

**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN WOLDIA
DISTRICT, NORTH WOLLO ZONE, AMHARA REGIONAL STATE,
ETHIOPIA**

M.Sc. THESIS

TESALE ANDARGIE FELEKE

AUGUST 2019

HARAMAYA UNIVERSITY, ETHIOPIA

**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN WOLDIA
DISTRICT, NORTH WOLLO ZONE, AMHARA REGIONAL STATE,
ETHIOPIA**

**A Thesis Submitted to the School of Biological Sciences and Biotechnology
School of Graduate Studies**

HARAMAYA UNIVERSITY

In Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE IN BIOLOGY

Teshale Andargie

August 2019

Haramaya University, Ethiopia

SCHOOL OF GRADUATE STUDIES

HARAMAYA UNIVERSITY

As Thesis research advisor, we hereby certify that we have read and evaluated this Thesis prepared, under our guidance, by **Teshale Andargie**, entitled: **Ethnobotanical Study of Medicinal Plants in Woldia Woreda, North Wollo Zone, Amhara Regional State, Ethiopia**. We recommend that it be submitted as fulfilling the thesis requirement.

Sewunet Mengistu (PhD)

_____	_____	_____
Name of Major Advisor	Signature	Date

Meseret Chimdessa (PhD)

_____	_____	_____
Name of Co Advisor	Signature	Date

As member of the Board of examiners of the M.Sc. Thesis Open Defense Examination, we certify that we have read, evaluated the thesis prepared by **Teshale Andargie** and examined the candidate. We recommended that the Thesis be accepted as fulfilling the Thesis requirement for the degree of Master of Science in Biology.

_____	_____	_____
Chair person	Signature	Date

_____	_____	_____
Internal Examiner	Signature	Date

_____	_____	_____
External Examiner	Signature	Date

DEDICATION

I dedicated this thesis manuscript to my beloved wife Desta Kebede, my son Iyoseyase Teshale and my mother Worekyea Yemata and for their love and dedicated partnership support, especially for their prayer in my academic success.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this Thesis is my own work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this Thesis. Any scholarly matter that is included in the Thesis has been given recognition through citation.

This Thesis is submitted in partial fulfillment of the requirement for M.Sc. degree in biology at the Haramaya University. The Thesis is reserved in Haramaya University Library and is made available to borrowers under the rule of the Library. I seriously declare that Thesis has not been submitted to any other institution anywhere for award of academic degree, diploma or certificate.

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Name: **Teshale Andargie**

Signature: -----

Place: Haramaya University, Ethiopia

School: School of Biological Sciences and Biotechnology

Date of Submission: August 18, 2019

BIOGRAPHICAL SKETCH

The author Teshale Andargie was born in 1967 E.C in Harar Town. He attended primary education in Hamaresa Primary School from 1974E.C to 1980E.C.then he continued his schooling at Hamaresa Primary School from 1981E.C to 1983E.C.Then he attended Harar secondary school from 1984 E.C to 1988 E.C and after passing university entrance exam, he studied diploma program joined kotebe college for from 1989 E.C to 1991E.C and joined Mekele University for summer program from 1996 E.C to 2000 E.C.and graduated with BSc in Biology. He joined postgraduate program of Haramaya University directly to pursue his MSc degree in Biology by being assigned from the ministry of education.

ACKNOWLEDGEMENTS

In all circumstances my praise is to the almighty God

I would like to express my deepest gratitude to my advisor Dr.Meseret Chimdessa and Dr.Sewunet Mengistu for their consistent invaluable inspiring guidance and constructive comments from the inception of the study up to the final work of this thesis. Without them to shape this study was not realized.

My heartfelt appreciation and gratitude go to MoE and Amhara Regional State Educational Bureau for giving me the chance for Masters Degree program.

I would like to thank people of Woldiya Woreda for their hospitality and kind response to my inquiries on information about the medicinal plants, Woreda health center and Woreda Agricultural office for their provision of data on major health problems and for various basic data concerning vegetation, livestock population climate, etc.

I am very much indebted to my mother Worekeye Yemataw, my wife Desta Kebede, and my family for their moral, money, material support and encouragement, in the course of my study.

LIST OF ACRONYMS AND ABBREVIATIONS

CBD	Convention on Biological Diversity
FAO	Food and Agriculture Organization
WDHO	Woldiya District Health Office
WDARDO	Woldiya District Agriculture and Rural Development Office
IBPGR	International Board for Plant Genetic Resources
ICF	Informant's Consensus Factor
IIRR	International Institute of Rural Reconstruction
IUCN	International Union For Conservation of Nature
NBSAP	Natural Biodiversity Strategy and Action Plan
REA	Rapid Ethnobotanical Appraisal
RRA	Rapid Rural Appraisal
MPs	Medicinal Plants
TM	Traditional Medicine
TMK	Traditional Medicinal Knowledge
TMP	Traditional Medicinal Practitioner
UNESCO	United Nations Educational Scientific and Cultural Organization
WHO	World Health Organization

TABLE OF CONTENTS

Contents	Pages
DEDICATION	.iv
STATEMENT OF THE AUTHOR	v
BIOGRAPHICAL SKETCH	vi
ACKNOWLEDGEMENTS	.vii
LIST OF ACRONYMS AND ABBREVIATIONS	viii
TABLE OF CONTENTS	.ix
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF APPENDICES	xiii
ABSTRACT	xiv
1.INTRODUCTION	.1
2. LITERATURE REVIEW	.4
2.2.Indigenous knowledge	.4
2.3. Traditional medicinal knowledge and practices	.5
2.3.1. Diversity and conservation of medicinal plants in Africa	6
2.3.2. Medicinal plants in Ethiopia	6
2.3.3. Medicinal plants preparation methods, dosage and administration route	8
2.3.4. Medicinal plants and ethnomedicinal research in Ethiopian	8
2.3.5. Threats to traditional medicinal plants in Ethiopia	9
2.3.6 Conservation of traditional medicinal plants	10
3. MATERIALANDMETHODS	11
3.1. Description of the Study Area	11
3.2. Climate and ecology	12

3.3. Agriculture and vegetation	12
3.4. Reconnaissance survey and Ethno botanical Data collection	12
3.6. Informant consensus factor (ICF)	13
3.8. Direct matrix ranking	14
3.9. Fidelity level Index (FL)	14
4. RESULT AND DISCUSSION	15
4.1 Medicinal plants of the Study Area	
.....	Error! Bookmark not defined.
4.2. Plant Habitat, Habit, Part(s) used and Preparation of remedies and their dosage	15
4.3. Informant Consensus Factors (ICF)	17
4.4 Preference and direct matrix ranking of medicinal plants	
.....	Error! Bookmark not defined.
4.5. Direct matrix ranking of medicinal plants based on multipurpose	20
4.6. Fidelity level index	21
4.7. Factors threatening traditional medicinal plants and knowledge	22
5. Summery and Conclusions	24
5.1 Summery	
.....	Error! Bookmark not defined.
5.2. Conclusions	
.....	Error! Bookmark not defined.
5.3. Recommendations	26
6. REFERENCES	27
7. APPENDICES	33

LIST OF TABLES

Table	Page
1. Informant consensus factors by categories of human only diseases	17
2. Preference ranking of seven selected medicinal plants used to treat febrile	19
3. Mean scores for direct matrix	20
4. Fidelity level for plant species those are used to treat febrile, malaria and devil disease	21
5. Ranks of threats on the basis of their frequency of occurrence and strength	22

LIST OF FIGURES

s

Figure	Page
1 Map of the study area (Woldia woreda)	11

LIST OF APPENDICES

Appendices	Page
1. Lists of medicinal plants for treating human disease	32
2. List of medicinal plants for treating livestock diseases	44
3. Semi-structured interview conducted in the stu	48
4. Family and number of species	54
5. Semi-structured interview conducted in the study area	56

Ethnobotanical Study of Medicinal Plants Used by Local Community of Woldia District in, Amhara Regional State, Ethiopia

ABSTRACT

*Ethnobotanical study of medicinal plants in Woldia district, north Wollo Ethiopia was conducted from 1 May to August 29, 2019 in Woldiya District, North Wollo Zone, and Amhara National Regional State. The overall objective of this study was to conduct ethnobotanical survey and document plant species, which have medicinal value for both human and livestock in Woldiya district. One hundred informants from four kebeles were selected to this study randomly and purposively. Ethnobotanical data were gathered using semi-structured interview, field observation, group discussion. The collected data was quantified using informant consensus, preference ranking, direct matrix ranking, and fidelity level index. 70 medicinal plant species belonging to 62 genera and 39 families used to treat human and livestock health problems were collected. Out of the total collected plant species 56,80% were used to treat only human ailments, 6 plant species 8.5% to treat only livestock ailments and 8 plant species 11.4% to treat both human and livestock ailments. The most frequently used plant parts in disease treatments were leaves 36, 51.4% followed by roots 10, 14.2% and the whole parts 4, 5.7% and others. The most frequently sources and growth forms of medicinal plants are wild and shrubs 64.3% and 38.5% respectively. Disease categories with relatively higher ICF values were stomach related problem 0.90; maternal and fertility problems 0.8. The most effective medicinal plants to treat febrile was *Ocimum lamiifolium* stood first among the seven plants species followed by *Zehneria scabra*. Fidelity level results show that *Ocimum lamiifolium*, *Aloe sp* and *Ziziphus sp* have high medicinal values against febril, malaria and devil disease respectively. The result of this study showed that, there was high diversity of medicinal plants knowledge among local people of Woldiya district, but they harvest them with little awareness of the threat they pose to the vegetation resource. Therefore, awareness creation among the society must be done by agricultural workers, district administrators, ensure sustainable harvesting be practiced. The documentation of medicinal plants and the associated knowledge on threats are vital for sustainable use of medicinal plants in the study area.*

Key words: Medicinal plants, indigenous knowledg, ICF.

