of night | Diabetes | **St 65** |
| *Arundo donax* L. | Poaceae | Lemicho | Sh | Dry leaves crushed and pounded with water, and then drunk in the morning<br>Dry leaves crushed and pounded and then parted on the wound | Intestinal parasites<br>Wound | **St 72** |
| *Bersama abyssinica* Fresen. | Melianthaceae | Xewerako | T | Dry leaves burned and mixed with butter, then parted in open sun light | Skin infection | **St 29** |
| *Calpurnia aurea* (Ait.) Benth. | Fabaceae | Cekata | Sh | Fresh leaves pounded and painted on the head<br>Dry/fresh leafs pounded and putted on the wound or washed until recovery<br>Fresh leaves pounded and sprayed on the infected skin on sun light | Head infection<br>Wound<br>Skin infection | **St 25** |

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| *Carica papaya* L**.** | Caricaceae | Papaya | T | Fresh leaves are boiled with water and cooled then drunk in the morning<br>Dry/fresh seeds is pounded with water and drunk three times<br>Fresh fruit taken orally | Intestinal parasites<br>Malaria<br><br>Gastric illness | **St 35** |
| *Catha edulis* (Vahl.) Forssk. ex Endl. | Celastraceae | Cate | Sh | Dry/fresh roots crushed, boiled, filtered, cooled and drunk until recovery | Amoeba | **St 71** |
| *Citrus limon* (L.) Burm.F. | Rutaceae | Lomee | Sh | Fresh fruits juice are drunk | Blood pressure | **St 56** |
| *Citrus sinensis* (L.) osb. | Rutaceae | Burtukane | Sh | Fresh fruits juice are drunk | Gastric illness<br>Common cold | **St 58** |
| *Commelina benghalensis* L. | Commelinaceae | Lalunxe | H | Leaf/stem Latex rubbed on infected part | Skin infection | **St 39** |
| *Cordia africana* Lam. | Boraginaceae | Wadicho | T | Fresh stem bark chewed | Teeth problem and sudden sickness | **St 33** |
| *Clutia abyssinica* Jaub. And spach. | Euphorbiaceae | Binjile | H | Fresh roots chewed<br>Fresh leaves crushed and pounded, the powder sprayed on the affected part | Toothache<br>To kill cockroach and bug | **St 51** |
| *Cucurbita pepo* L. | Cucurbitaceae | Baqula | Cl | Dry seeds are cocked and eaten in the morning. | Tape worm and Ascaries | **St 84** |
| *Cynoglossum coeruleum* (Hochst.ex.A.rich.) | Boraginaceae | Hifaticho | H | Fresh roots chewed and sprayed on swollen part | Body swelling | **St 22** |
| *Datura stramonium* L. | Solanaceae | Banje | H | Fresh leaves pounded and parted on the head | Head infection | **St 80** |
| *Delonix regia* (Boj.ex Hook.) Raf. | Fabaceae | Mimi | T | Dry/fresh leaves crushed, boiled and filtered, then the decoction drunk in the middle of night | Diabetes | **St 83** |

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| | | | | Fresh leaf extract are parted on the wound | Acute bleeding Wound | |
| *Dovyalis caffra* (Hook.f and Harv.) Hook.f. | Flacourtiaceae | Faranjete shisho | Sh | Fresh roots chewed and sprayed on the bite place | Snake bite | **St 67** |
| *Eucalyptus citriodora* Hook. | Myrtaceae | Shitote barzafe | T | Fresh leaves rubbed by hand and sniffed | headache | **St 31** |
| *Euphorbia ampliphylla Pox.* | Euphorbiaceae | Care | Sh | Latex mixed with butter taken orally | Intestinal parasites | **St 63** |
| *Euphorbia tirucalli* L. | Euphorbiaceae | Shuramo care | Sh | Latex dropped on the place | Skin cancer | **St 47** |
| *Ficus sur* Forssk. | Moraceae | Odako | T | Dry fruits pounded, powdered and then mixed with honey and taken orally twice<br>Dry fruits pounded, powdered and then parted on wound<br>Fresh stem barks crushed, pounded, boiled, and cooled, then drunk twice as tea | Malaria<br>Wound<br>Acute bleeding<br>Vomiting | **St 64** |
| *Flacourtia indica* (Burm. f.) merr. | Flacourtiaceae | Hagaala | Sh | Dry parts of the plants put in to the fire and smoking | Teeth problem<br>Evil eye<br>Headache | **St 42** |
| *Galinsoga quadriradiata* Ruiz and Pavon. | Asteraceae | Bexissa | H | Fresh flowers chewed and swallow orally | Tonsillitis | **St 15** |
| *Justicia schimperiana* (Hochst.ex A.Nees) T.Anders | Acanthaceae | Cikicho | Sh | Fresh Leaf heated on fire, then salt added and tied on the swollen part | Leg swelling | **St 21** |

