

**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
BIOLOGY DEPARTMENT
Dryland Biodiversity Stream**



**Ethnobotanical Study of Traditional Medicinal Plants of
Goma Wereda, Jima Zone of Oromia Region, Ethiopia**

By Behailu Etana

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Addis Ababa**

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN
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ABSTRACT

*An ethnobotanical study of medicinal plants was conducted to document the indigenous plant-based medical knowledge of the people of Goma Wereda in southwestern Ethiopia from September, 2009 to May, 2010. A total of 100 informants (73 males and 27 females) between the ages of 20 and 80 were selected to collect information on medicinal plant use from ten sampled kebeles. Out of these, 24 key informants (22 males and 2 females) were purposively selected based on recommendation from elders and local authorities. Other informants were selected randomly. Data were collected using semi-structured interviews, field observations and group discussions. Informant consensus, preference ranking, paired comparison, direct matrix ranking, informant consensus factor (ICF) and Jaccard's coefficient of similarity were calculated. A total of 160 plant species: 101 species from wild vegetation and 59 species from home gardens distributed in 124 genera and 58 families were collected and identified. Of these, 121 medicinal plant species were used as cure for 102 ailments. From these, 92 species were recorded for the treatment of human health problems, 12 species for livestock and 17 species for the treatment of both human and livestock. From the total medicinal plants species 54 species of the medicinal plants were herbs, followed by 30 species of shrubs, 26 species of trees and 11 species of climbers. The most frequently used plant parts were leaves (61.66%) followed by roots (13.33%). The most widely used method of preparation was crushing (26.80%) of the different plant parts followed by squeezing (22.68 %) and burning (7.21%). The common route of administration recorded was oral (52.01%) followed by dermal (28.52%) and nasal (8.3 %). The most commonly used application of medicinal plant was drinking (43.37%) followed by painting (10.84%) and put on and washing accounted for 10.84% each. The medicinal plants that are presumed to be effective in treating certain diseases such as *Ocimum lamiifolium* and *Croton macrostachyus* have high informant consensus. The disease categories such as rheumatism and stabbing pain as well as the categories of evil eye and evil spirit have higher ICF value of 0.907. Preference ranking showed that people of the area have preference for *Acmella caulirhiza* for the treatment of tonsillitis. Paired comparison of five species of plants that are used for the same disease showed that *Indigofera spicata* is the most preferred species by traditional healers for the treatment of insect allergy ('Hadha'). Direct matrix ranking showed *Cordia africana* as the most utilized species by the community. Agricultural expansion, firewood collection, timber production and construction are major threats to plants in general and medicinal plants in particular in the study area. The participation of the local people, awareness raising through training or education on sustainable utilization and management of plant resources, establishment of forest protected areas should be encouraged.*

Key words: Ethiopia, Ethnobotany, Goma. homegardens, informant consensus factor

1. INTRODUCTION

1.1 Background of the Study

Ethnobotany is defined as the study of local people's interaction with the natural environment: how they classify, manage and use plants available around them (Martin, 1995). Over centuries, indigenous people have developed their own locality specific knowledge on plant use, management and conservation (Cotton, 1996). The complex knowledge, beliefs and practices generally known as indigenous knowledge or traditional knowledge develops and changes with time and space, with change of resources and culture. To view this ethnobotanical studies are useful in documenting, analyzing and disseminating knowledge and interaction between biodiversity and human society, how diversity in nature is used and influenced by human activities (Martin, 1995).

Local communities have indigenous experience in categorizations, where they use their perceptions and experiences to categorize plants. From their experience, a number of categorization and classification criteria were developed which is important in plant diversity conservation and management. The common criteria here include plant use, habitat, life form, colour, abundance, morphological characteristics and combinations (Martin, 1995; Cotton, 1996).

Moreover, the use of plants in medicinal sector by local people over the past period takes a huge concern as they have long year's lineage of utilization and management. This has been achieved through many generations of age old, time-tested practices, and as a consequent accumulation of knowledge through a series of observations, interactions and innovations (Cunningham, 1996).

In Ethiopia, though there has been some organized ethnomedicinal studies, there is limited development of therapeutic products and the indigenous knowledge on usage of medicinal plants as folk remedies are getting lost owing to migration from rural to urban areas, industrialization, rapid loss of natural habitats and changes in life style. In addition, there is a lack of ethnobotanical survey carried out in most parts of the country. In Ethiopia, traditional medicine is faced with a problem of sustainability and continuity mainly due to the loss of taxa of medicinal plants (Ensermu Kelbessa *et al.*, 1992). In view of these, documentation of the traditional uses of medicinal plants is an urgent matter and important to preserve the knowledge (Tilahun Teklehaymanot and Mirutse Giday, 2007). According to Ermias Lulekal *et al.* (2008), the current loss of medicinal plants in the country due to natural and anthropogenic factors links with the loss

of valuable indigenous knowledge associated with the plants. Hence, there exists an accelerated devastation of plant resources with loss of indigenous knowledge.

The lack of conservation actions and activities is observed in Goma Wereda, as is the case in many other areas in Ethiopia. Even though the Wereda is known to have a relatively better plant resource (ILRI, 2007) and hence, the associated traditional knowledge resource is expected to be significant. The current plant use trend shows that the environment is facing problems of resource depletion and loss of indigenous knowledge like other areas of the country. Thus, concerted ethnobotanical research plays a vital role to draw information on plants associated with indigenous knowledge for conservation and sustainable utilization. In addition, right from its beginning, the documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day (Balick and Cox, 1996). It was also emphasized that if one is interested in taking a phytochemical approach in ones field work, referring to the chemical and ethnopharmacological literature to discover the existing knowledge about the various species of plants in ones ethnobotanical inventory will avoid wasting time and money unnecessarily (Martin, 1995).

Among rural communities in Goma Wereda, as would be the case elsewhere, traditional medication is believed to be an important healthcare system, which mainly involves the use of locally available medicinal plants. Recently, some studies were done on some localities of Ethiopia. For example, Mirgissa Kaba (1998); Mirutse Giday (1999); Debela Hunde (2001); Endalew Amenu (2007); Etana Tolasa (2007); Fisseha Mesfin (2007); Haile Yineger and Delenasaw Yewhalaw (2007); Tilahun Teklehaymanot and Mirutse Giday (2007); Ermias Lulekal *et al.*, (2008); Haile Yineger *et al.*, (2008); Seyoum Getaneh (2009); Zewdie Kassa (2009) and others more. Nevertheless, no study was done to include medicinal plants and indigenous knowledge of the local communities of Goma Wereda in the medicinal records of Ethiopia. This study is believed to add up to the country database of medicinal plants and in documenting local knowledge of the people.

This study has been initiated to conduct ethnobotanical study of medicinal plants in Goma Wereda and to compile and document indigenous plant based medical knowledge of the people.

1.2 Objectives

1.2.1 General objective

- To conduct ethnobotanical study of traditional medicinal plants in Goma Wereda, Jima Zone of Oromia Region, southwestern Ethiopia; and to compile and document indigenous plant based medical knowledge of the people.

1.2.2 Specific objectives

The specific objectives of the study were:

- To identify plant species used for medicinal purposes in treating human and livestock health problems in Goma Wereda;
- To gather, record, and document indigenous knowledge of the people on medicinal plants in the study area;
- To identify plant parts used to treat diseases, method of preparation and route of administration as implemented by the local people in Goma Wereda;
- To assess the role of traditional practices and indigenous knowledge in maintaining medically important plant species; and
- To find out the threats and local methods used by indigenous people to conserve medicinal plants.

2. LITERATURE REVIEW

2.1 Origin and Development of Ethnobotanical Study

John Harshberger in 1895 brought up the term ethnobotany for the first time (Harshberger, 1896; cited in Cotton, 1996). He defined ethnobotany as “the use of plants by aboriginal people”. Martin (1995) broadly defined ethnobotany as the subject dealing with the study of direct interactions between humans and plants. Balick and Cox (1996) included the use of plants as food, medicinal, forage and for any other economic purpose within field of ethnobotany. According to Cotton (1996), ethnobotany encompasses all studies that concern the mutual relationships between plants and traditional people.

As stated by Martin (1995) to achieve more detailed and reliable information of plants and plant use, ethnobotanical study needs involvement of specialists from various disciplines, such as plant taxonomists, plant ecologists, anthropologists, linguists, economic botanists, pharmacologists and others. With such interdisciplinary and multidisciplinary approaches, ethnobotany is aimed at gathering and documenting indigenous botanical knowledge, cultural practice, use and management of botanical resources and discovers benefits from plants. Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of drugs.

2.2 Indigenous Knowledge and Medicinal Plants

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

Systematic application of indigenous knowledge is important for sustainable use of resources and sustainable development (Thomas, 1995). Various animal and mineral products contribute to human welfare; the plant kingdom is most essential to human well being especially in supplying basic human needs. Since ancient times, human beings used plants for the purpose of disease

control and prevention. It was believed to be the result of many generations long year's experiences, careful observations and trial and error experiments that early humans acquired the knowledge on the utilization of plants for disease prevention and curative purposes (Sofowora, 1982; Martin, 1995). So, the knowledge and application of traditional medicine is one of the widely used indigenous knowledge systems. This implies that humans are dependent on other organisms for their life. This close interaction and dependency of humans on plants is studied under the field of ethnobotany. Such knowledge, known as ethnomedicinal knowledge involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescription to the patients. The documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day (Balick and Cox, 1996).

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

2.3 The Role of Medicinal Plants

According to Fassil Kibebew (2001), about 75-90 % of the rural population in the world (excluding western countries) relies on traditional medicines as their only healthcare system. The majority of the population in developing countries (for instance, 80% of the population in Africa) primarily rely on traditional medicinal plants for their healthcare (WHO, 2002). In northern Ethiopia, the major portion (87%) of the parts used in traditional medicine come from plant sources, while animal parts and minerals contribute only a small supply (Dawit Abebe and Ahadu Ayehu, 1993). More than 35,000 plant species are being used around the world for medicinal purposes (Lewington, 1993) and, in Ethiopia there are 800 or more plant species employed as medicinal agents (Tesema Tanto *et al.*, 2002); which according to the data base of the National Herbarium has grown to 1000 and more will be added to the list as new studies bring as new medicinal plants from various cultures.

Traditional medicine remains the main resource for a large majority (80%) of the people in Ethiopia to treat their illnesses and maintain their health and a traditional medical consultancy including the consumption of the medicinal plants has a much lower cost than modern medical

attention (Asfaw Debela *et al.*, 1999). However, this is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally acceptable and meet the psychological needs in a way modern medicine does not. So, medicinal plants are the main source of traditional medicine for the rural population and are of high demand in the healthcare systems of this population when compared to modern medicine, ethnomedicine activities need special consideration and back-up (Abbiw, 1996).

Apart from their use in the traditional system of medical care at the local level, medicinal plants are currently used in the production of modern drugs as a source of direct therapeutic agents, as raw materials for the manufacture of complex semi-synthetic compounds and as taxonomic markers in the search for new compounds (WHO, 1998). Most pharmaceutical companies recently have developed mechanisms to involve indigenous people collect plant samples on the recommendation of traditional practitioners. This approach is reported to be more successful than random collection of sample of medicinal plants (Balick and Cox, 1996; Alexiades, 1996; Asfaw Debela *et al.*, 1999).

Medicinal plants have got special attention and regional offices were established by World Health Organization to coordinate basic and applied research activities on medicinal plants (WHO, 1978). This was linked to the establishment to record medicinal plants to improve accessibility and dissemination of information on medicinal plants (Tsige Gebre Mariham and Kaleab Asres, 2001).

2.4 Medicinal Plants in Ethiopia

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

The antiquity of the traditional use of medicinal plants in Ethiopia could never be disregarded (Pankhurst, 1990; Mirutse Giday, 1999). Due to acceptability, accessibility and biomedical benefits there is a large magnitude of use and interest of medicinal plants in Ethiopia (Dawit Abebe, 2001). The long history of use of medicinal plants in Ethiopia is reflected in various

medico- religious manuscripts produced on parchments and believed to have originated several centuries ago (Fassil Kibebew, 2001). Reviews of medical textbooks that have been written in Geez or Arabic between 17th and 18th centuries indicated that the majority of Ethiopians, with the exception of few privileged groups, starting from the time of the Italian occupation, have been depending almost entirely on the traditional medicine (Pankhurst, 1990).

2.4.1 Medicinal plants in human healthcare system

Plant diversity remains crucial for human well-being and still provides a significant number of remedies required in healthcare. Medicinal plants played a pivotal role in the treatment of various afflictions in Ethiopia (Fekadu Fullas, 2007). For the role-played by plant-derived products in human and livestock health, systematic scientific investigation is vital (WHO, 1998). Pharmaceutical industries and western researchers on plant-based drugs have now rediscovered that plants have much to contribute to the discovery of new, effective, safe and profitable therapeutic agents (Pistorius and Van Wiik, 1993). Plants play a major role in providing prototype molecules for possible development into conventional drugs by the pharmaceutical industry (Fekadu Fullas, 2007). However, only small fractions of the world's plants have been investigated scientifically so far, but, human kind has already reaped enormous benefits from it (Farnsworth *et al.*, 1985).

2.4.2 Plants in ethnoveterinary medicine

In Ethiopia as well as in most developing countries, animal disease remains one of the principal causes of poor livestock performance, leading to an ever increasing gap between the supply of, and the demand for, livestock products (Teshale Sori *et al.*, 2004). Pharmacotherapy is one of the most important means of controlling livestock 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. Livestock owners cannot rely on veterinary services for control of various important livestock diseases. A practical solution to this problem is to develop socially acceptable and effective remedies from reasonably inexpensive sources that can complement modern medicine (Ibrahim, 1986). The practice of traditional veterinary medicine provides such a short cut.

In Ethiopia people have used traditional veterinary methods to treat livestock diseases for generations. Plants comprise the largest component of the diverse therapeutic elements of

traditional livestock healthcare practices. Herbal medicine is the branch of traditional medical practices that is most amenable to scientific investigation. Plants are also invaluable subjects of international development. Knowledge of medicinal plants can empower livestock owners to solve animal health problems cost-effectively.

2.5 Threats and Conservation of Medicinal Plants in Ethiopia

2.5.1 Threats to traditional medicinal plants

Ethiopia's traditional medicine as elsewhere in Africa is faced with problems of continuity and sustainability (Ensermu Kelbessa *et al.*, 1992). Nowadays herbal practitioners have to walk greater distances for herb collections that once grew in the vicinity of their homes. This is because of availability of plants in general and medicinal plants in particular have been affected by a dramatic decrease in areas of native vegetation (Cunningham, 1996). The primary causes of this problem are loss of taxa of medicinal plants, loss of habitats of medicinal plants and loss of indigenous knowledge (Ensermu Kelbessa *et al.*, 1992). In support of this Mirutse Giday (1999) found out that the practice of using plant remedies by Zay people to treat different ailments has been declining from time to time mainly as a result of continued deforestation in the area. In addition, Zemede Asfaw (2001) argues that medicinal plants are considered to be at conservation risk due to over use and destructive harvesting (roots and barks collection). The problem is further compounded by the fact that traditional knowledge on traditional medicine is also being lost at an alarming rate (Tewolde Berhan Gebre Egziabher, 1991).

There are two sources of threats to medicinal plants, i.e. human-made and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, invasive species, commercialization, honey harvesting, degradation, agricultural expansion and habitat destruction are human caused threats to medicinal plants. Likewise, natural causes include recurrent drought, bush fire, disease and pest out breaks (Ensermu Kelbessa *et al.*, 1992). In addition to this, most of the medicinal plants utilized by Ethiopian people are harvested from wild habitats (Mirutse Giday, 1999). Hence, this aggravates the rate of loss of taxa with related indigenous knowledge and loss of widely occurring medicinal plant species. The consequence is also bad in such a way that, when the plants that have been serving as the raw material for the preparation of different remedies are being destroyed, the traditional practices associated with them would also diminish.

2.5.2 Threats to indigenous knowledge on medicinal plants

Traditional herbal practitioners are important custodians of indigenous knowledge on the utilization of medicinal plants. Moreover, as a result of their experience they are skilled 'botanists' and have a great talent for locating the correct plant among the many plants species found around them. But, many are less cooperative to show their knowledge and skill on traditional medicine to others. According to Pankhurst (1990), the knowledge on medicinal plants and method of use circulated mainly among practitioners and the beneficiaries of such practice. Because of the impact of modern education, increase in health coverage and urbanization, indigenous knowledge and usage of medicinal plants are being lost globally at a fast rate (WHO, 2002). This has made the knowledge and skill on traditional medicinal plants and traditional medicine more hidden and less available to the public (Abbink, 1995). The issue is being even more serious in developing countries where such important information is not recorded in writing but passed on from one generation to the other orally; few are available in written records. To make matters worse, the younger generations of today, unfortunately, often have different ambitions and priorities. As a result, this traditional skill is doomed to be lost even faster than the plants themselves (Sofowora, 1982).

Considering the role-played by plant-derived products in human and livestock health, the effective conservation of medicinal plants and associated indigenous knowledge, needs to be initiated as a matter of urgency.

2.5.3 Conservation of traditional medicinal plants

There are some conservation actions that have been undertaken around the world designed to protect threatened medicinal plants from further damage (Cunningham, 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 habitat. Some traditional medicinal plants have to be conserved *in-situ* due to difficulty for domestication and management (Zemedede Asfaw, 2001). Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been traditionally (Zemedede Asfaw, 2001), this can be possible in places of worship (churches, mosques, grave yards, etc), scared grooves, farm margins, river banks, road sides, live fences of gardens and fields.

2.5.3.1 Conservation of medicinal plants in homegardens

Large concentrations of the useful plants found in Ethiopia are located in homegardens. Homegardens are agricultural spaces that typically contain wide plant diversity, including crops with excellent micronutrient properties. They are usually located close to the homestead; homegardens can accommodate women's food production and household responsibilities (FAO, 2005). The homegarden agroecosystem in Ethiopia maintains a wide range of taxa of perennial and annual crop plants. According to Zemedu Asfaw (2001), medicinal plants can be conserved using appropriate conservational methods in gene banks and botanical gardens. This type of conservation of medicinal plants can also be possible in homegardens, as the homegarden is strategic and ideal farming system for the conservation, production and enhancement of medicinal plants. For poor rural people, medicinal plants represent affordable and locally available resources to address many diseases and health problems.