INTRODUCTION

Traditional medicine is any ancient and culturally based healthcare practice different from scientific medicine and is commonly regarded as indigenous, alternative or folk medicine which is largely orally transmitted knowledge used by communities of different cultures (Cotton,1996;Martin,1995). WHO (2003) also defined traditional medicine as health practices, approaches, knowledge and beliefs incorporating plants, animals and minerals based medicines, spiritual therapies, manual techniques and exercise applied to treat, diagnose and prevent illness or maintain the wellbeing of human beings.

Ethnobotany is a broad term referring to the study of people's classification, management and use of plants. It is defined as local people's interaction with plants: how they classify, manage and use plants available around them (Martin, 1995). Ethnobotany encompasses all studies relating to the mutual relationships between plants and people (Cotton, 1996). Among the relationships of humans with plants, dependence of people on plants for their medicinal value is one. Thus, people depend on plants not only for food, but also for preparation of remedies. Ethnobotanical studies are useful in documenting, analyzing and communicating knowledge and interaction between plant biodiversity and human society, how plant diversity in nature is used and influenced by human activities (Martin, 1995; Cotton, 1996; Black and Cox, 1997).

In many developing countries, people mostly rely on ethnomedicinal knowledge to treat diseases using local plants. Thus, ethno medicine is a system of maintaining health and curing diseases using locally available plant or animal materials based on folk beliefs, traditional knowledge, skills, methods and practices. Ethnomedicinal knowledge is disappearing because of rapid socio-economic, environmental, and technological changes, suggesting urgent documentation and preservation of indigenous knowledge on traditional medicines (Mohammed *et al.*, 2006). From earliest times, humankind has been using plants in attempting to cure diseases and related physical sufferings. Primitive people in all ages have had some knowledge of medicinal plants through trial and error (Hill, 1989). Ethiopia is home to many languages, cultures and beliefs, which have in turn contributed to the high diversity of traditional knowledge and practices of the people, which among others, includes the use of

medicinal plants to cure different diseases. Hence, in Ethiopia, plants have been used both in the prevention and cure of various diseases of humans and other animals from time immemorial (Mirutse Giday and Gobena Ameni, 2003). (Dawit Abebe and Ahadu Ayehu, 1993) reported that 80% of the Ethiopian population depends on traditional medicine for their health care. More than 95% of traditional medicinal preparations is of plant origin in northern Ethiopia (Dawit Abebe, 1986).

People in different parts of Ethiopia have traditional practices, which they accumulated for generations to treat both human and livestock ailments. They use different parts of plants to prepare remedies (root, bark, leaves, and other plant structures). The elders, who know more about medicinal plants, may die without sharing their traditional knowledge to the young generation. Since the knowledge of traditional medicine is transferred orally from generation to generation, basic information on the use of medicinal plant may also be lost. Therefore, in order to pass the knowledge that can be used as basis for the invention of modern medicine, documentation of medicinal plants and the knowledge associated with their usage is paramount importance (Ensermu Kelebesa *et al.*, 1992)

This study was conducted in Woldia District of North Wollo Zone. The indigenous people also have diverse and unique traditions of interactions with plants of their surroundings. However, there has been no study conducted on the Ethnobotany of this area. This study is, therefore, designed to carry out Ethnobotanical study on medicinal plants used by local people of Woldia district with the following objectives.

General objective

The overall objective of this study is to investigate and document plant species which have medicinal value in Woldiya District.

Specific objectives

To document traditional medicinal plants and their parts used for the treatment of human and livestock ailments.

To list the common types of traditional medicinal practices.

To describe the method of preparation and mode of administration of herbal medicine.

To analyze the current and potential major threats to medicinal plants.

2. LITERATURE REVIEW

2.1. Theory and Principles of Ethnobotany

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 close interaction and dependency of humans on plant is studied under the field of ethnobotany. Ethnobotany is formed from two words, 'ethno' which means the study of people and 'botany' which means study of plants. The first person who proposed the term Ethnobotany was (Black and Cox, 1996). Most research designs used in Ethnobotanical and Ethnoecological studies are time consuming and expensive. Long-term projects allow for working with local people to record ecological knowledge in a variety of context, include ritual occasions and seasonal farming activities (Geriquea, 2006). But sometimes it is not possible to conduct a long-term project that Rapid Ethnobotanical Appraisal (REA) derived from the Rapid Rural Appraisal (RRA) can be used. As stated by (Martin, 1995) to achieve more detailed and reliable information of plants and plant use, Ethnobotanical study needs involvement of specialists from various disciplines such as plant taxonomists, plant ecologists, anthropologists, linguists, economic botanists, pharmacologists 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.

2.2. Indigenous knowledge.

Indigenous knowledge is the accumulation of knowledge because of many years' experiences, careful observations, trial and error experiments (Martin, 1995). This knowledge is built by a group of people through generation of living in close contact with nature and it is cumulative and dynamic. Indigenous knowledge develops and changes with time, space, resource and culture. Therefore, such knowledge includes time-tested practice that developed in the process of interaction of humans with their environment (Alcorn, 1984; Black and Cox, 1996; Cotton, 1996). One of the indigenous knowledge is knowledge on the use of plants by humans as medicines. When primitive man started to select his food from plants growing nearby, he

must have kept some of those which he found to cure some of the ailments or which he thought would cure disease (Mesfin Tadesse, 2004). In similar way (Fikadu Fulase, 2001), reported that throughout history, humans had been looking to nature to provide them with remedies for their various maladies. In so doing, they had been using trial and error approach to sort-out, which plants are therapeutic and which are not and, further which are too toxic to use. Through the centuries, some of these plants have used successfully in the treatment of disease and later on, they constituted the basis for many of the modern day drugs.

The term indigenous medicine (traditional or folk medicine) describes medicinal knowledge system, which developed over centuries with in various societies before the era of modern medicine (Dawit Abebe, 1986). Traditional medicine has maintained its popularity in all regions of the developing world and its use is rapidly spreading in the industrialized countries. In Ghana, Mali, Nigeria and Zambia, the first line of treatment for 60% of children with high fever resulting from malaria is the use of herbal medicines at home. In china, also, traditional herbal preparations account for 30-50% of the total medicinal consumption (WHO, 2003).

Consultation of medicinal practitioners is very helpful for the development and incorporation of useful approaches in planning and budgeting system for healthcare provision of most developing countries and indigenous communities (WHO, 2001).

2.3. Traditional medicinal knowledge and practices

Traditional medicine is the sum total of knowledge skills and practices based on theories, beliefs and experiences indigenous to different cultures that are used to maintain or improve health and prevents or diagnoses physical, mental illness, and social imbalance. It exclusively relies on practical experience and observation handed down from generation to generation, either verbally or in writing forms (WHO, 2009).

2.3.1. Diversity and conservation of medicinal plants in Africa

Biodiversity is the variety and variability of living organisms and biological communities in which they live plus the ecological and evolutionary processes that keep them functioning. Conservation on the other hand, involves a careful preservation and protection of something especially through planned management of a natural resource to prevent neglect, over - exploitation or even destruction of the resource (WHO, 2009).

Medicinal plants represent a consistent part of the natural biodiversity endowment of many countries in Africa, as well as the world at large. Medicinal plants are plants containing inherent active ingredients tending or used to cure disease or relief pain Aromatic plants on the other hand, have strong characteristic smell and fragrance (King, 1992).Plants representing a huge store house of drugs produce more than 10,000 different compounds to protect themselves from predators, which could also be used for potential drugs production (King, 1992 and Izuakor, 2005).

2.3.2. Medicinal plants in Ethiopia

Ethiopia is the land of great topographical diversity .this topographical variation made the country to have a diversified climatic condition (tropical, subtropical, and temperate) possessing a heterogeneous and rich endemic species of vegetation (Dawit Abebe and Ahadu Ayehu,1993). Among the African countries, Ethiopia often quoted as one of the six countries of the world where about 60% of the plants said to be indigenous with healing potential (UNESCO,1998).There are about 213 families of flowering plants in Ethiopia ,and of these 92 families and one family of each gymnosperms and ferns are known to conation species with medicinal properties (Edward and Zemedede Asfaw,1992).Generally there are about 700-800 species of plants used in the traditional healthcare system to treat nearly 300 mental and physical disorders (Tilahun Teklehaymanot and Mirtutse Giday, 2007), most of which are believed to be confined to southwest Ethiopia (Haile Yineger and Delenasaw Yewhalaw, 2007).

Ethiopia traditional medicinal practices consist of the use of herbs, cauterization, and steam bath, spiritual healing holy water, bone setting, and minor surgical procedures (Etana Tolasa, 2007). Traditional medicine is largely practiced by traditional medicine practitioners, although particularly common health problems, It is also practiced at home by the elderly and by mother (Pankhurst, 1965; 1990; Abbink, 1995).It is accessible to most people and is important for primary health care delivery and its used wide spread in developing countries (Zhang, 2000). In Ethiopia, about 80% of human population and 90% of livestock rely on traditional medicine (Mekonen Bishaw, 1990; Tesema Tanto *et al.*, 2003). Socio-cultural appeal, the cultural acceptability of healers and local pharmacopoeias accessibility, and effectiveness against a number of health problems seem to faster its widespread use (Mwambazi, 1996; Kebede Deribe *et al.*, 2006).

Ethiopian traditional medicinal system characterized by variation and had shaped by the ecological diversities of the country, socio-cultural background of the different ethnic groups as well as historical development that is related to migration, introduction of foreign culture and religion (Pankhurst, 1965; Dawit Abebe and Ahadu Ayehu, 1993). Traditional medical practitioners treat both people and domestic animals. Most of the health services rendered by these practitioners focused on communicable diseases among people and domestic animals.

