Jimma University

College of Natural Sciences

School of graduate studies

Department of Biology

Ethnobotanical study of medicinal plants used to treat human and livestock ailments in and around Chato natural Forest, Horo District, Horo Guduru Wollega Zone, Western Oromia, Ethiopia.

BY: Kasahun Dima Bayissa

A Thesis submitted to Department of Biology, School of Graduate studies, College of natural Sciencies, Jimma University in partial fulfillment of the requirements for the degree of Master of Science in Biology.

October, 2015

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Advisors:

Balcha Abera (PhD)

Tamen Belude (MSc)

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Declaration

I here by, declare that this thesis is my own original work and has not been presented for a degree in any other universities and that all sources of materials used for the thesis have been duly acknowledged. Thesis submitted to Department of Biology, School of Graduate studies, College of natural Scincies, Jimma University in partial fulfillment of the requirements for the degree of Master of Science in Biology.

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BIOGRAPHY

The author was born at Harbu Bosoko specific village, Horo District, Horo Guduru Wollega Zone, Western Oromia on May 19, 1977. He attended his elementary lesson at Sekela Elementary school, high school at Shambu Senior secondary school and completed in 2000, diploma at Jimma Teachers'college graduated in biology since 2003 and employed in 2003 at Jardega Jarte District and thought biology at Alibo high school, then joined Mekelle University in 2006 and graduated in 2009. Now he has been working from Shambu preparatory school in 2011. Finally he has been serving for twelve years in teaching, attended master of degree in Biology at Jimma University in 2012 and graduated in 2015.

ACRONYMS

FAO – Food and Agriculture Organization

IBC - Institute of Biodiversity Conservation

IBCR - Inistitute of Biodiversity Conservation and Research

WHO – World Health Organization

NFPAs - National Forest Priority Areas

UNEP - United Nations Environment Programme

IUCN - The World Conservation Union

WWF - World Wide Fund for Nature

HGWFWED – Horo Guduru Wollega Forest and Wildlife Enterprise District.

ZOFED - Zonal Finance and Economic Development.

EVM – Ethnoveterinary Medicine.

FIC – Factors of Informant Consensus

ABSTRACT

Medicinal plants are essential part of the variety of cultures among ethnic groups in Ethiopia and have been used in several parts of the world. The purpose of the study was to document traditional medicinal plants species and indigenous knowledge of the inhabitant people used to treat both human and livestock ailments in and around Chato Forest, Horo District, Western Oromia, Ethiopia. The study involved traditional healers, knowledgeable elders and local people. Various ethnobotanical techniques were used to collect and analyze the data including: semi- structured interview, guided field walk and observation, group discussion, preference raking and paired comparison, direct matrix ranking and fidelity level index, combined with descriptive statistical analysis. Sixty five informants from four kebeles and 16 local study areas were included in the study. A total of 97medicinal plant species 65(67.01%) wild, 11(11.34 %) cultivated and 21(21.64 %) both wild and cultivated were categorized into 92 genera and 53 families. Of these 76 (78.35 %) treat 48 human ailments, 40 (43.47 %) 16 livestock ailment and 34 (35.05 %) treat both human and livestock ailments. Of these herbs 41 (40.19 %), shrubs 32 (31.37 %) and liana 22 (14.7 %) were mainly used growth forms. Leaves 40 (41.23%), root 27 (27.83 %) and seed 14 (14.43 %) were primarily used parts. Where as pounding 32 (32.98 %), powdering 23 (23.71 %) and concoction 5(5.15 %) were predominantly used modes of preparation. Oral 42 (43.29 %), dermal 32 (32.98 %) and nasal 13 (13.98 %) were major routes of administration. About 65 (67 %) the medicine were prepared and used fresh, 22 (23 %) dried and 10 (10 %) both fresh and dry. Medicinal plants were utilized for forage, fencing, fire wood, construction, charcoal and furniture needs. The highest informant consensus was documented for Thalictrum rhynchocarpum (0.98), *Acmella caulirhiza (*0.97), *Allium sativum (*0.96) and *Ocimum urticifolium (*0.96) *informants ranking them 1st, 2nd and 3rd respectively for their medicinal value. Preference ranking, paired comparison and fidelity level index showed the efficacy, popularity and preference people have for some species over the other for different uses and in treating ailments. Awareness education and announcement from health professional have contributed in making the younger generation indisposed to practice and retain the knowledge. Encroachment* (40 %), new settlement (23.07 %) and fire wood (20 %) *were major threat factors to medicinal plants. All inclusive conservation action should be taken to preserve both medicinal plants and the* indigenous *knowledge.*

Key words: - Ethnomedicne, Ethnoveternary, indigenous knowledge, ailments, Chato Forest

1. INTRODUCTION

1.1. Background of the study

Ethnobotany is a broad term referring to the study of direct interrelations between humans and plants (Martin, 1995). This includes plants used as food, medicines, building materials and for any other economic application (Farnsworth, 1994). Man was well aware of the medicinal properties of some plants growing around him since 3000 B.C. Hippocrates was referred to as the father of medicine (Lewis, 1981). Pankhurst (1990) explained that, during and after the Italian occupation the general population, with the exception of the privileged groups, depended almost entirely on traditional medicine. Wilson and Woldo (1997) explain that much of the knowledge on the traditional medicinal plants was available in rural communities perpetuated by word of mouth within families and small communities.

Herbs are staging a comeback and herbal 'renaissance' is happening all over the globe. The herbal products today symbolize safety in contrast to the synthetics that are regarded as unsafe to human and environment. The blind dependence on synthetics is over and people are returning to the naturals with hope of safety and security. Over three-quarters of the world population relies mainly on plants and plant extracts for health care. More than 30% of the entire plant species, at one time or other was used for medicinal purposes (Joy *et al*., 1998).

It has been estimated that in developed countries including United States, plant drugs constitute as much as 25% of the total drugs, while in developing countries such as China and India, the contribution is as much as 80%. Thus, the economic importance of medicinal plants is much more to countries such as India than to the rest of the world. These countries provide two thirds of the plants used in modern system of medicine and the health care system of rural population depends on indigenous systems of medicine. Of the 250,000 higher plant species on earth, more than 80,000 have medicinal property. India is one of the world's 12 biodiversity centers with the presence of over 45,000 different plant species (Joy *et al*., 1998).

There are some attempts in investigating medicinal plant uses and there is yet no in depth study on the relation between medicinal plants and indigenous knowledge on sustainable management of such plant resources. The IBCR has promised to do this in its long-range strategic research plan (IBCR, 2000).

Different countries have vernacular names to describe medicinal practitioners emphasizing their close association with their community in which they live and practice. For example, in India they are called Indigenous healers, In China they are called Bare footdoctors ,in Cuba they are called Corianders, In Ethiopia *"Ogeessa Qoricha aadaa''*(in Oromo language), (Yebahil Hakim). Terminologies which donate colonial fruits should be avoided as much as possible and be substituted with more accepted title that is cultural medicinal practitioners (Lewis, 1981).

Ethiopia is well known for its significant geographical diversity which has favored the formation of different habitats and vegetation zone, as well as Ethiopia is the home of many language, culture and beliefs of traditional knowledge and practice of the people which among others includes the use of medicinal plants (Giday, 2001).

Some studies have shown that most of the medicinal plants utilized by the Ethiopian people are harvested from wild (Giday, 1999). As time goes by, however, these widely occurring medicinal plant species and the associated traditional knowledge are being eroded. Similarly (Abera, 2014) stated that the transfer of indigenous knowledge is declining as the result of oral transmission from generation to generation, for this reason argent incorporation of this knowledge into formal education before it is lost.

Horo District has a protected Chato Forest which is full of indigenous plants because of its richness in biodiversity (Abdena, 2010). The Forest is not well studied; the inhabitant population have been using traditional medicinal plants to treat both human and livestock ailments because of shortage of health service (clinics), less accessibility of drugs and high cost of western drugs. For this reason, the study was conducted to documents such important medicinal plant species and indigenous knowledge of the local societies for future use and for further investigation. The study was conducted in and around Chato Forest of Horo District on culturally used medicinal plants, to document medicinal plants, parts used, mode of preparation, dosage and antidotes used by understanding the absence of reference documents on medicinal plants and indigenous knowledge of the inhabitant people.

1.2. Statement of the problem

Medicinal plants had been used since 3000 B.C (Lewis, 1981) and then followed by western drugs, even if western drugs have been developed and used widely most of the current study indicates that, because of its increasing side effect and cost of modern drugs most of the developed countries and developing countries have gone back to using cultural medicinal plants (Joy *et al*., 1998).

In and around Chato Forest traditional medicinal plants have been used by inhabitant people because of insufficient service of health care (clinics), less accessibility of drugs and cost of synthetic drugs. The study was conducted in and around Chato Forest of Horo District to document medicinal plants species and indigenous knowledge of the inhabitant people. Therefor, the study was conducted to document and assess the indigenous knowledge of the resident people and medicinal plants used to treat both human and livestock ailments through the following perspectives:

- What are the medicinal plants used for treating various diseases?
- What are the most common diseases of human and livestock in the study area?
- What are the existing threat factor to medicinal plant species and traditional knowledge transferred?
- How do local communities conserve medicinal plants?

1.3. Objectives

1.3.1. General objective

- To document traditional medicinal species and the associated indigenous knowledge used to treat both human and livestock ailments in and around Horo District, Horo Guduru wollega Zone, Western Oromia, Ethiopia

1.3. 2. Specific objectives

- To collect, document and identify medicinal plants species and their growth form;
- To document plant part (s) used, mode of preparation and route of administration;
- To document both human and livestock diseases treated by medicinal plants;
- To identify season in which medicinal plants are mostly available;
- To identify threat factors to medicinal plants in the study area;

1.4. Significance of the study

The study has the following significances:

- Enhances moral and performance of cultural medicinal practitioners.
- Makes easy to get, prepare and to use cultural medicinal plants among the society.
- Could be a reference document on culturally used medicinal plants.
- Develop awareness in the society to use and conserve medicinally important plants

1.5. Delimitation of the study

The study was carried out in Ethiopia, Oromia Regional state, Horo Guduru Wollega Zone, Horo District, in and around Chato Forest. As data source the study includes nine kebeles (*ganda*) in three districts including Horo, Jardega Jarte and Abe Dongoro of the Zone. The study focused on medicinal plants used to treat both human and livestock ailments. Similarly the study includes: identification of medicinal plants species, growth forms, parts used, mode of preparation, routes of administration, dosage and antidotes used with medicinal plants.

1.6. Limitation of the study

The study was limited because of several factors like:

- Shortage of time because it was done on part-time basis while teaching,
- Lack of transport to the study area.
- Reluctances of the medicinal practitioners to tell (disclose) their medicinal knowledge,
- Shortage of money (fund) and facilities.

2. REVIEW OF RELETED LITERATURE

2.1. Indigenous knowledge

Indigenous knowledge can be defined as a body of knowledge built up by a group of people through generations of living in close contact with nature (Fikret, 1993), is a broad concept that covers all forms of knowledge of a particular community living in a particular area and also it is specific to communities and local environments (UNEP, 2008), 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).

The folk knowledge and traditions of Ethiopia utilize the herbal resources available in nature. The knowledge is conveyed from generation to generation orally. It is more diverse based on the ecosystem and the household level health practices. The health practices that start from home remedies for primary health care to specialized healing traditions like bone setting, poison healers, delivery, and veterinary healers are found among various communities (Hiranmai, 2013).

It is widely believed in Ethiopia that the skill of traditional health practitioners is 'given by God' and knowledge on traditional medicines is passed orally from father to a favorite child, usually a son or is acquired by some spiritual procedures. Traditional Healing knowledge is guarded by certain families or social groups secretively (WHO, 1990; Pankhurst, 1965; Vecchiato, 1993).

The wide spread use of traditional medicine among both urban and rural population in Ethiopia could be attributed to cultural acceptability, efficacy against certain type of diseases, physical accessibility and economic affordability as compared to modern medicine. Ethiopian traditional medical system is characterized by variation and is shaped by the ecological diversities of the country, socio-cultural background of the different ethnic groups as well as historical developments, which are related to migration, introduction of foreign culture and religion (Pankhurst, 1965; Vecchiato, 1993).

Traditional medicinal knowledge is dynamic and practitioners make every effort to widen their scope by reciprocal exchange of limited information with each other or through reading either one of the traditional pharmacopeias written in Arabic or Geez that are produced as far back as one hundred or more years (Dawit, 1986).

Professional traditional healers known by different names in different parts of Ethiopia are the primary players in the curative aspect of traditional medicine practice. One of the well recognized groups of these healers are the secular *medhanit awakis* (*kitel betashs*), herbalists using plants as their primary means of providing treatment. A large number of plant medicines are used, and for the purpose of references, most *medhanit awakis* possess pharmacopoeias. Minerals and animal-derived substances are additional items in the pharmacopoeia of *medhanit awakes* also they are called *debtera, tenquay* (witch doctors), *weqaby and kalicha* (Mogessie, 1988).

2.2. Medicinal plants and ethnomedicine.

Globally the estimate of medicinal plant species range from 35, 000 - 50, 000 species, out of this about 4000 - 6000 species have entered the world market of medicinal plants (Farnsworth and Soejarto, 1991). About one hundred plant species having been used as a source of modern drug. The greater concentration of medicinal plants are found in the south and south western Ethiopian parts of the country following the concentration of biological and cultural diversity (Edwards, 2001)

Ethiopia has a considerable portion of the two of the world's 25 biodiversity rich areas hot spot in eastern Afromontane Biodiversity Hotspot and the Horn of Africa-Biodiversity Hot Spot this is because of the geographical diversity of Ethiopia has favored different habitats and vegetation types, that medicinal plants are also a component of these. This geographical diversity couples with multiplicity of ethnic groups with complex cultural diversity make the country the home for high diversity of traditional knowledge, practice and uses of traditional medicine (Abebe and Ayehu, 1993; Asfaw, 2001; Giday, 2001).

Ethiopia is believed to be home for about 6,500 species of higher plants with approximately 12% endemism, and hence one of the six plant biodiversity rich countries of Africa (UNEP, 1995) of these about 800 species of plants are used in the traditional health care system to treat nearly 300 mental and physical disorders (Pankhurst.1965 and Vecchiato.1993) . 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 decisive diversity hot spot for plants. As one of the 12th Vavilovian centers of origin for domesticated crops and their wild relatives, it is home of many endemic crops and genetic stocks (Vavilov, 1951; Harlan, 1969; Bekele, 1978).

Diverse vegetation types that are found in the various agro ecological zones of Ethiopia accommodate various types of medicinal plants (Bekele, 2007). Similarly Edwards (2001) reported that the woodlands, montane vegetation including grasslands, forests, evergreen scrubs and rocky areas contain more medicinal plants with higher concentrations in the woodlands. 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. One thousand identified medicinal plant species were reported in Ethiopian Flora, however, many others are not yet identified. About 300 of these species are frequently mentioned in many sources. Jansen (1981) asserts that Ethiopia has rich medicinal plant lore and points out that almost all plants of the Ethiopian flora are used someplace somehow medicinally.

2.3. Sources of supply of medicinal plants to treat human ailments

According to Asfaw (1999; 2001) description in Ethiopia, most of medicinal plants used by the herbalists are collected from the natural vegetation. Home based medicinal plants use relies on plants of the home garden crops, weeds and that grow wild around human habitation. Medicinal plants of home garden were known to the public as the knowledge on them is open or public. Several studies Birhanu and Abera (2015); Abera (2014); Adefa and Berhanu (2011) reported that most of medicinal plants were harvested from wild some from home garden and few of them are form both home garden and wild area.

According to Bekele (2007) Medicinal plants obtained from wild habitats are found in different natural ecosystems of the forests, grasslands, woodlands, wetlands, in field margins and garden fences, as weeds and in many other microhabitats from where they are harvested when the need arises. These are free access resources to all with appropriate knowledge and who want to use them for the family, for practicing traditional medicine or for sales. Consumers get their supply from different sources including from own garden, purchasing from traders and healers. Medicinal plants are also imported informally from Sudan through border towns such as Assosa, Dire Dawa and others. The domestic supply sources are closely associated with the biodiversity and concentration of forest areas for instance Jimma, Bale. Traders from Dire Dawa for illustration travel to Bale, Jimma, Gonder, Menz and the like.

In Ethiopia, except in a few cases where a few food crops with medicinal value are cultivated, there is no organized cultivation of plants species for medicinal purposes. The reason for this is that the quantities of medicinal plants traded are very small, and there is no organized large scale value addition and processing. However, there is a potential in the future for increased demand for some of the species and, therefore, it is important to identify them and start the necessary research on the propagation and cultivation techniques. Such program will also provide basis for small enterprises to improve the income generating capacity of the local people (Bekele, 2007).

2.4 Ethnomedicinal plants growth form, part used, mode of preparation and routes of administration

According to Moffat *et al.* (2011) from Pakistan reported that the most medicinally significant growth forms of plants are herbs followed by shrubs and trees respectively. Anant *et al.* (2012) from western Nepal and Njau (2001) in Tanzania reported that herbs were the primary source of traditional medicine pursued by trees. Ahmad *et al.* (2011) from Namibia reported as shrubs, herbs and climbers are the most medicinal significant growth form.

Similarly Mussa *et al.* (2014) from south west Ethiopia, Engedasew *et al*. (2015); Tekele (2015) reported that herbs, shrubs, trees and climbers were the most medicinally used growth forms in dawuro zone and Amaro District (Hawasa) respectively. Giday *et al.* (2009) from South Nation Nationality People, Abera (2011 and 2014) from Jimma and Ghimbi, Moa *et al*. (2013) from Wayu Tuka reported that herbs are the most medicinally used growth form of plant and is followed by shrubs. Same result was reported by several studies such as Amenu (2007); Hundie (2001); Luelka (2005) from Ethiopia. In contrary to this Keteme *et al.* (2013) from Omo reported as shrubs are the most medicinally significant growth form followed by trees. Similarly Giday (2009) reported as trees are the most medicinally used growth form of plants. Likewise Adefe and Berhanu (2011) from south Wollo reported that herbs are the primary source of ethnomedicine followed by shrubs and trees.

According to Helen *et al.* (2013) from South Africa depicted that leaves, bark and roots are the most medicinally harvested part of medicinal plants. Additionally Nwachukwu *et al.* (2010) from Nigeria reported that bark root, seeds, fruit, leaves are the most medicinal collected part, similarly they reported that secondary metabolite of plants have medicinal value. According to Abera (2011); Yirge *et al.* (2011); Adefe and Berhanu (2011), Musae *et al.* (2013); Habtamu *et al.* (2014) reported from different part of Ethiopia that leaves were the most harvested part for medicinal purpose followed by roots and seed. Engedasew *et al.* (2015); Tekele (2015) reported that leaves, roots and barks were the most medicinally used parts of plant.

Accordingto several studies Agisho *et al.* (2014); Yirga *et al.* (2011); Ashagire (2011) depicted that the primary mode of preparation of ethnomedicinal plants was pounding.

Many studies, Musa *et al.* (2013); Adefe and Berhanu (2011); Abera (2011 and 2014); Sori *et al.* (2004); Ashagire (2011); Yirga (2009); Engedasew *et al.* (2015); Tekel (2015) reported that oral route of administration was the main used followed by dermal (topical) and nasal and oral and dermal.

2.5. Dosages administered

Healers obtain their drugs mainly from natural substances like plants, animals and minerals. Drugs are prepared in various dosage forms including liquids, ointments, powders and pills, prescribed in a non formulated form and additives are usually incorporated and more than one drug is used in a single dosage form (Abebe, 1984).

Most medicinal plants prescribed were administered without any standardized doses (Abera, 2014; Lulekal *et al*., 2013). However, approximate dosages (although no fixed standards) were reported to be determined based on age, sex and physical appearance of patients visiting local healers. Some medicinal plant preparations were mentioned to be measured in small cups locally called "*Yebuna sini*" referring to traditional cups used for drinking coffee or plastic jugs, while others were measured as handful, spoonful or size of a finger. Coffee, milk, honey, yoghurt, butter and dissolved powder of roasted barley, locally known as "*Besso*", were commonly reported antidotes for herbal preparations with adverse side effects (Lulekal *et al*., 2013).

2.6. Plants in ethnoveterinary medicine

Traditional animal healthcare system (also known as ethnoveterinary medicine or EVM) is as old as the history of domestication of animals (Joe *et al*., 2010). Ethnoveternary medicine refers to centuries' old inter-and multidisciplinary components of health that are holistic in application and comprises local ethnomedicinal knowledge and associated skills, techniques, practices, beliefs, taboos, cultures, practitioners and socio-economic structures pertaining to the healthcare and healthful husbandry of food, work and other income producing animals (McCorkle, 1986 and McCorkle 1992).

Similarly Etana (2010) explain that in Ethiopia people have used traditional veterinary medicine 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 subjects of international development. Knowledge of medicinal plants can empower livestock owners to solve animal health problems cost-effectively.

Ethiopia covers several ecological zones and therefore has a wide variety of natural resources, many of which are favorable to various species of plants and animals. Unfortunately, a large number of animal diseases also exist in the country, limiting livestock production. In this country, as in other countries, traditional veterinary medicine involves the work of bone-setters, midwives, religious healers and people who claim the ability to communicate with devils (Mesfin and Obsa, 1994). Traditional medicines were also seen as alternative medicine as described by Abebe (2001) are sometimes the only source of therapeutics for nearly 80% of human population and 90% of livestock in Ethiopia. For the moment 95% of these alternative medicines are of plant origin (Abebe, 1986; Giday and Ameni, 2003).

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 demand and supply of livestock products (Agrawal, 1995). Cattle owners in Ethiopia have long been aware of serious diseases such as desta (rinderpest), aftegir (foot and mouth disease), abasenga (anthrax), abagorba (blackleg), gendi (tryps) and diseases caused by internal and external parasites, and of the zoonotic nature of diseases such as anthrax and rabies. Before the introduction of modern veterinary practice, traditional healers were usually the only people approached to attend to these livestock diseases. Various traditional practices included were prevention of diseases, recognition of toxic plants, surgical intervention and crude vaccination methods (Mesfin and Obsa, 1994).

The emergence or re-emergence of certain diseases and drug resistance are also mentioned as additional problems Abebe (2001). Similarly Zewdu *et al.* (2001) explain that, in the developing countries traditional medicine has remained the main alternative treatment due to shortage of pharmaceutical products and their unaffordable prices.

Pharmacotherapy is one of the most important means of controlling livestock diseases, 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. In Ethiopia, conventional veterinary services have been playing a paramount role in the control and prophylaxis of livestock diseases in the last three decades. However, they cannot yet deliver complete coverage in preventive and curative health care practices because of

inadequate labor, logistical problems, an erratic supply of drugs, and the high cost of drugs and equipment. Consequently, the majority of those raising stock in rural areas are far from the site of veterinary stations, and those who have access to veterinary services may not be able to afford to pay for them. Additionally, reduced funding for animal disease control is an issue in Ethiopia and is likely to influence the incidence of some serious livestock diseases (Sori, *et al.,* 2004).