3. DESCRIPTION OF THE STUDY AREA

3.1 Geographic Location

Goma Wereda, is found in Jima Zone, Oromia Regional State, southwestern Ethiopia, that extends between $7^{\circ} 40' - 8^{\circ} 04' N$ and $36^{\circ} 17' - 36^{\circ} 46' E$. It is located 390 km south west of Addis Ababa and about 50 km west of the Jima town. It ranges from an altitude of 1387 to 2870m a.s.l. Most parts of the Wereda lay between 1387 and 1643 m; and 1849 and 2067 m a.s.l. However, some areas of the Wereda have altitudes ranging from 2229 to 2870 m a.s.l. The total area of the Wereda is 96,361.72 ha (963.62 km²). It is situated in the centre of the Zone bordered with Gumaye Wereda in the north, Limmu Kossa Wereda in the east, Manna Wereda in the southeast, Seka-chokersa in the south and Gera Wereda in the west. Currently, the Wereda undertakes its administrative duties and responsibility in 36 peasant associations and 3 urban centres (Keso-heti, Limmu-shaye and Choche towns). Totally, this Wereda comprises 39 kebeles.

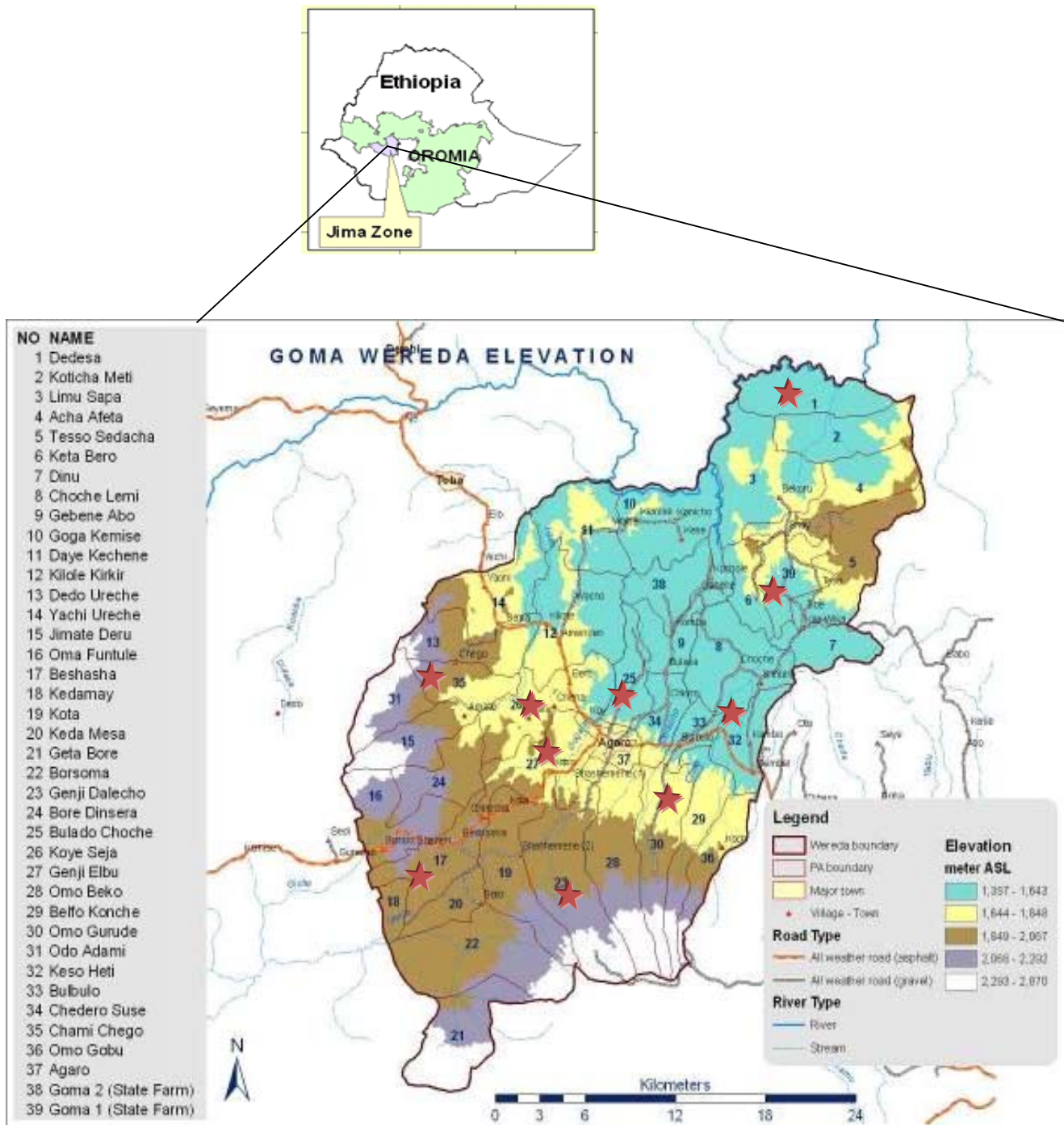


Figure 1 Map of Goma Wereda (Source ILRI, 2007)

Key: With ★s are the ten sampled areas

- Lower altitudinal areas (1387-1643 m a.s.l) (Dedesa, Choche, Keso-heti and Bulado-choche)
- Medium altitudinal areas (1644-1848 m a.s.l) (Koye-seja, Genji-elbu and Omo-gurude)
- Higher altitudinal areas (1850-2870 m a.s.l) (Beshasha, Genji-dalecho and Cami-chego)

3.2 Soils and Drainage

The three dominant soil types in the area are Eutric Vertisols, Humic alisols and Humic Nitosols (ILRI, 2007). Among these soil types, Nitosols is the most abundant covering about 90% of the Wereda. These soils are young soils and are generally acidic soils. However, farmers grow crops that are acid tolerant. The pH of the soils in Goma ranges between 4.5 and 5.5. All the soils types in the area have good agricultural potential (ILRI, 2007).

The topography, vegetation and rainfall pattern in the Wereda encourages the existence of many perennial rivers. The rivers drain to Ghibe/Omo to the east and Dedesa River in the north. Currently there are many small rivers (Didesa, Awetu, Temsa, Colombos, Naso, Dogaja, Melkayida, Chiseche, Loga,) that have been providing an irrigational function under traditional system.

3.3 Climate

Goma Wereda enjoys well distributed annual rainfall. Based on 15 years weather data obtained from National Meteorological Service Agency, it indicates that the average annual rainfall is 1524 mm and in the vast area of the Wereda annual rainfall varies between 1700 - 2100 mm. The annual rainfall variability is very low. All in all, there are about 7 rainfall months in the Wereda. However, rainfall is sometimes received even during the other months. Hence, crop and livestock production is not constrained by the amount and distribution of rainfall as in other parts of the country. Dry spell months in the Wereda are few. Agroecologically, Goma Wereda is classified as 96% wet Weina Dega (wet-midland) and 4% kolla (lowland). The average mean annual temperature of the area is 20.8⁰C (Figure 2).

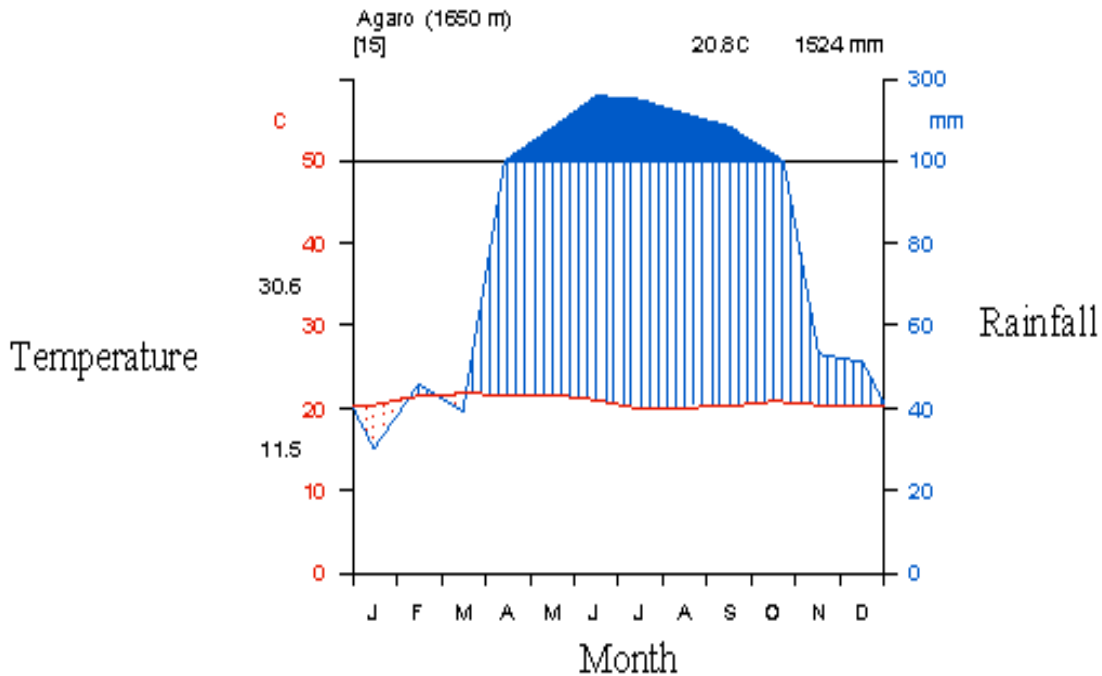


Figure 2 Climadiagram showing rainfall distribution and temperature variation from 1992 – 2007 at Agaro station. (Data Source: National Meteorological Service Agency)

3.4 People, Population and Healthcare Status

The total population of the Wereda was 243,376 in 2006/07, of whom 123,354 were men and 120,022 women; 39,663 or 16.3% of its population were urban dwellers. The five largest ethnic groups reported in Goma were Oromo (79.11%), Amhara (7.28%), Dawro (4.2%), Silte (2.6%), and Keficho (2.04%); all other ethnic groups made up 4.77% of the population. Afan oromo was spoken as a first language by 78.78%, 14.22% spoke Amharic, 2.43% Dawro, 1.14% Silte and 1.12% spoke Kefa; the remaining 2.31% spoke all other primary languages. The majority of the inhabitants were Muslim. While the number of rural households in the Wereda is 45,567 (35,533 male and 10,034 female). There are 36 peasant associations and 3 towns’ associations (ILRI, 2007).

Historically, the name Goma was derived from the name of local chief called “Goomma” who administered the current area. Goma Wereda is one of the foundation and origin lands of Arabica coffee. One of the coffee biodiversity centre (Choche) in Ethiopia is found in this Wereda. The agroecology of Goma is favourable for coffee production. It is known for predominantly growing

coffee. The life of the people in this Wereda is directly or indirectly connected with coffee production (ILRI, 2007).

According to Goma Wereda Health Office report, the first ten major diseases in the area are: rheumatic pain, upper respiratory tract infection (URTI), malaria, diarrhea, internal parasites, gastritis, eye disease, anaemia, toothache and skin infection respectively. In the Wereda, there is one health centre, eight clinics, two health stations and seven private clinics. The health service given is below the needs of more than two hundred thousand people. These conditions and others force people to be served by traditional health practitioners and traditional means of treatment.

3.5 Livestock

Livestock population is relatively high in Goma Wereda. However, their productivity is very low as in most places in the country. The livestock resources of Goma Wereda have not yet been exploited. Their performance (milk, meat, egg, honey production) and contribution to the regional and national economy is very low mainly due to poor management, low genetic potential due to inbreeding, inadequate and low quality feed supply, and the prevalence of various animal diseases. Even though there is ample vegetation, including grasses suitable for feeding, the livestock are not in good condition (Goma Wereda Agriculture development office).

According to the same report above, the numbers of livestock in the Wereda include: cattle 105,122; sheep 24,751; goats 11,177; poultry 209,096; mules 2,623; horses 2,030 and donkeys 2,640. In the Wereda, livestock make a substantial contribution to the rural economy. Most rural farming, transport and source of income do directly or indirectly link with them.

The most important animal diseases in Goma Wereda include: bacterial infections (black leg, pastureolosis, anthrax, mastitis, fowl typhoid and avian salmonellosis), endoparasites (fascioliasis, paramphitomiasis, strongyliasis), ectoparasites (ticks, mites, lice and insect flies), viral infections (rabies, african horse sickness AHS, foot and mouth disease) and protozoal infections (trypanosomiasis, babesiasis, coccidiosis) (ILRI, 2007).

3.6 Land Use and Agriculture

The Wereda has a total area of 96,361.72 ha (963.62 km²) of which 80 % is under cultivation for growing both annual and perennial crops, while 20% of the total land area is occupied by forest and grassland. The general land-uses are given in Table 1. Average land holding of the households is between 0.5 and 1.0 ha (ILRI, 2007).

Table 1 Land resources by use of Goma Wereda (in hectares)

| Land under crops | | | Cultivable land | Uncultivable land | Grazing land | Forest | | Fallow land | Settlement | Coffee state farms | Others |
|------------------|-----------|--------|-----------------|-------------------|--------------|---------|---------|-------------|------------|--------------------|---------|
| Annual | Perennial | | | | | Manmade | Natural | | | | |
| | Coffee | Others | | | | | | | | | |
| 25,258.9 | 22,561.82 | 290.01 | 7698.25 | 7400 | 7850 | 2296.1 | 2209.2 | 100 | 11,912.72 | 2704 | 6080.72 |
| Total area | | | | | | | | | | 96,361.72 | |

Data source: - Goma Wereda Agricultural Development Office

Goma Wereda has an ideal agro-ecology for agriculture such as crop production, livestock rearing and cultivating different annual and perennial plants such as coffee. The major food crops grown in the area are given in Table 2. Mixed farming is a common practice prevailing in the Wereda as a result the livelihood of the rural population is depended on coffee production, crop production and livestock rearing. Priority marketable livestock commodities are: apiculture, small ruminant fattening (mainly sheep), cattle fattening and poultry. Among these livestock commodities, apiculture has been suggested to be very important. There are 2 agro-ecological zones (lowland and highland) and hence crops grown are also diversified.

Table 2 Major Food crops grown in the study area

| Crop category | Scientific name | English name | Local name (Or.) |
|----------------------|--------------------------------|---------------------|-------------------------|
| Cereals | <i>Sorghum bicolor</i> | Sorghum | Boobee |
| | <i>Zea mays</i> | Maize | Boqqolloo |
| | <i>Eragrostis tef</i> | Tef | Xaafii |
| | <i>Eleusine coracana</i> | Finger millet | Daagussaa |
| | <i>Hordeum vulgare</i> | Barley | Garbuu |
| | <i>Triticum aestivum</i> | Wheat | Qamadii |
| Vegetables | <i>Capsicum frutescens</i> | Chili | Barbaree |
| | <i>Allium cepa</i> | Shallot | Qullubbii |
| | <i>Lycopersicon esculentum</i> | Tomato | Timaatimii |
| | <i>Cucurbita pepo</i> | Pumpkin | Buqqee nyaataa |
| | <i>Allium sativum</i> | Garlic | Qullubbii adii |
| | <i>Brassica oleracea</i> | Cabbage | Raafuu |
| Fruits | <i>Citrus sinensis</i> | Orange | Burtukaana |
| | <i>Citrus limon</i> | Lemon | Loomii |
| | <i>Musa x paradisiaca</i> | Banana | Muuzii |
| | <i>Mangifera indica</i> | Mango | Maangoo |
| | <i>Carica papaya</i> | Papaya | Paapaayaa |

| | | | |
|------------|------------------------------|---------------|---------------|
| | <i>Persea americana</i> | Avocado | abukaado |
| Pulses | <i>Pisum sativum</i> | Field peas | Atara |
| | <i>Phaseolus vulgaris</i> | Haricot beans | Adenguare |
| | <i>Vicia faba</i> | Horse beans | Baaqelaa |
| Cash crops | <i>Coffea arabica</i> | Coffee | Buna |
| | <i>Saccharum officinarum</i> | Sugar cane | Shonkoraa |
| | <i>Catha edulis</i> | Khat | Caatii |
| Oil crops | <i>Linum usitatissimum</i> | Lin seed | Talbaa |
| | <i>Guizotia abyssinica</i> | Niger seed | Nuugii |
| | <i>Brassica napus</i> | Kale seed | Sanyii raafuu |
| Root crop | <i>Ipomoea batatus</i> | Sweet potato | Sukaaree |

Source: Goma Wereda Agriculture Development Office (2007)

3.7 Vegetation

The major forest tree species in Goma Wereda include *Acacia abyssinica*, *Albizia gummifera*, *Albizia schimperiana*, *Brucea antidysentrica*, *Cordia africana*, *Croton macrostachyus*, *Ficus* species, *Millettia ferruginea*, *Sapium ellipticum*, *Syzygium guineense*, *Vernonia* species, and different shrubs and herbs. However, there is very fast encroachment of the forest areas due to high population pressure. Evidence from some reports indicates that the natural resources (vegetation, wildlife and soils) are facing indiscriminate depletion mainly due to expansion of croplands (Regional Government of Oromia, 2003).

It is becoming hard to find large areas under conserved natural forests. Currently, the Wereda has about 2209.2 ha of natural forest and 2296.1 ha of human made forest cover (GDFED, 2009). These vegetation covers represent 2.3 and 2.5% of the total Wereda respectively.

Major types of natural vegetation such as forest, wood land and shrubs cover 8.88% of the total area of the Wereda and these accounts for 8316.81 hectares. There is a community protected *Juniperus* forest located in Genji-elbu area such approximately covers 60 hectares.

4. MATERIALS AND METHODS

4.1 Reconnaissance Survey and Selection of Study Sites

A reconnaissance survey of the study area was conducted from September 15 to 25, 2009. The study sites are selected. Thus, the study was carried out in three altitudinally varying ten sites. These are: areas with higher altitude (1850-2870 m a.s.l) (Beshasha, Genji-dalecho and Cami-chego), medium altitudinal areas (1644-1848 m a.s.l) (Koye-seja, Genji-elbu and Omo-gurude) and lower altitudinal areas (1387-1643 m a.s.l) (Dedesa, Choche, Keso-heti and Bulado-choche).

4.2 Sampling of Informants

A total of 100 individuals in the ages of 20 and above were selected from ten kebeles. Out of these, 24 key informants were purposively selected based on recommendation from elders and local authorities (Development Agents and kebele administration leaders). The choice of key informants is following the suggestion made by Martin (1995). The other 76 informants were selected randomly from the local people of the study area to see the general knowledge of medicinal plants in the people. 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.

4.3 Data Collection

Ethnobotanical data were collected in two trips the first one from December 1 to December 30, 2009 and the second from March 20 to April 20, 2010. The techniques employed for data collection were group discussion, semi-structured interviews, field observations or guided field walks with informants was employed to obtain indigenous knowledge of the local community on health, local classification, use, conservation and threats of medicinal plants.

4.4 Specimen Collection

At the end of the interview, sample specimens of the plants cited for their medicinal use were collected, numbered, pressed and dried for identification.