Ethiopia has a long history of using traditional medicines from plants and has developed ways to combat disease through its (Asfaw Debela *et al.*, 1999).A significant number of people in Ethiopia societies use traditional medicinal plants for their primary health care. Much of the earliest knowledge was not written down because priests and other knowledgeable persons (Mirutse Giday *et al.*, 2003) kept them secret. It is not easy to get traditional medicinal knowledge of the healers because they want to pass, mostly to the eldest son. This becomes practical when they approach death (Jansen, 1981).

Different vegetation types that found in the various agro-ecological zones of Ethiopia accommodate various types of medicinal plants (Edwards,2001).Edwards reported that the woodlands, Montana vegetation including grasslands and forests and the evergreen scrubs and rocky areas conations 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 afro alpine vegetation ranked last.

The number of different languages spoken Ethiopia corresponds to its unique socio-cultural 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 plants use of some species being restricted to that given culture (Mirutse Giday *et al.*,2003).

2.3.3. Medicinal plants preparation methods, dosage and administration route

The preparation and application of medicinal plants is accomplished in various formulations. Medicinal plants preparation could contain several compounds like powdered plant materials, extracts and purified active ingredients isolated from plants materials. Moreover, in some cases, materials derived from animals or minerals may also be added in such preparations (Etana Tolasa, 2007).

Ethnobotanical studies done so far showed that the most common methods of medicinal plants preparation is simple crushing and pounding a particular plant(s)and homogenizing it in water ,which is used in the form of herbal preparation for both human and livestock health problem (Etana Tolasa,2007). Researches on medicinal plants in various parts of Ethiopia, reported by (kebu balemie *et al.*, 2004), depicted the existence of various routes of application in which oral (51.7%), dermal (31%), nasal and others (0.1% each) are common. The dosage or amount and unit of measurement plants used by traditional healers vary with the types of health problem .This shows the lack of precision and standardization as a drawback for the recognition of traditional health care system (Dawit Abebe, 1986; Kebu Balemie *et al.*, 2004).

2.3.4. Medicinal plants and ethnomedicinal research in Ethiopian

The world health organization(WHO, 1978), had officially launched an international program to program to promote and developments basic and applied research in traditional medicine (Fisseha Mesfin, 2007).Therefore, traditional medicine has been practiced for the last several thousand years, but its legitimate place in WHO, was found only about 37 years ago.

Medicinal plants, then, got a focus of attention and regional offices were established to coordinate basic and applied research activities on such plants. Moreover, pharmaceutical industries and western researchers have rediscovered plant-based drugs, which have much contribution to the discovery of new, effective, safe, and profitable therapeutic agents (Etana Tolasa, 2007).

2.3.5. 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 near 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 (Cunningham, 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 because of continued deforestation in the area. (Zemedede Asfaw, 2001) also argues that medicinal plants are at conservation risks due to over use and destructive harvesting (roots and barks collections).

Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting invasive species, commercialization, degradation, agricultural expansion, urbanization and habitat destruction are human made caused threats to medicinal plants. A natural cause includes recurrent drought, diseases, pest out breaks and bush fires (Ensermu kelbessa *et al.*, 1992). 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.

2.3.6 Conservation of traditional medicinal plants

There were some conservation action that have been undertaken around the world designed to protect threatened medicinal plants from further damage .This include in-situ and ex-situ conservational 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 (Zemedede Asfaw, 2001). Medicinal plants can also be conserved by ensuring and encouraging their growth in special places such as in churches, mosques, graves yards, farm margin, and riverbanks and so on. The second one is ex-situ conservation means conservation outside their natural habitats. This includes gen bank, botanical gardens, and others.

3. MATERIAL AND METHODS

3.1. Description of the Study Area

Woldia is located at the north east of Amhara National Regional State, 521km in the north direction from the capital, Addis Ababa. The area lies between $11^{\circ} 46'$ and $11^{\circ} 50'$ North latitudes and $38^{\circ} 50'$ and $39^{\circ} 38'$ East longitude Fig-1. According to the Central Statistical Agency, population size of Woldia woreda was 59,054 of which 28,465 male and 30,589 female (CSA, 2013).

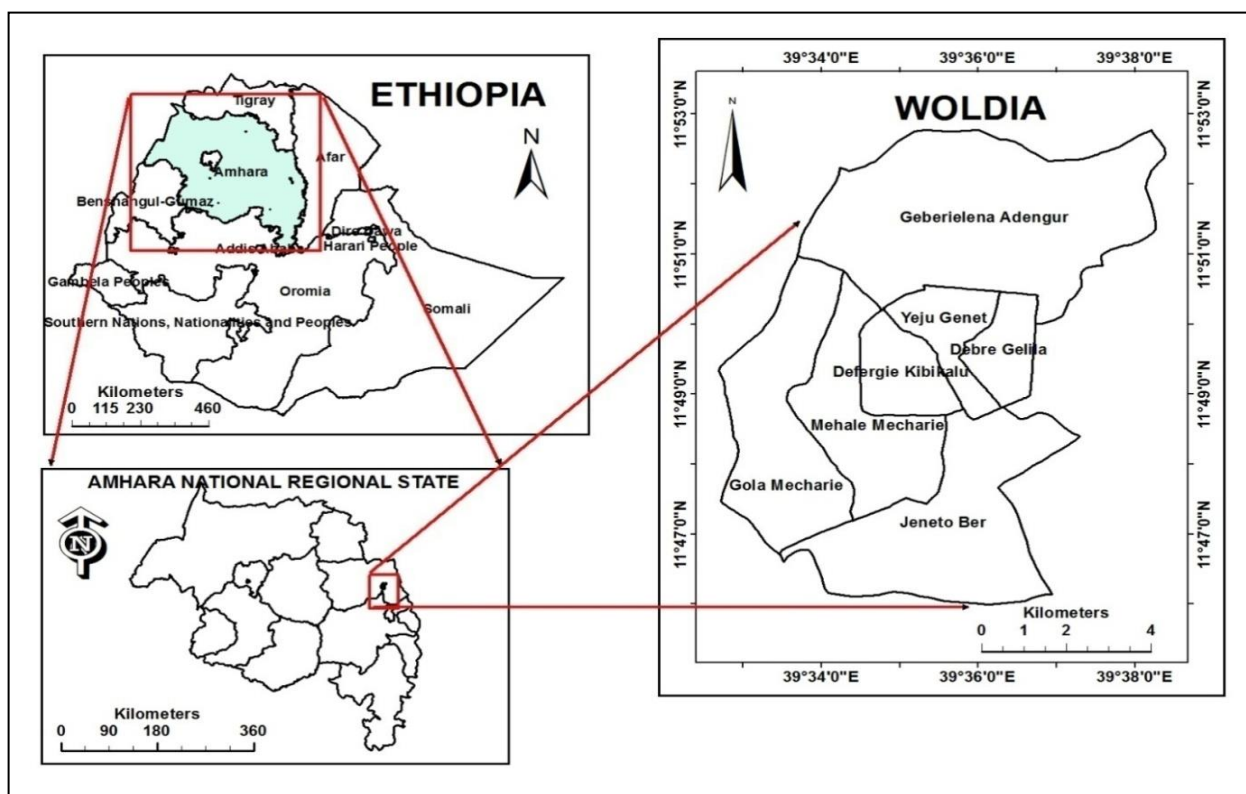


Figure 1. Location map of Woldia woreda, Source : (Ethio-GIS, 2015)

3.2. Climate and ecology

Woldia District is characterized by two agro climatic zones, most part is Woina Dega and some part is dega. Especially most part of Woldia is Woina dega with altitude range of 1800 to 2300 meters above sea level according to (KMSC, 2016).

Based on Woldia District Agricultural and Rural Development Office (WDARDO, 2015) report the highest and the lowest temperatures recorded are 22.8 and 7 degree centigrade respectively, and the annual average temperature is 18 degree centigrade. The annual rain fall ranges from 800-1050 ml.

3.3. Agriculture and vegetation

The vegetation of the study area consists of tree, shrub, climbers, epiphytes, and herbaceous species. In the district the main activity of the population is mixed agriculture, including its different fields such as crop production and livestock rearing. Most parts of the district especially Woina Dega and some parts of dega cultivate crops 2-3 times per year by using irrigation. But the agricultural products and activities vary in some ways, for instance the dominant crops are *Hordeum vulgare*, (barley) *Pisum sativum*, (garden pea) *Lens culinaris*, (lentil) *Vicia faba* (broad bean flowers) *Sorghum bicolor* (sorghum) *Eragrostis teff* (teff) etc. The dominant livestock are *Ovisaries*, (domestic sheep) *Equues africanus* (donkey) and *Equues ferus*. (Domestic horse) (WDARDO, 2015).

3.4. Reconnaissance survey and Ethno botanical Data collection

A reconnaissance survey of the study area were be conducted to select study sites (four kebeles such as Mehalmecharie, Adengure, Jentobere, and Golamecharie) were purposively selected based on availability of medicinal plant and traditional healer out of ten kebeles of the district from May 1 to August 24, 2019 G.C.

Data were gathered from 100 respondents. According to the rule of thumb for ethno botanical data collection (Hoffman Gallalter, 2007)(40 female and 60 male) were randomly and purposively selected by using information and recommendation from Woldiya district office, local kebele, administrator, kebele agricultural office, knowledgeable person, students and

religious leader and as well as other members of the local community. In general 64 informants were selected randomly from the households where as 36 key informants were selected purposively which include herbalist, elders, and knowledgeable person.