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| *Kalanchoe petitiana* A. Rich | Crassulaceae | Hanculule e | H | Fresh Leaves heated with fire, then salt added and tied on the swollen part | Leg swelling | **St 30** |
| *Lactuca inermis* Forssk. | Asteraceae | Amessa | H | Fresh leaf/whole plant crushed and pounded is filtered and mixed with coffee and milk then drunk | Anemia | **St 54** |
| *Lagenaria siceraria* (Molina) Standl. | Cucurbitaceae | Surupha | Cl | Fresh seeds pounded with water, filtered and drunk until recovery in the evening<br>Dry seeds pounded with water, and then drunk two times a day | Jaundice<br>Intestinal parasites | **St 18** |
| *Leucas tomentosa* Gurke**.** | Lamiaceae | Balbalato | H | Fresh leaves mixed with *Ocimum urticifolium* chewed and swallowed in the morning | Intestinal parasites | **St 52** |
| *Melia azedarach* Forssk. | Meliaceae | Kiniin | Sh | Fresh leafs pounded with water, filtered, and then drunk in the morning for three days<br>Chewing and swallowing the juice of fresh root<br>Dry leaves are pounded and parted on | Malaria<br>Intestinal parasites<br>Wound<br>Acute blooding<br>Tetanus | **St 32** |
| *Momordica foetida* Schumach. | Cucurbitaceae | Herase | Cl | Whole part crushed and pounded, then filtered and drunk | Glandular swelling | **St 74** |
| *Momordica boivinii* Baill. | Cucurbitaceae | Kiree | Cl | Fresh roots chewed and swallowed after break fast<br>Fresh leafs crushed, pounded and filtered, then mixed with goat milk and drunk in the morning | Gonorrhea<br>Intestinal parasites | **St 10** |

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| *Moringa stenopetala* L. | Moringaceae | Shiferaw | Sh | Fresh leafs cocked as food and eaten | Diabetes | **St 69** |
| *Ocimum jamesii* Sebald. | Lamiaceae | Ambibisha | Sh | Fresh leaves rubbed by hand and droplets are drunk and leaves painted on the body and sniffed | Fibril illness<br>Headache | **St 50** |
| *Ocimum urticifolium* L. | Lamiaceae | Machete xagicho | Sh | Fresh leaves rubbed by hand and droplets are drunk and leaves painted on the body and sniffed | Fibril illness<br>Headache | **St 36** |
| *Olea europea* subsp. *Cuspidata* (Wall.ex G. Don) Cif. | Oleaceae | Ejerssa | T | Dry/fresh branches used as tooth brush and chewed<br>Fresh leaves boiled and the infusion drunk in the morning | Teeth problem<br>Intestinal parasites | **St 70** |
| *Orobanche ramosa* L. | Orobanchaceae | Yemako | H | Fresh roots chewed | Toothache | **St 77** |
| *Podocarpus falcatus* (Thunb.) Mirb. | Podocarpaceae | Dagucho | T | Fresh stem barks boiled and filtered and then drunk in the middle of night for three days<br>Dry stem bark crushed and pounded then parted on the wound | Jaundice<br>Wound | **St 02** |
| *Pittosporum abyssinicum* Del. | Pittosporaceae | Bobantich o | T | Fresh stem bark sniffed | Headache | **St 17** |
| *Rhamnus prinoides* L'Herit. | Rhamnaceae | Xaddo | Sh | Fresh leaves rubbed on the infected skin | Skin infection | **St 46** |
| *Rhus glutinosa* A. Rich | Anacardiaceae | Oloncho | T | Dry/fresh stem bark boiled and decoction drunk | Vitamin shortage | **St 07** |
| *Rubia cordifolia* L. | Rubiaceae | Dumo | Cl | Fresh root chewed and sprayed on swollen part | Body swelling | **St 48** |
| *Rubus apetalus* Poir. | Rosaceae | Gora | Sh | Fresh leaves are chewed and sprayed on the swollen part<br>Fresh/dry leaves are pounded then either sprayed | Body swelling<br>Wound | **St 04** |

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| | | | | or tied on the wound | | |
| *Rumex abyssinicus* Jacq. | Polygonaceae | Shishone | H | Fresh roots pounded and boiled and then mixed with milk and drunk in the morning for two days<br><br>Dry roots chewed and swallowed | Amoeba<br>Intestinal parasites<br>Goiter | **St 43** |
| *Rumex nepalensis* Spreng. | Polygonaceae | Sharbicho | H | Fresh leaves heated on fire then fluids from the leaf are dropped in to the ear and putted in side<br>Dry/fresh root chewed and put on the swollen part | Ear problem<br><br>Body swelling | **St 26** |
| *Senna occidentalis* (L.) Link | Fabaceae | Hamash h aqa | Sh | Fresh leaves pounded and sprayed on bite place | Poisoning | **St 44** |
| *Sesbania sesban* (L.) Merr. | Fabaceae | Arbeti | Sh | Fresh/dry roots chewed and sprayed on the swollen part | Body swelling | **St 79** |
| *Sida ovata* forsk. | Malvaceae | Qirqixxe | Sh | Fresh leaves rubbed on infected skin<br>Fresh leaf pounded and mixed with the leaf of *Vernonia auriculifera* and parted on | Skin infection<br>Wound | **St 66** |
| *Solanum incanum* L. | Solanaceae | Borbodho | Sh | Fresh root chewed and swallowed<br><br>Fresh leafs are rubbed and inserted in to nose<br>Fresh fruits or leaves are rubbed on the part with the snake bite | Intestinal parasites<br>Amoeba<br>Nasal blooding<br>Snake bite | **St 37** |
| *Solanum nigrum* L. | Solanaceae | Xunayee | H | Fresh leaves cocked and eaten as vegetables | Intestinal parasites | **St 19** |