4.5 Specimen Identification

Preliminary identification was done in the field. In addition, identification of unidentified specimens was done in February and April 2010, using Flora of Ethiopia and Eritrea and also by comparison with authentic specimens, illustrations and taxonomic keys and with the assistance of experts at Addis Ababa University, National Herbarium. Voucher specimens with scientific

names, vernacular names, families and collection numbers for all medicinal plants and plants recorded from the study area, homegardens were stored at the National Herbarium.

4.6 Vegetation Description

Two approaches were used in describing the vegetation of the study area. On one hand, information was gathered from informants following the emic categorization technique i.e. categorization by indigenous people based on their own indigenous knowledge. On the other hand, it was described and classified through repeated curious visual observation following the etic classification technique of ethnobotany as described by Martin (1995). In the latter case, morphological characteristics or general appearance of vegetation such as growth and life forms of the dominant or co-dominant plants were focused upon.

4.7 Data Analysis

4.7.1 Descriptive statistics

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

4.7.2 Informant consensus

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

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

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

Where: ICF is informant Consensus Factor
 n_{ur} is number of use citation
 n_t is number of species used

4.7.3 Preference ranking

Preference ranking was computed following Martin (1995). Ten key informants have been selected to assess the degree of effectiveness of seven medicinal plants against tonsillitis. The medicinal plant believed to be most effective to treat the illness has got the highest value (7), and the one with the least effective got the lowest value (1). The value of each species was summed up and the rank for each species was determined based on the total score. This helped to indicate the most effective medicinal plants used by the community to treat the disease.

4.7.4 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). Paired comparisons to indicate the efficacy and popularity of five medicinal plant species used to treat insect allergy were employed as described by Martin (1995). In such a way that seven key informants were randomly selected by flipping coins and allowed to show their responses independently for pairs of five traditional medicinal plants that are noted for treating insect allergy. A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to selected informants and their responses will be recorded, total value summarized and rank made based on the report of the informants.

4.7.5 Direct matrix ranking

Direct matrix ranking was conducted in order to compare multipurpose medicinal plants commonly reported by informants following Cotton (1996). Based on the relative benefits obtained from each plant, six multipurpose tree species were selected out of the total medicinal plants and seven use diversities of these plants were listed. Four key informants were chosen to assign use values to each attribute (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used). The seven use-values include medicinal, fodder, firewood, construction,

charcoal, fencing, and furniture making. Based on information gathered from informants, average value of each use-diversity for a species was taken and the values of each species summed up and ranked.

4.7.6 Jaccard's coefficient of similarity

Jaccard Coefficient of Similarity (JCS) was conducted to determine species composition similarity among five different areas. It was calculated between paired habitats (the study area with other areas which were studied by others in different parts of the country). JCS calculated as follows (Kent and Coker, 1992).

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

Where JCS = Jaccard's Coefficient of Similarity

a = Number of species found only in habitat A

b = Number of species found only in habitat B and

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

5. RESULTS AND DISCUSSION

5.1 Knowledge of Local People on Health

People of Goma Wereda give great value for their health. In the discussion with elders, the community expressed the value of their health by using different proverbs among them:

“Fayyaa fi farsootu firra qabaa.” meaning a healthy person and the common local drink ‘tella’ would have friends.

“Fayyaan culullee dha.” meaning a healthy person is like a kite. This is to say that just like a kite can get whatever it wants by flying here and there, the same holds true for a healthy person. A healthy person can do things he wants to do.

“Fayyaan haajiraatu.” meaning wishing healthy life.

These proverbs indicate that, the local people of Goma Wereda confer great value for their health. Health is a great asset for them.

The same study carried out in indigenous people of Gimbi Wereda, Western Wellega by Etana Tolasa (2007) and a study carried out by Endalew Amenu (2007) at Cheliya Wereda in West Shewa have reported that the people of the study areas expressed the value of health by using different proverbs like that of Goma Wereda people. This might be the dominance of the people in these study areas are from the same ethnic group (Oromo) as a result there might be such a culture in Oromo society.

5.2 Local Beliefs on Medicinal Plants

The local people exploit their shared knowledge in order to manage health problems at home by using different plants found around them before looking for other options regardless of the type of health problem and its intensity. There is a saying in the community that the majority of people agree that regarding medicinal plants by saying **“Qoricha biyya tokkotti yaala biyya tokkotti baala”** meaning leaves used as medicine in one area are just leaves in another area. This emphasizes the importance of knowledge of plants. If there is knowledge it is used as medicine if not, leaves are simply leaves. For Goma Wereda people, the traditional systems regarding a medicinal plant play a vital role in their healing strategies and in the local primary healthcare systems.

According to the respondents of the study area, the preference of traditional medicine was as a result of lack of substitutes, that is, they would not get better medications for some of the diseases

in modern health services. For example, diseases like: insect allergy, evil eye, evil spirit, fibrile illness, diseases believed to be caused by urine of bat, spider poison in addition to that of easy access and low cost of treatment for traditional medicine.

Some healers connect the knowledge with spiritualism. One traditional healer among the informants beliefs that “I get the medicine when the patient comes and asks the medicine, otherwise I do not remember the leaves and all other things. I will ask my sprit to let me know the medicine for that particular disease and only after that I will collect the medicine for the patient in need.” This might indicate the secrecy of traditional medicinal knowledge, not to let others know about it. Another healer expressed it as follows “ if I collect the medicine myself it will serve as medicine; if another person harvests it the parts on my behalf do the medicine does not work as I will share whatever I will get with my God .” This type of beliefs might probably help to restrict others not to join in this kind of business.

According to the traditional healers, extensive indigenous plant use knowledge was retained and transferred orally to a selected family member. Most of the traditional healers reported that modernization had effect on the transfer of the indigenous knowledge to the next generations.

The proportion of healers who used to transfer their knowledge and those who did not use to transfer was also similar. This reveals that some of the traditional healers might have given much attention to the indigenous knowledge transfer while others kept the knowledge with them for the sake of secrecy or they might have little concern regarding the value of indigenous knowledge.

5.3 Indigenous Knowledge on Soil, Landform, and Botanical Classification

5.3.1 Soil classification by indigenous people

The local people of Goma Wereda classify soil (‘Biyyoo’ in local Afan oromo language) based on soil characteristics, colour of the soil, fertility of the land, and other criteria. The following soil types have been identified by local people:

- **Biyyoo kotichaa:** - This soil type refers to black soil and with better fertility for crop production in comparison to other soil types. The people use this soil to grow crops like teff, sorghum, maize and others.
- **Biyyoo diimaa:** - This soil is red sandy soil type; it has less fertile in comparison to the black soil. But, it can enable to grow crops of various types by applying fertilizer and/or if it contains remnants of plants it can be used for coffee plantation.

- **Biyyoo osoo:** - This soil type is characterized by high quantities of organic matter such as plant residues. Mostly the local people prefer this type of soil for coffee plantation.
- **Biyyoo suphe:** - This type of soil is not suitable for cultivation because rain water does not percolate. It is used for brick production. But, according to some key informants plants that grow in this soil type have great medicinal value.
- **Biyyoo Xaa'o:** - This is soil type created as a result of erosion. It is a very fertile soil and there is no need for fertilizer use in this soil type for crop cultivation.
- **Biyyoo seefoo:** - This soil type is characterized as unproductive without the application of fertilizer.
- **Biyyoo borale:** - This type of soil is white soil which is not suitable for crop production as well as for vegetation.

The report of a study carried out in Cheliya Wereda in West Shewa by Endalew Amenu (2007) showed that there is similarity of soil classification with the people of Goma Wereda. They classify the soil depending on the colour, texture and suitability for cropping. For example, in Cheliya Wereda 'Biyyoo Koticha' is given to black fertile soil and the red clay soil they call it 'Biyyoo diimillee' which is similar with 'Biyyoo diimaa' in Goma Wereda in which the name is given depending on the colour of the soil. This might be due to language as well as cultural similarity of the two groups of peoples.

5.3.2 Landform classification

5.3.2.1 Use based land classification

Indigenous people of Goma Wereda classify land based on the use of the land as agricultural land, grazing land, forestland, marshland, residential area, etc.

- **Lafa qonnaa:** - This is agricultural land that serves for cultivation of different crops.
- **Lafa bosanaa:** - This is forest land where different plant species are found.
- **Lafa caffee:** - This is marshland which is suitable for livestock grazing as well as some agricultural activities to take place.
- **Lafa horrii /Lafa walliinii/ Lafa kallo:** - is an open grazing land left aside by community for common livestock grazing.
- **Lafa bunaa:** - This is land used for coffee plantation.
- **Lafa dhagaa:** - rocky areas where stones are extracted and sold.

- **Lafa manaa:** - residential land where the community has settled. They make fences around and restricted cropping for vegetable cultivation as homegarden.

In a similar study carried out by Endalew Amenu (2007) the local people of Cheliya Wereda classify landforms depending on grazing land, agricultural land, forestland, river bank, residential area and marshland, which shows the same bases for classification of land forms in Goma. For example, from the given land form classification “lafa qonnaa, lafa bosanaa, lafa caffee and lafa manaa” have been expressed in the same way by the two groups of people. Whereas, in Jeldu Wereda the classification criteria are based on soil characteristics, fertility of land and physiographic features of the land (Zewdie Kassa, 2009). So, local people of Goma Wereda classify land based on its uses.

5.3.2.2 Topographic land classification

The local people of the study area classify their land based on topographic land setting.

The local people classify their land topographically as:

- **Tabba:** - This refers to land forms with some elevation which is suitable for forest plantation. But, now in the area some agricultural activities can be performed.
- **Erkataa:** - This refers to land forms with very low elevation in comparison to the first type on which agriculture and grazing can take place.
- **Diriraa (Bakkee):**- This refers to plain land on which settlement, agricultural activities as well as livestock grazing are practiced.
- **Dhibu:** - This refers to land which is found in between elevated land forms; a valley.

Topographic classification of lands is also reported in Cheliya Wereda in which land forms with low elevation call it ‘tabba’ like Goma people. Other classifications like ‘Tullu’ for mountainous area that lack in Goma Wereda; ‘Goodaa’ is an area with low elevation and left aside for grazing (Endalew Amenu, 2007). But, in Jeldu Wereda ‘Goodaa/Dirree’ represented a plain land (Zewdie Kassa, 2009) whereas, plain land in Goma is known as Diriraa/Bakkee; ‘lafa ciisaa’ the name given to plain land in Cheliya (Endalew Amenu, 2007). Even though, there is a difference in the word they use, an agreement may exist among these people because one might be the synonym of the other.

5.3.3 Indigenous vegetation classification

The local communities categorized the vegetation of the study area into:

- **Bosanaa:** refers to densely forested lands composed of ranges of large trees. Now-a-days this type of vegetation has declined in the study area because of agricultural expansion and overharvesting.
- **Caffee:** refers to herbaceous vegetation growing in wetlands (marshy or water logged areas) in which some grasses and *Cyperus* species are more frequent and it is evergreen throughout the year.
- **Dagala:** refers to complex plant association in the wild, road side as well as for those plants grown in garbage area. The majority of plants observed in these areas are herbs and shrubs. According to informants the plants grown in this category have medicinal value.
- **Marga:** refers to an area dominated by grass and other herbaceous plants.

Vegetation classifications of Cheliya, Gimbi and Jeldu Weredas have shown that there is similarity for the name given to densely forested land with Goma Wereda which is called ‘Bosanaa’ (Endalew Amenu, 2007; Etana Tolasa, 2007 and Zewdie Kassa, 2009). ‘Caffee’ is a name given to vegetation grown in marshy or water logged areas in Goma Wereda which is similar with the classification of Endalew Amenu (2007) and Zewdie Kassa (2009). The name ‘Caffee’ associated with the name of the dominant vegetation type mostly grown in water logged area particularly *Cyperus* species; the name is given as a result of the dominance of this kind of species in the area.

5.4 Visual Vegetation Classification

To indicate the distribution of medicinal plants in the study area with respect to the dominant tree species, careful visual observation was made and vegetation of the study area was classified into community types by taking the dominant species for naming the community which gave seven types.

1. ***Ficus sycomorus* and *Ficus sur*** dominated community type: - This community is predominantly observed at an altitude around 1450 m a.s.l. It is characterized by trees with larger canopy, under side covered with thick bushes and shrubs. It is observed at Didesa Kebele study sites where one could observe remnant forests in farmlands and at margins of agricultural fields. The major species obtained from this community type are: *Ficus sycomorus*, *Ficus sur*, *Combretum molle*, *Combretum collinum*, *Piliostigma thonningii*, *Vernonia leopoldii*, *Stereospermum kunthianum*, *Indigofera vohemarensis*, *Gardenia ternifolia*, *Ficus ovata*, *Sesbania sesban* and others.

2. ***Albizia gummifera* and *Croton macrostachyus*** dominated community type:-This community type is normally found at sites in which the vegetation is associated with coffee plantation covering the majority of the study sites. It is predominantly observed at an altitude range of 1560 – 1950 m a.s.l. The major species obtained from this community type are *Albizia gummifera*, *Croton macrostachyus*, *Acacia abyssinica*, *Albizia schimperiana*, *Coffea arabica*, *Trichilia dregeana*, *Brucea antidysenterica*, *Calpurnia aurea*, *Erythrina brucei*, *Buddleja polystachya*, *Celosia trigyna*, *Vernonia* species. and others. This community type is found in Cami-cago, Bulado-coce, Koye-seja, Genji-elbu, Keso-heti, Omo-gurude kebeles, and other study sites.

3. ***Sapium ellipticum* and *Maesa lanceolata*** dominated community type: - This community is predominantly observed at an altitude from 1680 – 2070 m a.s.l. The major species collected from this community type are *Sapium ellipticum*, *Maesa lanceolata*, *Albizia gummifera*, *Celtis africana*, *Ehretia cymosa*, *Millettia ferruginea*, *Acacia abyssinica*, *Bidens biternata*, *Bidens prestinaria*, *Bidens pilosa*, *Clausena anisata*, *Rytigynia neglecta* and others. This community type is found in Beshasha, Keso-heti, Cami-cago and Genji-elbu study sites.

4. ***Cordia africana* - *Ficus vasta*** dominated community type: - This community is predominantly observed at an altitude ranging from 1528 – 1735 m a.s.l. The major species obtained from this community type are *Cordia africana*, *Ficus vasta*, *Albizia grandibracteata*, *Coffea arabica*, *Asparagus africanus* and others. This community type is found in Choche and Omo-gurude study sites.

5. ***Vernonia amygdalina* - *Syzygium guineense*** dominated community type: - This community is predominantly observed at an altitude range from 1720 – 2070 m a.s.l. The major species obtained from this community type are *Vernonia amygdalina*, *Syzygium guineense*, *Calpurnia aurea*, *Dracaena steudneri*, *Ekebergia capensis*, *Premna schimperi* and others. This community type is found in Beshasha and Genji-elbu study sites.

6. ***Eucalyptus* Plantation:** - This type of community is recorded in almost all study sites. It is one of the good income generating plants for the farmers in the area as a result it is displacing croplands. The major species observed in this type of community are *Eucalyptus* species, *Solanum dasyphyllum*, other herbs and small shrubs.

7. **Riverine Vegetation:** This type of community is observed along the river banks and streams in the study area. The major species observed in this type of community which are recorded along the river courses of river Degujaja and Chiseche which is observed at an altitude around 1600 – 1680 m a.s.l are *Cyperus alopecuroides*, *Cyperus distans*, *Acmella caulirhiza*, *Arundinaria alpina*, *Drymaria cordata*, *Ensete ventricosum*, *Impatiens rothii*, *Persicaria senegalensis*, *Snowdenia polystachya* and others.

5.5 Plants in the Homegardens

The local community of the study area obtain many services from homegardens or ‘Boro’ as it is called in local language. They provide food, spices, medicine and other services. A good number of medicinal plants have been obtained in and around gardens of local people in the study area that are used for different human ailments. The people of the study area cultivate diverse plant species in their homegardens (Appendix 5).

In this study, 59 useful plant species were collected in homegardens. Out of these 46 plant species were used as traditional medicine. The plants are distributed among 31 families and 49 genera. The highest family in terms of species composition is Lamiaceae contributing 8 species (13.55%), family Asteraceae, Rutaceae and Solanaceae each with 4 species (6.77%), Brassicaceae is represented by 3 species and families Acanthaceae, Convolvulaceae, Fabaceae, Musaceae, Myrtaceae and Poaceae are represented by 2 species each and the remaining 22 families are represented by one species each. This indicates there are diverse plants that can be cultivated in the homegardens of the study area. The same study carried out in Gimbi Wereda by Etana Tolasa (2007) come up with 52 species that are collected from homegardens. This number is comparable with the number obtained from Goma Wereda. So, these two groups of people are good practice of cultivating plants in their homegardens.

5.5.1 Habit and use category of homegarden plants

Regarding the habit of plants 25 species (42.37%) are herbs, 19 species (32.20%) are shrubs, 12 (20.33%) are trees and 3 (5.08%) are climbers (Figure 3). The finding of these habits agrees with investigations of Etana Tolasa (2007) and Endalew Amenu (2007) in such a way that the diversity of herbs as the dominant growth form was reported.

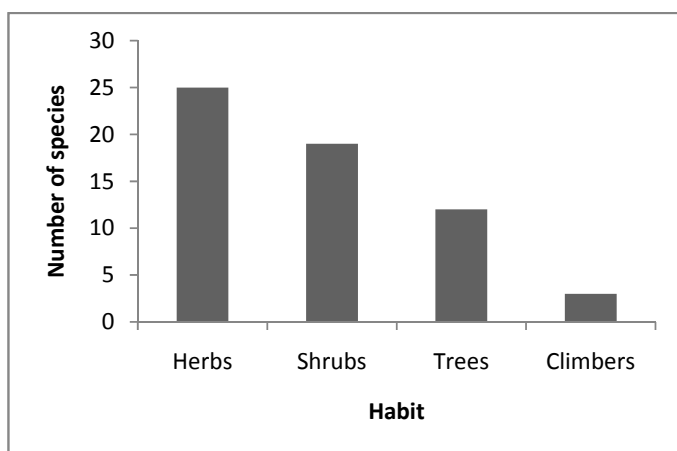


Figure 3 Habits of plants that are collected from homegardens of the study area

The local community gain various uses from the plants in the homegardens. In this study 18 species (30.5%) of the gardens plants have only medicinal value, 14 species (23.72%) are used as both medicine and food and 6 species (10.16%) are purely for food and others do have different uses as Table 3 shows. The majority of the homegarden plants do have more than one use. This result disagrees with the finding of most researches like Etana Tolasa (2007) in which most of the plants obtained from homegardens are food plants. This shift may be as a result of the depletion of medicinal plants in the wild. So, the people of the study area have good habit of cultivating medicinal plants in the homegardens.