The informants' kebele, name, age, sex marital status, and education are listed. And available key informants through semi-structured questionnaire, guided field walk and group discussion. Respondents were asked to provide information on locality, scientific and vernacular names, parts of the plant used, methods of preparation for use, with/without additives, diseases for which plant is used. Plant specimens were collected based on the information provided by informants and numbered, pressed, and dried for identification. Primary identification was being done in the field. Unidentified specimens' identification was being done according to Flora of Ethiopia and Eritrea Such as (Friis, 1995), (Tewolde B. Gebregziabeher and Edwards, 1997), (Friis and White 2003) and (Gilbert, 1995) as cited in (Amenu, 2007). The identified specimen were collected from study site and deposited in Haramaya university herbarium

3.5. Data analysis

3.6. Informant consensus factor (ICF)

Informant consensus was quantitatively analyzed for specific number of group of plant uses reported by informants. It revealed the consistency of plant use among informants. The agreement of the informants on the reported use of medicinal plants to cure a group of ailments was tested by calculating the informants' consensus factor" (ICF) (Heinerich *et al.*, 1998; as cited in Mesfin, 2007).

The ICF was calculated as

$$ICF = \frac{nuc - nt}{nuc - 1}$$

Where **nuc** = number of use citations in each category of disease, **NT** = total number of medicinal plant species used.

3.7. Preference ranking

If different species are prescribed for the same health problem, people show preference of one over the other. Preference ranking of 7 medicinal plant species used to treat febrile (Mich) was conducted to identify the most preferred one against febrile based on (Martin,1995).Informants selected the best-preferred medicinal plant species to treat that specific disease. Each informant assigned most preferred and the least preferred plant against the illness their order. These values are summed up and ranks are given to each plant species.

3.8. Direct matrix ranking

In order to compare multipurpose use of a given medicinal plant species and to relate this to the extent of its utilization versus its dominance, direct matrix ranking was done as indicated by (Martin, 1995). Based on information that was gathered from informants. Seven major threats were ranked based their frequency of occurrence in the locality.

3.9. Fidelity level Index (FL)

The relative healing potential of each reported medicinal plant used against human ailment was estimated using an index called Fidelity Level (FL). Its formula is given as

$$FL = \left(\frac{N_p}{N}\right) \times 100$$
 Where N_p is the number of informants that claim the use of a plant species to treat a particular disease and N is the number of informants that use the plants as a medicine to treat any disease as described by (Alexiades, 1996). Accordingly, FL index was calculated for 12 medicinal plant species used for treating febrile, malaria and devil disease (4 species) each.

4. RESULT AND DISCUSSION

4.1 Medicinal plants of the Study Area

A total of 70 medicinal plants were reported by the local informants from the study area as being used for the treatments of human and livestock ailments. These plants are distributed in 62 genera and 39 families. Of these about 80%, 11.4%, 8.5% of medicinal plants were reported to treat only human, both human and livestock and only treat for livestock disease respectively. The most diverse families in terms of species composition were Euphorbiaceae is represented by 7 species, followed by Lamiaceae is represented by 6 species, Asteraceae is 5 species, Solanaceae and Fabaceae each represented by 4 and 3 species respectively. Cucurbitaceae, Acanthaceae, Aloaceae, Apiaceae, Piperaceae, Polygonaceae, Rosaceae, Moraceae each represented by 2 species. The remaining families are each represented by 1 species. (Appendix 4)

4.2. Plant Habitat, Habit, Part(s) used and Preparation of remedies and their dosage

Most (45 Spp.) of the medicinal plants were collected from wild in the forest. Considerable number (13 Spp.) was also obtained from home a garden few of them were collected from both wild and cultivated (12 Spp.). This observation tells that the knowledge of local people in conserving and cultivating medicinal plants was low. In terms of majority (38.5%) of the medicinal plants were shrubs followed by herbaceous (34.2%), tree (20%) and climbers (5.7%). This reports indicate that shrubs plants were easy and accessible to use in the study sites. In the contrary, in most other researches also herbaceous plants are reported to dominate medicinal plants such as Mohammed Adefa and Seyoum Getaneh, (2013) ; Debela Hunde, (2001); Mohammed Adefa and Berhanu Abraha, (2011); and Endalew Amenu, (2007) in their ethnomedicinal research area in Chenchu district, Bososat woreda, Tehuledere district and Ejaji area respectively. Similar findings were reported by, Haile Yineger and Delnasaw Yewhalaw, (2007) and Ermial Lulekal *et al.*, (2008) have found shrubs to make up the highest proportion of medicinal use followed by herbs in their ethnobotanical research of Sekoru and

Mana Angetu districts respectively. Leaves (51.4%) and roots (14.2%) are the most cited plant parts used for remedy preparation. It is found that the local people used different part of the plant to treat human ailments. However, some plant parts such as leaves are frequently used than other part of the plants. This may not be the same throughout by all communities found in different area. Likewise, certain ethnobotanical researches in other parts of the country reported leaves followed by roots to be predominantly used in the treatment of various health problems (Mohammed Adefa and Seyoum Getaneh, 2013); (Haile Yineger and Delnesaw Yewhalaw, 2007); (Mirutse Giday, 1999) and (Endalew Amenu, 2007). On the other hand, (Ermias Lulekal *et al.*, 2008) have found roots to take the highest proportion of remedies in Mana Angetu district. In fact, the high rate use of roots for medicinal preparations exacerbates the disappearance of medicinal plants from their natural habitat. Fruits (4.2%), the entire plant parts (5.7%), latex (5.7%) and seeds (2.8%) were also reported for use in remedy preparation. More over stem and other plant parts were reported and each accounted (4.2%) and (2.8%) respectively. The finding shows that leaves were the easiest and accessible plant parts for remedy preparation. Remedies are prepared mainly (74.2%) from single plant although reports show that about (25.7%) were made from parts from different plant species put together. Preparation involve mainly pounded and mixed together are used internally as a form of drink/ food. External application by creaming on the skin or rubbing against the skin is also form of application of the remedies. In general rout and form of uptake depends on the site and nature of ailments. Honey, dorrowete, milk, lemonjuice and boiled coffee are some of reported additives meant to improve the flavor and efficacy of the remedies. Remedies were administered with no precise dosage, but locals estimate the amount to be taken particularly, the one to be taken internally through the mouth, nose, ear and eye based on the age and severity of the disease. Traditional measuring units such as spoon, coffee cup, count or number and glass cups are commonly used to determine the dosage. Lack of precise dosage is known to be the major drawback of using traditional medicine (Dawit Abebe and Ahadu Ayehu, 1993).

4.3. Informant Consensus Factors (ICF)

All cited human only diseases were categorized into 10 categories: namely stomach related problems;

hemorrhoid and cardiovascular related problems; musculoskeletal, wart, body swelling related problems; respiratory system and throat related problems; headache, evil eye, fever and febrile illness related diseases; diarrhea and gastrointestinal related diseases; viral diseases; fungal disease bacterial diseases; maternal and fertility problems and psychological problems. These diseases are categorized based on nature of disease, conditions that cause, place of attack, symptoms and sign of disease. Disease categories with relatively higher ICF values were stomach related problems 0.90; maternal and fertility problems 0.80; musculoskeletal, wart, body swellings related problems 0.71; hemorrhoid and cardiovascular related problems 0.6; diarrhea, gastrointestinal related diseases 0.6; bacterial diseases and psychological problems 0.5. This may indicate the common occurrence of these diseases so that more number of people exchanging information and agree on plant species that can be used to treat these diseases than the rest. The medicinal plants that are effective in treating a certain disease have higher ICF values. On the other hand, the rest of disease categories had ICF value of lower than 0.5. This indicates that these diseases are not frequently occurred in the study area. (Table1)

Table.1. Informant consensus factors by categories of human only diseases

Human only disease category	Ns	Nuc	ICF
Stomach complaint related problem	2	12	0.90
Maternal and fertility problems	2	6	0.80
Musculoskeletal, wart, body swelling, heamolobin, related problems	14	15	0.71
Diarrhea and gastrointestinal related diseases	5	11	0.60
Hemorrhoid, ascaris and cardiovascular related problems	3	6	0.60
Bacterial diseases	2	3	0.50
Psychological problems	2	3	0.50
Respiratory system and throat related problems	3	4	0.33
Headache, evil eye, fever and febrile illness related diseases	4	5	0.25
Viral diseases, fungal diseases	4	5	0.25

4.4 Preference and direct matrix ranking of medicinal plants

In this study, the score was given by selected seven key informants. It found that preference ranking for 7 selected plants on the basis of healing febrile (Mich) revealed *Ocimum lamifolium* to be the most preferred species followed by *Zehneria scabra* (Table 2).

Table 2. Preference ranking of seven selected medicinal used to treat febrile

Species	Respondents							Total	Rank
	R5	R14	R 24	R39	R52	R65	R74		
<i>Ocimum lamiifolium</i>	10	9	10	8	10	9	10	66	1
<i>Zehneria scabra</i>	10	10	9	9	8	9	10	65	2
<i>Eucalyptus globules</i>	8	9	10	9	9	7	8	60	3
<i>Calpurnia aurea</i>	10	9	8	9	8	7	8	59	4
<i>Cordia Africana</i>	7	8	9	8	8	9	8	57	5
<i>Capparis tomentosa</i>	8	7	9	6	7	5	7	49	6
<i>Ecinops keberich</i>	6	8	7	5	8	6	6	46	7

As it is stated so far, plant species of various types are used for the treatment of single ailment. In such case, indigenous people show preference to wards plant species on the basis of their healing power against a given diseases.