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| *Stephania abyssinica* Dillon and A.Rich. | Menispermaceae | Kalaalaa | H | Fresh roots chewed and the juice swallowed<br>Fresh leaves rubbed by hand and droplets rubbed on the skin<br>Fresh and whole parts crushed, pounded, then infusion and decoction drunk on the evening<br>Fresh stem chewed and extracts swallowed | Sudden sickness<br>Skin cancer<br>Jaundice<br>Cough | **St 11** |
| *Toddolia asiatica* (L.) Lam. | Rutaceae | Harangama | Sh | Fresh roots chewed and swallowed in the morning and rubbed in to the swollen part | Glandular swelling<br>Body swelling | **St 45** |
| *Vernonia auriculifera* Hiern | Asteraceae | reejje | Sh | Fresh roots chewed and sprayed on swollen part<br>Fresh leaves crushed and pounded, then dremed on the wound<br>Dry/fresh leaves pounded and mixed with butter and pasted | Body swelling<br>Wound<br>Head infection | **St 40** |

**Appendix 2** List of medicinal plants for treating livestock diseases, Habit: T-tree, Sh-shrub, H-herb, and Cl-climber.

| **Scientific name** | **Family** | **Sidama name** | **Habit** | **Preparation and application** | **Diseases treated** | **Voucher Number** |
|---|---|---|---|---|---|---|
| *Achyranthes aspera* L. | Amaranthaceae | Nole | H | Fresh leafs are pounded with water and drunk<br>Fresh root are pounded with water and drunk in the morning | Stomach problem<br>Pneumonia | **St 08** |
| *Antiaris toxicaria* Lesch. | Moraceae | Dimbicho | T | Dry/fresh stem bark is pounded and powdered then mixed with milk and given orally | Rabies | **St 27** |
| *Dodonaea angustifolia* L.f. | Sapindaceae | Itancha | T | Fresh leafs are crushed and pounded with water then leaf extract given orally and pounded leafs are painted on the body | Ecto-parasities | **St 14** |
| *Ehretia cymosa* Thonn. | Boraginaceae | Gidicho | T | Fresh stem bark crushed, pounded and mixed with water and drunk | Stomach problem | **St 59** |
| *Hibiscus crassinervius* Hochst.ex.A.Rich. | Malvaceae | Woranticha | H | Whole plant parts are crushed and pounded then given orally in the morning | Worantote dhiba | **St 78** |
| *Hypoestes forskaolii* (Vahl) R.Br. | Acanthaceae | Xexxe | H | Fresh root is pounded with water and given orally | Stomach problems | **St 57** |
| *Millettia ferruginea* (Hochst.) Bak. | Fabaceae | Hengedicho | T | Fresh stem bark is crushed and pounded with water and given orally and painting on the body | Ecto-parasities | **St 60** |
| *Nuxia congesta* R.Br. ex Fresen. | Loganiaceae | Burcanna | T | Fresh leaves are pounded with water and given orally | Stomach problem | **St 13** |

**Appendix 3** List of medicinal plants for treating both human and livestock diseases, Habit: T-tree, Sh-shrub, H-herb, and Cl-climber.

| **Scientific name** | **Family** | **Sidama name** | **Habit** | **Preparation and application** | **Diseases treated** | **Voucher Number** |
|---|---|---|---|---|---|---|
| *Allium sativum* L. | Alliaceae | Wajo tuma | H | Bulbs are mixed with *Zingiber officinale* and chewing and swallowing<br>Seeds are mixed with *Zingiber officinale and Nicotiana tabacum* then pounded and given through mouth<br>Bulbs are chewed and swallowed in the night and sleeping<br>Bulbs are pounded with water and given orally in the morning | Common cold (Human)<br>Common cold (Livestock)<br><br>Typhoid<br>Malaria (human)<br>Pneumonia (livestock) | **St 83** |
| *Albizia gummifera* Oliv. | Fabaceae | Galcaca | T | Fresh stem bark is crushed, pounded and boiled, after cooling the decoction part is drunk in the middle of the night for human and in the morning for livestock<br><br>Fresh stem bark is crushed, pounded and boiled, after cooling the decoction part mixed with milk is drunk in the middle of night | Pneumonia a (both)<br>Cough (both)<br><br>Jaundice (human) | **St 73** |
| *Coffea arabica* L. | Rubiaceae | Bunna | Sh | Whole parts are burned and smoking<br>Seeds are cocked and chewed and swallowed<br><br>Dry Cocked seeds are pounded and given nasal | Malaria (human)<br>Gastric illness<br>Headache (human)<br>Sudden sickness (both) | **St 85** |