Table 3 Service categories of homegarden plants

| Service category | Total no. of species | Percent |
|--|-----------------------------|----------------|
| Only medicinal | 18 | 30.50 |
| Medicine & food | 14 | 23.72 |
| Food | 6 | 10.16 |
| Medicine & Ornamental | 2 | 3.38 |
| Medicine & spice | 2 | 3.38 |
| Medicine & live fence | 2 | 3.38 |
| Forage, food & cash income | 2 | 3.38 |
| Live fence, food, cash income | 2 | 1.69 |
| Cash income | 1 | 1.69 |
| Spice | 1 | 1.69 |
| Medicine & firewood | 1 | 1.69 |
| Medicinal & cash income | 1 | 1.69 |
| Medicine, cash income, stimulant | 1 | 1.69 |
| Medicine, Forage, Food, Cash income | 1 | 1.69 |
| Medicine, live fence, fire wood | 1 | 1.69 |
| Medicine, fire wood, fence | 1 | 1.69 |
| Medicine, live fence, forage, food, fence | 1 | 1.69 |
| Medicine, fire wood, live fence, forage, fence | 1 | 1.69 |
| Medicine, fire wood, charcoal, live fence, forage, fence, construction | 1 | 1.69 |
| Total | 59 | 100 |

5.6 Plant Resources of the Study Area

A total of 160 species belonging to 124 genera and 58 families were collected and identified in the study area (Table 4).

Table 4 Distribution of collected species in different family

| Family | Number of Species | Percent |
|--------------------------|-------------------|---------|
| Asteraceae | 17 | 10.62 |
| Fabaceae | 16 | 10.00 |
| Lamiaceae | 13 | 8.12 |
| Solanaceae | 9 | 5.62 |
| Euphorbiaceae | 7 | 4.37 |
| Moraceae | 5 | 3.12 |
| Poaceae | 5 | 3.12 |
| Rutaceae | 5 | 3.12 |
| Amaranthaceae | 4 | 2.50 |
| Boraginaceae | 4 | 2.50 |
| Convolvulaceae | 4 | 2.50 |
| Myrtaceae | 4 | 2.50 |
| Polygalaceae | 4 | 2.50 |
| Brassicaceae | 3 | 1.87 |
| Cyperaceae | 3 | 1.87 |
| Meliaceae | 3 | 1.87 |
| Ranunculaceae | 3 | 1.87 |
| Rubiaceae | 3 | 1.87 |
| Acanthaceae | 2 | 1.25 |
| Apiaceae | 2 | 1.25 |
| Combretaceae | 2 | 1.25 |
| Cucurbitaceae | 2 | 1.25 |
| Musaceae, | 2 | 1.25 |
| Rhamnaceae | 2 | 1.25 |
| Rosaceae | 2 | 1.25 |
| Vitaceae | 2 | 1.25 |
| The remaining 32 species | 1 | 20.00 |

Of these, 101 species were collected from the vegetation in the wild and 59 species are obtained from homegardens. This finding is a good indicator for the presence of considerable diversity of plant species both in the wild as well as in the homegardens of the study area. In terms of family distribution Asteraceae stood first contributing 17 species (10.62%) followed by Fabaceae (16 species) and Lamiaceae (13 species). This agrees with the finding of Endalew Amenu (2007) in which family Asteraceae is the dominant family followed by Fabaceae. This may be due to the weedy nature of the family Asteraceae take advantage of disturbance.

Regarding the habit diversity, herbs were the most common and stood first with 69 species, followed by trees (44 species), shrubs (35 species) and climbers (12 species) (Figure 4). A detailed overview of all plants encountered, their scientific and vernacular names, and uses, are given in Appendices 1, 4 and 5.

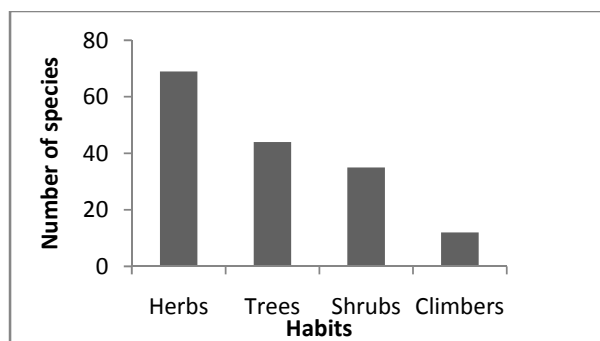


Figure 4 Habits of plants that are collected in the study area.

5.7 Ethnomedicinal Plant Species Used by People of Goma Wereda

From the collected 160 species in the study area a total of 121 medicinal plant species were gathered and documented that are used for the treatment of human and livestock ailments. From these, 92 species (76.03%) were used as human medicine, 12 species (9.91%) as livestock medicine and the remaining 17 species (14.04%) were used for treating both human and livestock ailments (Figure 5). These plants are distributed in 101 genera and 49 families. The family Asteraceae was represented by 15 species, followed by Fabaceae and Lamiaceae represented by 12 species each, Solanaceae 8 species, Euphorbiaceae accounted for 7species, Amaranthaceae, Myrtaceae and Rutaceae were represented by 4 species each; Convolvulaceae, Polygalaceae and Ranunculaceae are represented by 3 species each. Whereas Acanthaceae, Apiaceae, Boraginaceae, Brassicaceae, Cucurbitaceae, Meliaceae, Rhamnaceae, Rosaceae and Vitaceae are represented by 2 species each. The remaining 28 families are represented by 1 species each.

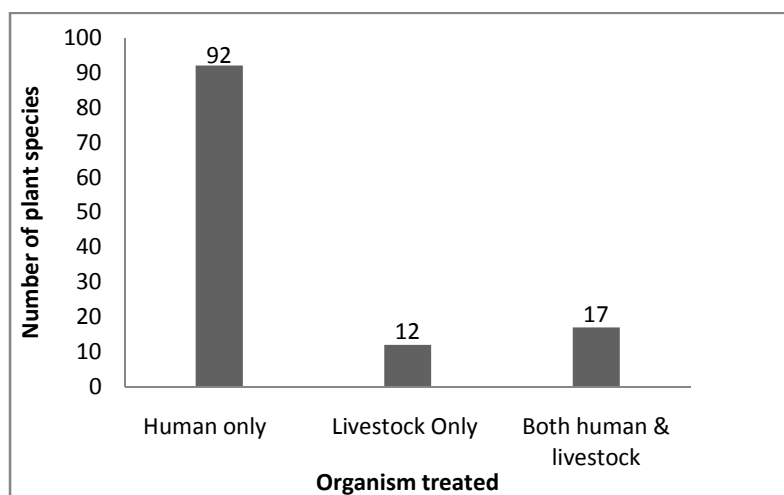


Figure 5 Proportion of medicinal plants used to treat human, livestock and both human and livestock diseases.

Most of the medicinal plant species collected and identified in this study were also medicinally used in other parts of Ethiopia. For example, of the 121 medicinal plants collected from Goma Wereda 47 of them were reported by Etana Tolasa (2007), 36 by Endalew Amenu (2007), 33 by Haile Yineger *et al.* (2008), 33 by Seyoum Getaneh (2009) and 29 by (Fisseha Mesfin, 2007), as medicinally important to cure human and livestock diseases. Such widespread report on the use of these plants by different groups of societies in different areas could be attributed to different cultural groups which could validate the medicinal properties of these species. So, people of Ethiopia over wide area have the tendency to use the same medicinal plants as a result of the wider distribution of medicinal plants in the country and to a certain extent their efficacy.

Of the 121 medicinal plants studied, 75 species were gathered from the wild and 46 species were collected from homegardens. This result indicates that the local communities mostly depend more on medicinal plants collected from the wild habitat than those from the homegardens. But, the activity of cultivating medicinal plants in homegardens is also not bad because the number of medicinal plants obtained in homegarden is also promising. This finding agrees with the general pattern seen in many investigations in Ethiopia in which more medicinal plants are collected from the wild than homegardens (Endalew Amenu, 2007; Etana Tolasa, 2007; Haile Yineger and Delenasaw Yewhalaw, 2007).

Habit

The results of growth form analysis of the reported medicinal plant species reveals that herbs constitute the largest category, with 54 species (44.62%), followed by shrubs 30 species

(24.79%), trees 26 species (21.48%) and climbers 11 (9.09%) species. The dominance of herbs is due to easy availability to local people and their abundance in the area and also, as a result of the existence of coffee plantation in such a way that other habits are easily cut during coffee preparation. The analysis of the data also showed that the majority of medicinal plants in the homegardens are herbs. This finding is in line with most medicinal plant inventories in Ethiopia (Endalew Amenu, 2007; Ermias Lulekal, 2005; Debela Hunde, 2001) in which herbs are the dominant growth form of medicinal plant.

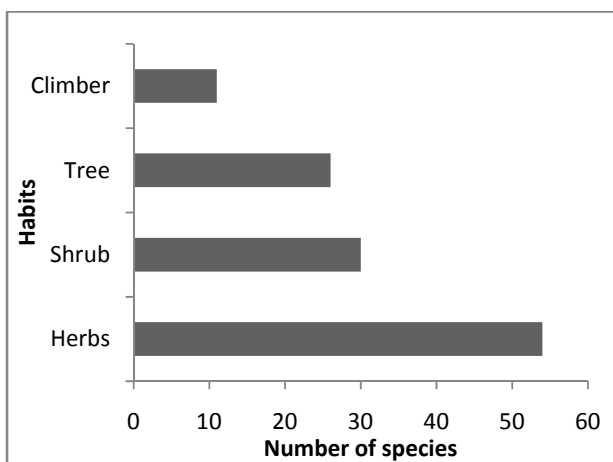


Figure 6 Habits of medicinal plant species in the area.

5.7.1 Distribution of medicinal plants in different plant community types

The distribution of medicinal plants in the visually recognized plant communities is shown in Table 5. From the collected medicinal plants 19.83% of them were obtained from *Albizia gummifera* and *Croton macrostachyus* dominated community type. This is because these species are important as coffee shade and farmers conserve the plants and the area is protected from intervention from human beings as a result large numbers of species are found as shade and fence. The next community types contained 9.91% of the medicinal plants each were the *Vernonia amygdalina* and *Syzygium guineense* and *Sapium ellipticum* and *Maesa lanceolata* dominated community type and the least number of medicinal plants (2.47%) were obtained from *Eucalyptus* plantation as a result of less number of species diversity in this community type which is also frequently harvested by the local people for different purpose.

Table 5 Distribution of medicinal plants in to dominated plant community types

| Community types | Number of medicinal plants | Percent |
|--|----------------------------|---------|
| Homegardens | 46 | 38.01 |
| <i>Albizia gummifera</i> and <i>Croton macrostachyus</i> | 24 | 19.83 |
| <i>Sapium ellipticum</i> and <i>Maesa lanceolata</i> | 12 | 9.91 |
| <i>Vernonia amygdalina</i> and <i>Syzygium guineense</i> | 12 | 9.91 |
| <i>Cordia africana</i> and <i>Ficus vasta</i> | 11 | 9.09 |
| Riverine Vegetation | 8 | 6.61 |
| <i>Ficus sycomorus</i> and <i>Ficus sur</i> | 5 | 4.13 |
| <i>Eucalyptus</i> plantation | 3 | 2.47 |
| Total | 121 | 100 |

5.7.2 Medicinal plants used to treat human diseases

The numbers of ethnomedicinally important plant species that are used to treat human ailments recorded in ten kebeles of Goma Wereda are 92. These plants belong to 80 genera and 44 families. Family Asteraceae contributed 13 species, Lamiaceae 11 species, Fabaceae 7 species, Euphorbiaceae 4 species, Amaranthaceae, Myrtaceae, Polygonaceae, Ranunculaceae, Rutaceae and Solanaceae comprises 3 species each, Acanthaceae, Apiaceae, Brassicaceae, Convolvulaceae and Rosaceae represented by 2 species each and the rest 29 families comprises 1 species each. Some of the medicinal plants recorded are also used as remedies in other parts of Ethiopia. Fisseha Mesfin (2007) documented 30 plant species and 25 plant species are mentioned in Endalew Amenu (2007). The dominance of family Asteraceae for the treatment of human diseases was reported in the work of Endalew Amenu (2007), Seyoum Getaneh (2009) and others. This might be due to their weedy nature of the family Asteraceae and take advantages of disturbance.

5.7.2.1 Sources of medicinal plants

From the medicinal plants that are used for human ailments 46 species were collected from the wild vegetation and 46 species from homegardens. These indicated that the local people obtain medicinal plant species from homegardens and wild vegetation in equal proportion. This contrast

to most investigations in Ethiopia that documented more human medicinal plants harvested in the wild rather than homegarden. This shows on the one hand the people do have a habit of cultivating medicinal plants and on the other side it shows agricultural activity are affecting the wild vegetation and this activity shifted the people to depend on homegardens to obtain medicinal plants. In the interview made with some of the traditional practitioners they move to neighbouring Wereda around Cira forest to collect medicinal plants due to the depletion of medicinal plants in the area.

5.7.2.2 Habits, parts used, method of preparation, route of administration, dosage and application of human medicinal plants.

Habits

This study revealed that medicinal plants used to treat human ailments constitute herbs (47 species), shrubs (22 species), trees (17 species) and climbers (6 species) (Figure 7). This finding shows that the most represented life forms of medicinal plants in the study area are herbs followed by shrubs. This could be due to the fact that naturally there are more herbs than woody plants and woody plants are overused because of their diverse use value. The analysis of the data also showed that the majority of medicinal plants in the homegardens are herbs. It might also indicate that the threats that exist on other growth form particularly trees and shrubs. Similar findings were also reported in earlier works in Ethiopia in which herbs are the dominant growth form for human health treatment (Endalew Amenu, 2007).

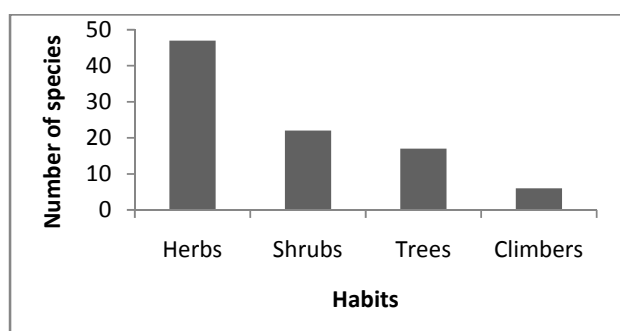


Figure 7 Habits of medicinal plants used for human ailment treatment

Parts used

With regard to the plant parts used for medicinal purposes, different parts of the plants were reported to be used for medicines. The most frequently utilized plant part was leaves (64.58%) of the total record of human medicinal plants preparations followed by roots (14.06%) and seeds (5.72%) (Figure 8). Leaves were the most reported plant parts in the preparation of remedies.

The preference of leaves to other plant parts could be due to ease of preparation and the chemical constituents of leaf for the treatment of diseases. Remedy preparation that involves roots, rhizomes, bulbs, barks, stems or whole plant have effects that pose a lasting danger to the continuity of an individual plant compared to leaves. In this study area, the fear of high threat of medicinal plants due to plant parts used for the purpose of medicine is minimal as leaves were the most harvested plant parts used in the area which has little effect on the survival of mother plant. This finding is in line with the results of other ethnomedicinal studies Endalew Amenu (2007); Etana Tolasa (2007); Haile Yineger and Delenasaw Yewhalaw (2007) who reported that leaves were the most cited plant parts used in remedy preparations.

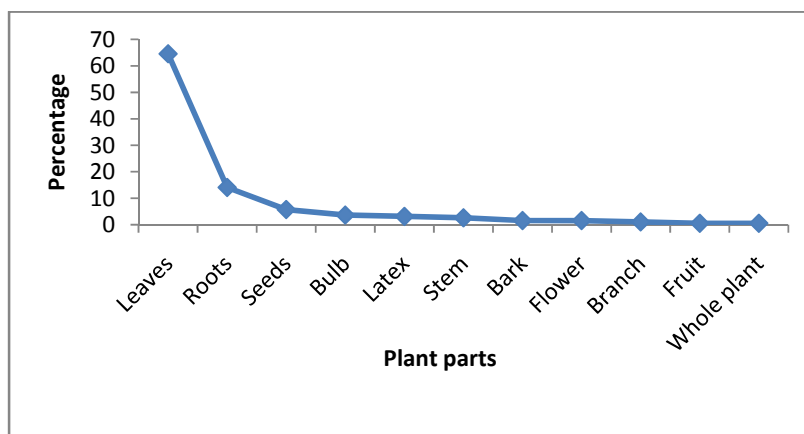


Figure 8 Plant parts used for human ailment treatment.

Method of preparation

Concerning the preparation of medicine for human, the local community employ various methods of preparation of traditional medicines for different types of ailments. The preparations vary based on the type of disease treated and the actual site of the ailment. The principal methods of plant parts remedy preparation forms were reported to be through crushing, which accounts for 26.94%, followed by squeezing (22.79%), burning (7.25%), boiling (6.73%), and squeezing and concoction (6.73%) together, the remaining proportion is accounted for methods like powdering, chewing, harvesting, mixing, cooking, drying, roasting and the combination of each methods (Figure 9).

The informants have various skills associated with remedy preparation. They tend to apply mixing of different plants. The result showed that the majority of remedies were prepared from single plant species and few are prepared from different plant species, which is a combinations of medicinal plants, was used to treat a disease. The result is consistent with the findings of Debel

Hunde (2001) and Etana Tolasa (2007) in which a single plant preparation were reported to be high.

Some of the remedies are taken with different additive substances like honey, sugar, ‘teff’ flour, butter, salt, milk, boiled coffee, tea, water, ‘tella’ and edible oil. These additives have important to minimize discomfort, improve the taste and reduce adverse effects such as vomiting and diarrhea, and enhance the efficacy and healing conditions as explained by informants. Mixing and using some medicinal plants with common foods and drinks might be an easy way for effective treatment.

For example, extracting the oil of *Olea europaea* subsp. *cuspidata* , by boiling on fire and mixing with stem of *Croton macrostachyus* and cooking together, honey is added and half of coffee cup is given. This is recommended for a patient as a cure for asthma.

The result in the conditions of plant part used indicated that 90.76% were used in fresh form and 9.23% in dried forms of preparation. Using of fresh materials that are harvested and used soon minimizes chance of preservation for later use. So, this dependency on fresh materials has thrown the species to serious threat than the dried forms, which can be stored for longer period of time. This might also be attributed to the availability of ethnomedicinal plant species in the area. Preservation of remedies was not reported by healers of the study area since the remedies were used mainly in their fresh forms. This finding is consistent with the finding of Endalew Amenu (2007) which reported that the majority of the remedy preparations were in fresh form.