4.5. Direct matrix ranking of medicinal plants based on multipurpose

Table. 3. Mean scores for direct matrix

Species	Use category									
	Medicine	Food	Fencing	For Age	Fire wood	Cha r coal	Const Ructio n	Shel Ter	Tot Al	Ra Nk
<i>Cordia Africana</i>	4	2	3	3	4	3	4	5	28	1
<i>Zizipus spina-christi</i>	4	3	3	2	4	3	4	4	27	2
<i>Olea europe subsp cuspidate</i>	3	0	2	4	4	5	4	4	26	3
<i>Dodonaea angustifolia</i>	3	0	3	4	5	4	3	4	25	4
<i>Carissa spinarum</i>	4	3	4	4	4	2	3	3	24	5
<i>Eucalyptus globulis</i>	4	0	2	3	4	2	5	3	23	6
<i>Juniperus procera</i>	4	0	3	1	4	2	5	4	23	6
<i>Ficus vasta(Warka)</i>	2	2	1	3	3	2	4	5	22	8
<i>Croton macrostachyus</i>	3	0	2	2	3	1	1	4	16	9

Medicinal plant species are utilized for multi purposes apart from their medicinal value. *Cordia africana*, *Zizipus spina-christi*, *Olea Europe subsp cuspidate* and *Dodonaea angustifolia* were found to be highly used by the local community for multiple purposes. This intensive utilization of these plant species for multiple uses rendered them scarce in the locality. For this reason, *Olea europesubsp cuspidate* and *Cordia africana* are not easily accessible in the study area. This is also true for *Juniperus procera*, but species like *Eucalyptus globules* and *Eucalyptus camaldulensis* are relatively abundant on the high land and low land of the district, respectively. Studies made in different areas indicates the multi used plant species varied from area to area such as *Olea europaea* ranked first in Mana Angetu District, Southeastern Ethiopia (Lulekal *et al.*, 2008); *Cordia africana* in Tehuledere district, South Wollo, Ethiopia (Seid & Tsegay, 2011).

4.6. Fidelity level index

Table.4. Fidelity level for plant species those are used to treat febrile, malaria and devil disease

Ailments	% of informants	Species	Np	N	Fidelity level index (Np/N)
Febrile	45	<i>Ocimum lamiifolium</i>	32	45	0.71
	20	<i>Eucalyptus globulis</i>	14	20	0.70
	42	<i>Zehneria scabra</i>	26	42	0.62
	16	<i>Capparis Tomentosa</i>	8	16	0.50
Malaria	41	<i>Aloe sp</i>	22	41	0.54
	42	<i>Azadirachata indica</i>	16	42	0.38
	12	<i>Echinops kebericho</i>	4	12	0.33
	5	<i>Carica papaya</i>	1	5	0.20
Devil disease	28	<i>Ziziphus sp.</i>	19	28	0.68
	4	<i>Carissa spinarum</i>	2	4	0.50
	6	<i>Capparis tomentosa</i>	3	6	0.50
	13	<i>Ricinus communis</i>	6	13	0.46

Fidelity level index is calculated to check the medicinal use values of species. In this study *Ocimum lamiifolium*, *Aloe* sp, and *Ziziphus* sp., have high medicinal value against febrile, malaria and devil disease respectively. For this, informant consensus could not be taken as the measure of the potential efficacy of any medicinal plants. For example, *Azadirachta indica* was reported by 42 % of informants, with FL value of 0.38 is found to be the second species, next to *Aloe* sp, (FL=0.54), used in the treatment of malaria.

4.7. Factors threatening traditional medicinal plants and knowledge

Analysis of threats to medicinal plants was ranked using seven selected key informants. Their ranking was based on the frequency of occurrence and the strength of the devastating effects they impose. The informants mentioned over exploitation to be the major one (40%) followed by agricultural expansion (38.6%) (Table.5.).

Table. 5.Ranks of threats on the basis of their frequency of occurrence and strength

Respondents	Factors threatening medicinal plants						
	Defores Tation	Agricul tural expansion	Drought	Over Exploitation	Over Grazing	Const Ruction	Urban Ization
R16	4	4	3	3	2	2	2
R24	4	4	2	5	4	3	2
R35	3	5	3	3	2	2	3
R43	4	4	4	4	3	1	1
R56	4	2	3	4	2	2	3
R67	3	4	4	4	2	3	2
R74	4	4	2	5	2	2	2
Total	26	27	21	28	17	15	15
Mean	3.71	3.85	3	4	2.42	2.14	2.14
Rank	3	2	4	1	5	6	6

Ranking of threats to medicinal plants in the study area showed that some factors are the most threats than the others. Accordingly, it is found that over exploitation, agricultural expansion and deforestation are found to be the most threats in the study area. Such factors also reported by other researchers to be the frequent threats in other parts of Ethiopia. For instance (Ermias Lulekal *et al.*, 2008) cited deforestation and agricultural expansion to be the most threatening factors in Mana Angetu district.

5. Summery and Conclusions

5.1 Summery

Woldiya district harbors diverse plant species. In this study, 70 medicinal plant species were recorded. Of these, 56, 80% and 14, 20% of the species were reported to treat human ailments and livestock respectively, while 8, 11.4% of them reported to treat both livestock and human ailments and 6, 8.6% used to treat only live stock. Majority of these medicinal plant species were obtained from wild 45, 64.3%.

Analysis of growth forms of these medicinal plants showed that shrubs 38.6% and herbs 34.2% that constitute the largest category followed by tree species 21.4%. Leaves were the most frequently used plant parts followed by roots for preparation of human and livestock remedies. Traditional medicine preparation mostly involved single plant. Route of administration was mainly internal in which oral administration is the common route followed by dermal (external application). Therefore, awareness rising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use. Further biological studies should also be conducted on the reported medicinal plant species of the study area so as to utilize them in drug development and the bases of further studies.

5.2 Conclusions

The study showed that there is high diversity of medicinal plant species and TMK among local people of Woldiya district. Like all parts of Ethiopian society, the common diseases in the study area were treated and protected by self-care system at house hold level or/and by the professional healers. Since the price for herbal remedies is relatively cheaper as compared to the modern drugs and due to the strong belief of the society on the traditional system, many of the community members visit the healers for their own and their livestock health problems. Various human and livestock ailments such as diarrhea, eye disease, devil disease, snake bite, stomach ache, wound, malaria, toothache, evil eye, cough, headache, gonorrhoea, febrile illness, anthrax, control of leech, external animal parasites, tonsillitis, urine retention and

fever are cured by the traditional treatments. Many of the medicinal plants are collected from the wild.

People of the study area mostly prepare the remedy from leaves and utilization of more leaves than other plant parts that do not put medicinal plants under pressure when compared with using roots or whole plants, which is the most important way of practice for medicinal plants sustainability. All medicinal plants have not equal importance, as there were medicinal plants mostly preferred by local people of the study area for the treatment of the same disease. Traditional healers acquire the knowledge through long experiences and from their family. They are capable of differentiating the most efficacious ones for the treatment of humans and livestock.

Human and natural factors are the major threats for plant species in general and to the medicinal plants in particular in the study area. Over exploitation, agricultural expansion, drought, deforestation and overgrazing are the major threatening factors to medicinal plants and associated knowledge. Hence, the future existence of medicinal plants and associated knowledge is under question because of the prevalence of these devastating threats that have detrimental effects on the existence of medicinal plants and associated knowledge. The conservation efforts done in Woldiya district are due to their uses other than medicine. They are useful in other aspects such as for food, fodder, spice, live fence, construction and the like.

5.3. Recommendations

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

Local people harvest plants for different purposes with little awareness of the threat they pose to the vegetation resource, so awareness creation among the society must be done by agricultural workers, district administration, NGOs and community developers in the district to ensure sustainable harvesting and conservation be practiced.

The local communities of the study area need to be involved in the conservation and management of plants in general and medicinal plants in particular.

Encouraging people to grow medicinal plants in home gardens mixing with crops, in farmlands, graveyard and live fences.

The district administration must establish Traditional Healers Association by providing supports like land, fund and assistances for cultivation of medicinal plants in the district. And implement in order to minimize or eradicate the threats to medicinal plants and its associated knowledge.

One way of preserving such important Tk to the new generation should be by integrating the TK to school curricula or at least introducing the idea of TK as an extracurricular school activity.

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7. APPENDICES

Appendix 1 List of medicinal plants used to treat human and/or livestock health problems

plant parts used, method of preparations, Route of administrations ,Dosage Local people involved ,collection number and management (Mngt) strategy (NB: Her=Herb,Shr=Shrub,Tr=Tree,cli.=climber)

No	Medicinal plant (s) documented			Type of disease treated by the plant	Plant part (s) used	Method preparation & route of administration	Status the of plant		
	Name	Habit	Habitat & Mngt						
	Local	English	Scientific and Family name						
1	Dema kessie	-	<i>Ocimum lamiifolium</i> Hochst ex Benth(Lamiaceae)	Shr	Wild & cultivated	Febrile with symptom of High fever (mich) Common cold Mich (Febrile)	Leaf Leaf	Febrile leaves squeezed & juice isolated and inserting in to ear or apply on body as cream: brushing-dermal Boiled being mixed with leaves of <i>Zehneria scabra</i> (decoction) and Nasal /oral Inhalation of steam-nasal/oral Boiled in water (decoction)and Nasal / oral Inhalation of steam	Common

2	Tosign		<i>Thymus serrula</i> Hochst.ex.Benth. (Lamiaceae)	Her /shr	Wild	Cough	The whole plant	Boiled in water (decoction) and drinking (oral)	Rare
3	Haregresa	-	<i>Zehneria scabra(L.f).</i> Sonder (Asteraceae)	Clim/ Her	Wild/cultivated	Febrile with High fever(mich)	Leaf >>> >>>	Boiled in water (decoction)and Nasal / oral Inhalation of steam Boiled mixed with O.sauve (decoction) and Nasal /oral Inhalation of steam Boiled being mixed with Blue gum & O.lamiifolium and Nasal /oral Inhalation of steam (decoction) Fresh leaves squeezed and Apply in to ear	Common
4	Naanana	Pepermint	<i>Mentha piperata</i> L. (Cucurbitaceae)	Her	Cultivate	Diarrhea	Leaf and stem	Pounded being mixed with N.sativa,A.satiumthensqueezed(concoction)Drinking (oral)	Rare