Several studies Sori *et al. (*2004) reported that Fabaceae, Asteraceae and Laminaceae; Engedasew et al. (2015) reported that Asteraceae, Fabaceae and Laminaceae; Bekele and Ramachandra (2015) reported that Asteraceae, eurphobiaceae and Borangiaceae; Birhanu and Abera (2015) reported that Solanaceae, Eurphobiaceae and Cuccurbitaceae and Araya et al. (2015) reported that Solanaceae, Lamiaceae and Fabaceae were the most commonly used families of plants in preparation of ethnoveternary medicine.

Several studies Sori *et al. (*2004); Engedasew *et al.* (2015); Bekele and Ramachandra (2015); Birhanu and Abera (2015); Araya *et al.* (2015) reported that shrubs, herbs and trees were primarily used growth forms in preparation of ethnovetrenary medicine.

Many author, Sori *et al. (*2004); Engedasew *et al.* (2015); Birhanu and Abera (2015); Bekele and Ramachandra (2015) and Araya *et al.* (2015) reported that leaves and roots were predominantly used parts of plants in preparation ethnoveternary medicine, pounding, crushing, grinding and chewing were mainly used modes of preparation and oral, dermal (topical) and nasal (inhalation) were primarily used routes of application of ethnoveternary medicine.

2.7.Threats factors to medicinal plants in Ethiopia

The traditional health care practice is mainly dependent on medicinal plants collected from the wild. In spite of this, the medicinal plant biodiversity is being depleted due to manmade and natural calamities. Moreover, the indigenous knowledge associated with the conservation and use of medicinal plants is also disappearing at an alarming rate. The widespread use of traditional medicine among both urban and rural population in Ethiopia could be attributed to cultural acceptability, efficacy against certain types of diseases, physical accessibility, and economic affordability as compared to modern medicine. In view of this, development and its ultimate integration of traditional medicine with the modern system is believed to have significant impact in the expansion of the health care coverage. There is a traditional distinction between attitudes to the knowledge, on the parts of academia and industry (Reta, 2013)

Environmental degradation, deforestation, agricultural expansion, over grazing and high population growth was potential threats to the survival of many potential valuable medicinal plants (Feoli *et al*., 2002). This trend is increasingly jeopardizing the ethnobotanical and other natural resources of the country, especially in the highlands, largely due to over population, inadequate environmental policies and failure to fully implement them (FDREMH, 2003).

Bekele (2007) explained many medicinal plants are also harvested for non medicinal values such as for timber implements, fuel wood and other purposes and hence they are subjected to multiple pressures like *Taverniera abyssinica* and *Prunus africana* are facing at present. Conservation measures should target habitats of such vulnerable species.

Similarly Bekele (2007) described threats to traditional medicinal plants like, Ecological degradation, loss of indigenous knowledge, loss of cultural assets, danger on medicinal plant through smuggling and misuse of resources, lack of suitable scheme for equitable sharing of benefits arising from biological resources, poor market situation may prevent enthusiastic cultivators from producing medicinal plants for the market and traditional healers may not participate and fully collaborate.

Construction, agriculture, cutting for fence, lack of awareness, urbanization and over-grazing were some of the anthropogenic threatening factors furthermore, pressure like recurrent drought, land fragmentation, erosion and deforestation were some of the natural threatening factors that aggravated the threats to the medicinal plant species (Mesfin *et al*.,2013). The future existence of medicinal plants resource and the associated knowledge is under question because of the ongoing practice of deforestation, agricultural encroachments, over exploitation or unwise use of plant resources and over grazing, and the frequent occurrence of drought (Adefe and Abraha, 2011), agricultural expansion, harvest for firewood and charcoal, home use and trade, Overgrazing important threat factors) in the study area (Agisho *et al*., 2014), dependency of the local people on unpreserved fresh materials removal of fresh barks and leaves put the plants under serious threat than the dried form (Abera, 2014).

2.8 Conservation status of medicinal plants in Ethiopia

According to (WHO, IUCN, WWF, 1993) the populations of medicinal plants, in many parts of the world are being seriously depleted due to overexploitation and loss of habitats, resulting in a lack of essential medicines and so reducing options for the future. For this reason, the best way for conservation of medicinal plant was to prepare a national strategy for the conservation and sustainable use of its medicinal plants. The process of preparing a strategy will help in developing a consensus on what needs to be done, assigning tasks to different institutions, motivating participants to undertake the tasks and monitoring progress. Then preparing the guide lines that assign each task to a target group (Example, the task of *ex situ* conservation is proposed to botanic gardens). Finally the experts most needed for a programme of conservation and sustainable utilization of medicinal plants are: Conversationalists, Campaigners, Ecologists, Ethnobotanists, Health Policy-makers, Horticulturists, Legal Experts, Park Managers, Park Planners, Pharmacognosists, Plant Breeders, Plant Genetic Resource, Specialists, Plant Pathologists, Religious Leaders, Resource Economists, Seed Biologists, Taxonomists, Traditional Health Practitioners and Agronomists.

Some studies have revealed that most of the medicinal plants utilized by the Ethiopian people are harvested from the wild (Giday, 1999; Awas and Asfaw, 1999). As time goes these wild occurring medicinal plant species and the associated traditional knowledge is getting eroded. The plant-based traditional medicine has been repeatedly verified by photochemical, pharmacological and clinical tests motivating further studies on medicinal plants in different parts of the world (Damtew et al., 2002).

There are some conservations action 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 their management (Asfaw, 2001). Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Asfaw, 2001). This can be possible in place of churches, mosques, graves yards, farm margin, and river bank. Ex-situ conservations mean conservation outside their natural habitats. This includes gen bank, botanical gardens and others. Creating awareness education on management strategies of medicinal plant species and replace these plants to ensure sustainability by establishing nurseries for the common medicinal plants so as to control deforestation as its associated consequences such as erosion and loss in soil fertility (Mesfin *et al*., 2013)

I*n-situ* and *ex-situ* conservation strategies of medicinal plants should be adopted and implemented by training (educating and awareness creating) the practitioners; and the local government should organize medicinal practitioners in association in such way that their valuable knowledge can be used along with modern medicines (Adefa and Abraha, 2011).

Indigenous practices favor biodiversity conservation cutting of trees, especially for charcoal, is culturally prohibited, for livestock forage, trees or shrubs are lopped or leaves, seeds and pods are shaken down using sticks, rather than cutting down the trees (Agisho *et al.*, 2014).

3. MATERIALS AND METHODS

3.1. Description of the study area

The study was conducted in and around Chato Forest, Horo District, Horo Guduru Wollega Zone, Western Oromia, Ethiopia. The Forest is found in western Oromia at about 353 km from Addis Ababa and 38 km from the Zone. Chato Forest is one of the National Forest Priority Areas (NFPAs) established as "Chato Zangi Dangeb" in 1972 (Communication with experties. 2014). Now it is known by the name Chato Forest which covers 14,290.97 hectares but as Chato-Zangi-Dangab Forest with Zangi-Dangab (Tullu Laaftoo) Forest, that covers 56,309.56 ha. (EFAP, 1994). The Forest lies approximately between $37^0$55'07'' E latitudes and $09^0$45'54'' N longitudes in Horo District. This Forest is located along altitudinal ranges between 1700 and 2350 m a.s.l. (Abdena, 2010).

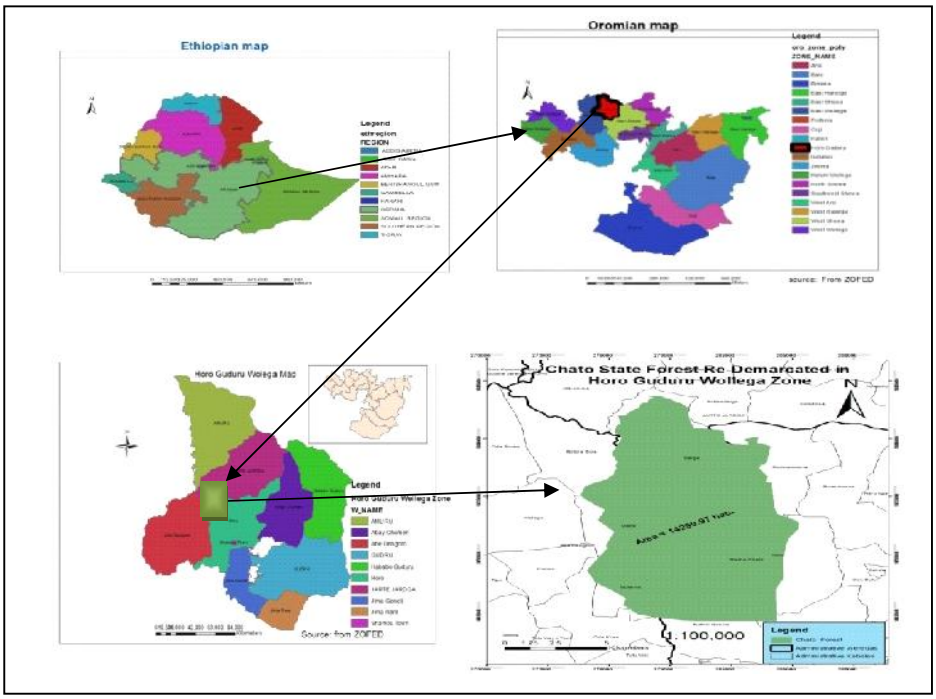


Figure 1 Geographical locations of the study area (Source - ZOFED, 2007/14).

Chato Forest is generally characterized by having different layers of forest (emerging trees, canopy, shrubs and herbs. The Forest positioned on irregular land with undulating plain, gorges, hills, slopes, deep valley, escarpments and dissected plateaus. Several perennial rivers such as Yamalagi, Badessa, Chiracho, Jaba and Gabar are flowing into Garchi River by

crossing the forest, all of which emerge from the highlands. It is bounded in the north by Jaba River (Jardega-Jarte District) in the west by Garchi River (Abe Dongoro District), in the southeast by Bafo-Gabar River and in the east direction by exotic plantation (Horo District). Because of its topographic nature, the forest area is not easily accessible as it is surrounded by steep hill slope and escarpments (Personal communication). The Forest has been disturbing by human actions for timber, expansion of farm land, new settlement in the forest and there is serious damage on under growth perennial and annual herbs, shrubs, lianas and lower plants because of extensive coffee plantation allowed by the government in the Forest. Similarly, the inhabitant people explained that many perennial sources of water (rivers) have been drying after plantation of exotic plants on field above the hill of Chato Forest.

3.1.1 Climate

3.1.2 Temperature and rainfall

Eighteen years rainfall data from 1996 - 2013 obtained from Shambu Meteorological Station were used to describe the climate of the study area. Shambu station is located at $9^0$34'N latitudes and 37^0 06'E longitudes with altitude of 2430 m a.s.l. According to 18 years data the annual rainfall in the study area is about 2559 - 1569 mm. Peak period of rainfall is between May to October, decreasing in November and December with small or no rainfall in January and February. Horro District has three Agro-Climatic Zones which correspond to the traditional classification systems: 43% Dega (Baddaa, in Afaan Oromo) 2500-3500 m. a.s.l, 55.56% Kolla (Badda daree, in Afaan Oromo) 1500 -2500 m a.s.l and 1.24% Woinadega (Gammoojjii, in Afaan Oromo) 500-1500 m a.s.l (discossion with experties).

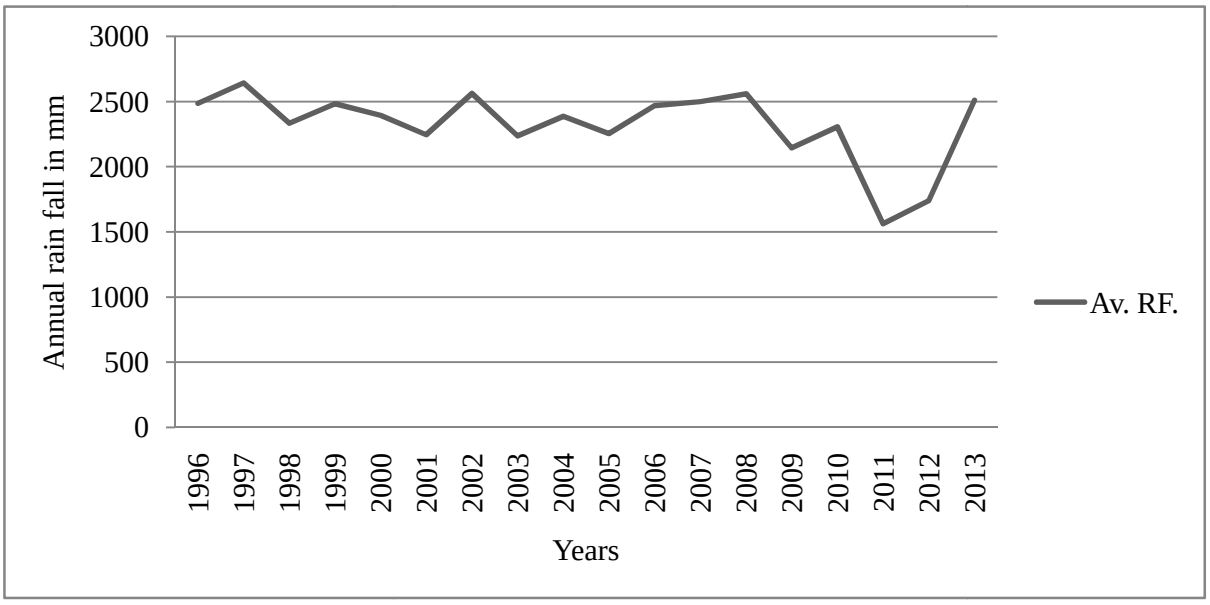


Figure 2 Eighteen years annual rain fall of the study area

Sixteen years temperature data from 1998 - 2013 obtained from Shambu Meteorological Station was used to describe the temperature of the study area. The average annual temperature was about 16.6^0C .The mean minimum and maximum temperatures are 10.78^0C and 22.32^0C respectively. There is little temperature variation throughout the year.

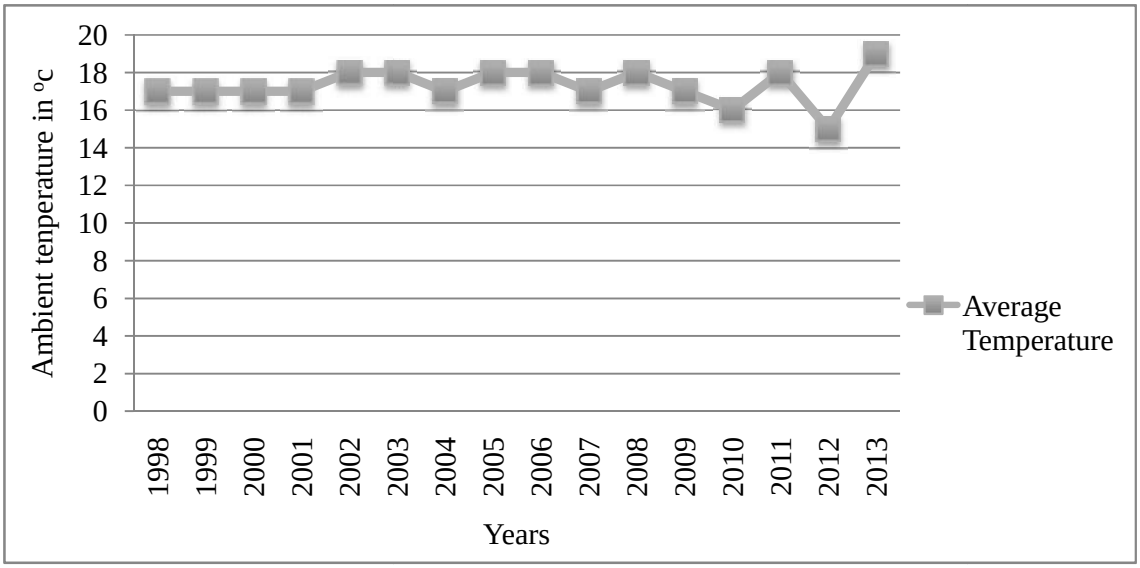


Figure 3 Sixteen years mean average temperature of the study area

3.1.3 Population and land use

The total population of Horo Guduru Wollega Zone was 695,557. Of these 348,460 were males while 347,097 were females. Of these, 90,665 were from Horo District, 59,493 were from Jardega Jarte and 80,924 were from Abe Dongoro for the study area. The people of the study areahave seen engaged in mixed farming of livestock rearing and crop production (ZOFED, 2014). Coffee production is more common in Abe Dongoro District and the Forest area of Jardega Jarte. Honey production is practiced in the Forest area of the Zone, mostly it is common around Chato Forest. The type of soil in the District is sandy-loam type. However, as visually observed the soils of the Forest are darker-reddish in color with concentrated humus as there is no strong eroding forces due to vegetation cover.

Because of alarming population growth the new settlers are still threatening the Forest, encroachment on to the forest. The data obtained from (Discussion with expertis) show that the major crops growing (cultivated) in the study area are cereal crops (teff, wheat, maize, barely), pulses (peas and beans) and oil crops (nug and rape seed). During the 2014 the Livestock populations in the Zone were (911,408) cows, (232,803) sheep,(163,987) goats, (39,710) poultry, (49,673) horses, (10,652) mules and (78,523) donkeys as reported by (discussion with expertise).

3.1.4 Vegetation

The main species of plants found in this Forest include broad-leaved and evergreen with important tree species such as; *Maytenus undata* (kombolcha), *Maytenus senegalensis*, *Manilkara butugi* (Buttujjii), *Markhamia lutea* (Botoroo), *Maesa lanceoleta* (Abbayyii), *Juniperus procera*, *Jacaranda mimosfolia* (muka qawwee), *teyphacne the baica* (meexxii), *Ficus sur* (harbuu), *ficus vasta* (qilxuu), *Ficus sycomorus* (Odaa), *Euphorbia ampliphylls* (Adamii), *Euphorbia abyssinica* (Adaamii), *Rhus glutinosa* (xaaxessaa), *Salix subserrata* (alaltuu), *Ekelergia capensis* (Somboo), *Dracaena steudneri*, *Dovyalis abyssinica* (koshommii), *Dombeya torrida* (daannisa), *Dodonaea amgustifolia* (Iittacha), *Diospyros abysinica* (lookoo), *Celtis africana*, *Barcemia discolor* (jajabba), *Albizia gummifera*, *Olea africana* (ejersa), *Nuxia congesta*, *Olinia rochetiana* (Anfaaree), *Phytolacca dodecandra* (Handoodee), *Premna schimperi* (urgeessaa), *Prunus africana* (Hoomii), *Rhamnus staddo* (Qadiidaa), *Rhoicissus tridentata* (Hidda reeffaa), *Syzygium guineensa* (Baddeessa), *Ficus ingins* (koonnoo), *Acacia abyssinica*, *Vernonia amygodalina*, *Aningenia anyssinica*, *Cordia*

africana (waddeessa), *Podocarpus falcatus* and *Pittospo rum viridiflorum* (discussion with expertise).

Table 1 Major food crops growing in the study area

Crop categories	**Scientific name**	**Oromo vernacular name**	**English vernacular name**
cereals	*Zea mays*	Boqqolloo	Maize
	Hordeum vulgare	Garbuu	Barley
	Triricum aestivum	Qamadii	Wheat
Fruits	*Citrus sinensis*	Burtukaana	Orange
	Citrus limon	Loomii	Lemon
	Musa paradoxa	Muuzii	Banana
	Mangifera indica	Maangoo	Mango
	Carica papaya	Paappayyaa	Papaya
	Persea americana	Avokaadoo	Avocado
Cash crops	*Catha edulis*	Caatii	Khat
	Coffea Arabica	Buna	Coffee
	Saccharum arabica	Shonkoraa	Sugar cane
Root crops	*Ipomoea batatus*	Mixaacisa	Sweet potato
	Solanum tuberosum	Moosee	Potato
	Daucus carota	Kaarotii	carrot
	Zingiber officinale	Jinjibila	Ginger

3.1.5 Wild life

Chato Forest possesses several kinds of wildlife including Colabus monkey, (*Colaus gureza*), Blue monkey (*Cercopthecus mits boutoutirilins*), Olive baboon (*Papio anubis*), warthog (*Phacochoerus africaus*), Africana civet cat (*Civetticits civetta*), Grevet monkey (*chlorocebus aethiops*), Porcupine (*Hystrix cristata*), Leopard (*Ponthera pardus*) and common bushbuck (*Tragelapus scrpitus*) and various kinds of birds (discussion with experties).

3.1.6. Population and medical services

The study area covers about 7,867.6 km^2 that has one general hospital which serves about 695,557 people, 348,460 males and 347,097 females as a zone. Of these 224,939 were peoples of the target District.

According to the report from Shambu Hospital (discussion made with doctor) the first ten major human diseases are pneumonia, acute malnutrition, gastro enteritis and sepsis for children, while AFI (typhoid, typhus and malaria), dyspepsia (gastritis), hypertension disorder, heart diseases, diabetes mellitus and appendicitis (acute abdomen) and HIV in adults. Even though the number of health care providers and clinics are increasing they fail to give the required service because of shortage of drug and medical instruments.

Table 2 Human population and medical service of the study area

Districts	**Health center of human**	**Health post of human**	**Private clinics**	**pharmacies**	**Hospital**	**Total population**	**Total area coverage**
Horo District	7	23	4	12	1	90,665	731km^2
Jardega Jarte District	6	20	4	-	-	59,493	1067.1km^2
Abe Dongoro	7	21	6	1	-	80,924	1034.5km^2

Source: - Zonal of Finance and Economic Development (ZOFED, 2014)

The resident of the study area rely on mixed farming, for this reason there were large population of livestock in the study area. Traditional farming is the common way of crop production which is basically supported by livestock. The most common livestock diseases were: Render pest, tryps, black leg, haemorrhaege septicemia, anthrax, external parasite and others.

Table 3 Population of livestock, poultry and the corresponding health service

District	Cattle	Goats	Sheep	Horses	Mule	Donkeys	Hens	Livestock clinic	Livestock health professionals
Abe Dongoro	78028	12641	8037	269	532	5241	44234	9	19
Jardaga Jarte	87063	18934	12017	816	1211	6688	60631	7	16
Horo	71001	30691	48720	20152	3844	14569	71694	10	18

3.2. Methodology

3.2.1. Reconnaissance survey and selection of study sites

A preliminary survey was conducted from November 05 to 18, 2014. The study was carried out in altitudinal relative variation of four kebeles as study sites.