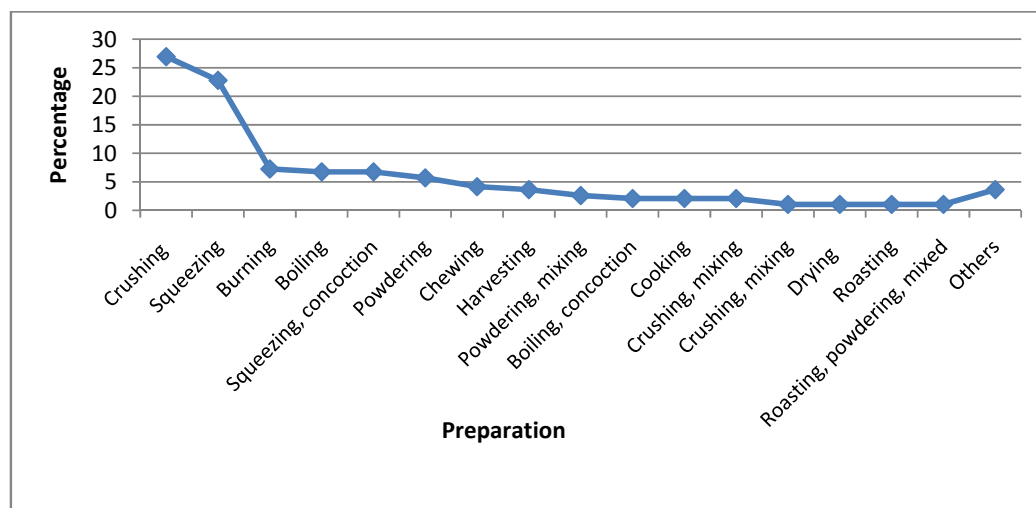


Figure 9 Graph showing ways of preparation of human medicinal plants

Routes of administration

Medicinal plants are applied through different routes of administration. In the study area oral administration is the dominant route with 50.76% of the cases followed by dermal (30.76 %) and nasal (7.17%) and others accounted the remaining percent (Figure 10). Similar results were obtained by Ermias Lulekal (2005), Endalew Amenu (2007), Etana Tolasa (2007), Haile Yiniger and Delenasaw Yewhalaw (2007) and others that indicated oral administration dominates over others routes of administration.

For example, leaves of *Ruta chalepensis* are squeezed and added to syringe up to the level of 1 cubic centimetre (cc) then added drop by drop on the left ear of the patient for 40 days. This is used to cure the person from risky disease known as epilepsy. A root of *Phytolacca dodecandra* is squeezed and 1cc is added in to the urethra of a gonorrhoea patient person by syringe. This is used to cure the person from the disease within five to seven days. Leaves from the red colour type *Catha edulis* are cooked, allowed to stay for an overnight and 1 glass is drunk for 2 - 3 days in the morning by adding small amount of sugar. This is used to cure the patient from gonorrhoea.

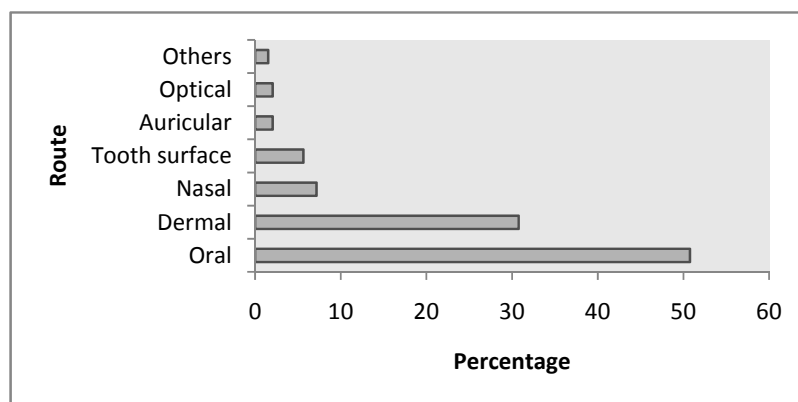


Figure 10 Route of administration of medicinal plants that used for human ailments.

Dosage

The local communities believe the effectiveness of traditional medicine but there is great fear about the amount taken particularly for human medicines which are taken internally. As in various parts of Ethiopia, the knowledge of traditional healers in Goma Wereda, the use of measurement of dosage to treat various diseases was poor. The traditional healers use different measurements for dosage, mostly they use their finger lines and finger nails for the measurement of the amount to be taken and different measuring materials like spoon, coffee cup, tea cup, and glass cups are common for those remedies which are taken orally. But, these measurements are not accurate enough to determine the precise amount. For medicinal plants that are taken topically

they do not have clear cut dosage. Sofowora (1982) and Dawit Abebe (1986) have also discussed lack of precision and standardization as one drawback for the recognition of the traditional healthcare system.

The measurements used to determine the dosages are not standardized and doses given depend on the age, physical appearances and health conditions; that is, children are given less dose than adults, physically strong individual take more dose than weak individual depending on the type of disease. Though such prescription difference was practiced, still the amount prescribed by healers for both children and adults might not conform to the standard prescriptions as in modern medical literature.

According to the discussion made the healers of Goma Wereda never administer treatments that are taken internally to pregnant women, for children below six months of age and people under coma.

The absence of any adverse effects of traditional medicines after administration were also more frequently mentioned by the traditional healers but some of the preparations were reported to have some adverse effects like diarrhea. The traditional healers indicated that they use antidotes for the adverse effects of some traditional medicines like eating cooked teff flour, bath after taking the medicine. For instance, the use of *Croton macrostachyus* for the treatment of gonorrhoea, leaves are powdered, placed on water overnight, filtered and 1 tea glass is taken for two days. During that diarrhea follows, as an antidote the local healers administer the patient to eat cooked teff flour to stop.

Applications

The prepared traditional medicines are applied in a number of methods, drinking account the largest (34.53%), followed by put on (15.97%), eating (10.82%), painting (9.27%), tied and washing accounts 6.7% each and the others dropping, sniffing, smoking, swallowing, brushing account the remaining proportions (Figure 11). Internal ailments were commonly treated by making the patient drink herbal preparations; tooth infection were treated by crushing and put on the remedial plant part on the tooth surface; skin infections such as ringworm were treated by painting herbal preparations on an infected skin.

Some plants do have different applications for different disease types. For example, the leaves of *Drymaria cordata* are covered and rolled seven times with leaves of *Ensete ventricosum* and placed on fire. This preparation will be used for different diseases by diverse application techniques. For instance, putting the leaves on tooth surface is used to cure toothache, to tie on swollen body part is used to cure swelling, sniffing the vapour treat nose smell and headache, to tie on infected body part with cloth is used to treat urine of bat and insect allergy. As a result of these diverse use of the plant the local community call the plant ‘‘Seyidesejel’’/ ‘‘Moti dagalaa’’ which means ‘‘king of plants’’.

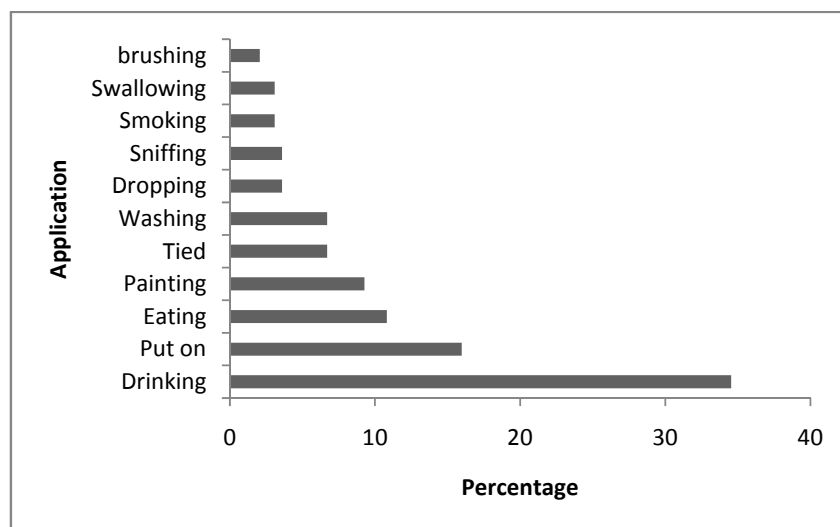


Figure 11 Graph showing ways of application of plant remedies in human ailment treatment

Some informants believed that having *Clerodendrum myricoides* near the house or fence is believed to keep away evil spirits from that area or having a piece of this plant as tooth brush is believed to prevent a person from evil eye. Although these spiritual acts are hard to be explained scientifically, they can give psychological confidence to the users. Some of the informants reported that restrictions are obligatory when patients take certain types of remedies. For instance, a patient who takes remedy against gonorrhoea by *Croton macrostachyus* strictly hides from shadow of humans for a day after medication.

5.7.2.3 Major human diseases and plant species used by local people

Though more than 79 different diseases of humans were recorded as human health problem that are treated by 109 plant species (Table 6), one species can treat a single disease or a number of diseases. The practitioners of the area commonly diagnose each health problem by an interview and visual inspection of the patient. These shows large numbers of diseases have got solution by

traditional medicine in Goma compared to different investigations in Ethiopia. For example, Endalew Amenu (2007) reported 47 human diseases treated by 48 plant species, Etana Tolasa (2007) reported 77 plant species used to treat 49 diseases of humans and Seyoum Getaneh (2009) reported 78 plant species that used to treat 50 diseases of humans.

According to the informants the largest number of species was used to treat toothache, which is treated with 16 species. This disease is common in the area because most people engage in chewing chat as a result their teeth are susceptible to the disease; the next is stomachache and wound each of them is treated by 12 species.

In addition to these, the practitioners were also visited more for diseases like evil eye, fibril illness, insect allergy, spider poison, urine of bat and others. The local community prefer traditional healers for such diseases rather than modern medication.

Table 6 Human diseases and number of plant species used

| Disease treated | Total Species | Percent |
|------------------------|----------------------|----------------|
| Toothache | 16 | 6.25 |
| Stomachache | 12 | 4.68 |
| Wound | 12 | 4.68 |
| Headache | 9 | 3.51 |
| Malaria | 9 | 3.51 |
| Fibril illness | 8 | 3.12 |
| Evil Eye | 7 | 2.73 |
| Gonorrhea | 7 | 2.73 |
| Tonsillitis | 7 | 2.73 |
| Blood clot | 6 | 2.34 |
| Diarrhea | 6 | 2.34 |
| Insect allergy | 6 | 2.34 |
| Rheumatism | 6 | 2.34 |
| Spider poison | 6 | 2.34 |
| Stomach Problem | 6 | 2.34 |
| Eye problem | 5 | 1.95 |
| 'Naqarsaa' | 5 | 1.95 |
| Urine of bat | 5 | 1.95 |
| Ascaries | 4 | 1.56 |
| Gastritis | 4 | 1.56 |
| Poisoning | 4 | 1.56 |
| Liver problem | 4 | 1.56 |
| Tape Worm | 4 | 1.56 |
| Rabies | 4 | 1.95 |
| Nose smell | 4 | 1.95 |
| Amoeba | 3 | 1.17 |

| | | |
|------------------------------|---|------|
| Asthma | 3 | 1.17 |
| Blood pressure | 3 | 1.17 |
| Cough | 3 | 1.17 |
| Ear problem | 3 | 1.17 |
| Glandular swelling | 3 | 1.17 |
| Kidney problem | 3 | 1.17 |
| Nasal bleeding | 3 | 1.17 |
| Snake bite | 3 | 1.17 |
| Stop pregnancy | 3 | 1.17 |
| Swelling | 3 | 1.17 |
| Vomiting | 3 | 1.17 |
| Warts | 3 | 1.17 |
| Skin rash | 3 | 1.17 |
| Common cold | 2 | 0.78 |
| Constipation | 2 | 0.78 |
| Dandruff | 2 | 0.78 |
| Epilepsy | 2 | 0.78 |
| Hemorrhoids | 2 | 0.78 |
| Intestinal parasite | 2 | 0.78 |
| Scabies | 2 | 0.78 |
| Stabbing pain | 2 | 0.78 |
| Tinea versicolor | 2 | 0.78 |
| 'Dhukuba lafaa' | 2 | 0.78 |
| Foot smell | 2 | 0.78 |
| Swelling of leg | 1 | 0.39 |
| 'Allaatii' | 1 | 0.39 |
| Anaemia | 1 | 0.39 |
| 'Hypertension' | 1 | 0.39 |
| Diabetes | 1 | 0.39 |
| Ecto-parasite | 1 | 0.39 |
| Evil spirit | 1 | 0.39 |
| Excessive menstrual bleeding | 1 | 0.39 |
| Fire Burn | 1 | 0.39 |
| Heart failer | 1 | 0.39 |
| Heart problem | 1 | 0.39 |
| Influenza | 1 | 0.39 |
| Insect bite | 1 | 0.39 |
| Madness | 1 | 0.39 |
| Male sexual impotency | 1 | 0.39 |
| Mouth smell | 1 | 0.39 |
| Mouth sore | 1 | 0.39 |
| Pancreatic problem | 1 | 0.39 |
| Ringworm | 1 | 0.39 |
| 'Harqansu' | 1 | 0.39 |
| Snake breath | 1 | 0.39 |
| Snef of faeces | 1 | 0.39 |

| | | |
|-------------------------|---|------|
| STDs | 1 | 0.39 |
| Swelling of leg | 1 | 0.39 |
| Tetanus | 1 | 0.39 |
| Weight loss of children | 1 | 0.39 |
| 'Xooroo' | 1 | 0.39 |

5.7.3 Medicinal plants used to treat livestock health problems

Medicinal plants that are collected and identified in the study area that are used for livestock health problems are 12 species. They are grouped in 10 genera and 10 families. Family Solanaceae and Vitaceae comprise 2 species each and Asteraceae, Bignoniaceae, Dracaenaceae, Euphorbiaceae, Fabaceae, Myrtaceae, Poaceae and Rhamnaceae comprise 1 species each. 10 species are obtained from the wild and 2 species from homegardens. More species for livestock treatment have obtained from the wild. This shows that the practice of local community is less for cultivating livestock remedies in homegardens.

As most informants agree even though the areas do have high number of livestock population the local people do have low knowledge of ethnoveterinary important medicinal plants compared to human treatment. Mostly they use clinics for the treatment of their livestock.

5.7.3.1 Habits, parts used, method of preparations, route of administration and application of livestock medicinal plants

Habits

The habits of medicinal plants that are used for ethnoveterinary health problem are trees comprises 5 species, herbs 3 species, climbers 3 species and shrubs 1 species (Figure 12). In this study trees like *Dracaena steudneri*, *Albizia schimperiana*, *Euphorbia abyssinica*, *Stereospermum kunthianum* and *Syzygium guineense*; shrub like *Solanum dasyphyllum* and herb species like *Pennisetum thunbergii*, *Solanum anguivi*, and *Tagetes minuta* as well as from climbers *Helinus mystacinus*, *Cyphostemma cyphopetalum* and *Cyphostemma adenocaulum* were used for the treatment of only livestock ailments in the study area. This finding agrees with the work of Endalew Amenu (2007) in which trees are the dominant habits for the treatment of livestock ailments. This indicates unlike that of human medicine the local community use more tree species for livestock health treatment.

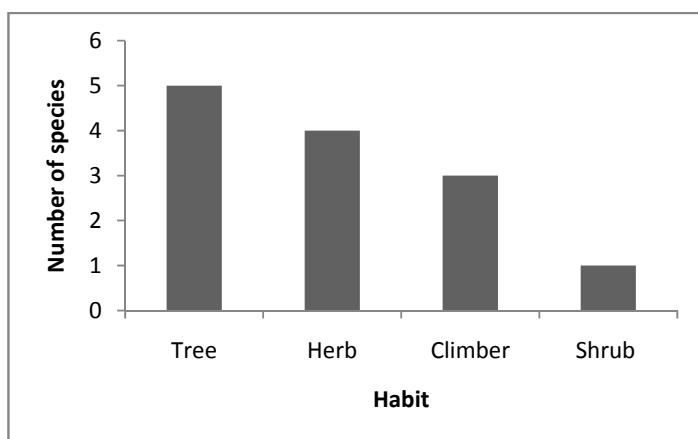


Figure 12 Distribution of habits of medicinal plants used for livestock health treatment.

Plant parts

The plant parts used for livestock health treatment in the area are leaves 57.14%, bark 14.28%, seed and root together accounts 14.28%, whole plant 7.14%, only root 7.14% (Figure 13). Like that of human medicine leaves again the most harvested plant part of remedy preparation for livestock ailments. This disagree with the report of Endalew Amenu (2007) in which roots are the major plant part used for livestock remedy preparation followed by leaf.

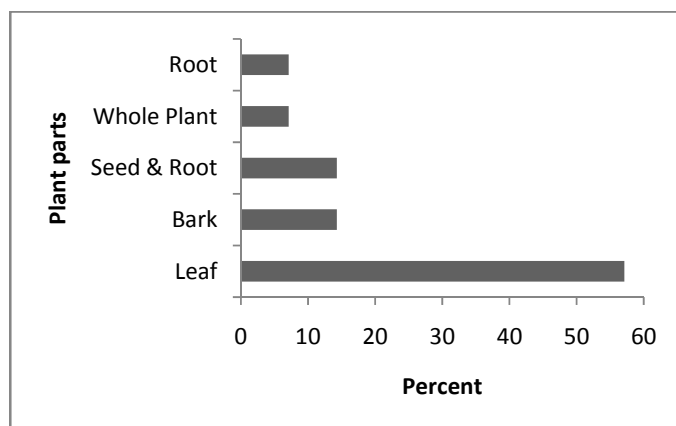


Figure 13 Percentage of medicinal plant parts used for livestock health treatment

Method of preparations and route of administration

The local people use different forms of remedy preparations and applications to treat livestock diseases. The technique of preparations used involved squeezing, crushing, squeezing followed by concoction and crushing followed by concoction and harvesting. For instance, the leaves of *Dracaena steudneri* is crushed with root of *Ricinus communis* and leaves of *Senna didymobotrya* then mixed with 1 litre of boiled water and given to cattle. This concoction result is used to treat the common disease in the area known as black leg (locally known as ‘sinch’). Fumigating the

leaves of *Euphorbia abyssinica* to cattle is used to relief the animal from a disease known as rinderpest.