5	Geber Embuary		<i>Solanum indicum</i> L.(Solanaceae)	Shr	Wild	Erectile Dysfunction of pens	Root	Pounded being mixed With roots of <i>Tragia</i> sp.(concoction) & drinking-oral	Rare
6	Qundoberbere	Black pepper	<i>Piper nigr</i> L.(piperaceae)	Tr	cultivated	Stomach complaints	Seed	Pounded being mixed With <i>Z. officinalis</i> , <i>R.chalepensis</i> .then left for 7 days (concoction) and eat every morning duringsuffer-oral	Common
7	Mimizaf	Nee m	<i>Melia azedarach</i> L.(Meliaceae)	Tr	Cultivated	-Malaria -Diarrhea	Leaf	Pouded & squeezed and drinking (oral)	Rare
8	Ablalit		<i>Tragia sp.</i> L(Euphorbiaceae)	Cli/her	Wild	-Stomach complaints -Erectile dysfunction	Root	Crushed or pounded and squeezed and drinking (oral) -Pounded being mixed with roots of <i>Solanum indicum</i> L.(concoction) and drinking (oral)	Rare
9	Weyra		<i>Olea europe subsp.</i> Cuspidate(Wall. ex G. Don) Cif (Oleaceae)	Tr	Cultivated/wild	-Hepatitis Wound/sore -Hypertension -Uvula	Bark Leaf Leaf Leaf	Boiled adding salt for night & isolate the residue (decoction)and eat-oral Squeezed and applay on the infected body-dermal Pounded & squeezed (and drinking (oral)) Wash it well and pound and chewing and swallowing the juice-oral	Moderate
10	Kentefa		<i>Pterolobium stellatum</i> (Forssk.) Brenan(Fabaceae)	Shr	Cultivated/wild	Evil eye	Leaf and root	Pounded being mixed with <i>R. chalepensis</i> (concoction)and eat along with meal when disease occur-oral	Moderate

11	Agam		<i>Carissa spinarum</i> L. (Apocynaceae)	Shr	Wild	Devil disease	Leaf	Boiled being mixed with roots of <i>C.macrostachyus</i> (decoction) and nasal (oral inhalation of steam)	Moderate
						Snake biting	Leaf	Pounded with left of <i>V.officinalis</i> (concoction) and drinking-oral	
						Devil disease	Root	Chewing-oral	
						Snake biting	Leaf	Chewed and swallowing-oral	
12	Kurkur a	De sert Ap ple	<i>Ziziphus spinachristi</i> (L) <i>Desf.</i> (Rhamnaceae)	Tr	Wild	-Devil disease	Leaf	Pounded & squeezed and drinking (oral)	Common
						-Dandruff	Leaf	Pounded, adding water & squeezed and cream on the infected body-dermal	
13	Gumer o	-	<i>Capparis tomentosa</i> <i>Lam.</i> (Capparidaceae)	Shr	Wild	-Devil disease	Root	-Boiled in water (decoction) and nasal/oral inhalation of steam	Moderate
						-Febrile	>>	-Boiled in water (decoction) and nasal/oral inhalation of steam	
14	Anterfa	-	<i>Euphorbia schimperiana</i> Scheele (Euphorbiaceae)	Her	Wild	Ringworm	Root	-Boiled in water (decoction) and nasal/oral inhalation of steam 3 times a day	Moderate
15	DemAk	-	<i>Achyranthes aspera</i>	Her	Wild	Bleeding after injury	Leaf	Pounded & squeezed and apply on the infected-	Rare

	urt		<i>L.(Amaranthaceae)</i>			and hemorrhoid		body-dermal	
16	Chifrig		<i>Sidatenuicarpa vollesen(Malvaceae)</i>	Shr	Wild	Erectile dysfunction	Root	Boiled being mixed with N.sativa& honey added (decoction) & eat-oral	Rare
						Abdominalache	Leaf	Pounded adding water & squeezed(concoction)and drinking (oral)	
						Tooth ache	Leaf	Pounded (concoction) and chewing & ingesting the juice-oral	
17	Benji	Jimson weed	<i>Datura stramonium</i> L.(Solanaceae)	Her	Wild	-Hemorrhoid	Leaf	Squeezed & juice isolated and apply on a bleeding wart anal-dermal	Common
						-Infection on swelling		Pounded being mixed with Chenopodium ambrosoides (concoction) and bandage(tie)on the swelling-dermal	
						Hemorrhoid	-Leaf	-Pounded with little water and bandage(tie) on the bleeding	
						Abortion	Leaf	Crushed, filter it and drink-oral	
						Dandruff	-Leaf	-Pounded & squeezed and apply it on the affected part until cure-dermal	
18	Wanza	-	<i>Cordiaafricana</i> Lam.(Boraginaceae)	Tr	Cultivated/wild	-Hepatitis	Leaf	Boiledwithsorghum(decoction)and drinking-oral	Common
						Mich(febrile)	Leaf	Boiled leaf with water and nasal /oral inhalation of steam	
						Jaundice	Leaf	Chew and swallow the fluid in the morning before food-oral	

						Hemorrhoids	Stem	Burn it on fire apply in to affected part while hot	
						Febrile (mich)	Leaf	Crush it with bulbs of <i>Allium sativum</i> and eat or rub it on the skin-oral/dermal	
19	Telbaye titi	-	<i>Diodia sp.</i> (Rubiaceae)	Her	Wild	-Snake biting	Leaf/ stem	Pounded & squeezed and drinking or bandaging on the bitten part	Rare
						To stop bleeding during birth time	Leaf	Squeezed and apply it on the reproductive organ(vagina)	
									Moderate
20	Dedeho		<i>Euclea racemosa</i> L. (Ebenaceae)	Shr	Wild	Evil eye	Whole	Crush and pounded and tie powder around the neck-dermal	Moderate
						Snake bite	Root bark	Crush pounded & add water & drinking the fluid-oral	
						Black spider bite	Root	Chewing & swallow the fluid-oral	
21	Yejib Shinkurt		<i>Crinum abyssanicum</i> Hochst. ex A. Rich(Amaryllidaceae)	Her	Cultivated/ wild	Tinea versicolor	Root	-crushed or pounded and apply or cream on the infected skin-dermal	Rare
22	Sama		<i>Urtica simensis steudel</i> (Urticaceae]	Shr	Cultivated/ Wild	Evil eye or feeling fever disease	Leaf & flower	The dried leaf of it will be powdered and one teaspoon of the powder will be drunk with tea every day for one week-oral	Rare

23	Digita		<i>Calpurnia aurea</i> (Ait.) Benth(Leguminosae)	Shr	Wild	Bloody diarrhea	-Leaf juvenile	-pounded being mixed with A.sativum then honey added (concoction) and eating-oral	Common
						Diarrheal	Seed	Grind part .mix it with milk product locally called (ayb) and drinking (oral)	
						Tinea capitis	Leaf	Crush and spread paste on the affected part-dermal	
						Diarrhea	-leaf	Pounded & squeeze and drinking (oral)	
						Typhoid	-Leaf	Pounded& squeezed and drinking (oral)	
						Wart	Leaf	Pounded squeezed apply or cream on the infected skin-oral	
						Mich (fever)	Leaf	Boiled beingmixed with zehneria scabranand nasal/ oral inhalationofnsteam	
						Ascrris	Leaf /fruit	Roasted pounded (griding) and mixed with coffee and drink-oral	
24	Qulqul		<i>Euphorbia abyssinica</i> Gmel(Euphorbiaceae)	Shr	Wild /cultivated	Thorn inside body as expellant	The bloody secretion (latex)	Simply bleed the plant and put in to pierced skin of the body-dermal	Rare
25	Tult		<i>Rumex nepalensis</i> (Polygonaceae)	Her	Wild	Abortion of unwanted pregnancy	Root	Pounded with water &squeezed juice isolated and drinking /oral	Rare
26	Wulaga		<i>Psychotria sp.</i> (Rubiaceae)	Tr.	Wild	Hemorrhoid &high bleeding during birth	Leaf	-pounded being mixed with a. A.aspera then squeezed (connection) and bandage on the bleeding part or vagina for 15 minutes or night-dermal	Moderate

27	Zigba		<i>Podocarpus falcatus gracilis</i> (Podocarpaceae)	Tr	Wild	Herpes zoster - Vomiting	Leaf	Leaves of <i>Podocarpus gracilis</i> pounded and mixed with water-oral	Rare
							Wound sore	Leaf	
28	Endahula	-	<i>Kalanchoe stenosiphon</i> Britten (Crassulaceae)	Her	Wild	Broken bone	Leaf	Roasted in fire and put on the broken body-dermal	Common

29	Tikur Girar		<i>Acaia negra</i> (Fabaceae)	Tr	Wild	Allergic	-Leaf	Crushed or pounded & squeezed apply on allergic skin-dermal	Rare
						Herpes zoster	»»	-Crushed or pounded ,squeezed and bandaging on the wound-dermal	
30	Sihferaw		<i>Moringa stenopetala</i> (Baker f.) (Moringaceae)	Tr	Cultivated	Leasm	Leaf	Drying crushed pounded & squeezed like tea and drinking (oral)	Common
						Hypotension	-Leaf	Drying ,crushed pounded & squeezed like tea and drinking (oral)	
						Hypertension	-leaf	Drying ,crushed pounded & filtering by habesha cloth and drinking (oral)	