The altitude ranges from 1700 and 2350 m a.s.l. Four kebeles (the smallest administrative unit in Ethiopia) were selected as study areas by lottery method and purposively based on their resourcefulness and were Dacha Chabir, Rifenti Gabar, Bone Abuna and Darge Koticha. Of these, sixteen study sites were estabilished at Dacha Chabir (Rifenti, Lafto Dera, Wabo Garado and Washe), Rifenti Gabar (Chato, Karsa, Bona and Ona Jale), Bone Abuna (Dire Farda, Hula Chulu, Burka Gamada and Walda) and Dargee Kotichaa (Laga Walo, Chato, Kilxuu Aba Dingo and Tulu Korma). They were found in and around the boundary of the Forest. The variations seen in the study were disease prevalence, as reported by informants in Abe Dongoro and Jardega Jarte sites malaria is prevalent which is very rare in Horo District. Similarly, concerning their climatic zone Horo District has Dega (Baddaa in Afaan Oromo), Kolla (Badda Daree) in Afaan Oromo and Kolla (Gammoojjii), Jardega Jarte has Dega (Baddaa), Woinadega (Badda Daree, in Afaan Oromo) and Kolla (Gammoojjii, in Afaan Oromo) and that of Abe Dongoro has Deaga (Baddaa, in Afaan Oromo), Sub Woinadega (Badda Daree, in Afaan Oromo) and Woinadega (Gammoojjii, in Afaan oromo).

3.2.2. Sampling of informants

A total of 65 informants (58 males and 7 females) in the ages of 20 and above were selected from four kebeles. Out of these, 20 key informants were purposively selected based on recommendation from elders, development agents, health post workers and kebele administration leaders, 1-2 key informants from each study area. The choice of key informants is following the suggestion made by Martin (1995). The rest 45 informants (2 -3 from each local village) were selected randomly from the local inhabitants in the study area based on their knowledge of medicinal plants. This was done by tossing a coin and using him/her as informant whenever head of the coin was up and if he/she volunteered to participate.

3.2.3. Demographics of informants

The demographics of informants concerned in the discussion and interview based survey which comprises residence, age group, gender, educational background, occupation, religious and marital status are presented in (Appendice VI).

3.2.4. Age group of informants

Respondents vary in age. Accordingly, some of them aged from 20 – 30 years (13, 20 %), 31 – 40 (9, 13.84 %), 41 – 59 (32, 42.23 %) and above sixty 11 (16, 92 %) old. The research included various age groups above twenty years.

3.2.5. Sex of informants

The research involved both sexes, 58 (89.23 %) of respondents were males while 7 (10.76 %) of them were females.

3.2.6. Religious of informants

From 65 respondents 29 (44.61 %) were Protestant, 21 (32.30 %) were Orthodox, while 15 (23.07 %) were Wakeffata and none of them were Muslim because of unwillingness of the practitioners.

3.2.7. Marital status of informants

Data of the study describe that the research embrace diverse marital status of the study area, and 61 (93.84 %) were married, 4 (6.15 %) of them were unmarried and none of them were widowed and divorced.

3.2.8. Educational background of informants

In the expressions of their educational background some of them joined 17 (26.15 %) elementary schools, 11 (16.92 %) high school, 5 (7.69 %) college diploma, 2 (2.07 %) preparatory school, 2 (2.07 %) hold first degree (University graduate) while 28 (43.07 %) were uneducated.

3.2.9. Occupational status of informants

The study consisted of respondents with different occupational background, 10 (15.38 %) were government employees, 52 (80 %) were farmers, 3 (4.61 %) were other such as students and religious men but none of them were private employee.

3.2.10. Ethical consideration

The ethical consideration and consensus was made with informants. Informants were informed that the purpose of the research was for educational, compiling and documenting of medicinal plants of the study area but not for commercial purposes. This was assured by showing the legal letter written from Jimma University ethical committee and Forest Agency of Horo District. Finally, informants reached consensus to offer their indigenous knowledge of medicinal plants by knowing the lawfulness of the study. Ethical consideration in ethnomedicinal study is a very important work.

3.2.11. Data collection

Ethnomedicinal data were collected from informants (during field walk) in four trips: the first one was from February 01 to March 01, 2015 while the second was from March 21-April - 21, 2015 based on methods given by Hedberg (1993); Martin (1995); Cotton (1996). Accordingly, semi-structured interviewees, observation, group discussion, and guided field walks with informants were employed to obtain indigenous knowledge of the local community on health, conservation and threats to medicinal plants. During this field walk, there was observation, photograph taking, listening to the informants and note taking was employed.

Interviews and discussions was based on, around a checklist of topics or questions prepared before hand in English and translated to Oromo language (Appendix: XIII). Interviews and discussions were held in Oromo language (mother tongue of respondents for smooth communication) directly by the investigator and information was gathered by speaking to the villagers and accessible informants on an informal based to maximize the source of information. Information regarding local names of medicinal plants, part(s) used, modes of preparation, diseases treated, dosage used, routes of application, antidotes used, uses other than medicinal uses, management methods and threat factors were recorded at the spot. Local

names of medicinal plants were studied by repeated inquiries at two times with the same informants to check the accuracy of information obtained and valid information was recorded. Discussions was conducted with 30% of the respondents which means 20 informants and residents in seeking to understand the traditional medicinal system of the people, its management, to know how the knowledge is maintained and transferred in family or younger generations. During these activities equipments like: herbarium, plastic bag, field note, gathering glove, news paper, secateurs (cutter) and photo camera was used as data gathering tools.

3.2.12. Specimen collection

At the end of the interview the photography of each medicinal plant was taken. Sample specimens of the plants cited for their medicinal use was collected, numbered, pressed and dried for identification.

Figure 4 Photo showing field note taking and plant specimen pressing in Chato Forest

3.2.13. Specimen identification

Preliminary identification of the specimens was done in the field during field trip with informants. Identification of scientific name and family of the specimens was done in May 1-20, 2015, using Flora of Ethiopia and Eritrea (Demissew and Inger, 2010; Renhard and adi, 1994; Bekele, 2007; Tadesse, 2004; Sue E. *et al*., 1995; Sue E. *et al.,* 2000) and also by comparison with authentic (genuine) specimens, illustrations and taxonomic keys with the assistance of experts at Jimma University Herbarium (species identification center). Voucher specimens were made with scientific names, vernacular names, families and collection numbers for all medicinal plants. Medicinal plants recorded from the study area were preserved in the Herbarium of Jimma University.

Figure 5 Photo showing species identification process

3.3. Data analysis

3.3.1. Descriptive statistics

A descriptive statistical method such as percentage and frequency were employed to analyze and summarize the data on use and associated knowledge of medicinal plants. The most useful information gathered on medicinal plants were: growth form, parts used, modes of preparation, routes of application, disease treated and antidotes used, which were analyzed through descriptive statistics. Facilities in Microsoft Excel spread sheet was utilized to make simple calculations to determine proportions and draw bar graphs, pie chart and tables were also used to present the data.

3.3.2. Informant consensus factor

In order to evaluate the reliability of information during the interview, informants were contacted at least two times for the same ideas and the validity of the information was proved and recorded. Following this, if the idea of the informant diverged from the original information, it was rejected since it was considered unreliable. Only the relevant one was statistically analyzed. This method was adopted from Alexiades (1996). Similarly, factor of informant consensus (agreement) was quantitatively analyzed for nine groups of plant uses reported by informants. The Informant Consensus Factor (ICF) was calculated for each category to identify the agreements of the informants on the reported cures for the group of ailments. The ICF was calculated as follows: number of use citations in each category (nur) minus the number of species used (nt), divided by the number of use citations in each category minus one or Nur – nt/nur-1 (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.

Where: ICF is informant Consensus Factor

Nur - is number of use citation

Nt - is number of species used

3.3.3. Preference ranking

Preference ranking was conducted following Martin (1995) for five most important medicinal plants used in treating leshimaniasis (kuyyiisa), as traditional healers treat it usually. Seven key informants (10%) were selected to identify the best-preferred medicinal plant species for the treatment of leshimaniasis (kuyyiisa). Each informant was provided with seven medicinal plants reported to cure leshimaniasis with each leaf of medicinal plant used being paper tagged named and asked to assign the highest value (1) for plant species most preferred and (0) for the least preferred plant. These values were summed up and ranks given for each medicinal plant species.

3.3.4. Paired comparison

Paired comparison can be used for evaluating the degree of preferences or levels of importance of certain selected plants, parts of plants (Nemarundwe and Richards, 2002). A list of the pairs of selected items with all possible combinations was presented to selected informants and their responses were recorded and total value was summarized. In this study, seven informants were involved to indicate the efficacy and popularity of six medicinal plants species used to treat the most frequent disease in the study area (Rabies) and they were ranked based on the report of informants.

3.3.5. Direct matrix ranking

Direct matrix ranking exercise was done following Martin (1995) in order to compare multipurpose use of a given plant species and to relate this to the extent of its utilization versus its dominance. Based on information gathered from informants, eight multipurpose tree species were selected out of the total medicinal plants and eight use diversities of these plants were listed for 15 selected key informants to assign use values to each species. The eight use-values include medicinal, fodder, food, firewood, construction, charcoal, fencing, and furniture making. Fifteen key informants were chosen to conduct this activity and they were asked to assign use values (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used). Accordingly, 15 key informants use values for the eight multipurpose medicinal plant species, average value of each use-diversity for a species was taken and the values of each species was summed up and ranked.

3.3.6. Fidelity level index

The fidelity level was calculated for those frequently reported diseases by informants so as to identify the most important medicinal plant species. In this study, two areas varying in altitude and the prevalent disease was chosen to indicate the fidelity (faithfulness) level of the most frequently reported medicinal plants and the disease treated. Therefore, about eight study areas in which the disease was most and/or list frequent was selected for the study.

It is calculated by using the formula as:

FL = Ni/NX100

Where, Ni - is the number of informants that claim use of a plant species to treat a particular disease and N - is the number of informants that use the plant as a medicine to treat any given disease? It is designed to quantify the importance of the species for a particular given purpose (Friedma, 1986: cited in Alexiades, 1996).

4. RESULTS

4.1. Attitude of the local people towards their health

From discussion made with elders and key respondents the resident people of the study area prioritize and give special attention to health. They expressed the value of their health by using poems, proverbs and songs. Including **"Dhibbi abbaan hin beekne fayyaadha**" to illustrate that a greatest wealth and gift not considered by owners is health. The proverbs point out that, health is considered fundamental and is greater than every resource, possession and any basic needs for survival of life.

4. 2 Medicinal plants of the study area

A total of 97 plant species with 92 genera and 51 families were collected and identified in and around Chato Forest of Horo District. Frequently reported genera of plants were Ficus, Rumex, Solanum, Girardenia and Guizotia contributes 2 (2.17%) species each. Commonly reported families of plants were Fabaceae and Asteraceae 6 (3.18%) species each, Eurphobiaceae, Moraceae and Laminaceae provided the same 3 (1.59%) each. These collected and identified medicinal plants have been using by inhabitant people of the study area as source of medicine to treat human and livestock ailments (Table 4).

Table 4: Families of ethnomedicinal plants collected and identified

Families	Total number	Percentage	Families	Total number	Percentage
Acanthaceae	1	0.53	Melianthaceae	1	0.53
Adiantaceae	1	0.53	Moraceae	3	1.06
Alliaceae	1	0.53	Musaceae	1	0.53
Aloaceae	1	0.53	Myrsinaceae	1	0.53
Amaranthaceae	2	1.06	Myrtaceae	1	0.53
Anacardiaceae	1	0.53	Oleaceae	1	0.53
Apiaceae	2	1.06	Phytolaccaceae	1	0.53
Apocynaceae	1	0.53	Plantaginaceae	1	0.53
Araceae	3	1.59	Plumbaginaceae	1	0.53

Table 4 continoued

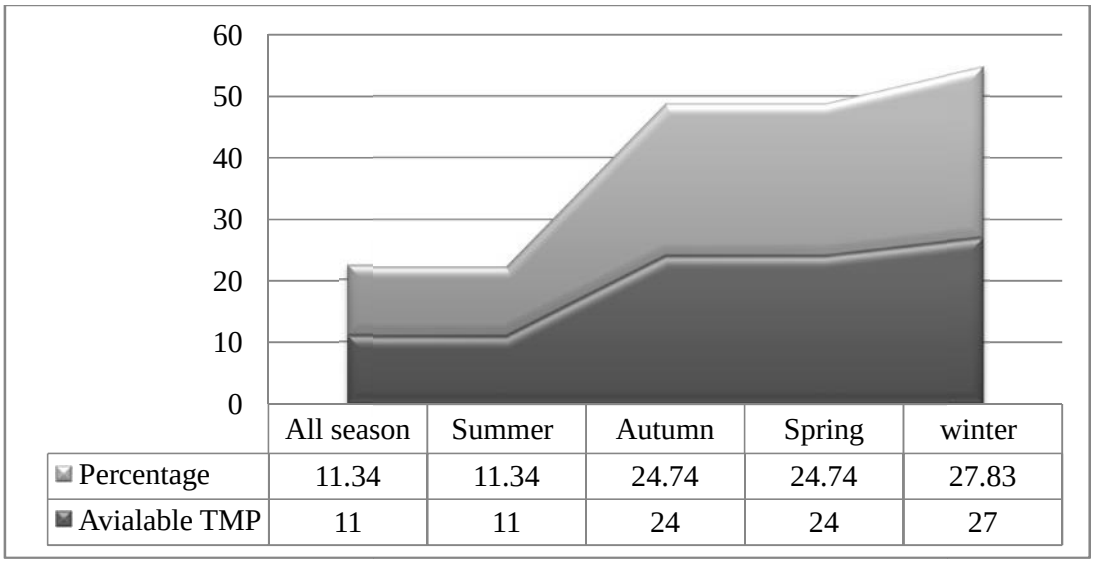
Asclepiadaceae	1	0.53	Podocarpaceae	1	0.53
Asparagaceae	1	0.53	Polygonaceae	2	1.06
Asteraceae	6	3.18	Proteaceae	1	0.53
Brassicaceae	2	1.06	Ranunculaceae	2	1.06
Campanulaceae	2	1.06	Rhamnaceae	1	0.53
Capparidaceae	1	0.53	Rosaceae	3	1.59
Commeliaceae	1	0.53	Rubiaceae	1	0.53
Crassulaceae	1	0.53	Rutaceae	2	1.06
Cuccurbitaceae	3	1.59	Santalaceae	1	0.53
Euphorbiaceae	3	1.59	Sapindaceae	1	0.53
Fabaceae	6	3.18	Scrophulariaceae	1	0.53
Lamiaceae	3	1.59	Simaroubaceae	1	0.53
Lineaceae	1	0.53	Solanaceae	4	2.12
Loganiaceae	1	0.53	Tiliaceae	1	0.53
Loranthaceae	1	0.53	Urticaceae	2	1.06
Malvaceae	3	1.59	Verbenaceae	1	0.53
Moraceae	2	1.06			

4.2.1 Medicinal plant species used to treat human diseases

Investigated data depicted that about 76 (78.35 %) plant species categorized into 73 genera and 22 families were used for the treatment of human ailments and Ficus, Rumex and Solanum provided 2 (2.63 %) species each. The most widely used families were Asteraceae, Lamiaceae, Solanaceae, Acanthaceae and Eurphobiaceae 3 (13.63 %) species each, Fabaceae, Polygonaceae, Rosaceae, Moraceae, Amaranthaceae, Brassicaeceae, curcubitaceae, Apiaceae and Ranunculaceae each accounted 2 (9.09 %) species. While the rest families were represented by species each (Appendice I).

The data indicated that medicinal plants used to treat human ailments were harvested from different sources, 55 (82.08 %) from wild, 11 (16.41%) cultivated and 10 (14.92 %) from both cultivated and wild.

Traditional medicinal plants were available in different season of year of these 27 (27.83 %), winter 24 (24.74 %) were in spring and autumn, while 11 (11.34 %) were available in summer seasons and the same number were in all season of the year (Figure 6). However most of medicinal plants were easly available in wet season of the year, could be collected from reverin side and irrigation area.



	All season	Summer	Autumn	Spring	winter
Percentage	11.34	11.34	24.74	24.74	27.83
Avialable TMP	11	11	24	24	27

Figure 6 Available season of traditional medicinal plants in the year

4.2.2 Growth form, part used, modes of preparation and routes of administration of medicinal plants used to treat human ailments

The study revealed that predominantly used growth form of medicinal plants for the treatment of human ailments were herbs 28 (36.83 %), shrubs 25 (32.89 %), trees 10 (13.15 %), and Liana 13 (16.36 %) (Figure 7).

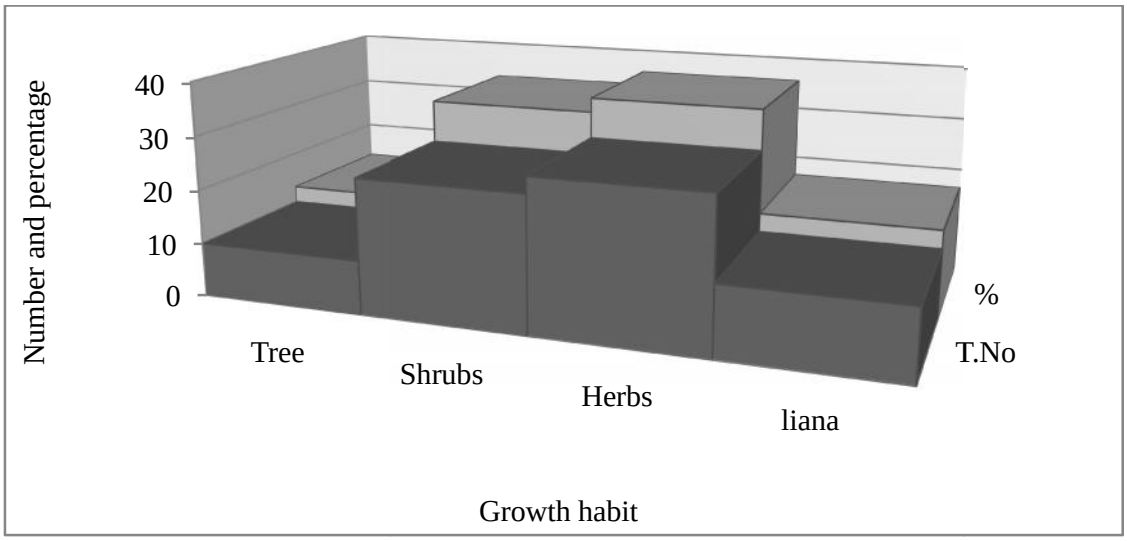


Figure 7 Growth form of traditional medicinal plants used for the treatment of human ailments

Regarding the part of plants harvested to prepare ethnomedicine to treat human ailments from the study area, leaves 32 (42.10 %), roots 24 (31.57 %), seeds 13 (17.10 %) , bark 8 (11.94 %), latex 6 (7.89 %) and stem 3 (3.94%) (1 plant species, 1.81 %) spike, fruit, bulb and whole plant each correspondingly (Table 5).

Table 5 Parts of plants harvested for medicinal purpose to treat human ailments

Parts used	**Number of species**	**Percentage**
Leaves	32	42.10
Roots	24	31.57
Barks	8	11.94
Seeds	13	17.10
Bulb	1	1.31
Whole part	1	1.31
Spike	1	1.31
Fruit	1	1.31
Latex	6	7.89
Stem	3	3.94

Data of the study showed that mainly used modes of preparation of ethnomedicinal plants to treat human ailments were, 25 (32.89 %) pounding, 16 (21.05 %) massaging, 20 (26.31 %) powdering, 7 (9.21 %) smoking, 6 (7.89 %) boiling, were extracting 5 (7.81 %), decoction 2 (3.12 %), mash 2 (2.63%) and others 5 (6.57 %) (Figure 8).

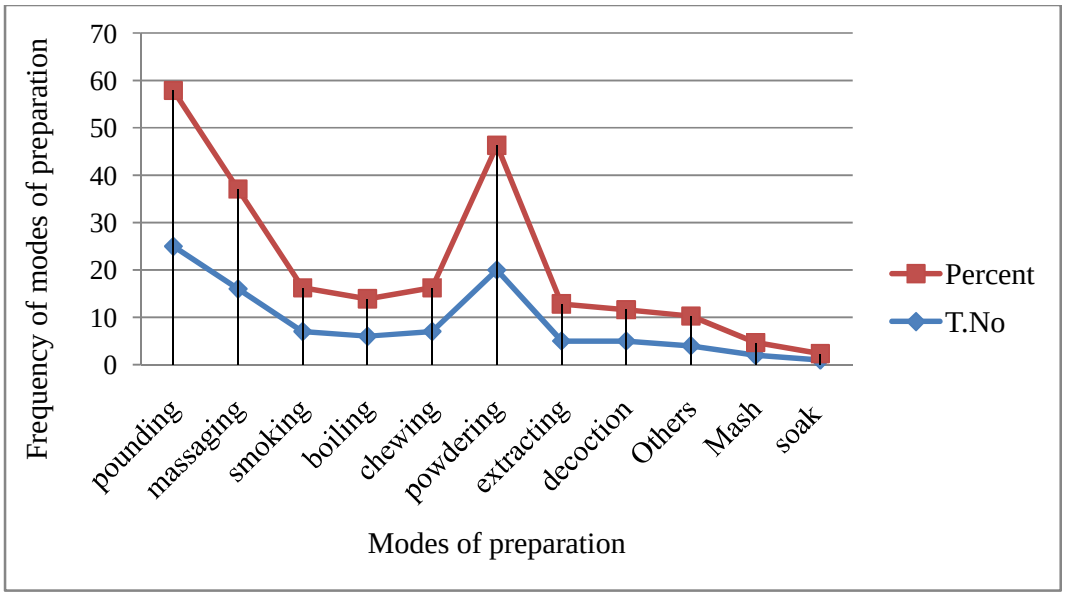


Figure 8 Modes of preparation of ethnomedicinal plants used for the treatment of human ailments

Equipped traditional medicinal plants administered through various routes of application to treat human ailments; these were, oral 47 (61.84 %), dermal 25 (32.89 %), nasal 17 (22.36 %), tooth surface 8 (10.52 %), vaginal 2 (2.63 %) optical and auditory 1 (1.31 %) respectively (Figure 9).

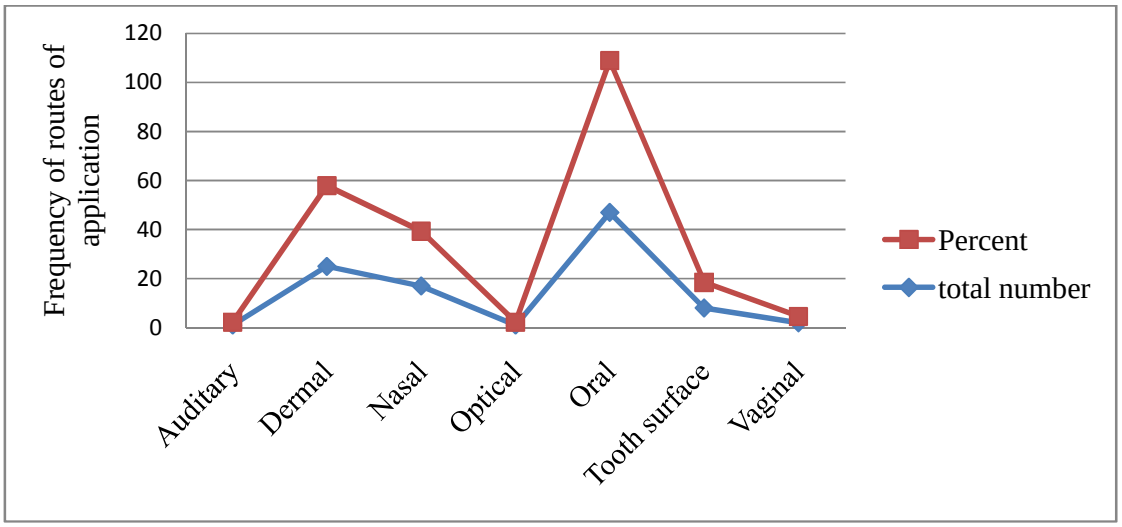


Figure 9 Routes of administration of traditional medicinal plants used to treat human ailments

4.2.3 Medicinal plant species used to treat livestock ailments

From the result of the study on ethnoveternary medicinal plants in the study area recorded 40 (41.23 %) plant species classified under 38 (95 %) genera and 32 (80 %) families. Commonly collected genera of plants were Grardenia and Guizotia two (5 %). Family Fabaceae and Asteraceae primarily comprise five (12 %), while Rutaceae, Amaranthaceae, Ranunculaceae, Urticaceae and Solanaceae each contributed 2 (5 %) while the remaining encompasse 1plant species (2.5 %) each.