Based on the nature of the ailment the remedies were applied through different routes. Oral application of remedies was found the highest (56.25%), followed by nasal (25%) and dermal application (18.75%) (Figure 14). This finding agrees with the work of Teshale Sori *et al.* (2004) and Endalew Amenu (2007) which reported that oral administration is the most common route of administration.

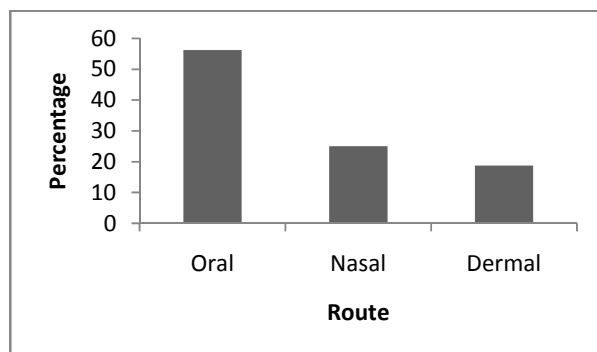


Figure 14 Percentage of route of medicinal plants administration for livestock ailments

Application

Application of ethnoveterinary medicinal plants involves drinking (56.25%), smoking (18.75%), put on (12.5%), dropping (6.25%) and tied (6.25%) (Figure 15). For example, if leaves of *Stereospermum kunthianum* squeezed with leaves of *Asparagus africanus* and the squeezed sap is given orally to cattle it can cure the animal from the poisonous snake bite. Crushing and adding the seeds of *Solanum anguivi* to the dermal of cattle will kill parasitic ticks that are found in the body of the animal

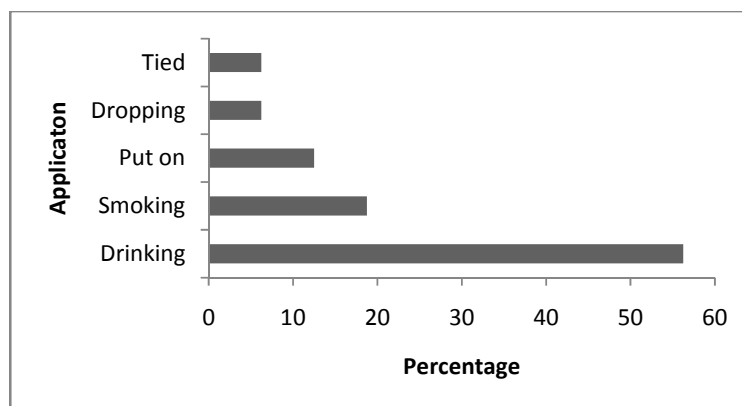


Figure 15 Application of livestock medicinal plants

5.7.3.2 Major livestock diseases and number of plant species used by local people

In comparison to human diseases livestock diseases are treated with a few number of plant species in the study area. A total of 25 livestock ailments were identified that are treated by traditional medicinal plants in the area. Common diseases affecting livestock health's in the study area are wound which is treated by 6 species. black leg by 5 species, blotting and stomachache by 3 species each, common cold, cough, eye problem, rabies and weight loss are treated by 2 species each and the remaining disease are treated by 1 species each (Table 7). This finding related with the work of Endalew Amenu (2007) that reported 27 livestock problems.

Table 7 Common diseases of livestock and number of species used.

| Disease treated | Total species | Percent |
|------------------------|---------------|---------|
| Wound | 6 | 33.33 |
| Black leg | 5 | 27.77 |
| Blotting | 3 | 16.66 |
| Stomachache | 3 | 16.66 |
| Common cold | 2 | 11.11 |
| Cough | 2 | 11.11 |
| Eye problem | 2 | 11.11 |
| Rabies | 2 | 11.11 |
| Weight loss | 2 | 11.11 |
| Ecto-parasite | 2 | 11.11 |
| Mastitis | 1 | 5.55 |
| Rinderpest | 1 | 5.55 |
| 'Dhora jabbii' | 1 | 5.55 |
| Evil eye | 1 | 5.55 |
| eye cataract | 1 | 5.55 |
| 'Goloba' | 1 | 5.55 |
| Infection | 1 | 5.55 |
| Internal parasite | 1 | 5.55 |
| Leeches | 1 | 5.55 |
| Malaria of mule | 1 | 5.55 |
| Pancreatic problem | 1 | 5.55 |
| Poisoning | 1 | 5.55 |
| Shivering of livestock | 1 | 5.55 |
| Snake bite | 1 | 5.55 |
| Ticks | 1 | 5.55 |

The local people use different species for the treatment of wound that require simple techniques of preparation. For example, the bark of *Albizia schimperiana* is crushed with bark of *Erythrina brucei* and added on the area. Or painting the latex of *Croton macrostachyus* on the area is used

to cure wound. They use also crushed root of *Ipomoea cairica* or leaves of *Datura stramonium* for the disease.

5.7.4 Medicinal plant species used to treat both livestock and human ailments

Medicinal plants recorded for the treatment of human and livestock in the study area are 17 species. These are distributed in 16 genera and 10 families. Family Fabaceae comprises 4 species, Solanaceae 3 species, Amaranthaceae 2 species, Euphorbiaceae 2 species; the others Boraginaceae, Convolvulaceae, Cucurbitaceae, Lamiaceae, Meliaceae and Rutaceae comprise 1 species each. The sources of these species are 13 species are from the wild vegetation and 4 species are from homegarden. This result agrees with the work of Endalew Amenu (2007), in which the wild sources of plants for the treatment of livestock and human ailments are took the lead.

5.7.4.1 Habits, parts used, method of preparation, route of administration and application

The habits of medicinal plants that are harvested for the treatment of human and livestock ailments are shrubs 7 species, herbs 5 species, trees 4 species and climbers 2 species (Figure 16). This agrees with the work of Endalew Amenu (2007) in which shrubs take the lead.

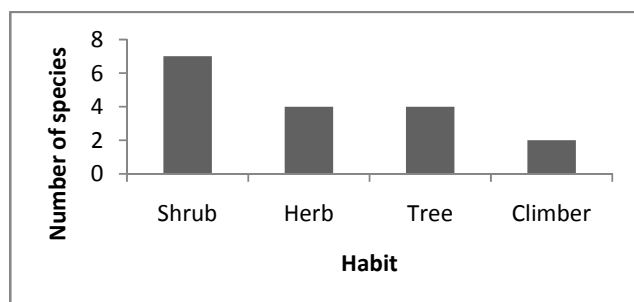


Figure 16 Habits of medicinal plants that used for both human and livestock treatment.

The parts of a plant used for remedy preparation of human and livestock ailments are leaves stood first (57.47%), followed by root (12.64%), stem accounted for 10.34%, seeds 10.34% of preparation, latex 4.59%, bark 3.44% and branch take 1.14% of the preparations.

The local community use different forms of remedy preparations and applications to treat livestock diseases. The common forms of preparations are squeezing (32.58%), crushing (13.48%), powdering (8.98%), harvesting (7.86%), chewing (6.74%), crushing and concoction (5.61%) and others (Table 8).

Table 8 Ways of preparations of human and livestock medicinal plants

| Preparation | Number | Percent |
|-------------------------------------|--------|---------|
| Squeezing | 29 | 32.58 |
| Crushing | 12 | 13.48 |
| powdering | 8 | 8.98 |
| Harvesting | 7 | 7.86 |
| Chewing | 6 | 6.74 |
| Crushing and concoction | 5 | 5.61 |
| Burning | 3 | 3.37 |
| Crushing and mixing | 3 | 3.37 |
| Boiling | 2 | 2.24 |
| Cooking | 2 | 2.24 |
| Squeezing and concoction | 2 | 2.24 |
| Boiling and mixing | 1 | 1.12 |
| Filtering | 1 | 1.12 |
| Homogenising in water | 1 | 1.12 |
| Mixing and boiling | 1 | 1.12 |
| Powdering and homogenising in water | 1 | 1.12 |
| Mixing and boiling | 1 | 1.12 |
| Powdering and mixing | 1 | 1.12 |
| Powdering and concoction | 1 | 1.12 |
| Squeezing and mixing | 1 | 1.12 |

In all of the cases, oral application is the dominant route that accounted for 55.17%, followed by dermal that accounted 26.43%, nasal and tooth surface take 6.89% each, optical 2.29%, auricular and neck each route take 1.14% for administration of plant remedies.

The medicinal plants have different application techniques the major ones are drinking take 37.93%, painting 12.64%, eating 9.19%, put on 9.19%, swallowing 6.89%, and others like

washing, dropping, Sniffing, tied, brushing, smoking take the remaining percent. This result agrees with the work of Endalew Amenu (2007), in terms of the habits, plant parts used, route of administration and method of application.

5.8 Informant Consensus

The results of this study showed that some medicinal plants are popular than others, in this study the highest informant consensus goes to *Ocimum lamiifolium* which is cited by 89 informants (Table 9). The popularity of this medicinal plant is due to the preference of the species for treating fibrile illness in the community rather than going to modern medication for the disease and its easy access in the homegardens of many people. *Croton macrostachyus* is cited by 60 informants, 58 informants cited *Allium sativum* species and *Vernonia* species by 58 informants for the treatment of wound, *Ruta chalepensis* by 55 and *Vernonia amygdalina* cited by 39 informants for treating different health problems. Popularity of these medicinal plants is due to the access of occurrence of the disease is high as a result everybody should have got a chance to see the treatment and as a result the secrecy become low.

Table 9 List of Medicinal plants and the corresponding informants (Percentage ≥ 10)

| Scientific Name | No. of informants | % of informants |
|--------------------------------|-------------------|-----------------|
| <i>Ocimum lamiifolium</i> | 89 | 89 |
| <i>Croton macrostachyus</i> | 70 | 70 |
| <i>Allium sativum</i> | 58 | 58 |
| <i>Vernonia</i> species | 58 | 58 |
| <i>Ruta chalepensis</i> | 40 | 40 |
| <i>Vernonia amygdalina</i> | 39 | 39 |
| <i>Trichilia dregeana</i> | 35 | 35 |
| <i>Artemisia abyssinica</i> | 34 | 34 |
| <i>Citrus limon</i> | 34 | 34 |
| <i>Rumex nepalensis</i> | 34 | 34 |
| <i>Artemisia afra</i> | 33 | 33 |
| <i>Foeniculum vulgare.</i> | 33 | 33 |
| <i>Lepidium sativum</i> | 33 | 33 |
| <i>Withania somnifera</i> | 33 | 33 |
| <i>Eucalyptus globulus</i> | 32 | 32 |
| <i>Brucea antidysenterica</i> | 30 | 30 |
| <i>Drymaria cordata</i> | 30 | 30 |
| <i>Clerodendrum myricoides</i> | 29 | 29 |
| <i>Solanecio angulatus</i> | 29 | 29 |
| <i>Coffea arabica</i> | 28 | 28 |

| | | |
|--|----|----|
| <i>Verbena officinalis</i> | 28 | 28 |
| <i>Ajuga integrifolia</i> | 26 | 26 |
| <i>Calpurnia aurea</i> | 26 | 26 |
| <i>Phytolacca dodecandra</i> | 25 | 25 |
| <i>Carica papaya</i> | 23 | 23 |
| <i>Clematis hirsuta</i> | 23 | 23 |
| <i>Nicotiana tobaccum</i> | 23 | 23 |
| <i>Thymus schimperi</i> | 23 | 23 |
| <i>Datura stramonium</i> | 22 | 22 |
| <i>Olea europaea</i> subsp. <i>cuspidata</i> | 22 | 22 |
| <i>Celosia trigyna</i> | 21 | 21 |
| <i>Rumex abyssinicus</i> | 21 | 21 |
| <i>Kalanchoe petitiata</i> | 21 | 21 |
| <i>Justicia diclipteroides</i> | 20 | 20 |
| <i>Ricinus communis</i> | 20 | 20 |
| <i>Acmella caulirhiza</i> | 19 | 19 |
| <i>Lawsonia inermis</i> | 19 | 19 |
| <i>Plantago lanceolata</i> | 19 | 19 |
| <i>Pycnostachys abyssinica</i> | 19 | 19 |
| <i>Asparagus africanus</i> | 18 | 18 |
| <i>Justicia schimperiana</i> | 18 | 18 |
| <i>Cordia africana</i> | 17 | 17 |
| <i>Ocimum basilicum</i> | 16 | 16 |
| <i>Senna petersiana</i> | 16 | 16 |
| <i>Achyranthes aspera</i> | 15 | 15 |
| <i>Albizia gummifera</i> | 15 | 15 |
| <i>Maesa lanceolata</i> | 15 | 15 |
| <i>Aloe kefaensis</i> | 14 | 14 |
| <i>Ananas comosus</i> | 11 | 11 |
| <i>Buddleja polystachya</i> | 11 | 11 |
| <i>Caylusea abyssinica</i> | 11 | 11 |
| <i>Catha edulis</i> | 10 | 10 |
| <i>Erythrina brucei</i> | 10 | 10 |
| <i>Laggera crispata</i> | 10 | 10 |
| <i>Ocimum gratissimum</i> | 10 | 10 |
| <i>Sonchus asper</i> | 10 | 10 |

Informant consensus factor (ICF)

The diseases of the study area have grouped in to different categories based on the site of occurrence of the disease, condition of the disease as well as treatment resemblance of the disease

to the local people. The informant consensus factors have been calculated for each category (Table 10). In this study, the informant consensus of medicinal plant usage resulted in ICF ranging from 0.675 to 0.907 per illness category. 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.

Table 10 Informant consensus factor by categories of diseases in the study area

| Category | Species | Use citation | ICF |
|--|---------|--------------|-------|
| Rheumatism and stabbing pain | 8 | 77 | 0.907 |
| Evil eye and evil spirit | 8 | 77 | 0.907 |
| Asthma, Common cold, Cough, Influenza | 9 | 83 | 0.902 |
| Blood clot, Excessive menstrual bleeding, Nasal bleeding | 10 | 92 | 0.901 |
| Fibrile illness and Headache | 17 | 160 | 0.899 |
| Amoeba and Diarrhea | 9 | 71 | 0.885 |
| Epilepsy and Madness | 3 | 18 | 0.882 |
| Rabies, Snake bite | 6 | 41 | 0.875 |
| Gastritis, Stomachache, Constipation, Vomiting | 22 | 156 | 0.864 |
| Kidney Problem, Liver problem, Pancreatic Problem | 8 | 46 | 0.844 |
| STDs | 8 | 44 | 0.837 |
| Fire burn, Wound, Mouth sore, Tonsillitis, Toothache | 38 | 219 | 0.830 |
| Swelling | 8 | 42 | 0.829 |
| Ringworm, Scabies, Skin rash, Tinea versicolor | 9 | 47 | 0.826 |
| Ascaries and Tape Worm | 8 | 36 | 0.800 |
| Insect allergy, Spider poison, Urine of bat | 17 | 69 | 0.764 |
| Eye problem, Ear problem, Nose smell, Mouth smell | 13 | 38 | 0.675 |

As the table shows the following two categories: rheumatism and stabbing pain; evil eye and evil spirit categories each have scored the highest informant consensus factor of 0.907 followed by Asthma, common cold, cough, influenza category and blood clot, excessive menstrual bleeding, nasal bleeding category each have scored an informant consensus factor of 0.902. A high ICF value (close to 1) indicates that the informants use relatively few taxa to manage specific disease conditions as well as consistency in the use of plant species, while a low value indicates that the informants disagree on the taxa to be used in the treatment within a category of illness. The lower informant consensus factor (0.675) in this study scored for the category of diseases like eye, ear,

nose and mouth problems. This category may be indicative for lack of consistency in the use of plant species in the study area.

5.9 Preference Ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of 7 medicinal plants that were reported for treating tonsillitis was conducted after selecting 10 key informants. The informants were asked to compare the given medicinal plants based on their efficacy, and to give the highest number (7) for the medicinal plant which they thought most effective in treating tonsillitis and the lowest number (1) for the least effective plant in treating tonsillitis (Table 11).

Table 11 Preference ranking of medicinal plants used for treating tonsillitis

| Informants Labelled 1-10 | Medicinal Plants | | | | | | |
|-----------------------------|-------------------------------|------------------------------|-----------------------------------|-----------------------------|-----------------------------|------------------------------|----------------------------|
| | <i>Acmella caulirhiza</i> | <i>Albizia gummifera</i> | <i>Dioscorea praehensilis</i> | <i>Erythrina brucei</i> | <i>Ricinus communis</i> | <i>Rhamnus prinoides</i> | <i>Solanum incanum</i> |
| I ₁ | 7 | 2 | 3 | 5 | 6 | 4 | 1 |
| I ₂ | 5 | 1 | 4 | 1 | 3 | 2 | 6 |
| I ₃ | 6 | 2 | 1 | 4 | 3 | 7 | 5 |
| I ₄ | 7 | 4 | 2 | 5 | 1 | 3 | 6 |
| I ₅ | 6 | 1 | 7 | 5 | 3 | 2 | 4 |
| I ₆ | 7 | 1 | 4 | 6 | 3 | 2 | 5 |
| I ₇ | 6 | 2 | 3 | 5 | 4 | 1 | 7 |
| I ₈ | 7 | 3 | 2 | 5 | 1 | 4 | 6 |
| I ₉ | 7 | 4 | 3 | 6 | 2 | 1 | 5 |
| I ₁₀ | 6 | 4 | 3 | 5 | 1 | 2 | 7 |
| Total | 64 | 24 | 32 | 47 | 27 | 28 | 52 |
| Rank | 1 st | 7 th | 4 th | 3 rd | 6 th | 5 th | 2 nd |

As indicated in the table preference ranking for seven medicinal plants used to treat tonsillitis shown that *Acmella caulirhiza* ranked first and hence is the most effective medicinal plant to cure tonsillitis. Ethnobotanical investigations done elsewhere in Ethiopia also reported that *Acmella caulirhiza* was used for treatment of tonsillitis (Endalew Amenu, 2007). The second, third, fourth and fifth most preferable medicinal plants against this disease are *Solanum incanum*, *Erythrina*

brucei, *Dioscorea praehensilis* and *Rhamnus prinoides* respectively, while the least preferable species compared to other five species are *Ricinus communis* and *Albizia gummifera* according to informants.

5.10 Paired Comparison

For medicinal plants that were identified by the informants to be used in treating insect allergy ('Hadha'), disease that develop when the larva of an insect touches human body, which was the most common disease for which patients visited the traditional medicinal practitioners rather than modern clinics. A pair wise comparison was made among five of them (Table 12).

Seven key informants did the pair comparison of five medicinal plants and the value is summarized. It was found that *Indigofera spicata* species stood first for the treatment of insect allergy and *Drymaria cordata*, *Ipomoea tenuirostris* and *Withania somnifera* will be 2nd, 3rd, and 4th respectively. *Kalanchoe petitiiana* was the least preferred species to treat the disease in the area. This rank is because of the efficacy of the plant at least in the context of local people.