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| *Cucumis prophetarum* L. | Cucurbitaceae | Basu baqula | Cl | Dry fruits are pounded and powdered then mixed with water and milk then drunk in the morning<br>Dry fruits are pounded and powdered then mixed with water and the decoction parts drunk in the morning until recovery<br><br>Whole plant parts/Dry seeds are pounded and powdered then mixed with water and given orally | Intestinal parasites (human)<br>Pneumonia (human)<br>Gonorrhea (human)<br>Glandular swelling (human)<br>Stomach problem (livestock)<br>Pneumonia (livestock) | |
| *Clemantis hirsuta* var. *hirsuta.* | Ranunculaceae | Fide | H | Leafs/stem bark mixed with leafs of *Plectranthus ingiarius* then pounding and filter and drunk<br>Stem is chewed and swallowed | Breast cancer (both)<br>Tonsillitis (human) | **St 09** |
| *Clerodendrum myricoides* (Hochst.) Vatke. | Lamiaceae | Soke | Sh | Dry/fresh roots are crushed, pounded and boiled with water then cooled and the decoction part is drunk in the morning until recovery<br>Fresh stem bark smelling nasal<br>Fresh root is chewed and put on<br><br>Leaves are pounded and powdered then spray to the eye | Pneumonia (both)<br><br><br>Headache (human)<br>Body swelling (human)<br>Eye problems (human) | **St 55** |
| *Croton macrostachyus* Del. | Euphorbiaceae | Masinna | T | Dry/fresh leaves pounded, powdered and put on. | Wound cancer (human) | |

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| | | | | From petiole or leaf Latex dropped on<br><br>Fresh stem bark crushed, pounded with water and filtered, then drunk after breakfast in the morning until recovery<br><br>Fresh leaf crushed, pounded and filtered, then drunk | Acute blooding &Tetanus (human)<br>Intestinal parasites, Amoeba, Gonorrhea and Pneumonia (human)<br>Stomach problem (livestock) | |
| *Delbergia lactea* Vatke. | Fabaceae | Batissa | Sh | Fresh leafs are pounded with water then drunk and the extract are painting on the body | Evil eye (both) | **St 24** |
| *Ekebergia capensis* Sparrm. | Melianthaceae | Godicho | T | Dry seed is chewed and swallowed<br><br>Dry seeds are chewed and given through nose | Intestinal parasites (human)<br>Cough (livestock)<br>Gadansu dhiba (livestock) | **St 16** |
| *Juniperus procera* Hochst. ex. Engl. | Cuppressaceae | Honcho | T | Dry seeds are a pounded and powdered then mixed with tea, and then drunk and smell through nasal<br><br>Fresh leaves are crushed and pounded then mixed with butter given orally | Pneumonia<br>Nasal problem<br>Asthma (human)<br>Worantote dhiba (livestock) | **St 20** |
| *Maesa lanceolata* Forssk. | Myrsinaceae | Gowacho | Sh | Fresh leaves are rubbed on the place<br><br>Dry leaves are pounded with water and powdered then given orally | Skin infection (human)<br>Gadansu dhiba (livestock) | **St 23** |

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| *Nicotiana tabacum* L. | Solanaceae | Arado | Sh | Dry leaves are Pounded and powdered then drunk for livestock or smelling through nose for human | Common cold (livestock)<br>Headache (human) | **St 68** |
| *Plectranthus igniarius* (Schweinf.) Agrew. | Lamiaceae | Tontona | Sh | Fresh/dry leaves are pounded and mixed with butter then painting<br>Fresh leaves are pounded and given orally<br><br>Fresh leaves are pounded the painting | Skin infection (human)<br>Stomach problems (livestock)<br>Tick (livestock) | **06** |
| *Premna schimperi* Engl. | Lamiaceae | Udo | Sh | Dry/fresh stem used as teeth brush and chewed<br><br>Dry leaves are pounded with water and powdered then given orally | Teeth problem (human)<br>Worantote dhiba (livestock) | **St 76** |
| *Prunus africana* (Hook.f.) Kalkm. | Rosaceae | Garbicho | T | Dry stem bark is crushed, pounded and powdered then put on | Wound (both) | **St 28** |
| *Phytolacca dodecandra* L'Herit. | Phytolaccaceae | Haranjicho | Sh | Dry/fresh root is chewed and swallowing<br><br><br>Stem bark is putted on sun light then after drying chewed and fluid is swallowed for three days<br>Dry root is pounded and powdered then mixed with water and drunk after breakfast<br>Fresh/dry stem bark or leaf is crushed and pounded then | Bliharzia (human)<br>Intestinal parasites<br>Amoeba (human)<br>Pneumonia (human)<br>Stop pregnancy (human)<br>Black leg, Leeches, Anthrax, Fascioliasis, | **St 05** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | filter and given orally and painting on the body<br><br>Dry/fresh root is crushed, pounded and powdered then mixed with milk and given orally<br>Dry/fresh root is crushed and pounded with water then filter and drunk for four days (livestock) and two days for human | African horse sickness and Mastitis (livestock)<br>Rabies (both)<br><br>Stomach problems (both) | |
| *Ranunculus multifidus Forssk.* | Ranunculaceae | Umixagicho | H | Fresh leaves are pounded then infusion and the decoction part drunk in the morning until recovery<br>Fresh leaves are rubbed by hand and pouted inside the nose | Pneumonia (both)<br><br>Headache (human) | **St 53** |
| *Ricinus communis* L. | Euphorbiaceae | Qomboho | T | Fresh root crushed and pounded then, decoction is drunk in the night/morning<br>Fresh/dry roots chewed and spray on place | Pneumonia (both)<br><br>Body swelling (human) | **St 61** |
| *Ruta chalepensis* L. | Rutaceae | Sunkurtaa | H | Fresh leafs and stems are chewed and swallowed in the morning<br>Dry leaves are cocked as tea and drunk<br>Fresh leafs are pounded powdered and mixed with oil then drunk in the morning for three days<br>Fresh leaves are chewed and swallowed for Huma and pounding with water and given orally for livestock mixed with salt | Amoeba (human)<br><br>Vomiting (human)<br>Pneumonia (human)<br>Stomach problem (both) | **St 49** |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Urtica dioica* L. | Urticaceae | Lalesa | Cl | Whole plant parts crushed and pounded then decoction part are drunk in the morning three days<br>Dry/fresh leaves are crushed, pounded and filter then drunk and painting on the body | Gonorrhea (human)<br><br>Evil eye (both) | **St 03** |
| *Vernonia amygdalina* Del. | Asteraceae | Hecho | Sh | Fresh leaves are pounded with water and filtered and drunk in the morning<br>Fresh leaves are mixed with the leaf of croton macrostachyus and pounded and filter then given orally<br>Fresh leaves are crushed, pounded and boiling then infusion and decoction parts drunk in the morning<br>Fresh leafs are pounded with water then filter and drunk | Intestinal parasites (human)<br>Stomach problems (livestock)<br>Jaundice (human)<br><br>Malaria (human)<br>Intestinal parasites (human) | **St 41** |
| *Withania somnifera (*L.) Dunal. | Solanaceae | Bula | Sh | Fresh root is crushed and boiled then infusion is filtered and drunk in the morning for human until recovery and for four days for livestock | Pneumonia (both) | **St 75** |
| *Zingiber officinale* Rosc. | Zingiberaceae | Jaanjiiweello | H | Dry/fresh rhizome is mixed with salt and pounded then given orally<br>Rhizome is chewed or pounded and cocked as tea and drunk | Livestock Common cold<br>Human common cold | **St 84** |