4.2.4 Growth form, parts used, modes of preparation and routes of application of medicinal plants used for the treatment of livestock ailments.

The collected data show that ethnoveternary medicinal plants were harvested from the wild 32 (80 %), home gardens (cultivated) five (12.5 %) and from both wild and cultivated sources three (7.5 %).

Growth form of plants used for the treatment of livestock ailments were herbs 18 (42 %) followed by shrubs 13 (32.5 %), liana 5 (2.5 %) and trees 4 (10 %) (Figure 10).

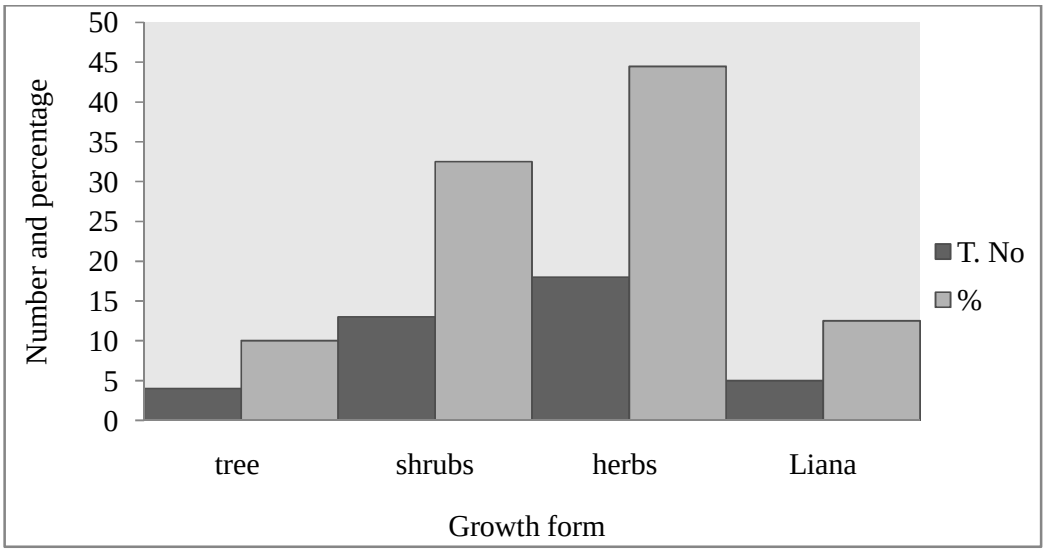


Figure 10 Growth forms of ethnoveternary medicinal plants used for the treatment of livestock ailments

The result of the study depicted that parts of medicinal plants used as ethnoveternary medicines were leaves 19 (47.5 %), root 12 (30 %), seed 5 (12.5 %) and stem (2 plant species, 5%) (Figure 11).

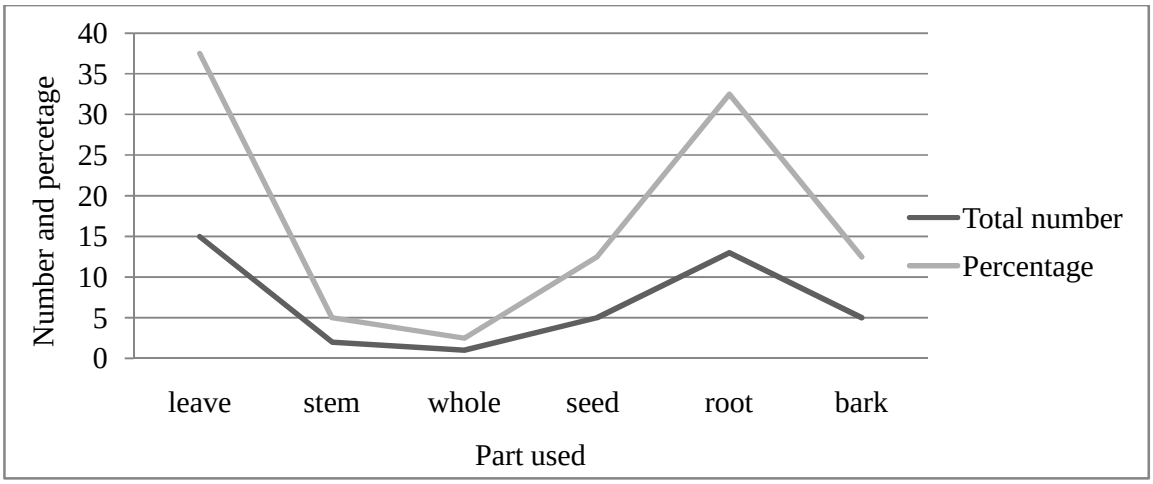


Figure 11 Parts of ethnoveternary medicinal plants used as source of medicine for the treatment of livestock ailments

The result of the study revealed that ethnoveternary medicines were prepared in various modes of preparation, such as, pounding (28, 70 %), decoction (5, 12.5 %), boiling (2, 5 %), soak (2, 5 %) and others (massage, crush and powderin 4 (10 %) (Table 6).

Table 6 Modes of preparation of ethnoveternary medicine used for the treatment of livestock ailments

Modes of preparation	**Total number of plant species**	**Percentage**
Pounding	28	70
Decoction	5	12.5
Boiling	2	5
Soak	2	5
Others	4	10

Collectd data indicated that ethnoveternary medicinal plants were administered along diverse routes of applications; these were oral (27, 67.5 %), dermal (13, 32.5 %), nasal and optical 2 (5 %) equally each (Figure 12).

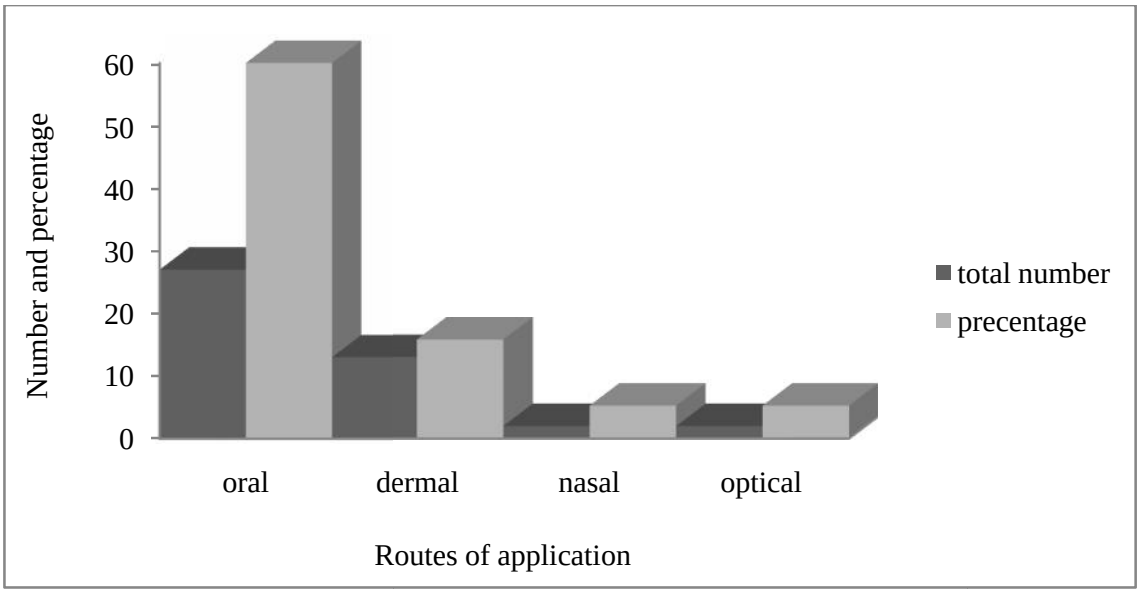


Figure 12 Routes of administration of medicinal plants used for the treatment of livestock ailments

4.2.5 Medicinal plant species used for the treatment of both human and livestock ailments

Out of 97 medicinal plants species identified from the study area, 34 (35.05 %) species categorized under 25 families were used for the treatment of both human and livestock ailments. Among these Lamiaceae, Moraceae and Cucurbitaceae 3 (8.8 %), Euphorbiaceae, Brassicaceae, Alliaceae 2 (8.88 %), while other families of medicinal plants contributed one (2.94 %) are which the predominantly used families of plants used as source of medicine for the treatment of both human and livestock ailments in the study area.

4.2.6 Growth form, parts used, modes of preparation and routes of application of medicinal plants used for the treatment of both human and livestock ailments.

The result of the study depicted that medicinal plants used to treat both human and livestock ailments were harvested from wild (29, 85.29 %), both wild and cultivated source (3, 8.82 %) and (1, 2.94 %) cultivated.

Concerning growth form of medicinal plants the result of the study showed that medicinal plants used to treat both human and livestock ailments were, herbs 14 (40.73 %), shrubs 12 (35.29 %), Liana 4 (11.42 %) and tree 4 (11.42 %) (Figure 13).

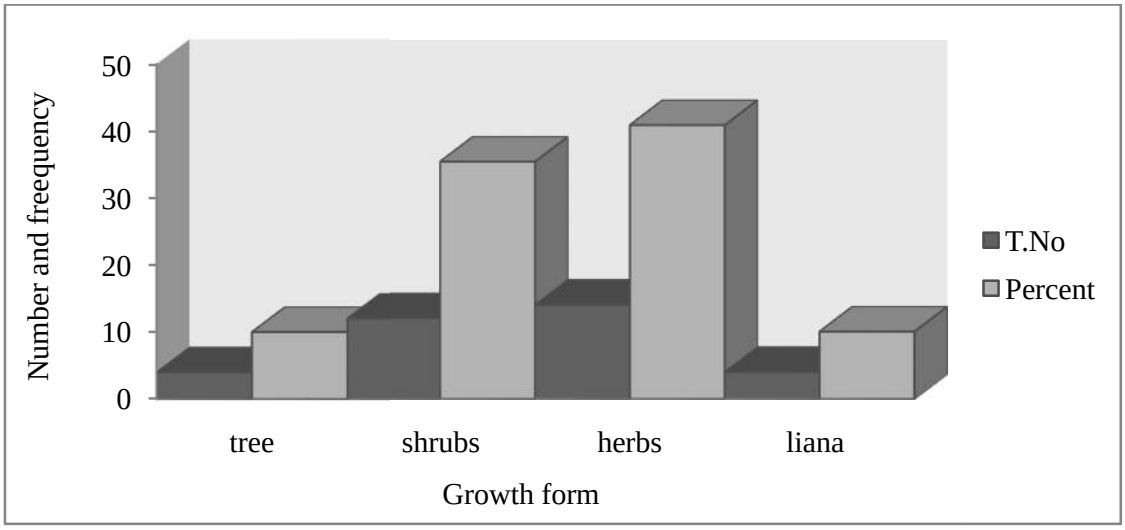


Figure 13 Growth form of medicinal plants used for the treatment of both human and livestock ailments

Collected data depicted that parts of medicinal plants used for the treatment of both human and livestock ailments in the study area were, root (14 plant species, 41.17 %), leaves (9 plant species, 26.47 %), bark (5 plant species, 14.70 %), seed (3 plant species, 8.82 %), stem (2 plant species, 5.88 %) and 1 (2.94 %) whole part (Table 7).

Table 7 Parts of medicinal plants harvested for the treatment of both human and livestock ailments.

Parts used	Total number of plants	Percentage
Leaves	9	26.47
Stem	2	6.66
Root	14	41.17
Seed	3	10
Whole parts	1	3.33
Bark	5	16.66

Analysed data specified that medicinal plant of the study area were prepared in different modes, such as pounding (13, 38.23 %), powdering (5, 14.70 %), massaging and chewing each (4, 11.76 %), chewing (4, 11.76 %), decoction (3, 8.82 %), painting (2, 5.88 %) and others mode account (5, 13.88 %) of preparation (Figure 14).

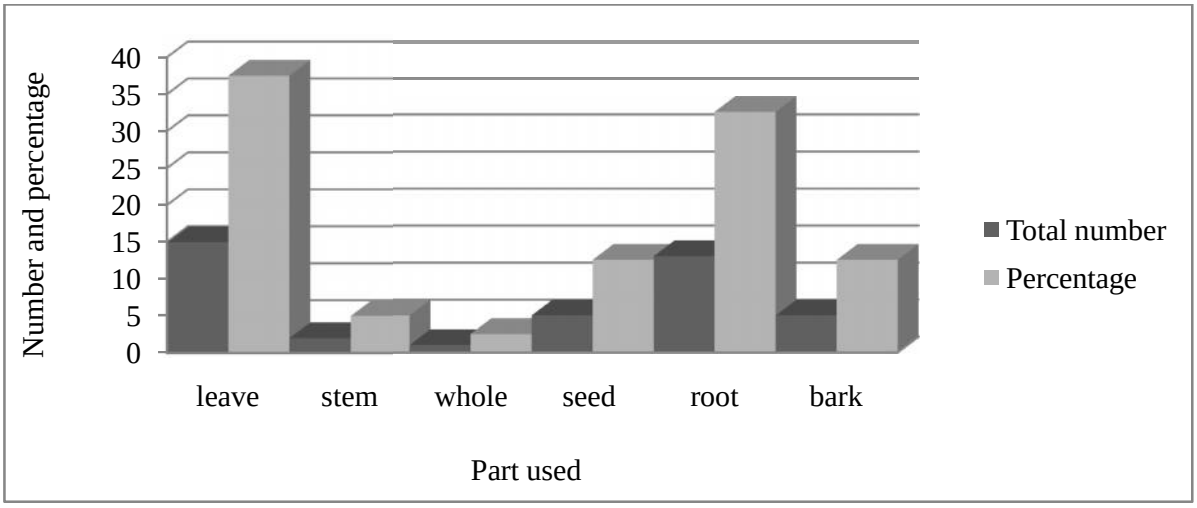


Figure 14 Modes of preparation of medicinal plants used for the treatment of both human and livestock ailments

Medicinal plants used to treat both human and livestock ailments were administered through, oral (21, 61.76 %), dermal and nasal (5, 14.70 %) each, tooth surface (3, 8.88 %), vaginal and optical accounts (1, 2.94 %) each (Figure 15).

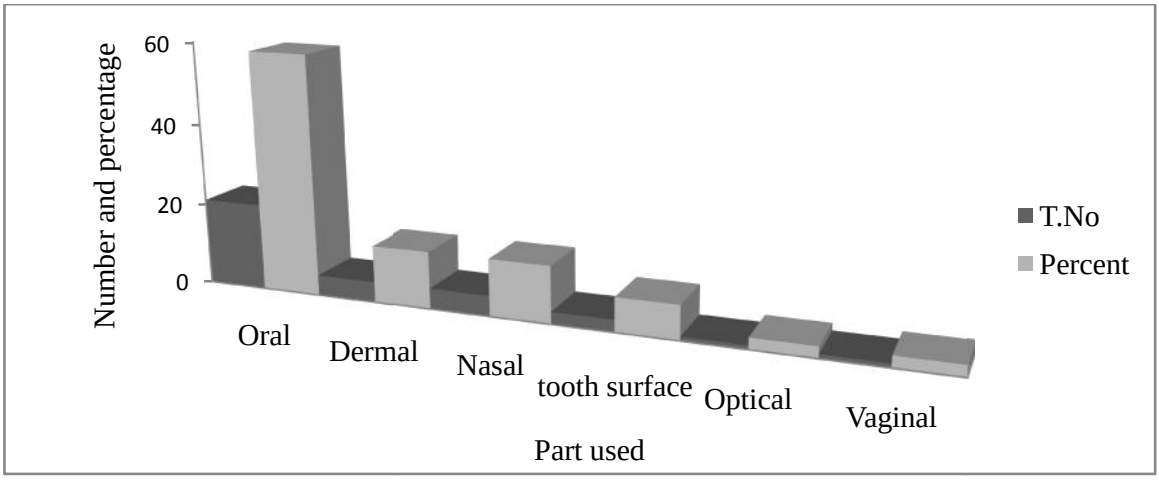


Figure 15 Routes of application of traditional medicinal plants used to treat both human and livestock ailments

4.3. Dosage administered and antidotes used with medicinal plants

Healers administer traditional medicinal plants using unstanderdized dosage by considering toxicity of the medicinal plant, age, sex and resistance (intensity) of users. Practitioners used different local measurements such as tea cup, coffee cup, locally used cup for water drinking, nodes of finger of the user (the practitioner) and nail of the practitioner or users.

Traditional medicinal practitioners and elders reported that medicinal plants were administered with antidotes to reduce its adverse effect, reduce toxicity, to improve flavor (test). Commonly used antidotes in the study area were catical a (areke), soup, milk, honey, coffee, barley pourage, butter and others.

4.4 Informant consensus factor

From collected and documented data of medicinal plants of the study area, some of the medicinal plants were more popular (commonly used) in different sites of the study area. Accordingly, ICF was calculated (Table 8) and the ICF of *Thalictrum rhynchocarpum* (shashara) was (0.98) the highest score to treat human and livestock ailments, black leg, swelling, placental case and was reported as none toxic, *Acmella caulirhiza* (siimboo) (0.97), the second commonly used medicinal plant in the study area. *Acmella caulirhiza* was used to treat both human and livestock ailments such as infected wound, leshimaniasis, tooth ache, intestinal parasite, tonsil infection and snack poisonous. Informants and users of the study area point out that *A. caulirhiza* was efficient and a non toxic medicinal plant. *Ocimum urticifolium* (hancabbii) (0.96) that was the third commonly used medicinal plant to treat human ailments such as, skin rash, influenza, eye pain and allerge. Same score *Allium sativum* (Qullubbii adii) (0.96) was used for the treatment of both human and livestock ailments such as tonsile infection, influenza, cough and black leg. *Pycnostachys abyssinica* (Fojogaa) (0.94) was the fifth most commonly used medicinal plant to treat human and livestock ailments, including tape warm, rabies and leshimaniasis. According to the expression of key informants, *P. abyssinica* was the most needed among the society but it is highly exploited in the study area. *Commelina foliacea* (Gorora fardaa) (0.89) was reported as highly toxic and effective to treat snack poison, infected wound and blackleg. *Guizotia scabra* (turfoo) (0.88) was used to treat heart diseases, tape warm, tryps and also it was important for fattening cows, to increase milk production. *G. scabra* was reported as one of the highly required, none toxic plant and it is seriously exploited. *Ficus ingens* (koonnoo) (0.87) was effective anti rabies with its strong damaging effect of users (cause intestinal ulcer) to treat infected human and livestock, also used as vaccination for livestock against Rabis. *F. ingens* was one of those endangered medicinal plants of the study area. *Plantago lanceolata* (Qorxobbii) (0.86) was commonly used to clot blood during injury.

Table 8 Informant censuses factor of most frequently reported medicinal plants

Plant Species category	Total informants	% total informants	Use report	% of use report	ICF
Thalictrum rhynchocarpum	54	83.15	412	37.08	0.98
Acmella caulirhiza	65	86.15	273	24.57	0.97
Allium sativum	46	60.96	254	22.86	0.96
Ocimum urticifolium	58	53.84	229	20.61	0.96
Pycnostachys abyssinica	51	72.53	151	13.59	0.94
Commelina foliacea	39	60	78	7.02	0.89
Guizotia scabra	51	72.53	72	6.48	0.88
Ficus ingens	51	72.53	65	5.85	0.87
Plantago lanceolata	35	53.84	62	5.58	0.86

4.5 Preference ranking

In the presence of several medicinal plants used to treat identical ailments, people showed preference for better treatment among traditional healers or towards clinics. Several informants reported that searching treatment from clinics for “kuyyisa” (leshimaniesis) has both shortage of drug and were less efficient. It was difficult to get this drug especially among rural residents and was mostly not curable in medical treatment. For this reason, the rural communities prefer traditional healers but by this time health post workers were strongly discouraging the use of traditional medicinal plants (Table 9).

Preference ranking for seven medicinal plants used for the treatment of ” kuyyisa” (leshimaniasis) (Table 9) exposed that “*Jimaa”* ranked first and hence is the most effective medicinal plant to cure leshimaniasis (kuyyisa) in the study area.

Table 9 Preference ranking of medicinal plants used to treat leshimaniesis (kuyisaa)

No	**Scientific name**	**Vernacular**	**Respondents and their selection value of TMPs**								**Percentage**	**Rank**
			R_1	R_2	R_3	R_4	R_5	R_6	R_7	Sum		
1		Jimaa	1	1	1	1	1	1	1	7	100	1st
2	*Brucea antidysentrica*	Qomonyo	1	1	0	1	1	1	1	6	87.71	2nd
3	*Dodonaea angustifolia*	Ittacha	1	1	1	0	1	0	1	5	71.42	3rd
4	*Peucedanum abyssinica*	Qoricha simbiraa	1	0	1	1	0	1	1	5	71.42	4rth
5	*Eurphobia ampliphylla*	Hadaamii	1	0	1	0	1	0	1	4	57.14	5th
6	*Achyranthes aspera*	Maxxanne	0	1	0	0	0	1	1	4	57.14	6th
7	*Croton macrostachyus*	Bakkanniisa	1	0	0	1	1	0	0	3	42.85	7th

4.6 Paired comparison

In this study, seven key informants were selected to specify the efficacy and popularity of plant species used to treat rabies did paired comparison of six medicinal plants (Table: 10). *Pycnostachy abyssinica (Fojogaa), Ficus ingens (Koonnoo)* and *Brucea antidysentrica* (Qomonyoo) were ranked 1st, 2nd, and 3rd in that order, *Phytolocca dodecandra (Handoodee) 4th , Justicia schimperiana (dhummuugaa) 5th* and *Ricinus communis (Qobboo) 6th* to treat rabies were less preferred and less efficient as compared to other.