Table 12 Paired comparison of medicinal plant species used to treat insect allergy

| Medicinal plants | Informants labelled 1 to 7 | | | | | | | Total | Rank |
|-----------------------------|----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|-------|-----------------|
| | I ₁ | I ₂ | I ₃ | I ₄ | I ₅ | I ₆ | I ₇ | | |
| <i>Drymaria cordata</i> | 3 | 2 | 3 | 3 | 4 | 2 | 2 | 19 | 2 nd |
| <i>Indigofera spicata</i> | 4 | 3 | 2 | 3 | 2 | 2 | 4 | 20 | 1 st |
| <i>Ipomoea tenuirostris</i> | 2 | 3 | 3 | 2 | 3 | 1 | 2 | 16 | 3 rd |
| <i>Kalanchoe petitiiana</i> | 1 | 0 | 1 | 0 | 1 | 3 | 3 | 9 | 4 th |
| <i>Withania somnifera</i> | 0 | 2 | 1 | 2 | 0 | 2 | 0 | 7 | 5 th |

5.11 Direct Matrix Ranking

In the study area the majority of the community relies on wild plants for various purposes such as charcoal, construction, fencing, firewood, forage, furniture making, medicinal, etc. To assess the relative importance and to check the major impact on such plants direct matrix ranking was preformed (Table 13). In the area a number of medicinal plants were found to be multipurpose species being utilized for a variety of uses. It was found that 70 species (43.04%) of medicinal plants have values other than their medicinal role.

Six commonly reported multipurpose species and seven use-categories were involved in direct matrix ranking with four informants. Respondents evaluate their relative importance to the local people and the extent of the existing threats related to their use values. The values for use reports across the selected species were summed up and ranked.

As table 13 shows, the results of the direct matrix ranking revealed that *Cordia africana* ranked first and hence it is the most preferred plant by local people for various uses and is the most threatened species as the informants reported, which is evidently shown by its scarce distribution in the area except in some protected coffee forests. This scarcity of *Cordia africana* is due to over harvesting for not only medicinal but also for other uses particularly for timber production. *Maesa lanceolata* ranked second, *Trichilia dregeana* ranked as third, *Syzygium guineense* obtained fourth place, *Premna schimperii* placed on fifth place and *Croton macrostachyus* got the last sixth place. So, the top ranked species are highly threatened that is there is high rate of loss of *Cordia africana* in the area. Even though the rank is given, all of the species particularly the top ranked ones are in the long-term their survival are under question, because as the livelihood of some people in the society depends on these species.

Table 13 Direct matrix ranking of six plant species by four informants based on seven use criteria (5 = best; 4 = Very good; 3 = good; 2 = less used; 1 = least used and 0 = no value)

| Use-categories | Medicinal Plants | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|--------------------------------|----|----|----|------------------------|----|----|----|-------------------------|----|----|----|-------------------------|----|----|----|---------------------------|----|----|----|---------------------------|----|----|----|
| | <i>Croton macrostachyus</i> | | | | <i>Cordia africana</i> | | | | <i>Maesa lanceolata</i> | | | | <i>Premna schimperi</i> | | | | <i>Trichilia dregeana</i> | | | | <i>Syzygium guineense</i> | | | |
| | Informants (I ₁₋₄) | | | | I | | | | I | | | | I | | | | I | | | | | | | |
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Charcoal | 2 | 3 | 2 | 1 | 4 | 4 | 5 | 3 | 3 | 5 | 2 | 2 | 2 | 2 | 3 | 1 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 5 |
| Fire wood | 3 | 4 | 5 | 3 | 4 | 3 | 3 | 4 | 5 | 4 | 3 | 2 | 2 | 1 | 3 | 2 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 3 |
| Construction | 3 | 4 | 2 | 3 | 5 | 5 | 5 | 5 | 3 | 3 | 2 | 4 | 3 | 4 | 3 | 3 | 4 | 3 | 4 | 5 | 2 | 1 | 1 | 2 |
| Fencing | 2 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 3 | 2 | 3 | 4 | 5 | 4 | 3 |
| Medicinal | 5 | 5 | 5 | 5 | 3 | 4 | 3 | 2 | 4 | 4 | 5 | 4 | 4 | 5 | 3 | 4 | 5 | 5 | 5 | 5 | 3 | 4 | 2 | 3 |
| Furniture | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 3 |
| Fodder | 2 | 1 | 1 | 1 | 3 | 3 | 4 | 2 | 4 | 3 | 5 | 4 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 1 | 5 | 5 | 5 | 4 |
| Ind. total | 18 | 20 | 19 | 15 | 29 | 29 | 30 | 26 | 25 | 25 | 24 | 22 | 19 | 21 | 20 | 19 | 24 | 22 | 25 | 24 | 24 | 24 | 22 | 23 |
| Grand total | 72 | | | | 114 | | | | 96 | | | | 79 | | | | 95 | | | | 93 | | | |
| Rank | 6 th | | | | 1 st | | | | 2 nd | | | | 5 th | | | | 3 rd | | | | 4 th | | | |

5.12 Jaccard Coefficient of Similarity

The results of the comparison by using Jaccard coefficient of similarity indicated that the highest degree of similarity was observed with the study conducted in Gimbi Wereda (29.5%) followed by Southwest Oromo (21.2%) followed by Cheliya Wereda (20.6%), then Wonago Wereda (19.3%) and finally with Debre Libanos Wereda (18.5%) (Table 14).

Table 14 The Jaccard coefficient of similarity of Goma Wereda with five other areas with respect to medicinal plant composition.

| Author and sample area | a | b | c | %JCS |
|---|----------|----------|----------|-------------|
| Goma Wereda | 121 | - | - | |
| Etana Tolasa (2007)/ Gimbi Wereda | 85 | 38 | 47 | 29.5 |
| Endalew Amenu (2007)/ Chelya Wereda | 89 | 53 | 36 | 20.6 |
| Haile Yineger <i>et al.</i> , (2008)/ Southwest Oromo | 67 | 34 | 33 | 21.2 |
| Siyoum Getaneh (2009)/ Derbre Libanos Wereda | 90 | 57 | 33 | 18.5 |
| Fisseha Mesfin (2007)/ Wonago Wereda | 58 | 29 | 29 | 19.3 |

The highest degree of similarity is observed with Gimbi, Southwest Oromo and Cheliya Wereda. This may probably due to socio-cultural factors that could contribute to the medicinal plant knowledge base of people. There is also nearness to each other of the study area that might contribute to higher degree of cultural influx. The lowest degree of similarity is observed in Debre Libanose Wereda this might be due to vegetation difference of the two study areas and cultural difference of the two groups of people.

6. THREATS AND CONSERVATION PRACTICES TO MEDICINAL PLANTS

People need plants for their daily life activity. In Goma Wereda from the interview of informants, various factors were recorded as the main threats for medicinal plants in the area. There is loss of plants as a result of agricultural encroachment, firewood, charcoal, timber, construction material are contributing factors for the loss of plant species in general and medicinal plants in particular. During field observation there is high rate of reduction of species is observed particularly for those plants which are not suitable for coffee shade. That is, most naturally grown plant species have been removed if it is less significant for coffee shade. In addition, problems related to the high mortality of a popular coffee shade tree (*Albizia gummifera*) death have also been observed in some places. *A. gummifera* is a famous shade tree in Goma, but the problem of its death is an issue which needs some attention. This requires identifying the causes of its death and trying to solve it in collaboration with extension and research system and farmers in the Wereda.

According to the traditional healers, nowadays searching of medicinal plants require long time and moving long distance even going to neighbouring Wereda to collect the plants. Even some healers have started to grow some medicinal plants in the coffee plant as a fence and in their homegarden as a result of scarcity of plants in the wild.

According to informants' response the most mentioned threats to medicinal plants of the study area are agricultural expansion (90%), fire wood (55%), charcoal production (45%), timber production (15%) and construction (15%) (Figure 17). Similar results were obtained in different investigation in Ethiopia Endalew Amenu (2007) showed that need for agricultural land and population pressure severely threatened plant species in general and medicinal plants in particular.

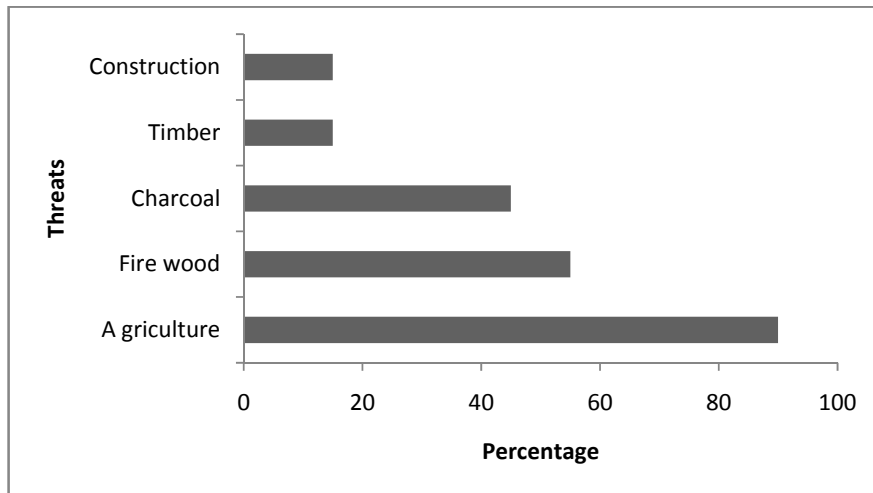


Figure 17 Percentages of reported threats to medicinal plants

According to Sofowara (1982) the loss of medicinal plants associates with the missing advantages gained from medicinal plants and indigenous knowledge associated with plants. Some of the traditional healers might have given much attention to the indigenous knowledge transfer while others have little concern regarding the value of indigenous knowledge. In general, the knowledge on medicinal plants become lesser and lesser due to its secrecy, unwillingness of young generation to gain the knowledge, oral based knowledge transfer, unavailability of the species, influence of modern education and awareness factors which all results in gradual loss of indigenous knowledge on medicinal plants in the area.

A remarkable traditional medicinal plant knowledge and practice was documented from the study area. Older traditional healers had greater knowledge and use of ethnomedicinal plant species than younger traditional healers. The average age of the traditional healers was 57.12 years. The fact that 70.83% of the healers were aged above 50 years implies that the legacy of the use of traditional medicines to manage diseases is in danger of being permanently lost if quick efforts are not exerted to document this invaluable knowledge. As a result, the community suffered an important erosion of ethnomedicinal plant knowledge. It is a fact that as traditional healers who value traditional knowledge are becoming very old, the indigenous medicinal plants use knowledge was declining among the younger generation, which could be attributed to the low interest of the younger generation to inherit and use ethnomedicinal knowledge.

Ethnomedicinal knowledge diminishes with the death of elderly knowledgeable person. A key informant from one of the study site Keso-heti with an age of 70 said “I will tell my knowledge

of medicinal plants to my child at the time when I die.” This saying indicates that there is poor ways of transferring knowledge on medicinal plants. Depending on the age of the healers passing the knowledge of numerous species of ethnomedicinal plants use, management and ways of preparation are threatened. Old aged healers provide the knowledge with doubtful accuracy to the learners. Results also revealed that many of the traditional healers reported to transfer their knowledge and use of ethnomedicinal plants orally to their favourite family member. Such transfer of indigenous knowledge is liable to erosion as it could vanish when knowledgeable elders die before the knowledge is transferred. So, apart from its effect on plants human thinking by itself is great threat to medicinal plants.

The practitioners know the importance of conserving medicinal plants; homegardens are good places for conservation of medicinal plants and for better transfer of the indigenous knowledge to the younger generation. Some traditional practitioners have started to conserve medicinal plants by cultivating at homegardens. About 38%, of the medicinal plants collected were reported as found cultivated at homegardens (Appendix 5). The local community manage vegetation of the area for their medicinal attributes. Some healers of Goma Wereda grow medicinal plants with coffee plantation and in homegardens as well as a fence in coffee plantation and resident place. This paves a way for knowledge on medicinal plants to pass from generation to generation.

Moreover, significant number of plant species (11) reported as endemic to Ethiopia thereby recorded in the IUCN Red List was also recorded in the study area. These species are *Aloe kefaensis*, *Cirsium englerianum*, *Cynoglossum densefoliatum*, *Erythrina brucei*, *Impatiens rothii*, *Kalanchoe petitiana*, *Leucas stachydiformis*, *Millettia ferruginea*, *Pycnostachys abyssinica*, *Thymus schimperi* and *Vernonia leopoldi*. Therefore, there are a considerable number of endemic plant species recorded in the study area and that more and more endemic species might be recorded if detailed botanical studies are undertaken throughout the area.

7. CONCLUSION

Goma Wereda is relatively rich in medicinal plant diversity. One hundred twenty one medicinal plants were recorded of which 92 species were noted to treat human ailments while, 12 species are documented to treat livestock ailments and 17 species are used to treat both livestock and human ailments. The medicinal plant species collected and identified were 75 species from the wild vegetation and 46 species are from homegardens. There are locally preferable treatments by traditional healers for some diseases in the area like evil eye, fibrile illness, evil spirit, insect allergy, spider poison and urine of bat rather than modern clinics.

In the study area, 102 ailments were reported (77 for human and 25 for livestock) which are being treated by traditional medicinal plants of the area. Herbs were found the dominant habits used for preparation of traditional remedies followed by shrubs and trees. Leaves were also found to be the most frequently used plant parts followed by roots for preparation of human and livestock remedies. Traditional medicine preparation mostly involves single plant; the mode of administration is mainly internal in which oral administration is the common route.

The main threat for medicinal plants in the area arises from agricultural expansion, firewood, charcoal production, timber production and construction. Threat comes to medicinal plants due to the utilization of these plants for medicinal purpose is negligible. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, reluctance of young generation to gain the knowledge, unavailability of the species, influence of modern education and awareness factors are the major ones. Therefore, awareness rising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use. Further biological studies should also be conducted on the reported medicinal plant species of the study area so as to utilize them in drug development.

8. RECOMMENDATIONS

Based on the research results, the following recommendations are forwarded:

- ❖ Local community of the study area should be involved in conservation and management of plant resources and their indigenous knowledge in their locality.
- ❖ Identifying effective medicinal plants and encouraging the local people to grow medicinal plants in homegardens, mixing with crops, coffee farms and as live fences of their resident and surrounding coffee plantation is crucial.
- ❖ Local people harvest plants for business or for household use with little awareness of its threat, awareness should be raised either, by development agents or agricultural workers through which sustainable harvesting be practiced.
- ❖ Since some of the traditional healers might have given much attention to the indigenous knowledge transfer while others have little concern regarding the value of indigenous knowledge, some governmental and nongovernmental organization should participate in awareness raising for healers to minimize the loss of indigenous knowledge.
- ❖ The knowledge of traditional medicine practitioners must be encouraged and protected. This could be the way through which such people could exercise their skill broadly.
- ❖ There is a need of coordination of traditional healers of the area together by certification or by organizing them at Wereda level that popularize their indigenous knowledge on medicinal plants. Establishing Traditional Healers Association, by providing land for cultivating medicinal plants, funds and assisting their activities with professional guidance helps to conserve the fast eroding medicinal plants of the area.
- ❖ There should be a need of development of community- based forest priority area (park) establishment in the Wereda for the conservation of forest in general and medicinal plants in particular rather than converting all areas in to coffee plantation sites.
- ❖ The overall analysis reveals that major uses of medicinal plants for treatment of different diseases ranges from simple diseases to fatal diseases. These traditional remedies indeed, need to be confirmed through scientific investigations to identify those that may provide alternatives for modern drugs.

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11. APPENDICES

Appendix 1: List of medicinal plants used for both human and/or livestock diseases, scientific name; family ; local name; habit; parts used; disease treated; mode of preparation with dosage used and route of administration. For voucher numbers see Appendix 4 and 5.