**Appendix 4** List of plant species in the study area in addition to medicinal importance, Wondo Genet Wereda (Habit: T-tree, Sh-shrub, H-herb, and Cl-climber. Habitat: W-wild and HG- home garden. Uses: F-food, CI- cash income, Or-ornamental, FW-fire wood, SD-shedding, CR-construction and St-stimulant)

| **Scientific name** | **Family** | **Sidama name** | **Habitat** | **Habit** | **Functions** |
|---|---|---|---|---|---|
| *Justicia schimperiana* (Hochst.ex A.Nees) T.Anders | Acanthaceae | Cikicho | W | Sh | **Fn** |
| *Allium sativum* L. | Alliaceae | Wajo tuma | HG | H | **F** |
| *Achyranthes aspera* L. | Amaranthaceae | Nole | W | H | **FW** |
| *Rhus glutinosa* A. Rich | Anacardiaceae | Oloncho | W | T | **Fn, FW,SD** |
| *Acokanthera schimperi* (A.DC.) Schweinf. | Apocynaceae | Qararo | W | T | **F, FW,SD** |
| *Vernonia auriculifera* Hiern. | Asteraceae | reejje | W | Sh | **Fn, FW** |
| *Vernonia amygdalina* Del. | Asteraceae | Hecho | W | Sh | **Fn, FW** |
| *Artemisia abyssinica* Sch.Bip. ex A. Rich. | Asteraceae | Sunado hayiso | HG | H | **Or** |
| *Cordia africana* Lam. | Boraginaceae | Wadicho | W | T | **FW, CI, Fn, SD, CR** |
| *Ehretia cymosa* Thonn. | Boraginaceae | Gidicho | W | T | **FW, Fn, CR** |
| *Catha edulis* (*Vahl*.) Forssk ex Endl. | Celastraceae | cate | H G | Sh | **FW, CI, St** |
| *Carica papaya* L. | Caricaceae | Papaya | HG | T | **F, CI** |
| *Cucurbita pepo* L. | Cucurbitaceae | Baqula | HG | Cl | **CI** |
| *Juniperus procera* Hochst ex.Engl. | Cuppressaceae | Honcho | W | T | **CI, Fn, FW, SD, CR** |
| *Croton macrostachyus* Del. | Euphorbiaceae | Masinna | W | T | **FW, Fn, SD** |
| *Euphorbia tirucalli* L. | Euphorbiaceae | Shuramo care | W | Sh | **Fn** |
| *Euphorbia ampliphylla* Pox. | Euphorbiaceae | Care | W | Sh | **Fn, CR** |
| *Millettia ferruginea* (Hochst.) Bak. | Fabaceae | Hengedicho | W | T | **FW, Fn, CR, SD** |
| *Delonix regia* (Boj. ex Hook.) Raf. | Fabaceae | Mimi | W | T | **FW, Fn, SD** |