Table 10 Paired comparisons of medicinal plants used to treat Rabies

No	Scientific name	Vernacular name of TMP	No of respondents assigned the highest value (1)	Percentage	Rank
1	*Pycnostachys abyssinica*	Fojogaa	7	100	1st
2	*Ficus ingens*	Koonnoo	6	85.71	2nd
3	*Brucea antidysentrica*	Qomonyoo	5	71.42	3rd
4	*Phytolocca dodecandra*	Handoodee	4	57.14	4th
5	*Justicia schimperiana*	Dhummuugaa	3	42.85	5th
6	*Ricinus communis*	Qobboo	2	28.58	6th

4.7 Direct matrix ranking

The study comprises number of medicinal plants found to be multipurpose species being utilized for variety of uses. The common uses include medicinal, fodder, food, firewood, construction, charcoal, fence and furniture making. Eight commonly reported multipurpose species and eight use categories were involved in direct matrix ranking exercise in order to evaluate their relative importance to the local people and the extent of the existing threats related to their use values (Table: 11).

Table 11 showed, *Vernonia amygdalina*, *Podocarpus falcatus*, *Euculyptus camaldulensis* and *Ficus ingens* were ranked 1st , 2nd , 3rd and 4th respectively. From this result it was clear that they were the most threatened medicinal plants since they were harvested for several values. *Croton macrostaachyus* and *Osyris quadripartita* were score 5th rank equally and *Ficus sycomorus* and *Embelia schimperi* were medicinal plants with least multipurpose use so they were less threatened medicinal plants for multipurpose uses.

Similarly the values of use reports across the selected species were summed up and ranked. The results illustrated that the inhabitant people in and around Chato Forest of Horo District harvest eight multipurpose plant species mainly for firewood, construction and charcoal ranked 1st, 2nd and 3rd respectively. Fire wood, construction and charcoal production were the most ranked values for which medicinal plants were harvested and under threat. Following

these Medicinal, Fencing, fodder, furniture and food were ranked of 4th, 5th, 6th, 7th and 8th in that order. For these reason medicinal plants were under threat since there was no habituated means of replace for indigenous plants in the study area purposively after used. Hor Guduru Wollega Zone Wild life and Forest Enterprise District plants large number of exotic plants. As a result, there was great threat for indigenous plants of the study area. Elders and key respondent of the study area also reported that after plantation of exotic plants on plains above (on high lands) of the Chato Forest performed so many water source were dried totally, which is another threat to herbs and shrubs of reverin dwellers.

Table 11 Direct matrix ranking of multipurpose medicinal plants

No	**The most dominant and selected**	**Medicinal**	**Fodder**	**Food**	**Fire wood**	**construction**	**charcoal**	**Fence**	**Furniture**	**Sum**	**Rank**
1	*Vernonia amygdalina*	2	3	1	3	2	2	1	1	15	1st
2	*Podocarpus falcatus*	1	0	1	3	3	2	2	2	14	2nd
3	*Euculyptus camaldulensis*	2	1	0	3	3	2	1	1	13	3rd
4	*Ficus ingens*	2	1	0	2	2	3	1	1	12	4th
5	*Croton macrostaachyus*	2	1	0	2	1	2	2	1	11	5th
6	*Osyris quadripartita*	2	1	0	2	2	2	1	1	11	5th
7	*Ficus sycomorus*	1	1	1	2	1	1	1	1	10	6th
8	*Embelia schimperi*	2	1	1	1	2	1	1	0	9	7th
Sum		14	9	4	18	17	16	10	8		
Rank		4th	6th	8th	1st	2nd	3rd	5th	7th		

4.8 Fidelity level index

Verification could not be taken as a single measure of the potential efficiency of any medicinal plant in fidelity level index. Efficacy is not the only factor that influences the informant choice but abundance of a given plant and prevalence of disease in the area can affect informants choices.

As black leg was one of the frequently reported livestock disease in high land areas "Dire Farada, Hula Culu, Burka Gamada and walda" and less frequent in low land areas "Laga Walo, Chato, Kiltu Aba Dindo and Tulu Korma". Different number of informants from the two areas for black leg case reported the use of *Thalictrum rhynchocarpum* as a medicinal plant. The fidelity level index was calculated for *T. rhynchocarpum* for the two altitudinally different areas. A total of 12 specific uses for the treatment of black leg and 16 general uses for *T. rhynchocarpum* were reported by informants from "Dire Farada, Hula Culu, Burka Gamada and walda". While 9 specific uses for the treatment of black leg and 16 general uses for *T. rhynchorpum* were reported by informants from "Laga Walo, Chato, Kiltu Aba Dindo and Tulu Korma" areas.

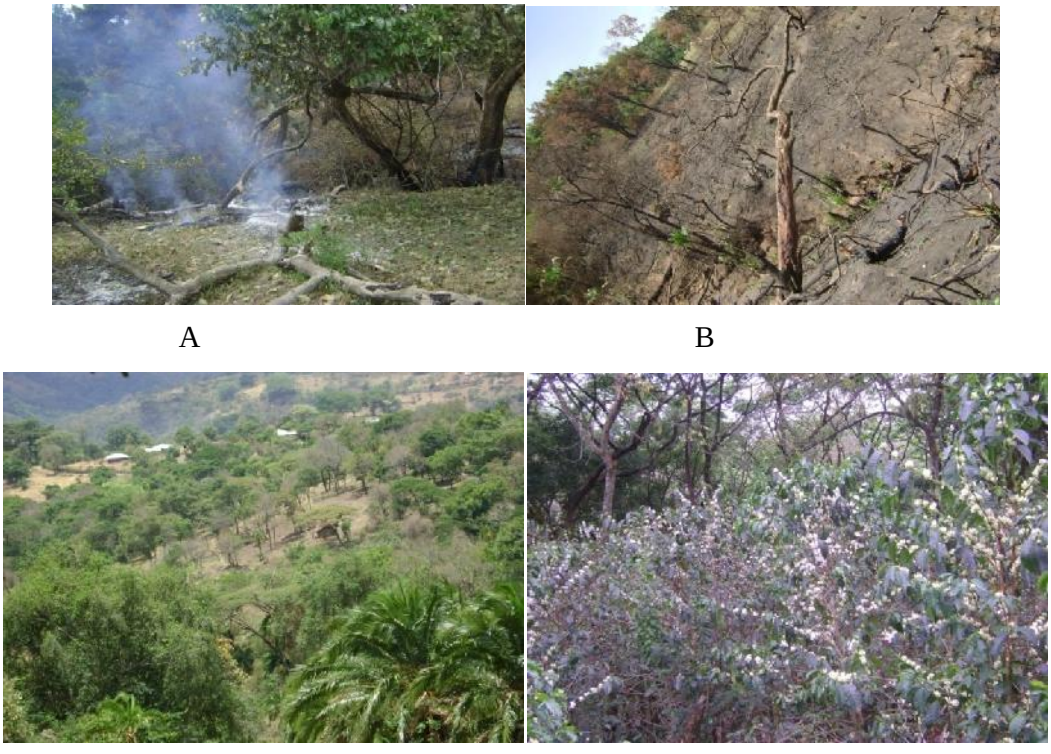
Use reports of informants from "Dire Farada, Hula Culu, Burka Gamada and walda" were compared with use reports of informants from "Laga Walo, Chato, Kiltu Aba Dindo and Tulu Korma" to assess the fidelity level of *T. rhynchorpum (*FL=IP/IU*).* From the comparison, it was found that the fidelity level of *T. rhynchocarpum* for black leg treatment by "Dire Farada, Hula Culu, Burka Gamada and walda" informants was 75 % and 47.36 % for "Laga Walo, Chato, Kiltu Aba Dindo and Tulu Korma". Thus, the medicinal value of *T. rhynchocarpum* was high in high land areas in contrast to the low land area in and around Chato Forest.

4.9 Threat factors of traditional medicinalnplants

Medicinal plants of the study area were threatened by several threatening factors as result a of human activities such as expansion of farm land (encroachment), new settlements, fire woods, sudden fire and coffee plantation were among the most frequently reported (Table 12 and Figure 16).

Table 12 Threat factors to medicinal plants in and around Chato Forest

No	Threat factors	No of respondents	Percentage
1	Expansion of farm land (enchoarchment)	26	40
2	New settlement	15	23.07
3	Fire wood	13	20
4	Sudden Fire	7	10.76
5	Coffee plantation	5	7.69



A B C D

Figure 16 Photo showing threat factors to medicinal plants in Chato Forest, A. Sudden fire, B. expansion of farm land, C. New settlement and D. Coffee plantation

5. DISCUSSION

The world health organization estimates that about 80% of the population of most developing countries relies on herbal medicines for their primary healthcare need (Mahendra, S.*et al*., 2011). Similarly residents of the study area largely used medicinal plants for their primary healt care.

The result of this study illustrated that both sexes (male and female), different educational back ground, diverse age groups, different occupational status, varied religious followers, married and unmarried respondents were traditional medicinal practitioners and using traditional medicinal plants. The data indicated that most knowledgeable age groups were more confined to 41 and above in the study area. The data indicated that most of medicinal pactitioners and users were rural residents. The transfer of the knowledge of medicinal plants towards the new generation was rare that was a threat to the sustainability of the indigenous knowledge. The knowledge of medicinal plants was mostly practiced by married, uneducated group of the residents and very much among female, educated and youth. The result of the study depicted that the involvement of the females wwas less than males because that females were occupied by household responsibilities more than practicing in the field according to elder description in the study area.

A total of 97 medicinal plant species categorized under 92 genera and 51 families of plants were collected and identified from the study area. Frequently reported genera of plants were Ficus, Rumex, Solanum, Girardinia and Guizotia. Among these, 42 species were in common with Amenu (2007) from west Shewa, Chalya District; 19 species with Abera (2014) from west Wollege, Ghimbi District; 18 species agree with Regassa et al. (2014); 17 species with Birhanu and Abera (2015) from Horo Guduru District and 17 species were reported by Gebeyehu (2011) from west Gojam.

Traditional medicinal plants were available in different season of year of these (27.83 %), winter (24.74 %) were in spring and autumn, while (11.34 %) were available in summer seasons and the same number were in all season of the year. Most of those most habitant medicinal plants were collecte from rivern side and irrigation area.

Frequently reported families of plants were Fabaceae, Asteraceae, Eurphobiaceae, Moraceae and Laminaceae. In line with this study, Abera (2014) reported Fabaceae, Asteraceae and Lamiaceae, Bekele et al. (2012) reported that Astereceae and Cucurbitaceae and Moffat et al. (2011) reported Asteraceae and Fabaceae were the main medicinally used families of plants while Engedasew et al. (2015) reported Fabaceae and Asteraceae was predominantly used families. Analogous result of the study approved that Fabaceae, Asteraceae and Laminaceae were the most commonly used medicinally important families of plants.

The study depicted that most medicinal plants were harvested from wild and home garden, while the least from both wild and home garden. In agreement with the result of the study, Regasa (2013) from Hawasa reported that 80.41 % from wild and 14.59 % cultivated. Ashagre (2011) from Borana reported that 51.5 % of medicinal plants were harvested from the wild. Accordingly, several studies, Amenu (2007), Mussa and Wolde (2013) and Moffat *et al.* (2011) reported that (78.7 %, 83.7 % and 54.5 %) of medicinal plants were harvested from the wild. Similaritythe result of several studies confirmed that most of medicinal plants were harvested from the wild, followed by cultivated and least from both wild and cultivated area. The availability of most of medicinal plants in wild area more than in home gardens made them to be an easy access to users but it put their ex-situconservation under threat.

According to the study, large numbers of medicinal plants (78.35 %) were distinguished to treat human ailments, (41.23 %) to treat livestock ailments and (35.05 %) to treat both human and livestock ailments. The study depicted that large numbers of medicinal plants were used by residents to treat several human and livestock ailments and the study point out the resource fullness of the area in medicinal plants. Several studies reported similar results including, Amenu (2007) from west Shewa who reported 53.9 % medicinal plants were used for the treatment of human ailment ailments only, Argisho (2014) from Hadiya reported 61.3 % were used for the treatment of human only, 22.6 % for both human and livestock ailments and 16.1 % were for livestock only. Engedasew *et al.* (2015) reported 71.67 % for human, 15.28 % for livestock and 12.28 % were for the treatment of both livestock and human ailments; Adefa and Berhanu (2011) reported that 99 plant species were used for the treatment of human ailments and 19 were to treat livestock ailments. The study pointed that out there were large number of ethnomedicinal plants used for the treatment of human ailments more than ethnoveternery medicine in and around Chato Forest of Horo District. Analogousness of reported results conducted in different parts of the country substantiate as

there were large number of medicinal plants to treat human ailments more than livestock ailments.

The data indicated that most of medicinal plants used to treat human ailments were harvested from wild and cultivated area, while the least were collected from both cultivated and wild. Matching result was reported by (Mussa *et al.*, 2013). The result of the study showed that most of the medicinal plants used to treat human ailments were harvested from wild, followed by from both wild and home garden and least from home garden alone.

The study identified that growth form of medicinal plants used to treat human ailments were herbs (36.83 %), shrubs (32.89 %), liana and tree. In agreement with the result of the study Giday *et al. (*2009), Abera (2014), Moa *et al.* (2013) reported that herbs were the most commonly used growth form of plant followed by shrubs. Ahmad *et al.* (2011), from Namibia reported that shrubs, herbs and climbers were the most medicinally significant growth form. Similarities of the reported result of several studies confirmed that herbs were the most predominantly used growth form of plants, followed by shrubs.

According to the analyzed data, parts of medicinal plants harvested for the treatment of human ailments were root (40 %), leaves (23.33 %), bark, seed, stem and whole part. The major parts of medicinal plants used for the treatment of human ailments in the study area were leaves and roots. In line with the result of the study, Mussa *et al. (*2013) and Argisho *et al.* (2014) reported leaves and roots as primarily used parts of ethnomedicinal plants to treat human ailments. Analogous result of the study approved that leaves and roots were the most medicinally used part of ethnomedicinal plants. The harvest of leaves and roots of medicinal plants for medicinal purpose harms the life of the mother plant and their sustainability. In particular the use of the roots of medicinal plants seriousely harms the future existence of such medicinally important plants, so it needs appropriate conservation action.

The result of the study depicted that several modes of preparation of medicinal plants were used to treat human ailments including pounding (36.11 %), powdering (13.88 %), massaging, chewing, decoction, painting and others mode of preparation

According to the current study traditional medicinal plants were administered through, oral (58.33 %), dermal, nasal, tooth surface, vaginal and optical accounts. Similar results were reported by Mussa *et al.* (2013), Argisho *et al.* (2014) that oral route of application was the primary route followed by dermal route of administration. Parallel results reported confirmed that oral and dermal route of administration were the most used.

The result of the study depicted that ethnoveternary medicinal plants in the study area recorded 40 plant species classified under 38 (95 %) genera and 32 (80 %) families. Commonly collected genera of plants were Grardenia and Guizotia. Family Fabaceae, Asteraceae primarily comprise followed by Rutaceae, Amaranthaceae, Ranunculaceae, Urticaceae and Solanaceae. Similar findings were reported by Bekele and Ramachandra (2015) from Guji Oromo was reported Asteraceae as predominantly used; Moffat et al. (2010) from Botswana reported that Asteraceae was the most commonly used family of plant in ethnovetrnary treatment. Analogous to the result Romha et al. (2015) from southern Ethiopia reported Eurphobiaceae, Fabaceae, Solanaceae, while Birhanu and Abera (2015) from Horo Guduru reported Solanaceae, Eurphobiaceae and Cuccurbitaceae were predominantly used families of plants. Similarity of the result with several reported studies proved that Asteraceae and Fabaceae were the most used families in ethnoveternary medicine.

Ethnoveternary medicinal plants in and around Chato Forest of Horo District were harvested from wild, home garden (cultivated) and from both wild and cultivated sources. Similarly, Birhanu and Abera (2015) from Horo Guduru reported 76.5 % from wild, 13.7 % cultivated and 9.8 % were form both wild and home garden and similar result was reported by Mussa *et al.* (2013). Large numbers of ethnoveternary medicinal plants were mainly harvested from wild in the study area. Comparable result of the study proved that most medicinal plants were harvested from the wild, followed by cultivated and least from both wild and home garden.

From the result of the study growth form of medicinal plants used for the treatment of livestock ailments were herbs, shrubs, liana and trees. Similar result were reported by, Bekele and Ramachandra (2015) shrubs (48.8 %), herbs (30 %), trees (20.9 %), Birhanu and Abera (2015) 44 % herbs, 32 % shrubs, Romha *et al.* (2015) 36.7 % herbs, 34.3 % trees, Araya *et al.* (2015) 42.2 % shrubs, 39 % herbs and 14 % trees . Moffat *et al.* (2010) from Botswana, Bekele *et al.* (2012) and Sori *et al.* (2004) from Ethiopia reported similar results. Comparison

of the result of the study with the results of several studies proved that herbs were the most medicinally significant growth form of ethnoveternary medicinal plants followed by shrubs and trees.

Collected data show that leaves, seed, root, stem and whole plant of ethnoveternary medicinal plants were harvested for preparation of the medicine. Primarily used part of ethnoveternary medicinal plants of the study area were leaves. In line with this study, Bekele and Ramachandra (2015) reported roots (39.5), leaves (30.2 %); Berhanu and Abera from Horo Guduru reported that leaves (48 %), root (36 %), Romha *et al.* (2015) leaves (38.8 %), roots (20.4 %) and Araya *et al.* (2015) leaves (44 %), roots (16 %) and whole part (10 % were predominantly used growth forms, Argisho *et al.* (2014) and Bekele *et al.* (2012) reported that leaves were mainly used part of ethnoveternary plant. Sori *et al.* (2004) reported that roots were primarily used part. Aswell the results of reported studies proved that leave and roots were the main used parts of ethionoveternary medicinal plants.

The study identified that ethnoveternary medicinal plants were prepared in several modes including pounding, decoction, boiling, soak, massage, crush and powdering. The result of the study depicted that the primarily used modes of preparation of ethnoveternary medicinal plants in the study area were pounding and decoction. Analogous to the result of the study Romha *et al.* (2015), reported pounding (78.2 %), Araya *et al.* (2015) pounding (15 %) the predominantly used mode of preparation. Comparsion of the result of reported studies with the result of the study confirmed that pounding was the main mode of preparation of ethnoveternary medicinal plants.

Ethnoveternary medicine in and around Chato Forest of Horo District were administered through diverse routes including, oral, dermal, nasal and optical. Oral and dermal route of application of ethnoveternary medicinal plants were the most commonly used routes in the study area. Corresponding results were reported by Birhanu and Abera (2015) oral (76 %) and dermal (24 %); Tekele (2015) oral (58 %) and dermal (29.17 %) and oral/dermal (12.5 %), Sori *et al.,* (2004) and Argisho *et al.* (2014) reported similar results from different areas of the country. Bekele *et al. (*2012) reported that spraying was administered for insects. Similarty of several reported results of studies confirmed that oral route of application was predominantly used, followed by dermal and nasal routes.

The result of the study depicted that plants used as source of medicine for the treatment of both human and livestock ailments were harvested from wild, both wild and cultivated and cultivated only. The study illustrated that most of medicinal plants used to treat both human and livestock ailments were harvested from the wild and least from home gardens.

Collected data illustrated that growth forms of ethnomedicinal plants used for the treatment of both human and livestock ailments were herbs, shrubs, liana and tree. Similar result was reported by (Agisho *et al*., 2014). The similarity of the results confirmed that herbs were predominantly used growth form of medicinal plants for the treatment of both human and livestock ailments.

From the result of the study, root, leaves, bark, seed, stem and whole part were parts used as source of medicine to treat both human and livestock ailments in and around Chato Forest of Horo District. In line with the study Argisho *et al.* (2014) reported the same result. Analogous result of the study implied that roots were predominantly used part of medicinal plant for the treatment of both human and livestock ailments.

In the present study, pounding, powdering, massaging, chewing, decoction and painting were modes of preparation of medicinal plants used for the treatment of both human and livestock ailments. Accordingly, the result of the study depicted that pounding and powdering were the main modes of preparation of ethnomedicinal plants used for the treatment of both human and livestock ailments from Chato Forest in Horo District.

The result of the study, illustrated that medicinal plants were administered through, oral, dermal, nasal, tooth surface, vaginal and optical routes of administration of medicinal plants to treat both human and livestock ailments. The result of the study was evidenced for oral route of administration was primarily used route of administration. Similar result was reported by Agisho *et al.* (2014) that proved oral route of administration of medicnal plants were the main used to treat both human and livestock ailments.

Threat factors to medicinal plants and indigenous knowledge.

There was legalized and traditionally habituated means of conservation of medicinal plants in and around Chato Forest. Lack of indigenous knowledge of conservation of medicinal plant of the study area is threat to their sustainability. Similar to results of the study point out that most of medicinal plants were harvested from wild (Forest). In agreement with the study (Giday, 1999; Awas and Asfaw, 1999) reported that medicinal plants were harvested from the wild. Inhabitant people of the study area were using medicinal plants without care for their medicinal purpose and future use. Medicinal plants of the study area were used for diverse purpose like fire wood, construction, forage, timber production, fence and others. Timber production and construction were critically harming those medicinal plants having tree and liana growth form for example, *Podocarpus falcatus* was frequently harvested for construction and timber production, *Olea europaea* for construction, fence and charcoal production, *Perpiloca linearifolia, Eucalyptus camaldulensis, Clematis simensis, Ficus sycomorus and Guizotia scabra* were the most endangered forage and medicinal plants of the study area.

The result of the study depicted that the growth form most of medicinally important plants were herbs and shrubs. Most herbs and shrubs were shade and moist dwellers. In Chato Forest the underside of the Forest was allowed for coffee plantation by inhabitant people that eradicate herbs, shrubs and liana as weeds except the canopy and the emerging trees. Dried source of water as the result of exotic plant plantation on high land of Chato Forest and coffee plantation underside of the Forest were other threats to herbs and shrubs mainly.

Chato Forest is found under government protection but still there is extensive Forest cleaning and expansion of farmland which have been eradicating plants with multipurpose especially expansion of farm land (enrchoachment) (40%), new settlement (23.07%), fire wood (20%), sudden fire (10.76%) and coffee plantation (7.69%).Analogous results were reported (Mesfin et al., 2013; Adefa and Abiraha, 2011; Abera, 2014), that encroachment, ecological degradation, conistruction and other similar factors were threats to medicinal plants.

Similarly, new settlement, clearing of Forest to establish new farm land and encroachment were other threats to the sustainable availability of medicinal plants in and around Chato Forest. According to discussion made with elders and key informants of the study area, these actions were taking place because of rapid population growth and dependency over natural resource including vegetations in the area. Similar result was reported (Mesfin et al., 2013) evenly population growth geopardized medicinal plants.

Additional threat to ethnomedicinal plants found in Chato Forest are uncontrolled burning of Forest which was suddenly released as the result of honey harvest and reasonably to expand their farm land while others do as the result of lack of awareness on conservation of natural Forest (vegetation).

Awareness education was given for resident people and medicinal practitioners of the study area by health post workers to stop the practice and usage of traditional medicinal plant.That is because of that medicinal plants have no standardized dosage and can harm the liver, intestine and other internal organis. This was a threat to the knowledge of medicinal plants. Accordingly, now days medicinal practitioners were frustrated to prepare, administer medicinal plants, to express themselves as knowledgeable individuals and to transfer their medicinal knowledge. The knowledge was passed orally and secretly to beloved son or closely related kinship that limits this knowledge to exist among few individuals. The current awareness and pressure against to use, prepare and administer medicinal plants forwarded from the government was seriously harming the knowledge of ethnomedicine in and around Chato Forest of Horo District.