31	Mekensa		<i>Croton macrostachyus</i> Hochst. ex Del (Euphorbiaceae)	Tr	Wild	Face fungus	Latex	Simply cut the leaf and Cream on the infected body-dermal	Common
						Abdominal pain	Bark	Crush with roots of <i>Cucumis ficifolius</i> dry and eat it with butter-oral	
32	Gesho	Dogwood	<i>Rhamnus prinoides</i> L'Hérit. (Rhamnaceae)	Shr	Cultivated	Uvula	Leaf	Pounded & squeezed and drinking (oral)	Common
33	Key bahrzaf		<i>Eucalyptus camaldulensis</i> Dehn. (Myraceae)	Tr	Cultivated	Mich	Leaf	Drying crushing or pounded boiled in water and nasal/oral inhalation of steam-nasal	
34	Nechlo		<i>Haplocarpha schimperi</i> (Sch.Bip.) (Asteraceae)	Her	Cultivated/wild	Wound/sore	Leaf	Being mixed with zehneriascabar and boil in water (decoction) and bandage on the infected body-dermal	common
35	Kumen	Wed seed	<i>Trachyspermum ammi</i> (L.) Sprague (Umbelliferae)	Her	Cultivated	Urine retention problem	The whole plant	Pounded and squeezed and drink or eat or simply chewing and swallowing-dermal	Rare
						Cough	Leaf	Boiled being mixed with <i>Carica papaya</i> and <i>Croton macrostachyus</i> (decoction) and nasal/oral inhalation of steam	Rare
36	Yesetaf		<i>Berberis holstii</i> Engl. (Berberidaceae)	Shr	Wild	Thorn inside body as expellant	Leaf	Pounded & squeezed (concoction) and bandage (tie) on the wounded part-dermal	Common

						Wound/sore	Leaf	-Being mix with Jasminum abssinicum pounded & squeezed (concoction)and bandage (tie)on the wounded part-dermal	
37	Kinchb t		<i>Euphorbia tirucali</i> L. (Euphorbiaceae)	Shr	Wild /cultiv ated	Thorn inside body as expellant	Latex	Simply cutting & bleeding the plant and apply or cream on the infected body-dermal	Rare
						Hemorrhoids	Latex	Apply the latex on affected part-dermal	
						Wart	Latex	Simply cutting &bleeding the plant and apply or cream on the infected body-dermal	
38	Tobia		<i>Calotropis procera</i> (Ait) (Asclepiadaceae)	Shr	Wild	Wart	Latex	Simply collect the latex and apply or cream on the infected body-dermal	Comm on
									Moder ate
39	Gid zemdie		<i>Medicago polymorpha</i> L. (Fabaceae)	Her	Wild	Abdominal pain	Leaf	Chew and swallow fluid-oral	Rare
40	Nech bahriza f	Blu e gu m	<i>Eucalyptus globulus</i> Labill.(Myrtaceae)	Cultivated	Tr	-Febrile or devil -common Cold	Leaf	Boiled being mixed with O. sauve& Z.scabra (decoction) and nasal/oral inhalation of steam	Moder ate
41	Tunjut		<i>Otostegia integrifolia</i> Benth (Lamiaceae)	Shr	Wild	Hypertension	Leaf	Drying pounded (grinding) & mixed with tea & coffee (concoction)and drink -oral	Rare

42	Mekakulkal		<i>Opuntia ficus-indica</i> (L.) Miller (Cactaceae)	Shr	Cultivated/wild	Anthrax	Leaf	Place it on fire and it on affected part while hot-dermal	Rare
43	Lut		<i>Alchemilla sp</i> (Rosaceae)	Her	wild	Hemorrhoid, placental delay (retention)	Leaf leaf/root	Pounded and & squeeze and drinking-oral	Rare
44	Warka		<i>Ficus vasta</i> Forssk. (Moraceae)	Tr	wild	Ascariasis	Bark	Crush and mixing with honey and eat-oral	Rare
45	Fiyle feji	Mistletoe	<i>Clusia abyssinica</i> (Euphorbiaceae)	Shr	Wild	Gonorrhea -Malaria -Hepatitis	Root	-Crushed boiled (decoction) and drinking (oral)	Rare
						Erectile dysfunction & stominal ache	Root	Boild being mixed with N. satuva, A. sativum then honey (decoction) and eat-oral	
						Abdominal pain	Root	Chew and swallow the fluid-oral	
46	Yechatekelsela	Mistletoe	<i>Viscum sp.</i> (Loranthaceae)	Shr/epiphyte		Rheumatic or nerve problem on legs	Leaf	Boiled & mixed with honey (decoction) and drink at every morning	Rare
47	Chikugun		<i>Artemisia abyssinica</i> Schultz Bip.	Her	Wild	Stomach complaints /ache with diarrhea	Leaf	Dried, grinded mixed with water & drinking (oral)	Rare

			(Asteracea)						
48	Chigua go		<i>Bidens pilosa</i> L. (Asteracea)	Herb	Wild	Tina versicolor caused by pityrosporum orbiculare	Leaf	Pounded & squeezed and apply on the infected skin	Rare
						Wound sore	Leaf	Grinded being mixed with salt (concoction) and bandaging on the sore	
49	Azo hereg		<i>Clematis hirsute</i> Perr. & Guill. (Ranuncul aceae)	Climber	Wild	Pustular psoriasis	Leaf	-Squeezed and apply on the wounded	
50	Keberi cho		<i>Echinops kebericho</i> Mesfin (Asteracea e)	Herb	Wild	Head ache and stomach ache	Leaf	Powder and drink with water(Oral)	
51	Sholla		<i>Ficus sur forssk</i> (Moraceae)	Tree	Wild	Asthma	Fruit	Boil and drink with watee (Oral)	Rare
52	Simiza		<i>Justicia schimperiana</i> (Hochst. ex Nees) (Acanthace ae)	Shrub	Cultiv ated	Rabbit	Leaf	Powder and drink with water(Oral)	Moder ate
53	Chicho		<i>Premna schimperi</i> Engl. (La miaceae)	Shrub	Wild	Tonsillitis	Leaf	Rub and drink the juice(Oral)	Rare
54	Enslal		<i>Foeniculum</i> <i>vulgar e</i>	Herb	Both wild and	Urinary retention	Leaf	Rub and squeeze the then drink with coffee/tea	Rare

			Miller(Apiaceae)		cultivated				
55	Koshim		<i>Dovyaliscaffra</i> (Flacourtiaceae)	Shrub	Wild	Stomch pain	Fruit	Drink amixture of one glass of fruit juice and crushed leaf-oral	
56	Grawa		<i>Vernoniaamygdalina</i> DeL.(Asteraceae)	Shrub	Wild	Ascaris	Leaf	Two spoonful of pounded leaf of grawa mixed with a glass of water taken orally-oral	

Appendix.2.List of medicinal plants for treating livestock diseases

Plant parts used method of preparations, route of administrations, habits and habitats of plants. *= Plant species used for both human and livestock disease

NO	Medical plant (s) documented			Habit	Habitat & mngt	Livestock disease healing	Plant part (s) used	Method of preparation and routes of administration
	Name							
	Local	English	Scientific					
1	Yemidir embuay *		<i>Cucumis ficifolius</i> A rich (Cucurbitaceae)	Climbing/her	Cultivated & wild	Fever lack of appetite and to fatten cattle	Root	Crushed pounded or adding water and let them drink
						Black leg	Root	Being mix with grass (concoction) and them eating

2	Kitkita		<i>Dodonaea angustifolia</i> L.f (Sapindaceae)	Shr	Wild	Diarrhea -thining disease	Bark	Pounded being mixed with leaf of <i>E.capensis</i> in water (concoction and feed every morning
							Dislocated	Leaf
3	Gulo*	Castor oil plant	<i>Ricinus communis</i> L.(Euphorbiaceae)	Shr	Cultivated	Lack of appetite divel disease	Leaf	Pounded being mixed with <i>C.macrostachyus</i> & <i>withania</i> sp. Then squeezed (concoction) and let them drink (oral/nasal)
						Eye disease (injury)	Fruit	Drying, crushing pounded and apply in to eye
						Eye disease (injury)	Leaf	Pounded & squeezed and apply in to eye
4	Emboy*	-	<i>Solanum marginatum</i> L.F (Solanaceae)	Shr	Wild	Eye disease	Fruits	Pounded being mixed with leaf <i>P. dedocandera</i> and apply in to eye along butter
5	Milas golgul		<i>Cyphostema</i> sp (Vitaceae)	Her	Wild	Stomach swelling disease - Anthrax	Root	Pounded being mixed with leaf <i>J.procera</i> <i>A. sativum</i> oil & salt (concoction) and feed the apply in to eye along butter
						Snak bite	Root	Pounded with water and let them drink (oral/nasal)
						Black leg	Stem	Pounded with water let them drink (oral)
6	Enkoshe shila*	Devils fig	<i>Argemone mexicana</i> L.(Asteraceae)	Her	Wild	Exotic disease or disease out break	Root	Pounded with water and let them drink (oral /nasal)

7	Tnbaho	Asthma weed	<i>Nicotiana tabacum.</i> (Solanaceae)	Shr	Cultivate & wild	Leech	Leaf	-Pounding & squeezed by adding water and let them drink (oral/nasal)
8	Yehabes ha tid*	Juniper	<i>Juniperus procera</i> Hochst. ex Endl. (Cupressaceae)	Tr	Cultivated	Leech	Leaf	Pounding & squeezed by adding water (concoction) and let them drink (oral/nasal)
								Pounding & squeezed by adding water (concoction) and let them drink (oral)
9	Ye embs tegedra		<i>Allophylus abyssinicus</i> (Hochst.) (Sapindaceae)	Shr	Wild	Filling of fever	Leaf	Pounding & squeezed by adding water (concoction) and let them drink (oral)
10	Embuac ho *		<i>Rumex nervosus</i> vahl (Polygonaceae)	Shr	Wild	Filling of fever	Root	Pounding & squeezed by adding water (concoction) and let them drink (oral)
11	Eret *		<i>Aloe sp</i> (Aloaceae)	Shr	Wild/Cultivated	Epidemic disease	Whole	Put on their house
12	Telenj *		<i>Achyranthes aspera</i> L. (Amaranthaceae)	Her	Wild	Eye infection	Root	Chew and spit the liquid on to the infected eye
13	Kotetina		<i>Verbascum sinaiticum</i> bennth (Scropholariaceae)	Her	Wild	Evil eye	Root	Pounded & boiled then cooled for night long (decoction) and let them feed every morning before any forge

			ae)					
14	Senbo		<i>Ekebergia capensis</i> Sparm.(Lamiaceae)	Tr	Cultivated & wild	Thinning disease	Leaf	Pounded being mixed with <i>Dodonaea angustifolia</i> in water then left for a day (concoction) and feed every morning