| | | | | | |
|---|---|---|---|---|---|
| *Albizia gummifera* Oliv | Fabaceae | Galcaca | W | T | **Fn, FW, SD, CR** |
| *Calpurnia aurea* (Ait.) Benth. | Fabaceae | Cekata | W | Sh | **Fn, FW, CR** |
| *Dovyalis caffra* (Hook.f and Harv.) Hook.f. | Flacourtiaceae | Faranjete shisho | W | Sh | **Fn, FW** |
| *Flacourtia indica* (Burm. f.) merr. | Flacourtiaceae | Hagala | W | Sh | **FW** |
| *Premna schimperi* Engl. | Lamiaceae | Udo | W | Sh | **FW** |
| *Clerodendrum myricoides* (Hochst.) Vatke | Lamiaceae | Soke | W | Sh | **FW** |
| *Nuxia congesta* R.Br. ex Fresen. | Loganiaceae | Burcanna | W | T | **FW, Fn, CR** |
| *Sida ovata* Forsk. | Malvaceae | Qirqixxe | W | Sh | **FW** |
| *Melia azedarach* Forssk. | Meliaceae | Kiniin | W | Sh | **F, FW, Fn, SD, CR** |
| *Ekebergia capensis* Sparrm. | Melianthaceae | Godicho | W | T | **Fn, FW, SD, CR** |
| *Ficus sur* Forssk. | Moraceae | Odako | W | T | **FW, Fn, F, CR, SD** |
| *Moringa stenopetala* L | Moringaceae | Shiferaw | W | Sh | **SD** |
| *Measa lanceolata* Forssk. | Myrsinaceae | Gowacho | W | Sh | **FW** |
| *Eucalyptus citriodora* Hook. | Myrtaceae | Shitote barzafe | W | T | **FW, CI, Fn, CR, SD** |
| *Olea europea subsp. cuspidata* (Wall. ex G. Don) Cif. | Oleaceae | Ejerssa | W | T | **FW, Fn, CR** |
| *Pittosporum abyssinicum* Del. | Pittosporaceae | Bobanticho | W | T | **Fn, FW** |
| *Arundo donax* L. | Poaceae | Lemicho | W | Sh | **Fn, CR** |
| *Podocarpus falcatus* (Thunb.) Mirb | Podocarpaceae | Dagucho | W | T | **FW, Fn, CR, SD** |
| *Rumex abyssinicus* Jacq. | Polygonaceae | Shishone | W | H | **F** |
| *Prunus Africana* (Hook.f.) Kalkam. | Rosaceae | Garbicho | W | T | **Fn, FW, CR, SD** |
| *Rubus apetalus* Poir. | Rosaceae | Gora | W | Sh | **F** |
| *Coffea arabica* L. | Rubiaceae | Bunna | HG | Sh | **St, FW, CI** |
| *Citrus limon* (L.) Burm.f. | Rutaceae | Lomee | HG | Sh | **CI** |
| *Ruta chalepensis* L. | Rutaceae | Sunkurtaa | HG | H | **Or** |

| | | | | | |
|---|---|---|---|---|---|
| *Citrus sinensis* (L.) osb. | Rutaceae | Burtukane | HG | Sh | **F** |
| *Toddolia asiatica* (L.) Lam. | Rutaceae | Harangama | W | Sh | **F** |
| *Rhamnus prinoides* L'Herit. | Rhamnaceae | Xaddo | HG | Sh | **CI** |
| *Dodonaea angustifolia* L.f. | Sapindaceae | Itancha | W | T | **FW, Fn, SD** |
| *Solanum nigrum* L. | Solanaceae | Xunayee | W | H | **F** |
| *Solanum incanum* L. | Solanaceae | Borbodho | W | Sh | **FW** |

**Appendix 5** Medicinal plants cited by less 43% of the informants

| | | |
|---|---|---|
| *Coffea arabica* | 34 | 42.5 |
| *Momordica foetida* | 34 | 42.5 |
| *Clutia abyssinica* | 34 | 42.5 |
| *Ricinus communis* | 33 | 41.25 |
| *Ruta chalepensis* | 33 | 41.25 |
| *Moringa stenopetala* | 33 | 41.25 |
| *Justicia schimperiana* | 32 | 40 |
| *Maesa lanceolata* | 30 | 37.5 |
| *Vernonia amygdalina* | 30 | 37.5 |
| *Podocarpus falcatus* | 30 | 37.5 |
| *Calpurnia aurea* | 29 | 36.25 |
| *Citrus sinensis* | 29 | 36.25 |

| | | |
|---|---|---|
| *Nicotiana tabacum* | 29 | 36.25 |
| *Carica papaya* | 29 | 36.25 |
| *Lagenaria siceraria* | 28 | 35 |
| *Leucas tomentosa* | 27 | 33.75 |
| *Urtica dioica* | 27 | 33.75 |
| *Kalanchoe petitiana* | 27 | 33.75 |
| *Premna schimperi* | 26 | 32.5 |
| *Toddolia asiatica* | 25 | 31.25 |
| *Clemantis hirsuta* | 25 | 31.25 |
| *Rubus apetalus* | 24 | 30 |
| *Croton macrostachyus* | 24 | 30 |
| *Cordia africana* | 22 | 27.5 |
| *Lactuca inermis* | 22 | 27.5 |
| *Flacourtia indica* | 19 | 23.75 |
| *Pittosporum abyssinicum* | 19 | 23.75 |
| *Albizia gummifera* | 19 | 23.75 |
| *Millettia ferruginea* | 19 | 23.75 |
| *Rubia cordifolia* | 18 | 22.5 |
| *Nuxia congesta* | 18 | 22.5 |
| *Clerodendrum myricoides* | 18 | 22.5 |
| *Galinsoga quadriradiata* | 18 | 22.5 |
| *Ranunculus multifidus* | 17 | 21.25 |