According to key informants, elders and health post workers description, the government was giving awareness education for inhabitant people in order to stop the use of traditional medicinal plants. Health post workers reported this is because of that numbers of clinics were increasing and medicinal plants have no standardized dosage, cause serious damage of users specially brain (is toxic) and is not clean. Similarly, practitioners were advised not to administer and inherit the knowledge of medicinal plants. Accordingly, key respondents realized that the usage and knowledge of medicinal plant was confined to habituated elders. For this explanation the government has been posting an announcement paper at different points (places) and clinics of the study area.

CONCLUSION

- ✓ The study depicteted that a large number of medicinal plants (97) and the wide uses of ethnomedicinal plants by residents of the study area for their primary health care needs. Limited service, shortage of health care facilities and less accessibility of drugs in the study area proved the sustainable use of medicinal plants.
- ✓ Primarly used genera of plants were Ficus, Rumex, Solanum, Girardinia and Guizotia while commonly used families of plants were Asteraceae, Solanaceae, Lamiaceae, Acanthaceae, Eurphobiaceae, Fabaceae and Amaranthaceae for medicinal purpose.
- ✓ Most of medicinal plants were harvested from the wild, wild and cultivated sources and the least from home garden. Wild existence of medicinal plants and the oral transmission of the indigenous knowledge of medicina plant is threat to both the medicinal plants and the indigenous knowledge.
- ✓ Medicinal plants of the study area were used to treat human ailments, both human and livestock ailments and livestock. Large numbers of ethnomedicins were prepared and used fresh and dry which are suitable to preserve as powder even for years.
- ✓ Predominantly harvested growth forms of medicinal plants were herbs, shrubs and liana. Primarily harvested parts of medicinal plants were leaves, root and seed. Main modes of preparation of medicinal plants were pounding, powdering and massaging. Chiefly used routes of administration were oral, dermal and nasal.
- ✓ Medicinal plants in the study area such as *Pycnostachys abyssinica (*against rabies), "*Jimaa"* (against leshimaniasis "*kuyyiisa*") and *Thalictrum rhynchocarpum (*against black leg) were the most favored, accepted and with the highest fidelity level (FL) values, an indication of their high efficacy. Expansion of farm land, new settlement, fire woods were major threat factors to medicinal plants, while awareness of government was threat to loss of the indigenous knowledge.

RECOMMENDATION

- Plants are natural resource on which all life of the world directly or indirectly depends. Therefore, native community of the study area should be involved in conservation and management plans of the plant resources and their indigenous knowledge in their locality.
- The knowledge of traditional medicinal plant is essential part of indigenous cultures and material needs. For this reason, formal and non- formal education systems should be designed to create positive attitude among the young by integrating in to the curriculum.

- Educating the resident people, on resource use value, management and conservation at local village, kebele or District level by agency of Chato Forest and development agents to facilitate an integration of medicinal plants conservation with sustainable use.

- Recognitions and intellectual property rights should be given to traditional healers, either through certification or by organizing them at community or District level, which popularizes their indigenous knowledge and encourage them to use medicinal plants.

- Encouraging inhabitant people to grow medicinal plants in their home garden, mixing it with crops in farm land and live fences.
- Promoting the establishment of local botanical gardens at least at Horo Guduru Wollega Forest and Wild life Enterprise District level.
- Encouraging people to protect medicinal plants around ritual and spiritual areas with higher distribution.

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Appendixes

Appendix I List of medicinal plants used for the treatment of human ailments, with their Familys, Vernacular names and other data (habitat, habits, part used, uses, mode of preparation, etc).

Scientific name; family; vernacular name; Ha = habit(H = Herb; Sh = Shrub; T = Tree; CL = Climber; Ep = epiphyte and V= vine and Li = liana); Ct = cultivated; Wd = wild; Pu = parts used (B= Bark; La= Latex; R= Root; L= Leaf; Fr= Fruit; F= Flower; Se= Seed; St= Stem; Bu= Bulb; Sa – sap, Wh= Whole plant); Disease treated; RA= Rout of application (Or= Oral, N= Nasal, Opt= Optical; Au=Auditory; AN= Anal; Dr= dermal; V= vaginal;Ts= teeth surface); Mede of preparation; Used for (Hu-Human).

Collection number	Scientific name	Family	Vernacular name	Wd/Cl	Habits	Part used	Used for	Mode of preparation	Routes A	Disease treated
KD01	*Acanthus polystachius* Adth.	Acanthaceae	Koshaashillaa	Wd	T	L	Hu	Leaves of were massaged and exudates applied on to ached tooth	Ts	Tooth ache
								Leaves were dried and powdered, then dusted over infected body part	Dr	Hemoridis
KD21	*Achyranthes aspera* L.	*Amaranthaceae*	Sabuqaanqee (maxxannee)	Wd	H	L	Hu	Fresh leaves are pounded, dried and then burned over infected body part	Dr	Leshimaniasis
								Massage leave of *Achyranthes aspera* and drop its exudates in to ach ear.	Au	Otitis media (Gurra waraansa)

Appendix 1 contiued ……..

KD27	*Achyrospermum schimperi* (Hochst.exBriq.)Perkins	Lamiaceae	Kusaayee	Wd	Sh	L	Hu	Infected conjunctiva was rubbed by the lower side the leaf	Opt	Eye pain
KD16	*Acmella caulirhiza* Del.	Asteraceae	Siimboo (Gutichee)	Wd	H	R	Hu	Root of mashed and tied to nose	Na	Leshimaniasis
						L	Hu	Leaves were massaged and bit over ached tooth	Ts	Tooth ache
						Fl	Hu	Dried flowers of *Acmella caulirhiza* were powdered and put its powder in digested tooth.	Ts	Tooth ache
						R	Hu	Roots of *Acmella caulirhiza* were chewed and swallow its exudates	Or	Intestinal parasite
								Roots of *Acmella caulirhiza* are chewed and swallowed its exudates	Or	Snake poisonous
						Fl	Hu	Flowers of *Acmella caulirhiza* are chewed and swallowed its juice (liquids)	Or	Tonsil

Appendix 1 continued ……..

KD86	*Allium sativum* L.	Alliaceae	Qullubbii Adii	Cl	H	Bu	Hu	Eat raw cloves of *Allium sativum* with injera (buddena) at night for 2 – 3 days	Or	Tensile/influenza
KD81	*Aloa pulcherrima* Gilbert and Sebsebe	Aloaceae	Hargiisa	Wd /Cl	H	L	Hu	Latex of the leaf of *Aloa pulcherrima* was painted over wound (burned body part)	Dr	Fire burn
KD20	*Alternanthera pungens* Kunth.	Amaranthaceae	Niggirtii	Wd	H	Se	Hu	Dried seed of *Alternanthera pungens* and seed of *Guizotia abyssinica* pounded together and eaten.	Or	Tape warm
							Hu	Dried seed of *Alternanthera pungens* was pounded and eat one tea spoon with two spoon of honey	Or	Tape warm
KD66	*Asparagus setaceus* (Kunth) Jessop.	Asparagaceae	Sariitii	Wd	V	R	Hu	Roots of *Asparagus setaceus* were pounded with salt and little water, then drink one coffee cup of its exudates. Not allowed for children	Or	Swelling
KD53	*Bersama abyssinica* Fresen.	Melianthaceae	Araarsaa (Lolchiisaa)	Wd	S H	L/ R	Hu	Leaf of *Bersama abyssinica* was boiled, then by using its water preparing barely forage and eat or prepar bea “mullu baaqelaa”	Or	Ascarise
KD90	*Brassica carinata* A. Br.	Brassicaceae	Raafuu	Cl	H	Se	Hu	Seed of *Brassica carinata* and feace of hyena was powdered together and paint to head with butter	Dr	Tinea capitis

Appendix 1 contiued ……..

KD12	*Brucea antidysentrica* J.F Mill	Simaroubaceae	Qomonyoo	Wd	SH	Se	Hu	Dried leaf of *Croton macrostachyus* and seed of *Brucea* antidysentrica are powdered together and inhaled through nose/ painted to wounded body part	Na	Leshimanias is
								Dried seed of *Brucea antidysentrica* is powdered and painte to infected body part with fresh butter	Dr	Hemoridis
KD18	*Calpurma aurea*	Fabaceae	Siiqqee Qamalee	Wd	H	R	Hu	Pound root of *Calpumata subdecandra* and drink 4 -6 cup of its exudates for one day	Or	Nam ilbiisa nyaateef
KD44	*Canarina eminii* Schweinf.	Campanulaceae	Xuuxxoo	Wd	Ep	R	Hu	Roots of *Canarina eminii* and *Cucumis ficifolius* leaves of *Dodonaea agustfolia* are dried and powdered then inhaled through nose	N	Leshimanias is
KD68	*Capparis timentosa* Lam.	Capparidaceae	Harangamaa Gurraacha	Wd	V	B	Hu	Dried barks of the root of *Capparis tementosa* and *Brucea antidysentrica* are mixed burned and smoked	Na	Evil eye
KD31	*Carissa spinarum* L.	Apocynaceae	Hagamsa	Wd	SH	Sp	Hu	Tip of the spike of *Carissa spinarum, Phoenix reclinata* and shoot tip of *Engilerina woodfordiodes,* internal bark of *Osyris quadripartite* are dried together and finely pounded, then very few (among fingers) of its powder is mixed with “farso” mainy and drink.	Or	Lubido

Appendix 1 contiued ……..

KD26	*Clematis simensis* Fresen.	Ranunculaceae	Hidda Feetii		V	R	Hu	Roots of *Clematis simensis* are decocted and bit over ached teeth	Ts	Tooth ache
KD52	*Colocasia esculenta* (L.)Schott	Araceae	Godarree	Wd	H	R	Hu	Root of *Colocasia esculenta* are decocted and drink one coffee cup of its exudates	Or	Placenta case
KD04	*Commelina folicea* Chiov.	Commeliaceae	Gorora Fardaa	Wd	V	R	Hu	Root of *Commelina folicea* dug out and washed then the victim bit and swallow it juice	Or	Snake poisonous
							Hu	Immediately the root of *Commelina folicea* is massaged and dropped its exudates over wound	Dr	Wound
KD24	*Croton macrostachyus* Hochst. Ex Del.	Euphorbiaceae	Bakkanniisa	Wd	Sh	L	Hu	Leaf of *Croton macrostachyus, Clematis simensis,Eurphobia*, sap of *ampliphylla* and *Ficus vasta* are pounded to gether and mixed with feace of Armageddon then, painted(burned) on to outgrowing diseases	Dr	Leshimaniasis
						B	Hu	Dried bark of *Croton macrostachyus* is powdered mixed with water and drink one cup once	Or	Gonorrhea

Appendix 1 contiued ……..

						B	Hu	As soon as part of body wounded pill out bark of *Croton macrostachyus* and dress over the wound	Dr	Wound dressing
						L & Sa	Hu	Infected skin is rubbed by lowes side of leaf of *Croton macrostachyus* then creamed by sap of its shoot tip	Dr	Psoriasis (Roobbii)
KD34	*Cucumis ficifolius* A.Ricc.	Curcurbitaceae	Hiddii Hoolaa	Wd	H	R	Hu	Roots of *Cucumis ficifolius* and *Canarina eminii,* leaves of *Dodonaea viscose* are dried and powdered then inhaled	N	Leshimaniasis
KD17	*Datura stramonium* L.	Solonaceae	Eleflefoo	Wd	H	Se	Hu	Seeds of *Datura stramonium* are directly put over fire and smoked in to mouth focusing ached tooth (some times using bamnoo), it kill if any warms	Ts	Tooth ache
						L		Leaves of *Datura stramonium* massaged and inserted in to digested tooth (pores) part		
KD39	*Dodonaea angustifolia* L. f.	Sapindaceae	Ittacha	Wd	S H	L	Hu	Leave from shoot tip of *Dodonia angustifolia* are dried and powdered, then painted over the mouth of infant then the infant normally release feces and urine	Or	Syphilis

Appendix 1 contiued ……..

KD94	*Echinops kebericho.* Mesfin	Asteraceae	Qarabichoo	Wd	H	R	Hu	Dry (fresh) root of *Echinops kebericho* is put over fire and smoked. An individual get free of Evil eye.	N	Evil eye
KD35	*Embelia schimperi* Votke.	Myrsinaceae	Haanquu	Wd	V	Se	Hu	Pounded ripen seed of *Embelia schimperi* and drink one cup of its juice is	Or	Tape warm
KD69	*Englerina woodfordiodes* Shms.	Loranthaceae	Eertoo	Wd	Sh	L	Hu	Fresh leaves of *Engilerina woodfordiodes,, Croton macrostachyus,* shoot tip of *Justicia schimperiana* and bark of *Osyris quadripartita* are pounded together with water and tied to swelled body part	Dr	Swelling
KD95	*Ensete ventricosum* (Welw.) Cheesman	Musaceae	Qooccoo (Warqee)	Cl	H	Sa	Hu	Extracted the water leflet of *Enset ventricosum,* mixe with powdered faece of hyena and fresh butter, then swallow the child	Or	Third stage syphilis
KD48	*Eucalyptus camaldulensis* Dehnh.	Myrtaceae	Baargamoo Adii	Cl	T	L	Hu	Leaves of *Hibscus macranthus*, *Eucalyptus camaldulensis* and whole part of *Capparis tementosa* boiled together, then steam smoke	N	Ahichaa

Appendix 1 contiued ……..

KD64	*Eurphobia ampliphylla* Pax.	Euphorbiaceae	Hadaamii	Wd/Cl	T	La	Hu	Latex of *Eurphobia ampliphylla* are accumulated, remove its outer part then drink one “malakke”. Allowed only for greater than 30 years old only.		Gonorrhea
							Hu	latex of *Eurphobia ampliphylla* is accumulated and painted with butter	Dr	Anche (farnculosis)
							Hu	After infected body part is warmed the latex of *Eurphobia ampliphylla* is painted over	Dr	Leshimaniasis
KD70	*Ficus sycomorus* L.	Moraceae	Odaa	Wd	T	Sa	Hu	Extracte latex of *Ficus sycomorus* and paint over infected body part	Dr	Leshimaniasis
KD80	*Ficus vasta*	Moraceae	Qilxuu	Wd	T	Sa	Hu	Extracte latex of *Ficus vasta* and painted on to infected body part	Dr	Leshimaniasis
KD65	*Foeniculum vulgare* Miller	Apiaceae	Insilaala	Wd /Cl	H	Se	Hu	Dried seeds of *Foeniculum uvigare* are powdered and swallowed with butter	Or	Tape warm
KD72	*Guizotia scabra* (Vios.) Chiov.	Asteraceae	Turfoo	Wd	H	Se	Hu	Dried seeds of *Guizotia scabra* are pounded and drink with water/eat with forage of barley	Or	Heart diseases
KD57	*Hagenia abyssinica* (Bruce) J. F. Gmel.	Rosaceae	Heexoo	T	V	L	Hu	Distributing the leaf of *Hagenia abyssinica* under bed and its surrounding		External parasite

Appendix 1 contiued ……..

KD75	*Hibiscus macranthus* Hochst ex A.Rich.	Mallaceae	Maxxajjii	Wd	SH	L	Hu	Leaves of *Hibscus macranthus, Zehneria scara* and *Eucalyptus camaldulensis* are boiled together and steam smoked	N	Head ache
KD08	*Hypoestes forskaolii* (Vahl) R. Schult.	Acanthaceae	Darguu	Wd	H	L	Hu	Leave of *Hypoestes forskaolii* are powdered and painted over wound or its fresh leaves are decocted and painted over wound	Dr	Wound (Madaa)
							Hu	Fresh leaves from shoot part of *Hypoestes forskaolii* are pounded, massaged and drop its exudes over wound then tie the rest residue over the wound	Dr	Gun shoot
KD47	*Justicia schimperiana* (Hochst.ex Nees) T.Anders.	Acanthaceae	Dhummuugaa	Wd/ Cl	SH	R	Hu	Pound fresh root of *Justicia schimperiana, Phytolaca dodecandra, Cucumis ficifolius, Solanum incanum, Ricinus communis Cucumis ficifolius and* bark of *Cyathula cylinderica* together, drink one coffee of its filtrate.	Or	Rabies
KD62	*Kalanchoe densiflora* Rolfe	Crassulaceae	Busuqqee	Wd	H	St	Hu	Cut out piece of stem of *Kalanchoe densiflora* and tie to fibers and inserte in to vagina for 2-5 days	V	Abortion
							Hu	Decocte shoot tip of *Kalanchoe densiflora* and drink little of its filtrate.	Or	Ascarise

Appendix 1 contiued ……..

						L	Hu	Leaves of *Kalanchoe densiflora* are heated over fire and painted to infected leg (skin)	Dr	Skin rush
KD82	*Pycnostachys abyssinica* Fresen.	Lamiaceae	Fojogaa	Wd	SH	R	Hu	Pound fresh/dry roots of *Pycnostachy abyssinica*, then drin its powder with milk. Allowed for above two years old only. Highly toxic medicinal plant.	Or	Rabies
						Se		Powdere dried seeds of *Pycnostachy abyssinica* and prepare as spice then eat with injera (budena)	Or	Tape warm
KD83	*Leucas martinicensis* (Jacq.) R. Br.	Lamiaceae	Daalachoo	Wd	SH	L	Hu	Leaves of *Leucas martinicensis* are massaged dried and burn over infected body part	Dr	Leshimaniasis (kuyyiisa)
KD88	*Lipidium sativum* L.	Brassicaceae	Feecoo	Wd	H	Se	Hu	Pound seeds of *Lipedium sativum*, internal part of roots of *Malva verticillata* and *Grewia ferruginea* together then filtred and drink one tae/coffee cup of its exudates.	Or	Placental case
KD41	*Malva verticillata* L.	Malvaceae	Litii	Cl	H	R	Hu	Pound internal part of roots of *Malva* verticillata, *Grewia ferruginea* and seeds of *Lipedium sativum* together then filtered and drink one tea/coffee cup of its exudates.	Or	Placenta case

Appendix 1 contiued ……..

KD71	*Ficus ingens* (Miq.) Miq.	Moraceae	Koonnoo	Wd	T	R	Hu	Powder dried bark of *Ficus ingens* mixed with injera and milk then offer to dog. Significant as vaccine and for the treatment.	Or	Rabies
KD10	*Mikaniopsis clematoides* (Sch.Bip. ex A. Rich.) Milne Redh.	Asteraceae	Kalaalaa	Wd	V	R	Hu	Pound roots of *Mikaniopsis clematoides, Phytolaca dodecandra, Cyathula cylinderica, Cucumis ficifolius* and *Justicia schimperiana* with water filtered its filtrate is mixes with water and provide for livestock to drink. Used as vaccine and to treat infected animals	Or	Rabies
KD13	*Nicandra physaloides* (L.)	Solanaceae	Wixiwwii	We	H	R	Hu	Chewe cleaned root of "wixiwwii" alone and swallow its filtrate.	Or	Diarrhea
KD45	*Nuxia congesta* R.Br.ex Fresen.	Loganiaceae	Anfaaree	Wd/ Cl	S H	L	Hu	Chewe fresh leaves from shoot area of *Nuxia congesta* with salt and swallow its exudates.	Or	Tonsile infection
KD30	*Ocimum urticifolium* Roth	Lamiaceae	Hancabbi i	Wd/ Cl	S H	L	Hu	Boiled leaves of *Ocimum urticifolium, Clematis simensis, Justicia schimperiana* and *Nicotiana tobacum* and steam smoked	Na	Skin rash
								Fresh leave of *Ocimum urticifolium* are massaged and inhaled	Na	Head ache
								Massage leaves of *Ocimum urticifolium* then drop its filtrate in to eye	Op t	Eye pain
								Massage leaves of *Ocimum urticifolium* and painted	Dr	Allergy

Appendix 1 contiued ……..

KD06	*Olea europaea.* (Wall, ex DC.).	Oleaceae	Noolee	Wd	T	L	Hu	Leave from shoot tip of *Olea europaea* is massaged and inserted in to digested (pores)tooth	T	Tooth ache
KD63	*Osyris quadripartita* Decne.	Santalaceae	Waatoo	Wd	SH	Se	Hu	Seeds of *Osyris quadripartite* are decocted and painted over infected skin	Dr	Anche (farnculosis)
						L	Hu	Powder fresh leave and roots of *Osyris quadripartite,* leave of *Clematis simensis and Olea europaea* and paint on to infected body part.	Dr	Leshimaniasis
KD40	*Peucedanum abyssinica* Vatke	Apiaceae	Qorich Simbiraa	Wd	H	L	Hu	Leaves of *Peucedanum abyssinica* are well pounded, rolled by wave cloth and inserted in to nose for an hour.	N	Leshimaniasis
KD29	*Phoenix reclinata* Jacq.	Arecaceae	Meexxii	Wd	SH	St	Hu	Picke out fresh meristematic region part of shoot of *Phoenix reclinata* then eat as food.	Or	Appetite loss Abdominal cramp Abdominal distention, Frath

Appedix 1 continued ……..

KD11	*Phytolacca dodecandra* L. Herit	Phytolaccaceae	Handoodee	Wd	S H	R	Hu	Pound roots of *Phytolaca dodecandra, Cyathula cylinderica, Mikaniopsis clematoides, Cucumis ficifolius* and *Justicia schimperiana* with water, offer its filtrete for livestocks to drink (eat with ijera). Used as vaccine and for the treatment.	Or	Rabies
KD02	*Plantago lanceolata* L.	Plantaginaceae	Qorxobbii	Cl	H	L	Hu	Massage leaves of *Plantago lanceolata* and drop its exudates over wound	Dr	Blood Clotting
KD74	*Plumbango zeylanica* L.	Plumbaginaceae	Ameeraa	Wd	V	St	Hu	Stem of *Plumbango zeylanica* rolled by cloth and rolled to ached body part	Dr	Rheumatits
KD09	*Podocarpus falcatus* R.Br. Ex Mrirb. Georgr	Podocarpaceae	Birbirsa	Wd	T	B	Hu	Pick inside part of bark of *Podocarpus falcatus* and bit over ached tooth	Ts	Tooth ache
						La	Hu	Latex of *Podocarpus falcatus* is mixed with coffee and drinks one coffee cup.	Or	Diarrhea
KD25	*Premna schimperi* Engl.	Lamiaceae	Urgeessaa	Wd	S H	Ba	Hu	Barks of *Premna schimperi* is chewed and allow its solution to concentrate on infected teeth.	Or	Tooth ache
KD51	*Rhamnus prinoides* L. Herit	Rhamnaceae	Geeshoo	Cl	S H	L	Hu	Massage leaves from shoot tip of *Rhamnus prinoides* and drop its exudates in to mouth of child	Or	Third stage syphylis (Urdeef)

Appendix 1 contiued ……..