Appendix.3.List of informants involved in the Ethnobotanical study

(NB: M=male=female, D=degree, Di=Diploma, SE, =Secondary school education, PE=Primary school education, IR=irregular education, IL=Illiterate, Md=married, S= single and * marked are key informants)

No.	Name	Kebele	Age	Sex	Marital status	Educational status
1	Ayalew Aragie	Adengure	40	M	Md	IL
2	Etwa Asmamaw*	>>	53	F	>>	IR
3	Fentaw Abebaw	>>	42	M	>>	PE
4	Setie Mengesha	>>	26	F	S	PE
5	Kes Desye Maregu*	>>	40	M	Md	IR
6	Fentaw Abebe	>>	80	M	>>	IL
7	Aynads Zewdu	>>	56	F	>>	IR
8	Asmamaw Yimam*	>>	51	M	Md	IR
9	Habtamu Derbew*	>>	48	M	>>	IL
10	Desale Kasaw	>>	43	M	>>	PE
11	Asefa Dagnaw*	>>	45	M	>>	IR
12.	Simegn Tareke	>>	43	F	>>	PE
13	Getahun Hailu	>>	66	M	>>	IL
14	Tiku Misganaw*	>>	51	M	>>	IR

15	Asres Abera	>>	47	F	Md	PE
16	Yemataw Asmare	>>	45	M	>>	IL
17	Arega Setegn	>>	62	M	>>	IL
18	Guzguz Kebede	>>	58	F	>>	IL
19	Shewaye Sete*	>>	43	F	>>	PE
20	Destaw Hailu*	>>	33	M	S	SE
21	Sisay Ambaw	>>	35	M	>>	Degree
22	Getachew Nigus*	>>	37	M	Md	PE
23	Debre Abate	>>	50	F	>>	IR
24	Wanaw Demeke*	>>	37	M	S	SE
25	Maritu Asefa	>>	50	F	Md	IL
26	Dubale Adisie	Jenetober e	44	M	>>	PE
27	Tiruye Achenef*	>>	39	F	>>	IR
28	Mola Tesfaye*	>>	32	M	S	PE
29	Adisu Kebede	>>	44	M	Md	PE
30	Berihun Abate	>>	63	M	>>	IL
31	Mekuye Tesfaye	>>	54	F	>>	IR
32	Birhanu Tesfaw	>>	30	M	>>	PE
33	Endris Muhammed(Sheik)	>>	50	M	>>	IR

	*					
34	Genzeb Yimer	>>	28	M	S	SE
35	Fentaw Mkonnen	>>	66	M	Md	IL
36	Belay Zenebe*	>>	37	M	>>	PE
37	Yalemwork Asmamaw	>>	24	F	S	SE
38	Tsehay Desale	>>	28	F	>>	SE
39	Asres Yilma*	>>	46	F	Md	IR
40	Tilahun Mebrie*	>>	43	M	>>	IR
41	Amelework Kidane	>>	28	F	S	SE
42	Mekuye Tesfaw*	>>	56	M	Md	IL
43	Belaynesh Desu	>>	29	F	>>	Diploma
44	Chane Asmamaw	>>	61	M	>>	IL
45	Ayalew Kasa	>>	42	M	>>	IR
46	Kes Desale Yitbarek*	>>	57	M	>>	IR
47	Yezina Bishaw	>>	25	F	S	PE
48	Bihon Kebede*	>>	47	M	Md	IR
49	Melaku Tegegne	>>	39	M	>>	SE
50	Tesfanesh Teshome	>>	24	F	S	PE
51	Hiekma Jemal	Mehalem	42	F	Md	IR

		echarie				
52	Hamelmal Tegegne(Debtera)*	>>	44	M	>>	IR
53	Desta Mesfin	>>	33	F	>>	SE
54	Adisu Kebede	>>	47	M	>>	Degree
55	Seada Yimer	>>	49	F	>>	IR
56	Tamru Ayalew	>>	67	M	>>	IL
57	Belay Tadese	>>	33	M	S	PE
58	Belaynesh Abrha	>>	51	F	Md	IL
59	Demise Asefa*	>>	46	M	>>	IL
60	Tsehaynesh Kasaw*	>>	55	F	>>	IR
61	Mohammed Fentaw	>>	29	M	S	SE
62	Gashaw Asefa	>>	34	M	Md	Diplpma
63	Hana Getahun	>>	46	F	>>	IR
64	Berihun Alemu	>>	50	M	>>	IR
65	Wasihun Seid*	>>	76	M	>>	IL
66	Erku Terefe	>>	66	M	>>	IL
67	Kedija Sisay*	>>	65	F	>>	IR
68	Setita Belete	>>	44	F	>>	PE
69	Menen Tegegne	>>	60	F	>>	IL

70	Ayehu Firew	>>	54	F	>>	IR
71	Sisay Derbie	>>	49	M	>>	IR
72	Merecho Kasaw*	>>	39	M	>>	PE
73	Musawa Sitot	>>	28	M	S	SE
74	Desalegn Molaw(Diakon)*	>>	55	M	Md	IR
75	Fozya Mekonen	>>	52	F	>>	IR
76	Araya Tesfay	Golamec harie	63	M	>>	IL
77	Nigistie Fentaw	>>	24	F	S	SE
78	Reta Adisu*	>>	56	M	Md	IR
79	Hadya Yimam	>>	20	F	S	PE
80	Getnet Tesfaye(Kes)	>>	64	M	Md	IR
81	Mola Sisay	>>	59	M	>>	IR
82	Tesfanesh Melese	>>	27	F	S	PE
83	Zeben Mekonnen*	>>	41	F	>>	IR
84	Lubaba Tibebu*	>>	54	F	>>	IR
85	Ashebir Mola	>>	55	M	>>	PE
86	Zeynu Husien*	>>	67	M	>>	IR
87	Mengesha Sisay	>>	28	M	S	PE

88	Teshome Mola*	>>	39	M	Md	PE
89	Birtukan Teka	>>	44	F	>>	IR
90	Muktar Mohammed(Sheik)	>>	64	M	>>	IL
91	Seada Hussien	>>	39	F	>>	PE
92	Jemila Desye*	>>	49	F	>>	PE
93	Yohanes Adimasu	>>	68	M	>>	IL
94	Fatima Ahmed*	>>	37	F	S	PE
94	Gubana Sisay*	>>	46	M	>>	IR
95	Mengesha Hussien	>>	41	M	>>	Degree
96	Yimer Ali	>>	76	M	>>	IL
97	Toyba Ashebir*	>>	42	F	>>	IR
98	Siraj Ali	>>	71	M	>>	IL
99	Asefa Getu	>>	39	M	S	Diploma
100	Habiba Seid*	>>	51	F	Md	IR

Appendix.4.Family and numbers of species

No.	Family name	No. of species
1	Asteraceae	5
2	Euphorbiaceae	7
3	Rubiaceae	1
4	Urticaceae	1
5	Rosaceae	1
6	Fabaceae	3
7	Acanthaceae	1
8	Berberidaceae	1
9	Boraginaceae	1
10	Capparidaceae	1
11	Crassulaceae	1
12	Cucurbitaceae	1
13	Cupressaceae	1
14	Ebenaceae	1
15	Amaranthaceae	1
16	Apocynaceae	1
17	Lamiaceae	6
18	Loranthaceae	1
19	Aloaceae	2
20	Meliaceae	1
21	Moraceae	2

22	Moringaceae	1
23	Myrtaceae	1
24	Oleaceae	1
25	Piperaceae	2
26	Polygonaceae	2
27	Ranunculaceae	1
28	Rhamnaceae	1
29	Apiaceae	2
30	Asclepiadaceae	1
31	Scropholariaceae	1
32	Solanaceae	4
33	Umbelliferae	1
34	Vitaceae	1
35	Malvaeae	1
36	Podocarpaceae	1
37	Flacourtiaceae	1
38	Sapindaceae	1
39	Lactaceae	1

No	Name of plant	Disease it treat	Growth form(habitat)	Source (habitat)	Part of the plant used	Method of preparation	Rate of administration	Dosage
1								
2								
3								

5. What is the common method of preparation of the medicine in your local area? Please fill the table

No	Name of plant	Crushed and powdered	Powdered	Boiled	Infusion	Used alone	Mixed with others	List of others
1								
2								
3								

6. from where you get those medicinal plants?

a) Wild b) home garden c) cultivated land d) others

7. Are medicinal plants marketable? a) Yes b) no

8. What are the current and potential threats for the loss of medicinal plants and the associated knowledge?

a) Agricultural encroachment b) deforestation c) overgrazing d) over exploitation e) others

9. How do you conserve traditional medicinal plants to decrease their removal from their habitat?

10. What are the reasons for the acceptance of the remedies by the local people?

11. For what other purposes do you use the medicinal plants?

12. From whom do you get the traditional medicinal plant knowledge practice?

a) Family b) colleagues c) religious books d) through innovations e) others

13. Are there any traditional medicinal practitioner associations in your locality? a) yes b) no

Survey area/ district _____

Community/kebele _____

Researcher _____

Date/Month/Year ____/____/____