| | | |
|---|---|---|
| *Cynoglossum coeruleum* | 17 | 21.25 |
| *Rhus glutinosa* | 17 | 21.25 |
| *Arundo donax* | 17 | 21.25 |
| *Achyranthes aspera* | 17 | 21.25 |
| *Withania somnifera* | 15 | 18.75 |
| *Argemone mexicana* | 15 | 18.75 |
| *Delonix regia* | 15 | 18.75 |
| *Dodonaea angustifolia* | 15 | 18.75 |
| *Rhamnus prinoides* | 15 | 18.75 |
| *Ekebergia capensis* | 15 | 18.75 |
| *Commelina benghalensis* | 15 | 18.17 |
| *Melia azedarach* | 15 | 18.75 |
| *Olea europea* subsp.*cuspidata* | 15 | 18.75 |
| *Artemisia abyssinica* | 13 | 16.25 |
| *Rumex abyssinicus* | 13 | 16.25 |

**Appendix 6.** Semi-structured interview schedule employed in the research area.

1. Name _____ Sex _____ Age ____ Keble _____ Educational Stat_____
2. Health status and use of traditional medicinal plants
   - 2.1 What types of traditional medicines do you use? For how many times did you use it?
   - 2.2 What are the major human diseases in this area?
   - 2.3 What are the major live stock diseases in this area?
   - 2.4 What are the major human and livestock disease in this area?
   - 2.5 What are the symptoms of these diseases that you know so far?
   - 2.6 How do you prevent and control these diseases?
   - 2.7 How do you treat or get treatment the diseases that you know?
3. About the traditional plant medicines
   - 3.1 List the traditional medicine plants used to treat humans?
   - 3.2 Which traditional medicinal plants are used to treat livestock ailments?
   - 3.3 Which medicinal plants are used to treat human and livestock ailments?

| S.No | Types of medicinal plants | Disease treated | Source |
|---|---|---|---|
| | | | |

4. Where do the medicinal plants grow? (From where you get?
5. Which part of the plant is used as remedy? (Leaf, stem, root, flower, bark, fruit, seed, latex, or whole plant)
6. What is the method of preparation of the medicine? (Crushed and pounded, powdered, concoction, decoction, infusion, used alone or mixed with others)
   - 6.1 Form of the medicinal plant used
   - 6.1.1 In fresh form

6.1.2 In dry form

6.1.3 In fresh or dry form

6 Is there difference in dosage among age or sex groups? If yes, state for each?

7 Is the way of administration internal or external? If internal how?? Oral, nasal? If external how?

8 Have you ever heard any danger of using traditional medicine (side effect) if you say yes, where, when and how did the problem happen?

9 What solutions do people use to treat the side effects of the traditional medicines? (anti dote)

10 Which group of the community use the traditional medicines most and why?

11 List all the uses of a particular medicinal plant other than its medicinal value

12 What are the ways of transferring of knowledge of the healers to the next generation?

13 Are the medicinal plants easily accessible? If not why?

14 How does modernization interfere with traditional medicinal knowledge?

15 How do you preserve the traditional medicinal plant?

16 Is there any restriction or taboos in collection of medicinal plants?

17 Do the communities use only traditional medicine?

18 What are the threats to the medicinal plants

19 What is the status of using traditional medicine at the moment?

20 Are the traditional medicinal plants easily available?

21 Do the traditional healer use only a single traditional medicinal plant to prepare the remedies or by mixing with others?

22 At what time do the patients take the traditional medicine

23 Any other additional information

**Appendix 7** List of informants participated in ethnobotanical data collection

| Name | Sex | Age | Education status | kebele |
|---|---|---|---|---|
| Matiwos Ligamo* | M | 69 | Illiterate | Wosha soyama |
| Mulu Haji | F | 42 | 2 | Wosha soyama |
| Bariso Banata* | M | 71 | Illiterate | Wosha soyama |
| Kafala Dagne | M | 34 | 5 | Wosha soyama |
| Aba namaro Dafurssa * | M | 75 | Illiterate | Wosha soyama |
| Dagne Burako | M | 53 | 3 | Wosha soyama |
| Haji Eba* | M | 69 | 4 | Wosha soyama |
| Mesafint Ego | M | 68 | Illiterate | Wosha soyama |
| Dusha Naramo | M | 59 | 2 | Wosha soyama |
| Tedy Mubarek* | M | 32 | 10 | Wosha soyama |
| Addurre Korosso* | M | 71 | 3 | Wosha soyama |
| Lalimo Namaro | M | 56 | 1 | Wosha soyama |
| Namaro Naramo | M | 53 | 2 | Wosha soyama |
| Shure Nue* | M | 65 | 3 | Abaye |
| Jamaneh Nue* | M | 71 | Illiterate | Aruma |
| Matawe Hewiso* | F | 46 | 1 | Aruma |
| Yane Butune* | M | 83 | Illiterate | Kela 01 |
| Bruk Shure | M | 18 | 6 | Aruma |
| Matago Shure | M | 35 | 5 | Aruma |
| Elias Eyamo | M | 31 | 12 | Wosha soyama |
| Manadu Kajawa | F | 27 | 10 | Kela 01 |