KD46	*Ricinus communis* L.	Euphorbiaceae	Qobboo	Wd/ Cl	SH	R	Hu	Pound fresh root of *Ricinus communis, Justicia schimperiana, Phytolaca dodecandra, Cucumis ficifolius, Solanum incanum, Cucumis ficifolius and* bark of *Cyathula cylinderica* together, and then drink one coffee cup of its filtered.	Or	Rabis
KD32	*Rubus steudneri* Schweif	Rosaceae	Goraa Arbaa	Wd	V	B	Hu	Mash bark from root of *Rubus steudneri* and root of *Thalictrum rhynchorpum* together, and then drink one tea cup of its filter.	Or	Swelling
KD60	*Rumex nepalensis* Spreng.	Polygonaceae	Simijjii (Reencii)	Wd	H	R	Hu	Chew root of *Rumex nepalensis* with salt and then swallow its exudates	Or	Abdominal clrump
						R	Hu	Pound root of *Rumex nepalensis* and swallow its exudates once (about $1/8^{th}$ of coffee cup).	Or	Diarrhea
						R	Hu	Tie cleane root of *Rumex nepalensis* to fibers and inserted in to vagina.	V	Abortion
KD84	*Rumex nervosus* Vahl	Polygonaceae	Dhangaggoo	Wd	V	L	Hu	Decocte leaves of *Rumex nervosus* and then drink its filtrate.	Or	Ascaris
								Massage leaves of *Rumex nervosus* and then drop its filtrate over infected body part	Dr	Hemoridis (Kintaarotii)

Appendix 1 continoued ……..

KD55	*Schimus molle* L.	Anacardiaceae	Qundabarbaree	Cl	T	Se	Hu	Powder half seed of *Schimus molle* dissolved in to water and drink the child with water.	Or	3rd stage sphylis
KD61	*Solanum incanum* L.	Solonaceae	Hiddii Saree	Wd	SH	R	Hu	Pound fresh root of *Cucumis ficifolius, Ricinus communis, Justicia schimperiana, Phytolaca dodecandra, Cucumis ficifolius, Solanum incanum, and* bark of *Cyathula cylinderica* together and then drink one coffee cup of its filtrate.	Or	Rabies
KD49	*Solanum marginatum* L. F.	Solonaceae	Hiddii Hongorcaa	Wd	SH	Fr	Hu	Fruit juice of *Solanum marginatum* is moisted with cotton and painted to infected tonsile.	Or	Tonsile infection
KD15	*Solanum tarderemotum* L.	Solonaceae	Cuucii	Wd	H	L	Hu	Massage leaves of *Solanum tarderemotum* and then drop its exudates over infected skin	Dr	Tineaca pitis
KD56	*Thalictrum rhynchocarpum* Dill. & *A.Rich.*	Ranunculaceae	Shaashara	Wd	H	R	Hu	Pound roots of *Thalictrum rhynchorpum* then drink one tea cup of its filtrate.	Or	Swelling
KD96	*Trigonella foenum graecum* L.	Fabaceae	Sunqoo	V	H	Se	Hu	Boil seed of *Trigonella foenum*, rhizome of *Zinger officinale* and clove of *Allium sativum* together and then drink its water with tea.	Or	Cough

Appendix I continued ……..

								Seeds of *Trigonella foenum* are powdered and soaked in to water over night, early in the morning dicard its water, using fresh water dissolve the residues with sugar and drink as one can.	Or	Gastroenteritis
KD54	*Urera hypselodendron* (A.Rich.) Wedd	*Urticaceae*	Laanqisaa	Wd	V	B	Hu	Pound internal part of the bark of *Urera hypselodendron* and troot of *Thalictrum rhynchorpum* together and then drink one tea cup of its filtrate with milk (honey).	Or	Placenta case
KD85	*Verbascum sinaiticum* Benth	*Scrophulariaceae*	Gurra Harree	Wd	H	L	Hu	Massaged leaves of *Verbascum sinaticum* then drop its exudates in to nose.	N	Epitaxis (Funuuna)
						R	Hu	Pound roots of *Verbascum sinaticum* then drink one tea cup of its filtere.	Or	Placenta case
KD91	*Coccinla abyssinica* (Lam.) Coyn.	*Cuccurbitaceae*	Hancootee	Wd/ Cl	V	R	Hu	Tubers of *Coccinla abyssinica* are cocked with wet (ittoo) and eat with injera (is dried and powdered with several cereal crops and then boiled with butter and sugar then drink). All are as food.	Or	Back pain
KD22	*Zehneria scara* (L. F.)	*Curcurbitaceae*	Hidda Reeffaa	Wd	V	L	Hu	Boile leave of *Zehneria scara* and steam smoke at night.	N	Head ache

Appendix 1 continued ……..

KD42			Ajaayee	Wd	Sh	L	Hu	Leaves of “ajaaye” and *Zehneria scara* are boiled together and steam smoked at night	N	Skin rush
KD87			Cingiitii	Cl/ Wd	Sh	L	Hu	Leaves of “ cingiiti” are burned and smoked in the home, it eradicate these diseases and insects	N	Typhoid Skin rush Insects
KD76			Gaanii	Wd	Sh	R	Hu	Roots of “gaanii” and *Carissa spinarum* are dried and smoked after fire.	N	Evil sprit
KD14			Jimaa	Wd	T	B	Hu	Powdere dried internal side of barks of “Jimaa” and inhale its powder.	N	Leshimaniasis
KD07			Qoricha ilkaanii	Wd	SH	L	Hu	Massaged leaves of “*Qoricha ilkaanii***”** are bit over ached teeth.	Ts	Toth ache

Appendix II: List of medicinal plants used for the treatment of livestock ailments

Scientific name; family ; vernacular name; Ha = habit(H = Herb; Sh = Shrub; T = Tree; CL = Climber; Ep = epiphyte and V= vine Li = liana); Ct = cultivated; Wd = wild ; Pu = parts used (B= Bark; La= Latex; R= Root; L= Leaf; Fr= Fruit; F= Flower; Se= Seed; St= Stem; Bu= Bulb; Ag= Above ground, Wh= Whole plant); Disease treated; RA= Rout of application (O= Oral, N= Nasal, Opt= Optical; Au=Auditory; AN= Anal; Dr= dermal; Ts= teeth surface); Mode of preparation); Used for (Ls-Livestock)

Collection number	Scientific name	Family	Vernacular name	Wd/ Cl	Habit	Part used	Used for	Mode of preparation	Rout of A	Disease treated
KD16	*Acmella caulirhiza* Del.	Asteraceae	Siimboo (Gutichee)	Wd	H	L	Ls	Massage leaves of *Acmella caulirhiza* and drop its exudates over wound.	Dr	Infected wound
KD67	*Adiatum capillus* veneris L.	Adiantaceae	Kaarrolee	Wd	Ep	St	Ls	Pound stem of *Addiatum capillus* and leaves of *Croton macrostachyus* and then allow to drink one cup of its filtere for livestock	Or	Black leg (Shafshaaffee)
KD20	*Alternanthera pungens* Kunth	Amaranthacea e	Niggirtii	Wd	H	Se	Ls	Pound dried seed of *Alternanthera pungens* and seed of *Guizotia abyssinica* and allow to eaten.	Or	Tape warm

Appendix II continued ……..

KD78	Amorphophallus gallaensis (Engl.) N.E.Br.	Araceae	Niitii Bofaa	Wd	H	R	Ls	Decocte leaves of *Amorphophallus gallaensis* and the drop its exudates over wound. Care for your eye during preparation and administration can cause blindness.	Dr	Infected wound
KD12	Brucea antidysentrica J.F Mill	Simaroubaceae	Qomonyoo	Wd	SH	R	Ls	Pound root of *Brucea antidysentrica* and *Thalictrum rhynchorpum* with water and drink one coffee cup of its exudates	Or	Black leg
KD86	Calpurnia aurea (Ait.) Benth.	Fabaceae	Ceekaa	Wd	Sh	L	Ls	By using pounded leaves of *Calpurnia aurea* wash all body of the infected livestock	Dr	Skin diseases
KD50	Clausena anisata (willd.) Benth.	Rutaceae	Ulumaayii	Wd	SH	L/ Se	Ls	Cleaning the invaded area by using leaves of *Clausena anisata*	Ot	Suusii handaaqqoo
KD26	Clematis simensis Fresen.	Ranunculaceae	Hidda Feetii	Wd	V	L	Ls	Pound leave of *Clematis simensis* are then exudates over wound or inserted the residue if it is pores	Dr	Infected wound
KD04	Commelina folicea Chiov.	Commeliaceae	Gorora Fardaa	Wd	V	R	Ls	Exudates the solution of root of *Commelina folicea* over wounded body part	Dr	Wound
							Ls	Decocte the roots of *Commelina folicea* and offer one tea cup of its filtirate to drink	Or	Snake poisonous

Appendix II continued ……..

KD58	Cyathula cylinderica Moq.	Amaranthaceae	Kobboo	Wd	Li	R	Ls	Pounde roots of *Cyathula cylinderica, Mikaniopsis clematoides, Cucumis ficifolius* and *Justicia schimperiana* with water, then filter its exudates mixe with "injera" and allow eating. Used as vaccine and for the treatment	Or	Rabies	
KD36	Dalbergia raclea Vatke	Fabaceae	Horabillee	Wd	SH	L	Ls	Decocte the leaves of *Dalbergia raclea* and filtere its filrate then piant to the skin by using soaked wave clothe.	Dr	Cinii jabbii	
KD59	Erythrina brucei Schweinf.	Fabaceae	Waleensuu	Wd/ Cl	T	L	Ls	Crushe dried leaves of *Erythrina brucei* and tie to the wound	Dr	Infected wound	
								Decocte leaves of *Phoenix reclinata* and *Erythrina brucei* and then drop its exudates in to eye for 2 – 3 days	Opt	Tracho ma	
KD65	Foeniculum vulgare Miller	Apiaceae	Insilaala	Wd /Cl	H	L	Ls	Pounde leaves of *Foeniculum uvigare, Ruta chalepsis* clove of *Allium sativum,* roots of *Canarina eminii, Thalictrum rhynchorpum, Lotus comiculatus* and *Commelina folicea* with water and drink 1-2 cup of its filtate.	Or	Black leg	

Appendix II continued ……..

KD77	Gardenia ternifolia Schumach. and Thonn.	Rubiaceae	Gambeelloo	Wd	SH	L	Ls	Pounde leave of *Gardenia ternifolia* is finely and painted to cleaned body of calf	Dr	External parasite of calf
KD43	Girardinia bullosa (Sleud.) Wedd.	Urticaceae	Doobbii	Wd	H	R	Ls	Decocte root of *Girardinia bullosa* with water and drink its exudates	Or	Placental case
KD73	Grewia ferruginea Hochst.ex A. Rich.	Tiliaceae	Oqonuu	Wd	Li	B	Ls	Soak internal part of the bark of *Grewia ferruginea* and seed of *Limum usitatissimum* over night and then drink its liquid	Or	Placental case
KD93	Guizotia abyssinica (Lf.) Cass.	Asteraceae	Nuugii	Cl	H	Se	Ls	Pound seed of *Guizotia abyssinica,* root of *Brucea antidysentrica* and whole part of *Maerua angolensis* together with salt and butter then allow the victim to eat or drink	Or	Linfageyet
KD72	Guizotia scabra (Vios.) Chiov.	Asteraceae	Turfoo	Wd	H	L	Ls	Chewe leave of *Guizotia scabra* mixed with salt and then provide for livestock	Or	Fattening ,Milk production
						L	Ls	Pound leaves of *Guizotia scabra* with salt and offer to eat	Or	Trps (Gandiif)

Appendix II continued ……

KD08	Hypoestes forskaolii (Vahl) R. Schult	Acanthaceae	Darguu	Wd	H	L	Ls	Powder leaves of *Hypoestes forskaolii* and painte over wound or decocte fresh leaves and painte over wound	Dr	Wound (Madaa)
KD47	Justicia schimperiana (Hochst.ex Nees) T.Anders.	Acanthaceae	Dhummuu gaa	Wd/ Cl	SH	R	Ls	Pounde fresh root of *Justicia schimperiana, Phytolaca dodecandra, Cucumis ficifolius, Solanum incanum, Ricinus communis Cucumis ficifolius and* bark of *Cyathula cylinderica* filtered and drink one coffee cup its filtrate	Or	Rabies
KD62	Kalanchoe densiflora Relfe	Crassulaceae	Busuqqee	Wd	H	St	Ls	Underground stem of *Kalanchoe densiflora* is cut in to piece and inserted in to skin beneath neck	Dr	Hudhaa
KD82	Pycnostachys abyssinica Fresen.	Lamiaceae	Fojogaa	Wd	SH	R	Ls	Pounde fresh/dry root of *Pycnostachy abyssinica* dissolve its powder with milk and allow to drink	Or	Rabies
								Pounde roots of *Pycnostachy abyssinica* is with water and mixe its filtrate with soup of barley and given to cattle / with milk to drink	Or	
KD97	Limum usitatissimum L.	Lineaceae	Talbaa	Cl	H	Se	Ls	Stems of *Limum usitatissimum* , *Guizotia abyssinica,* mixe with ash and add to source of water	Dr	External parsite

Appendix II continued ……

KD28	Lobelia rhynchopetalum Hemsl.	Campanulaceae	Faaggaa Jaldeessaa	Wd	H	L	Ls	Pounde fresh leaf of *Lobelia rhynchopetalum* with water and put its filtrate over wound (paint it).	Dr	Infectd wound
KD19	Lotus comiculatus L.	Fabaceae	Dabbaaqiddii	Wd	H	B	Ls	Pounde leaves of *Foeniculum uvigare, Ruta chalepsis* clove of *Allium sativum* roots of *Lotus comiculatus, Canarina eminii, Thalictrum rhynchorpum* and *Commelina folicea* with water and drink 1-3 cup of its filtrate.	Or	Blackl eg
KD71	Ficus ingens (Miq.) Miq.	Moraceae	Koonnoo	Wd	T	R	Ls	Powder dried barks of *Ficus ingens* mixed with "budena" and milk then given to dog. It is a significant vaccine.	Or	Rabies
KD10	Mikaniopsis clematoides (Sch.Bip. ex A. Rich.) Miln Redh	Asteraceae	Kalaalaa	Wd	V	R	Ls	Pounde roots of *Mikaniopsis clematoides, Phytolaca dodecandra, Cyathula cylinderica, Cucumis ficifolius* and *Justicia schimperiana* with water and allow to drink its filtrate	Or	Rabies
KD03	Millettia ferrugina (Hoschst.) Baker	Fabaceae	Sootalloo	Wd	T	L	Ls	Pounde leave of *Millettia ferruginae* and adde to water source. It is also toxic to fish.		Leech

Table II continued ……..

KD79	Nicotiana tobacum L.	Solanaceae	Tamboo	Cl	H	L	Ls	Leave or loaf of *Nicotiana tobacum* are soaked over night and the drop it in to nose	Na /Or	Leechs
KD06	Olea europaea. (Wall, ex DC.).	Oleaceae	Noolee	Wd	T	B	Ls	Pounde bark of *Olea europaea* and clove of *Allium sativum* with salt and then allow drinking	Or /N	Black leg
KD29	Phoenix reclinata Jacq.	Arecaceae	Meexxii	Wd	SH	L	Ls	Chewe leave of *Phoenix reclinata* and spit its exudates on ached eye	Opt	Eye pain
KD11	Phytolacca dodecandra L. Herit	Phytolaccaceae	Handoodee	Wd	SH	R	Ls	Pounde roots of *Phytolaca dodecandra, Cyathula cylinderica, Mikaniopsis clematoides, Cucumis ficifolius* and *Justicia schimperiana* with water and offer its filtrate to drik.	Or	Rabies
KD37	Protea gaguedi J.F Gmel.	Protaceae	Daansee (Yuubdoo)	Wd	SH	L	Ls	Wash the wound using filtrate of pounde leaves of *Protea gaguedi* and *Olinia rochetina.*	Dr	Wound (Madaa)
KD46	Ricinus communis L.	Euphorbiaceae	Qobboo	Wd/ Cl	SH	R	Ls	Pounded fresh root of *Ricinus communis, Justicia schimperiana, Phytolaca dodecandra, Cucumis ficifolius, Solanum incanum, Cucumis ficifolius and* bark of *Cyathula cylinderica* and allow drinking of one coffee cup of its filtrate	Or	Rabis

Appendix II continued ……

KD38	Ruta chalepansis L.	Rutaceae	Cilaattama	Cl	H	L/Se	Ls	Pounde leaves (seeds) of *Ruta chalepsis,* clove of *Allium satuvum* and seed of *Lipedium sativum* are with water and drink one cup (tea cup) of its exudates	Or	Ascaris of calf
KD61	Solanum incanum L.	Solonaceae	Hiddii Saree	Wd	SH	R	Ls	Pounded fresh root of *Cucumis ficifolius, Ricinus communis, Justicia schimperiana, Phytolaca dodecandra, Cucumis ficifolius, Solanum incanum, and* bark of *Cyathula cylinderica* and allow drinking of one coffee cup of its filtere	Or	Rabies
KD56	Thalictrum rhynchocarpum Dill. & A.Rich.	Ranunculaceae	Shaashara	Wd	H	R	Ls	pounded fresh root of *Thalictrum rhynchorpum,*bulb of *Allium sativum,* stem of ferns from *Podocarpus falcatus and* stem of *Eragrostis tef* then offer its filtrate to drink	Or	Black leg
KD54	Urera hypselodendron (A.Rich.) Wedd	Urticaceae	Laanqisaa	Wd	V	B	Ls	Pounde internal part of the bark of *Urera hypselodendron* and the root of *Thalictrum rhynchorpum* and offer one tea cup of its exudates to drink with milk (honey).	Or	Placenta case
KD23	Vernonia amygdalina Del.	Astraceae	Eebicha	Wd	Sh	L	Ls	Pounde roots of *Vernonia amygdalina, Justicia schimperiana* and *Mikaniopsis clematoides,* mixes its exudates with milk and drink	Or	Rabies

Appendix II continued ……

KD05	Maerua angolensis DC.	Capparidaceae	Sogidda Re'ee	Wd	H	Wh	Ls	Pounde whole part of *Maerua angolensis* seed of *Guizotia abyssinica,* root of *Brucea antidysentrica* salt and butter then paint or drink the victim	Or	Linfageyet

Appendix III: list of human ailments treated by medicinal plants in Horo District

No	Medical name of disease	Local name of diseases	Number of medicinal plants used to treat	% of TMP used to treat
1	Leshimaniasis	Kuyyiisa	14	13.58
2	Skin rush	Dhahicha	5	4.85
3	Rheumatitis	Dhaqna nyaataa	1	0.97
4	Tosile infection	Arsassee	4	3.88
5	Ascarise	Maagaa	3	2.91
6	Head ache	Mata bowoo	4	3.88
7	Gonorrhea	Cobxoo	2	1.94
8	Wound dressing	Madaa golguuf	1	0.97
9	psoriasis	Roobbii	1	0.97
10	Tooth ache	Dhibee ilkaanii	8	7.76
11	Diarrhea	Teessisaa	3	2.91
12	Abortion	Ulfa baasuuf	2	1.94
13	Trachoma	Hibirkuu	2	1.94
14	Typhoid	Golfaa	1	0.97
15	Insects	Ilbiisa	1	0.97
16	Tenea capitis	Qaaqqee	2	1.94
17	Wound	Madaa	4	3.88
18	Gun shoot	Dhahicha Qawweef	1	0.97
19	Hemoridis	Kintaarotii	2	1.94
20	Placental case	Obbaatii deessisuuf	7	6.79
21	Swelling	Dhiitoo	4	3.88
22	Tape warm	Koosoo	5	4.85
23	Evil eye	Budaa	3	2.91
24	Third stage syphilis	Urdee	4	3.88
25	Snake bit	Snake poisonous	3	2.91
26	Epitaxis	Funuuna	1	0.97

Appendix III continued ……

27	Anche (farnculosis)	Kormommuu	2	1.94
28	Lubido	Dhiira saal qunnamtii dadhabeef	1	0.97
29	Eye pain	Dhibee ijaa	3	2.91
30	Allergy	Dhahicha qaamaa	1	0.97
31	Dhibee dugdaa	Back pain	1	0.97
32	Fire burn	Nama abiddi gubeef	1	0.97
33	Syphilis	Fanxoo	1	0.97
34	Otitis media	Gurra waraansa	1	0.97
35	Appetite loss	Fedha nyaataa dhabuu	1	0.97
36	Abdominal crump	Garaa ciniinnaa	2	1.94
37	Abdominal distention	Garaa bokoksaa	1	0.97
38	Faths	Wichiirra'uu	1	0.97
39	Blood clothing	Dhiiga dhaabuuf	1	0.97
40	Cough	Qufaa	2	1.94
41	Invertebrate reproduced in intestine	Nam qoricha nyaachisaniif	1	0.97
42	Intestinal parasite	Maxxantuu mar'immaanii	2	1.94
43	Gastric ulcer	Dhibee garaachaa	1	0.97
44	Heart disease	Dhibee onnee	1	0.97

Appendix IV: List of Livestock ailments treated by ethnoveternary medicinal plants

No	Medical name	Vernacular name	Number of TMPs used to treat	% of TMP used to treat
1	Skin diseases	Dhibee gogaa	1	0.97
2	Ascaris of calf	Maagaa jabbii	1	0.97
3	Wound	Madaa	4	3.88
4	Black leg	Shafshaaffee	7	6.79
5	Rabies	Dhibee saree maraattee	10	9.7
6	Infected wound	Madaa raamma'eef	6	5.82
7	Snake bit	Snake poisonous	3	2.91
8	Linfageyet	Biichee	2	1.94
9	Intestinal parasite	Maxxantuu mar'immaanii	2	1.94
10	Leech	Dhalaandhula	3	2.91
11	Fattening	Beeylada furdisuu	1	0.97
12	To improve milk production	Oomish aannanii giddisuu	1	0.97

Appendix V: List of both human and livestock ailments treated by ethnomedicinal plants

No	Vernacular name of ailments	Medical name	Number of TMPs used to treat	% of TMP used to treat
1	Nama sareen maraattee ciniinteef	Rabies	10	9.7
2	Bofa nama iddeef	Snake bit	3	2.91
3	Maxxantuu mar'immaanii	Intestinal parasite	2	1.94
4	Obbaatii (dil'uu) dahuu (buusuu) dadhabuu	Placental case	3	2.91

Appedix VI: Background of respondents

No	Items	Options	Total number	percentage
1	Residence	A, Rural	63	96.92
		B, Town	2	3.07
2	Age	A, 20 – 30	13	20
		B, 31 – 40	9	13.84
		C, 41 – 60	32	42.23
		D, above 60 years old	11	16.92
3	Sex	A, Male	58	89.23
		B, Female	7	10.76
4	Religious	A, protestant	29	44.61
		B, Orthodox	21	32.30
		C, Waakefata	15	23.07
		D, Muslim	-	
5	Marital status	A, Un married	4	6.15
		B, married	61	93.84
		C, widowed	-	
		D, divorced	-	
6	Educational background	A, Elementary	17	26.15
		B, High school	11	16.92
		C, preparatory	2	3.07
		D, diploma	5	7.69
		E, first degree	2	3.07
		F, Uneducated	28	43.07
7	Occupation	A, government employee	10	15.38
		B, private employee	-	
		C, farmer	52	80
		D, other	3	4.61