| | | | | | |
|---|---|---|---|---|---|
| Masho | Lema | F | 36 | 8 | Wosha soyama |
| Bashure | Buna | F | 53 | 9 | Abaye |
| Buna | Burako* | M | 77 | Illiterate | Chuko |
| Teshome | Mesafint | M | 38 | 8 | Chuko |
| Almaz | Dobe | F | 5 | Illiterate | Abaye |
| Bonge | Borja | M | 57 | Illiterate | Abaye |
| Kassu | kibamo | M | 48 | 9 | Edo |
| Bexissa | Buna | M | 64 | Illiterate | Edo |
| Shaluko | Arfassa | M | 22 | 6 | Edo |
| Habtamu | Elias* | M | 42 | 3 | Abaye |
| Haile | Haji* | M | 39 | Collage | Wosha soyama |
| Masantu | Atoyee | F | 43 | 5 | Chuko |
| Tomas | Harqa | M | 27 | Collage | Abaye |
| Barisso | Banata | M | 68 | Illiterate | Abaye |
| Tongola | Hanfo | M | 26 | Collage | Edo |
| Qinadu | Batisso | F | 33 | 3 | Chuko |
| Abate | Shone | M | 36 | 10 | Chuko |
| Adane | Muktar | M | 72 | Illiterate | Abaye |
| Habtamu | Haile | M | 27 | 8 | Edo |
| Muluneh | Lema | M | 38 | 10 | Kela 01 |
| Usman | Shure | M | 82 | Illiterate | Kela 01 |
| Kafala | Adoye | M | 33 | Collage | Kela o1 |
| Jamal | Nuara | M | 89 | Illiterate | Chuko |
| Shuramo | Noe | M | 76 | Illiterate | Aruma |

| | | | | |
|---|---|---|---|---|
| Aba lexa Tasha* | M | 69 | Illiterate | Abaye |
| Shama Nugusse | M | 63 | 1 | Abaye |
| Mehamed Ahmed | M | 53 | 3 | Wosha soyama |
| Soyatu Naro | F | 64 | 2 | Aruma |
| Matawe Babiso | F | 44 | 6 | Abaye |
| Moxi Belguda | F | 25 | 8 | Kela 01 |
| Haile Eyamo | M | 59 | Collage | Chuko |
| Erdacho Eyamo | M | 81 | 1 | Chuko |
| Lidia Eias | F | 29 | Collage | Abaye |
| Shimale Argo | F | 34 | 3 | Edo |
| Nadamo Lalamo | M | 28 | 8 | Kela 01 |
| Marta Halchamo | F | 49 | 5 | Aruma |
| Dawit Amalo | M | 51 | 10 | Edo |
| Qemeriya Husen | F | 83 | 6 | Abaye |
| Birqe Haxiya | F | 63 | 2 | Abaye |
| Huriso Buna | M | 97 | Illiterate | Chuko |
| Danchile Kayamo* | F | 73 | 1 | Abaye |
| Hamiso Dido | M | 77 | 3 | Abaye |
| Yosef Merssa | M | 83 | 5 | Kela 01 |
| Chuche Gelfato | M | 78 | Collage | Kela 01 |
| Lansamo Lalade | M | 37 | 8 | Aruma |
| Shonkore Gasha | M | 68 | 3 | Wosha soyama |
| Manaye Yukula | M | 57 | 6 | Edo |
| Shambele Argo* | M | 63 | 4 | Kela 01 |

| | | | | | |
|---|---|---|---|---|---|
| Shimelis | Yoke | M | 49 | 9 | Aruma |
| Masamo | Amalo | M | 59 | 5 | Wosha soyama |
| Mariwo | Wayu | M | 89 | Illiterate | Aruma |
| Hilassa | Ararso | M | 47 | 5 | Edo |
| Legesse | Urgumo | M | 38 | 4 | Abaye |
| Lema | Halcho | M | 49 | 4 | Wosha soyama |
| Gaduda | Xona | M | 93 | 10 | Chuko |
| Wondimu | Xona | M | 89 | Collage | Chuko |
| Shalaqa | Yure | M | 68 | 2 | Kela 01 |
| Abululu | Husen | M | 58 | 1 | Edo |
| Abubeker | Mehamed | M | 79 | Illiterate | Abaye |

**Key: Names with key '*' are key informants.**

## Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any universities and all sources of materials used for the thesis have been correctly acknowledged.

**Name: Sintayehu Tamene Beyene**

**Signature** _____

**Date** _____

**This thesis work has been submitted for examination with my approval as advisors:**

_____

**Dr. Zemede Asfaw**

_____

**Prof. Sebsebe Demissew**