Appendix VII: List of key respondents and their occupation

No	Full name	Sex	Age	Local village (Garee)	Kebele (Ganda)	Occupation
1	Abdisa Laban	M	67	Sombo Naga'o	Dabisi	Farmer
2	Fekadu Chernet	M	55	Laga Waloo	Dege koticha	Farmer
3	Alemi Hinsarmu	F	48	Laga walo	Derge koticha	Farmer
4	Neme Dessalegn	M	28	Tulu Korma	Derge koticha	Farmer
5	Latera Tolessa	M	27	Tulu Korma	Derge koticha	Farmer
6	Bekana Ayana	M	47	Gaba hamusi	Dacha Chabir	Farmer
7	Hinnew Dewu	M	62	Gaara Godee	Haroo Agaa	Farmer
8	Merga Feyisa	M	62	Dire Farda	Bone Abuna	Farmer
9	Guta Gobena	M	25	Ejersa gote	Bone Abuna	Farmer
10	Hundera Geleta	M	61	Walda	Bone Abuna	Farmer
11	Phawulos Beyene	M	55	Laga Walo	Darge Koticha	Farmer
12	Tulke Ayana	F	60	Chato	Darge Koticha	Farmer
13	Geremu Hedata	M	60	Tulu korma	Darge Koticha	Farmer
14	Adugna Shekata	M	45	Laga waloo	Darge Koticha	Farmer
15	Kefale Duri	M	40	Walda	Bone Abuna	Farmer
16	Melkamu Wakoya	M	45	Waldaa	Bone Abuna	Farmer
17	Bekana Hundera	M	30	Walda	Bone Abuna	Farmer
18	Abeya Yadeta	M	36	Gaba Hamusii	Dacha Chabir	Farmer
19	Benti Feyissa	M	32	Dire Farda	Bone Abuna	Farmer
20	Chaltu Woyessa	F	40	Laga walo	Darge Koticha	Farmer
21	Dese Duguma	F	50	Laga walo	Darge Koticha	Farmer
22	Temesgen H/meskel	M	58	Shaambuu	Shaambuu	Record officer
23	Ayana Gari	M	65	Tulluu Simbirroo	Rifenti Gabar	Farmer
24	Begna Abdena	M	45	Harbuu Bosoqqoo	Abille Iggu	Farmer

Appendix VIII: List of non key (randomly selected) respondents and their occupation

No	Full name	Sex	Age	Local village (Garee)	Kebele (Ganda)	Occupation
1	Gete Feyissa	F	35	Chato	Darge Koticha	Farmer
2	Abdisa Chibsa	M	53	Caatoo	Darge kotichaa	Farmer
3	Jabessa Phawulos	M	20	Laga waloo	Dargee Kotichaa	Student
4	Birhanu Tilahun	M	45	Ulaa Culuu	Bone Abuna	Farmer
5	Takele Guyasa	M	43	Ulaa Culuu	Bone Abuna	Farmer
6	Takele Ayana	M	48	Wabo Garado	Dacha Chabir	Farmer
7	Itiyophia Oljira	M	30	Dire Farda	Bone Abuna	Kebele manager
8	Dessalegn Belisa	M	37	Gaba Hamusii	Dacha Chabir	Farmer
9	Melkamu Woyessa	M	45	Laga waloo	Darge kotichaa	Farmer
10	Gutu Regassa	M	28	Siqilaa	Bone Abuna	Farmer
11	Lulu Wogderessegn	M	63	Tulu Korma	Darge koticha	Farmer
12	Dugassa Bogale	M	67	Chato	Darge Koticha	Farmer
13	Wolde Beyene	M	25	Tulu Korma	Darge Koticha	Teacher
14	Tsegaye Wolde	M	45	Wahbo Garaadoo	Dacha Chabir	Farmer
15	Hailu Beyene	M	30	Laga waloo	Darge koticha	Teacher
16	Derese Beyene	M	55	Walda	Bone Abuna	Teacher
17	Abebe Yadeta	M	31	Caatoo	Rifentii Gabar	Farmer
18	Dessalegn Belisa	M	37	Caatoo	Rifentii Gabar	Farmer
19	Fekadu Kenea	M	40	Dugda fardaa	Bone Abuna	Farmer
20	Jebane Abdena	F	25	Shaambuu	Shaambuu	Teacher
21	Dima Bayissa	M	62	Harbu bosokkoo	Abbillee Igguu	Farmer
22	Gerba Bayissa	M	56	Harbu bosokkoo	Abbillee Igguu	Farmer
23	Tola Wamile	M	45	Bonee	Ashaya Dado	Farmer
24	Jitu Terefe	F	56	Harbu bosokkoo	Abbillee Igguu	farmer
25	Marga Chali	M	48	Shaambuu	Shaambuu	Lawer
26	Zewude Hinawu	M	45	Gaara Godee	Haroo Agaa	Farmer
27	Dungula Asefa	M	45	Tulluu simbirroo	Rifenti Gabar	Farmer

Appendix VIII: continued ……

28	Tolasa Gonfa	M	67	Tulluu simbirroo	Rifenti Gabar	Farmer
29	Amara Doshu	M	50	Gaba Sanbataa	Rifenti Gabar	Farmer
30	Mitike Meta	F	49	Gaba sanbataa	Rifenti Gabar	Farmer
31	Daba Hosana	M	47	Tulluu Diimaa	Rifenti Gabar	Farmer
32	Daba Duguma	M	48	Chato	Darge Koticha	Farmer
33	Fayaera Phawulos	M	21	Laga waloo	Dargee kotichaa	Student
34	Turu Debelo	F	62	Dasoo	Akkajjii Sabbat	Farmer
35	Cibsa Hinawu	M	38	Gaara Godee	Haroo Agaa	Farmer
36	Rabira Tadesse	M	37	Dirree fardaa	Bonee Abuna	Farmer
37	Mengesha Beyene	M	25	Laga walo	Darge koticha	Farmer
38	Bakana Ayana	M	55	Gaba hamusii	Dacha Chabir	Farmer
39	Latu Tadesse	F	25	Gaba snbataa	Rifenti Gabar	Nurse
40	Tekalign Idosa	M	27	Gabaa sanbataa	Rifent Gabar	Nurse
41	Dessalegn Dugasa	M	35	Dirree fardaa	Bonee Abuna	Farmer

Appendix IX: Questionieries used to collect data on background of respondents

Direction – please would you give your answer by writing/encircling to the appropriate letter of the given alternatives.

1. Date _____
2. Name of the cultural medicinal practitioner _____
3. Your kebele (Gandaa) _____
4. Residence A. Rural B. Town
5. Age A. 20 – 30 B. 31 – 40 C. 41 – 60 D. above 60 years old.
6. Sex A. Male B. Female
7. Religious A. protestant B. Orthodox C. Waakefata D. Muslim
8. Marital status A. Un married B. married C. widowed D. divorced
9. Educational background A. Elementary B. High school C. preparatory D. diploma E. first degree F. Uneducated
10. Occupation A. government employee B. private employee C. farmer D. other

Appendix X: Questioniaries used to collect ethnobotanical data

1. Is there plant species which you use to treat human, livestock or both when they have health problem? A. Yes B. No
2. The local (English) name of Livestock/human disease/s treated by this cultural medicinal plant _____
3. What is/are the local name of the plant used _____?
4. From where the plant is harvested (collected)? A. Wild B. cultivated
5. In which season the medicinal plants can be harvested easily (access)? A. winter B. Summer C. Autumn D. Spring
6. What is the habit of the plant used? A. Tree B. shrub C. herbaceous D. epiphyte F. parasite G. liana
7. Part (structure) of the plant harvested for preparation of the medicine (for remedy) in the study area? A. Leave B. root C. Stem D. fruit E. flower F. sap G. latex H. whole plant
8. If the cultural medicine is prepared from two and above plants list their local/vernacular name of the plan and the structure of the plant used for medicinal value:

Local/vernacular name **structure (part) used**

i. _____ _____

ii. _____ _____

iii. _____ _____

iv. _____ _____

9. Method of preparation
    a. Preparation form? A. crushed B. pounded C. powder D. exudation E. concoction F, milk latex G. if any other mention _____.
    b. The cultural medicine is used A. alone B. mixed with water C. mixed with milk D. if any other mention _____
    c. The state of preparation is? A. liquid B. solid C. semi solid D. dry powder E. gaseous
    d. Condition A. dried B. fresh C. both
10. Rout of administration: A. Oral B. Nasal C. Dermal D. auditory E. Optical F. Anal G. teeth surface
11. Dosage: in local (exact) measurement _____ (if any, mention the unit of measurement)
    a. Does it differ among sex and age groups? If yes mention for each _____?
12. Which age groups of the local people use the medicinal plant frequently _____?
13. Is there any side effect of the medicine/medicinal reaction? Mention _____
14. If yes how can you solve the side effect (the problem) explain _____
15. Are there conditions which restrict taking of the medicine _____?
16. Are there medicinal plants easily accessible _____?
17. How do you explain(see) accessibility of medicinal plants when compared with the past decade _____

18. Is there any belief or taboos associated with medicinal plants use and utilization? (Date of collection, time of collection, method of collection, time of administration, health status, sex, age storage etc) _____
19. Either any marketable traditional medicine A. yes B. No

    If there are marketable cultural medicinal plants list them

    a. _____
    b. _____
    c. _____
20. Is there any relationship between cultural medicine and modern medicine in the study area _____?
21. Do the local people prefer the traditional medicine to modernization medicine? If yes what are/is the reason _____
22. How is the effectiveness of the medicinal pants? A. excellent B. very good C. good D. unsatisfactory
23. Are there any economic groups who frequently use the medicinal plants?

    _____

24. How is the knowledge of traditional medicine passed to a family member/younger generation? _____
25. Are there existing problems on traditional knowledge transfer? list them

    _____

26. What are the major treats to medicinal plants in the study area?

    _____

27. Is there any effort made to conserve medicinal plants in the area

    _____

28. What are the traditional practices used by the local people to conserve and manage the medicinal plant specifies? _____

Appendix XI: Semi structured interviews for collecting ethnomedicinal data

I. General information

1. Date _____ Residence Kebele (Gandaa) _____
2. Name of respondent _____ sex _____ Age _____
   2.1.Occupation _____
   2.2.Marital status _____
   2.3.Religion _____
   2.4.Educational background _____
3. How do you classify vegetation traditionally _____
4. How do you classify landscapes traditionally _____
5. What are the most common human health problems in your kebele(Gandaa) _____
6. What are the most common livestock health problems in your kebele(Gandaa) _____

I. Ethnobotanical data

7. Is there plant species which you use to treat human, livestock /both when they have health problem

   _____

8. What is the local name of the plant you use _____
9. What is the human/livestock ailments treated by species mention _____

   _____

10. Maqaan dhukkuba namaa/beeyladaa qoricha aadaa kanan yaalamuu maal jedhama _____?
11. From where are the plants harvested (Ct/Wd)

    _____

12. Part of the plant harvested for remedy in the study area (leaves, root, stem, fruit, flower, sap, latex, whole plants)

    _____

13. Habit of the plants (tree, shrub, herb, liana, epiphyte, parasite and other categories)

    _____

14. Method of preparation
    14.1. Preparation forms: crushed, pounded, powder, exudation, concoction, milk latex if any other

14.2. Used alone mixed with other _____

14.3. If mixed with other mention the specific mixture _____

14.4. Condition: fresh, dried/ both

15. Route of administration (oral, auditory, nasal, anal, optical, dermal, tooth surface, other specify)
16. Dosage: _____, does it differ among sex and age group? If yes mention for each _____
17. Which age groups of the local people use the medicinal plants frequently? _____ _____ mention if they do have any reasons _____ _____
18. Is there any antidotes used to reduce/avoid medicinal reaction _____ _____

Appendix XII: Tables used for final report of ethnomedicinal plants

A. Plants used as a source of human medicine (filled by cultural medicinal practitioner)

Cultural medicine for _____ disease

Collection number	Scientific name	Family	Vernacular name	From Wd/Cl	Growth Habit	Used to treat	part plant used	Mode of preparation	Route of Administration	Disease treated

B. Plants used as a source of livestock medicine (filled by cultural medicinal practitioner)

Cultural medicine for _____ disease

Collection number	Scientific name	Family	Vernacular name	From Wd/Cl	Growth Habit	Used to treat	part plant used	Mode of preparation	Route of Administration	Disease treated

Appendix XIII: Questionaries translated in Afan Oromo

This is translated questioner in to Afaan Oromoo to have smooth communication with cultural medicinal practitioners.

Bargaaffiin kun kan qophaa'e qorannoo barumsa digirii lammaffaa Jimmaa Yuuniversiitiitti xuumuruudhaaf odeeffannoo qoricha aadaa bosona Caatoo keessaa hawwaasni aanaa Horoo dhukkuba namaa fi beelladaa wal'aanuuf fayyadamu irratti walitti qabachuuf qofa kan oolu malee daldalaaf miti. Bargaaffiin kun Ogeessosa (Beektota) qoricha aadaa fi hawwaasa keessa namoota muraasaan qofa kan guutamudha.

I. Odeeffannoo deebbii kennaa (gaafatamaa)

Kallattii deebbii – bar gaaffii armaan gadiif barreessudhaa ykn filanootti maruudhaan debbii sirrii ta'e deebisaa.

1. Guyyaa _____
2. Maqaa ogeessa qoricha aadaa _____
3. Gandi keessan _____
4. Bakki jireenya keessanii A. baadiyaa B. magaala
5. Umuriin keessan A. 20 – 30 B. 31 – 40 C. 41 – 60 D. 60 - ol
6. Saala A. dhiira B. dhalaa
7. Amantaan keessa A. protestaantii B. Oortodoksii C. Waaqeffataa D. Musliima
8. Sadarkaa barnootaa A. Sadakaa 1^{ffaa} B. sadarkaa 2^{ffaa} C. Qophaa'ina
   D. dipiloomaa E. digirii jalqabaa F. hinbaranne
9. Haala gaa'elaa A. hin kaadhimmanne B. kaadhimmadheera C. gaa'elattin jira D. hiikeera
10. Hojiin keessan A. hojjetaa mootummaa B. dhuunfaaf qacarameen hojjedha C. qonnaan bulaadhar D. kanbirooti

II. Odeeffannoo haala qorichummaa biqiltuu

11. Sanyiin biqilootaa dhukkuba namaa/belladaa ittiin wal'aanuuf gargaaramtan akka aadaatti jiruu? A. eeyyee B. lakki
12. Maqaan dhukkuba namaa/beeyladdaa qoricha aadaa kanaan yaalamuu maal jedhama _____?

13. Maqaan biqiltichaa/tootaa qorichummaaf ooluu akka naannootti maal jedhama/mu _____?
14. Biqiltuu/toota kana eessaa funaannattu/argattu? A, bosonaa B, oomishinee (biqilchinee)
15. Waqtiilee isa kam keessa biqiltootni qoricha aadaaf gargaaran salphaatti argamuu (funaanamuu)? A. Bona B. Ganna C. Birraa D. arfaasa
16. Amalli guddina biqiltuu kanaa maali? A. muka dheeraa B. shiraabissi C. Hebaashiyeesii D. epiifayitii E. maxxantuu F. liilaanaa (hidda)
17. Caasaa biqiltuu isa kamtu qorichaa aadaa qopheessuuf funaanama? A. baala B. hidda C. Jirma D. fruit E. daraaraa F. dhangaloo isaa (aannan isaa) G. haphee H. guutummaa biqiltichaa
18. Qorichi aadaa kun biqiloota hedduu irraa qophaa'a yoo ta'e maqaa isaanii fi caasaa isaanii qorichummaaf oolu tarreessi

    Maqaa biqiltichaa akka naannootti caasaa isaa qorichummaaf oolu

    i. _____ _____
    ii. _____ _____
    iii. _____ _____
    iv. _____ _____
19. Haala qophii qorica aada

19.1. Bifti ittiin qophaa'u? A. ni caccabsama B. ni tumama C. ni daakama D. in cuunfaama E. walmakaa isaatti fayyadamama F. aannan isaatu qeensama G. kan biraa yoo jiraateef ibsaa _____ _____.

19.2. Kan fayyadamamu A. qofaa isaa B. bishaaniin makamee C. aannaniin makamee D. kan biraa yoo jiraate ibsaa _____

19.3. Falkaaleen ittiin qopha'u? A. dhangala'aa B. jajjaboo C. walakkeessaan jajjaboo D. daakuu gogaa E. Ulachuun (aara isaa)

19.4. Haalli isaa A. goggokfamee B. ho'aa akka citetti C. lamaaniinuu

20. Karaan itti fayyadaman: A. afaaniin B. funyaaniin C. gogaa irratti D. gurratti E. ijatti F. ilkaanitti dibuu
21. Hangi fayyadamnu safartuu aadaatiin _____

21.1.Hangi isaa garaagarummaa saalaa/gare umuri gidduutti addummaa yoo qabaatef ibsaa?

_____

22. Qoricha aadaa kan garee umurii isaan kamtu irra deddeebi'uudhaan fayyadama _____?

23. Miidhaa geessisa yoo ta'e miidhaa isaa kana akkamiin salphiftu? ibsaa

_____

24. Qoricha kana fudhachuu haalli daangessu ni jiraa? ibsaa _____

_____

25. Qorichoonni aadaa salphaatti argaman jiruu? _____

_____

26. Waggoota kurnnan darban duukaa yeroo wal madaalchiftan argamsa (fayyadama) qoricha aadaa akkamiin ibsitu? _____

_____

27. Haalli amantaa ykn aadaa (safuu) fayyadama qoricha aadaa waliin wal qabatu ni jiraa? (guyyaa funaanamuu qabu, yeroo funaanamuu qabu, tooftaa ittiin funaanamuu qabu, yeroo fudhatamuu qabu , haala fayyaa fayyadaamaa waliin , saala, umurii fi kkf).

_____

_____

28. Qorichoonni aadaa gabaa irratti gurguraman ni jiruu A. eeyyee B. lakki

28.1.Qorichoonni aadaa gabaatti gurguraman yoo jiraata tarreessa?

i. _____

ii. _____

iii. _____

29. Qorichoota aadaa fi ammayyaa gidduu hariiroon ni jiraa _____

_____?

30. Uummaani fayyadama qoricha aadaa isa kan ammayyaa caalaa fedha yoo ta'e sababni isaa maali _____

_____

31. Haalli fayyisuu qoricha aadaa hangam amansiisaadha? A. baay'ee baay'ee gaariidha B. baay'ee gaariidha C. gaariidha D. quubsaa miti

32. Gareen itti fufinsaan qoricha aadaa fayyadaman jiruu? Tarreessaa _____
_____
33. Beekumsi qoricha aadaa haala kamiin dhaloota irraa dhalootatti/dargaggootatti daddarbaa jira? _____
_____
34. Haala daddarbinsa beekumsa qoricha aadaa irratti rakkoon jiraa? Tarreessaa _____
_____
35. Haala qoricha aadaa irratti akka naannoo kanaatti sodaa maaltu jira? Ibsaa
_____
36. Biqiloota qoricha aadaaf oolan kunuunsuuf yaaliin taasifamu akka naannootti jiraa? Tarreessa _____
37. Haala aadaatiin immoo shaakalli (barsiifanni) ittiin qorichi aadaa hawwaasni kunuunsu jiraa? Tarreessaa _____
_____
38. Uummaani naannoo biqiloota qoricha aadaaf gargaaraan faayidaa biroofis itti gargaaramuu? Tarreessaa _____
_____

Appendice XIIII: Questioneries translated in to Afan Oromo for semi structured interview data collection

Gaaffilee afaaniffaa (aaf-gaaffii) armaan gadiif afaaniin deebisaa.

1. Guyyaa _____ Ganda _____
2. Maqaa ogeessa qoricha aadaa _____ saala ____ Umurii _____

2.1. Amantaan keessa _____

2.2. Haala barnootaa _____

2.3. Haala gaa'elaa _____

2.4. Hojiin keessan _____

3. Akka naannootti biqilootaa haala kamiin qoqqoddu _____
4. Haala teessuma lafaa akkkamiin adda baaftu _____
5. Akka ganda keessaniitti dhukkubni namaa deddee bi'ee mul'atu maali _____
   _____
6. Akka ganda keessaniitti dhukkubni beelladaa deddee bi'ee mul'atu maali
   _____

II. Odeeffannoon Qoricha aadaa

7. Sanyiin biqilootaa dhukkuba namaas/belladaa ittiin wal'aanuuf gargaaramtan jiruu?
   _____
8. Maqaan dhukkuba namaa/beeyladdaa qoricha aadaa kanaan yaalamuu maal jedhama
   _____?
9. Maqaan biqiltichaa/tootaa akka naannootti maal jedhama/mu _____
   _____?
10. Maqaan dhukkuba namaa ykn beeyladaa qoricha aadaa kanan yaalamuu maal jedhama
    _____?
11. Biqiltuu/toota kana eessaa funaannattu/argattu (bosona, oomishinee) _____
    _____
12. Amalli guddina biqiltuu kanaa maali? (muka dheeraa, shiraabissi, Herbaashiyeesii, epiifayitii, maxxantuu, hidda) _____
13. Caasaa biqiltuu isa kamtu qorichaa aadaa qopheessuuf funaanama? (baala, hidda, Jirma, fruuttii, daraaraa, dhangaloo isaa (aannan isaa), haphee, guutummaa biqiltichaa)
    _____

14. Qorichi aadaa kun biqiloota hedduu irraa qophaa'a yoota'e maqaa isaanii fi caasaa isaanii qorichummaaf oolu tarreessaa**?** _____

_____

15. Haala qophii qoricha aadaa

15.1. Bifti ittiin qophaa'u? (ni caccabsama, ni tumama, ni daakama, in cuunfaama, walmakaa isaatti fayyadamama, aannan isaatu qeensama, haphee isaa fi kan biraa yoo jiraateef ibsaa) _____.

15.2. Qofaa moo biqilituu biroo waliin qophaa'a _____

15.3. Yoo makamee ta'e makaa isaa adda baasuun ibsaa _____

15.4. Haalli isaa: (jiidhaatti ykn ho'aatti, gogsamee, lamaanuu) _____

16. Karaan itti fayyadaman: (afaaniin, funyaaniin, gogaa irratti, gurratti, ijatti, ilkaanitti dibuu, kan biroo) _____

17. Hangam fayyadamnu safartuu aadaatiin _____

18. Hangi isaa garaagarummaa saalaa fi garee umurii gidduutti addummaa yoo qabaate ibsaa?

_____

19. Qoricha aadaa kana garee/umurii isaan kamtu irra deddeebi'uudhaan fayyadama _____?

20. Miidhaa geessisa yoo ta'e miidhaa isaa kana akkamiin salphiftu? ibsaa _____

_____

Figure 17 Diagram of Chato Forest