Key: Habit (Ha.): Herb (H); Shrub (S); Tree (T); Climber (Cl). Parts used (Pu) (Bark, B; Latex, La; Root, R; Leaf, L; Fruit, Fu.; Flower, F.; Seed, Se.; Stem, S.; Bulb, Bu.; Above ground, Ag; Whole plant, Wp.). Use (Hu-Human, Ls-Livestock).

| Scientific Name | Family | Local Name | Ha | Use | Pu | Disease Treated | Mode of Preparation | Route |
|---|---------------|--------------------------------------|----|-----|----|------------------------------|---|---------------|
| <i>Acacia abyssinica</i> Hochst. ex Benth. | Fabaceae | Lafto | T | Hu | L | Skin rash | Powdered and put on the area | Dermal |
| <i>Achyranthes aspera</i> L. | Amaranthaceae | Cagogit/ xalanji/ gerbi | H | Ls | L | Eye problem | Chewed and added on the eye | Optical |
| | | | | Hu | Br | Excessive menstrual bleeding | Tied on the foot | Dermal |
| | | | | Hu | R | Nasal bleeding | Crushed and sniffed with leaves of <i>Solanum incanum</i> | Nasal |
| <i>Acmella caulirhiza</i> Del. | Asteraceae | Yamidir barbare | H | Hu | F | Toothache | Chewed and put on | Tooth surface |
| | | | | Hu | F | Tonsillitis | 3 flowers are chewed together | Oral |
| <i>Ageratum conyzoides</i> L. | Asteraceae | Tuffoo cabii/ Qoricha shankila | H | Hu | L | Blood clot | Crushed and put on | Dermal |
| <i>Ajuga integrifolia</i> Buch,Ham | Lamiaceae | Harma bussee/ Anaamiro | H | Ls | L | Black leg | Crushed with powdered <i>Echinops kebericho</i> and 1 L is given to cattle | Oral |
| | | | | Hu | L | Rheumatism | Squeezed and 1 glass cup is taken per day for 3 consecutive days by adding salt | Oral |
| <i>Albizia gummifera</i> (J.F. Gmel.) C.A.Sm. | Fabaceae | Anbabesaa | T | Hu | Ba | Stomachache | Chewed | Oral |
| | | | | Hu | Ba | Diarrhea | Powdered and 1 coffee cup is taken | Oral |
| | | | | Hu | Ba | Tonsillitis | Chewed | Oral |

| | | | | | | | | |
|--|--------------|--------------------|---|----|----|-------------------|--|--------|
| <i>Albizia schimperiana</i> Oliv. | Fabaceae | Ca'o | T | Ls | Ba | Wound | Crushed with bark of <i>Erythrina brucei</i> and added on the area | Dermal |
| <i>Allium sativum</i> L. | Alliaceae | Qullubi adii | H | Hu | Bu | Malaria | Crushed and eaten | Oral |
| | | | | Hu | Bu | Heart failer | Crushed and eaten for 2-3 days in the morning | Oral |
| | | | | Hu | Bu | Hemorrhoides | Mixed with honey, butter, <i>Nigella sativa</i> and <i>Trachyspermum ammi</i> filtered and stayed for 1 day then one soup spoon is taken each day in the morning | Oral |
| | | | | Hu | Bu | Stomachache | Eaten by mixing with <i>Ruta chalepensis</i> and adding salt | Oral |
| | | | | Hu | Bu | Asthma | Mixed with honey, <i>Nigella sativa</i> and <i>Trachyspermum ammi</i> and one soup spoon is taken each day in the morning. | Oral |
| <i>Aloe kefaensis</i> Gilbert & Sebsebe | Aloaceae | Argisaa/ Arkiso | H | Hu | La | Fire burn | The latex is painted on the wound | Dermal |
| <i>Ananas comosus</i> (L.) Merr. | Bromeliaceae | Anaanaasii | H | Hu | Fr | Vomiting | Eating the fruit | Oral |
| <i>Artemisia abyssinica</i> Sch. Bip. ex A.Rich. | Asteraceae | Sukundee | H | Hu | L | Kidney problem | Squeezed with <i>Thymus schimperii</i> and drunk half of coffee cup | Oral |
| | | | | Hu | L | Gastritis | Squeezed and drunk 1 glass cup | Oral |
| | | | | Hu | L | Child Stomachache | Squeezed and ¼ of coffee cup is given to children | Oral |
| <i>Artemisia afra</i> Jacq. ex Willd. | Asteraceae | Godo guraachaa | H | Hu | L | Diarrhea | Crushed, squeezed and 1 coffee cup is given | Oral |
| | | | | Hu | L | Evil eye | Crushed, squeezed with <i>Withania Somnifera</i> and 1/4 coffee cup is given | Oral |
| | | | | Hu | L | Fibril illness | Mixed with <i>Foeniculum vulgare</i> , <i>Kalanchoe petitiiana</i> , <i>Withania somnifera</i> squeezed together, filtered and 1 glass cup is given. | Oral |

| | | | | | | | | |
|--|---------------|------------------------|---|---------|-------|--------------------------|--|---------------|
| | | | | Hu | L | Stomachache for children | Mixed with <i>Ruta chalepensis</i> squeezed and given to children. | Oral |
| <i>Asparagus africanus</i> Lam. | Asparagaceae | Sarriti/ qastanicha | H | Hu | L | Snake bite | Squeezed with leaves of <i>Stereospermum kunthianum</i> and <i>Citrus limon</i> and 1 coffee cup is given | Oral |
| | | | | Hu | L | Poisoning | Squeezed and given | Oral |
| | | | | Hu | R | Diabetes | Powdered and taken with honey | Oral |
| <i>Bidens pilosa</i> L. | Asteraceae | Maxanee | H | Hu | L | Ear problem | Squeezed and added | Auricular |
| | | | | Hu | R | Gonorrhea | Squeezed and drinking 1 glass cup | Oral |
| | | | | Hu | L | Spider poison | Burned on fire and put on the area | Dermal |
| <i>Bidens prestinaria</i> (Sch.Bip) cufod. | Asteraceae | Kello | H | Hu | L & F | Ear problem | Squeezed and added | Auricular |
| <i>Brassica carinata</i> A.Br. | Brassicaceae | Ija raafu | H | Hu | Se | Stomach problem | Crushed and eaten with <i>Allium sativum</i> by adding salt | Oral |
| <i>Brucea antidysenterica</i> J.F.Mill. | Simaroubaceae | Qomonyo | S | Hu | L | Rheumatism | Crushed and washed by adding leaves of <i>Justicia shimperiana</i> , <i>Acacia abyssinica</i> and <i>Momordica foetida</i> | Dermal |
| | | | | Hu | L | Rabies | Squeezed and baked with teff flour and given for 3 days | Oral |
| | | | | Hu | L | Swelling of leg | Boiled and washed for 3 days | Oral |
| <i>Calpurnia aurea</i> (Ait.) Benth. | Fabaceae | Cekaa | S | Hu | L | Stomachache | Squeezed and drunk one spoon | Oral |
| | | | | Ls & Hu | L | Ecto-parasite | Crushed and washed | Dermal |
| | | | | Hu | S | Amoeba | Squeezed, drunk 1/2 glass cup | Oral |
| | | | | Hu | S | Toothache | Harvested and brushed | Tooth surface |
| | | | | Hu | L | Diarrhea | Squeezed and drunk 1/2 glass cup | Oral |
| <i>Carica papaya</i> L. | Caricaceae | Papaye | T | Hu | L | Gastritis | Crushed, squeezed and drunk 1 glass cup in the morning | Oral |
| | | | | Hu | L | Malaria | Yellow leaves are squeezed and drunk | Oral |
| | | | | Hu | R | Malaria | Crushed, boiled by adding sugar and | Oral |

| | | | | | | | | |
|---|---------------|----------|----|---------|----|---------------------|---|---------------|
| | | | | | | | taken | |
| | | | | Hu | Se | Ascaries | The seeds are dried and eaten | Oral |
| | | | | Hu | R | Wound | Crushed and painted | Dermal |
| | | | | Hu | Se | Amoeba | Dried, powdered and taken with tea | Oral |
| <i>Catha edulis</i> (Vahl) Forssk. ex Endl. | Celastraceae | Caati | S | Hu | L | Gonorrhea | Red colour <i>Catha edulis</i> cooked, stayed for one night and 1 glass cup is taken for 2 - 3 days in the morning by adding small amount of sugar. | Oral |
| <i>Caylusea abyssinica</i> (Fresen.) Fisch. & Mey. | Resedaceae | Aranci | H | Hu | L | Tinea versicolor | Crushed and painted | Dermal |
| | | | | Hu | R | Intestinal parasite | Eaten with roasted barley | Oral |
| | | | | Hu | R | Diarrhea | Crushed and eaten by salt | Oral |
| <i>Celosia trigyna</i> L. | Amaranthaceae | Dagiso | H | Hu | R | Tapeworm | Squeezed and drunk 1 glass cup or eaten with roasted barley. | Oral |
| | | | | Hu | L | Gonorrhea | squeezed and drunk 1/4 coffee cup | Oral |
| <i>Centella asiatica</i> (L.) Urban | Apiaceae | Tussee | H | Hu | L | Toothache | Crushed & put on | Tooth surface |
| <i>Cirsium englerianum</i> O.Hoffm. | Asteraceae | Umbahoo | H | Hu | R | Liver problem | Squeezed and 1 tea cup is given | Oral |
| <i>Citrus limon</i> (L.) Burm.f. | Rutaceae | Lomi | S | Hu & Ls | Fr | Poisoning | Squeezed and given | Oral |
| | | | | Ls | Fr | Eye cataract | Squeezed and added on eye | Optical |
| | | | | Hu | Fr | Common cold | Boiled with sugar and taken | Oral |
| <i>Citrus medica</i> L. | Rutaceae | Tiringo | T | Hu | L | Stabbing pain | Cooked and drunk the sap | Oral |
| <i>Clausena anisata</i> (Willd.) Benth. | Rutaceae | Ulmaayii | S | Hu | L | Fibril illness | Boiled and washed | Dermal |
| <i>Clematis hirsuta</i> Perr. & Guill. | Ranunculaceae | Fiitii | Cl | Hu | L | Urine of Bat | Placed on fire and put on the area | Dermal |
| | | | | Hu | L | Toothache | Crushed and put on | Tooth |

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| | | | | | | | | surface |
| | | | | Hu | L | Swelling of leg | Placed on fire with leaves of <i>Plumbago zeylanica</i> and <i>Drymaria cordata</i> and washed | Dermal |
| | | | | Hu | L | 'Xooroo' | Crushed and painted | Dermal |
| <i>Clerodendrum myricoides</i> (Hochst.) Vatke | Lamiaceae | Maraasisa/ Misirich | S | Hu | L | Evil Eye | Squeezed and 1 coffee cup is given | Oral |
| | | | | Hu | S | Toothache | Brushed | Tooth surface |
| | | | | Hu | S | Evil Spirit | To brush the teeth | Tooth surface |
| <i>Coffea arabica</i> L. | Rubiaceae | Buna | S | Hu | Se | Wound | Roasted, powdered and put on | Dermal |
| | | | | Hu | Se | Spider poison | Roasted, powdered, mixed with butter and painted | Dermal |
| | | | | Hu | Se | Diarrhea | Roasted, powdered, mixed with honey and eaten in the morning | Oral |
| <i>Colocasia esculenta</i> (L.) Schott | Araceae | Godare | H | Hu | R | Ascaries | Cooked and eaten | Oral |
| | | | | Hu | L | Constipation | Boiled and eaten | Oral |
| | | | | Hu | L | Gastritis | Boiled, cooled, stay for one night and the sap is taken in the morning | Oral |
| <i>Cordia africana</i> Lam. | Boraginaceae | Wadeesaa | T | Hu | L | Skin rash | Dried, powdered, mixed with butter, painted by washing the area every day for 7 days and tied with cloth | Dermal |
| | | | | Hu | S | Skin rash | Dried and added on the area with coffee, butter and faeces of rabbit for 3 days | Dermal |
| | | | | Hu | S | Smell of foot | Stem soaked and added on leg | Dermal |
| | | | | Hu | L | Wound of leg | Placed on fire and put on the area | Dermal |
| | | | | Hu | L | Scabies | Powdered, mixed with butter and painted | Dermal |
| <i>Crotalaria</i> species | Fabaceae | Yeayit shimbraa | S | Hu | L | Glandular swelling | Rubbing the area with crushed leaves | Dermal |
| <i>Croton macrostachyus</i> Del. | Euphorbiaceae | Makanisaa | T | Ls | L | Blotting | Crushed and sniffed | Nasal |
| | | | | Hu | L | Blood clot | Squeezed on the area | Dermal |

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| | | | | Ls | L | Stomachache | Crushed, squeezed and drunk | Oral |
| | | | | Hu | La | Ringworm | Painted on the area | Dermal |
| | | | | Hu | S | Liver problem | The middle part of the stem cooked with teff flour and 5 - 7 spoons is taken. | Oral |
| | | | | Hu | L | Malaria | Crushed and Smoked | Nasal |
| | | | | Ls | La | Wound | Harvested and painted on the area | Dermal |
| | | | | Hu | L | Gonorrhea | Powdered, placed on water overnight and filtered and drunk 1 tea glass for two days, hiding from shadow for one day; cooked teff flour is eaten to stop diarrhea. | Oral |
| | | | | Hu | S | Ascaries | Cooked with teff flour and eaten from 3-5spoon. | Oral |
| | | | | Hu | La | Constipation | Harvesting the soft part of stem and drinking with 'Borde or Merek' | Oral |
| | | | | Hu | L | Tetanus | The upper part of the plant leaf is crushed and added to the area | Dermal |
| <i>Cucurbita pepo</i> L. | Cucurbitaceae | Buqee/dubaa | H | Hu | Se | Tape worm | Roasted and eaten | Oral |
| <i>Cuscuta australis</i> R. Br. | Cuscutaceae | Sabata waaqayoo | H | Hu | L | Stomach problem of child | Boiled and 1/4 coffee cup is given | Oral |
| <i>Cyanotis</i> species | Commelinaceae | Araman dawaa | H | Hu | R | 'Naqarsa' | Crushed and 1 coffee cup is taken by adding sugar | Oral |
| <i>Cyathula cylindrica</i> Mog. | Amaranthaceae | Maxanee | H | Hu | L | Nasal bleeding | crushed and sniffed | Nasal |
| | | | | Hu | L | Wound | Crushed and added | Dermal |
| <i>Cyathula uncinulata</i> (Schrad.) Schinz | Amaranthaceae | Maxane hoollaa | S | Hu | L | Blood clot | Squeezed and painted | Dermal |
| | | | | Hu | L | Ear problem | Squeezed and added | Auricular |
| | | | | Hu | L | Spider poison | Crushed and tied on the area | Dermal |
| <i>Cyperus</i> species | Cyperaceae | Qunnii | H | Hu | R | Cough | Crushed, boiled with sugar and taken | Oral |
| <i>Cyphostemma adenocaula</i> (Steud. ex | Vitaceae | Aserkush tebetbkush | Cl | Ls | Ag | Infection on neck | Tied on the area | Dermal |

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| A.Rich.) Desc. ex wild & Drummond | | | | | | | | |
| <i>Cyphostemma cyphopetalum</i> (Fresen.) Discoings ex Wild & Drummond | Vitaceae | Hida reenfaa | Cl | Ls | R | Weight loss | Squeezed and given 1 glass cup by adding salt | Oral |
| <i>Datura metel</i> L. | Solanaceae | Qoricha bofaa | H | Hu | L | Snake breath | Crushed and painted | Dermal |
| | | | | Hu | L | Snake bite | Squeezed and drinking 1/2 coffee cup | Oral |
| <i>Datura stramonium</i> L. | Solanaceae | Asangiraa | H | Hu | L | Nasal bleeding | Squeezed and dropped | Nasal |
| | | | | Hu | L | 'Dhukuba lafaa' | Boiled and taken up to half of the smallest finger nail | Oral |
| | | | | Ls | L | Wound | Crushed and put on | Dermal |
| | | | | Hu | L | Dandruff | squeezed and painted on bare head | Dermal |
| | | | | Hu | Se | Gonorrhea | Crushed, mixed with butter, taken | Oral |
| <i>Dioscorea praehensilis</i> Benth. | Dioscoreaceae | Wacino | Cl | Hu | L | Tonsillitis | Chewing the leaves in the morning | Oral |
| | | | | Hu | Bu | 'Hypertension' | Boiled and eaten | Oral |
| <i>Dracaena steudneri</i> Engl. | Dracaenaceae | Gido/Algee | T | Ls | L | Black leg | Crushed with root of <i>Ricinus communis</i> , leaves of <i>Senna didymobotrya</i> and mixed with 1 lt boiled water and given. | Oral |
| <i>Drymaria cordata</i> (L.) Schultes | Caryophyllaceae | Sayidasajal/ Moti dagalaa | H | Hu | L | Toothache | Covered with leaves of <i>Ensete ventricosum</i> and placed on fire and put on tooth | Tooth surface |
| | | | | Hu | L | Swelling | Covered with leaves and placed on fire and tied on the area | Dermal |
| | | | | Hu | L | Nose smell | Covered with leaves, placed on fire and sniffed | Nasal |
| | | | | Hu | L | Headache | Covered with leaves, placed on fire and sniffed | Nasal |
| | | | | Hu | L | Urine of bat | Covered with leaves, placed on fire and put on | Dermal |

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| | | | | Hu | L | Insect allergy | Covered with leaves, placed on fire and tied on | Dermal |
| <i>Ehretia cymosa</i> Thonn | Boraginaceae | Ulaagaa | T | Hu | L | Toothache | Crushed and put with leaves of <i>Psidium guajava</i> and <i>Calpurnia aurea</i> | Tooth surface |
| | | | | Ls | L | Shivering of livestock | Crushed, squeezed with the leaves of <i>Caylusea abyssinica</i> , <i>Justicia shimperiana</i> and 1 litre is given in the morning and evening to cattle. | Oral |
| | | | | Hu | L | Rheumatism | Washing with leaves of <i>Acacia abyssinica</i> , <i>Ocimum lamiifolium</i> and <i>Justica shimperiana</i> for 3 days | Dermal |
| <i>Ensete ventricosum</i> (Welw.) Cheesman | Musaceae | Qocho | S | Hu | R | Diarrhea | Roasted and eaten with salt | Oral |
| <i>Erythrina brucei</i> Schweinf. | Fabaceae | Walleensu | T | Ls | L | Eye problem | Squeezed and added | Optical |
| | | | | Hu | L | Stomachache | Chewed | Oral |
| | | | | Ls | L | Cough | Crushed, mixed with food and given to hen | Oral |
| | | | | Hu | L | Insect bite | Squeezed and painted | Dermal |
| | | | | Hu | Ba | Tonsillitis | Chewed in the morning | Oral |
| | | | | Hu | L | Toothache | crushed and put on | Tooth surface |
| | | | | Ls | Ba | Wound | powdered and added | Dermal |
| <i>Eucalyptus globulus</i> Labill. | Myrtaceae | Baarzaafii adii | T | Hu | L | Cough | Boiled with sugar 1 tea cup of syrup is given | Oral |
| | | | | Hu | L | Influenza | Smoked | Nasal |
| | | | | Hu | L | Malaria | Smoked | Nasal |
| <i>Eucalyptus</i> species | Myrtaceae | Baarzaafi | T | Hu | L | Foot smell | Added on shoes | Dermal |
| <i>Euphorbia abyssinica</i> Gmel. | Euphorbiaceae | Adaami | T | Ls | L | Mule malaria | Fumigating the mule with leaf | Nasal |
| | | | | Ls | L | Rinderpest | Fumigating the animal | Nasal |
| | | | | Ls | L | 'Golobaa' | Fumigated with the leaf of <i>Croton macrostachyus</i> & <i>Ricinus communis</i> | Nasal |

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| <i>Euphorbia tirucalli</i> L. | Euphorbiaceae | Cadaa | S | Hu | La | Warts | the latex are painted on the area | Dermal |
| <i>Falkia canescens</i> C.H.Wright | Convolvulaceae | Gura hantutaa | H | Hu | L | Spider poison | Crushed and put on the area | Dermal |
| | | | | Hu | L | Insect allergy | Crushed and tied on the area | Dermal |
| | | | | Hu | L | Male sexual impotency | Crushed, mixed with butter and eaten for 5 days | Oral |
| <i>Foeniculum vulgare</i> Mill. | Apiaceae | Wallaago | H | Hu | L | Kidney Problem | Squeezed with leaves of <i>Thymus schimperi</i> and drunk 1 coffee cup for 3 days | Oral |
| | | | | Hu | L | Blood pressure | Squeezed and drunk 1 glass cup | Oral |
| | | | | Hu | L | Stomachache | Squeezed with leaves of <i>Ocimum lamiifolium</i> and <i>Withania somnifera</i> and taken | Oral |
| | | | | Hu | L | Snef of faeces | Squeezed with leaves of <i>Ruta nepalensis</i> and taken | Oral |
| <i>Guizotia scabra</i> (Vis.) Chiov. | Asteraceae | Tuffoo | H | Hu | L | Wound | Squeezed on the area | Dermal |
| <i>Hagenia abyssinica</i> (Brace) J.F.Gmel. | Rosaceae | Koso | T | Hu | Se | Tape worm | Crushed and drunk with local drink 'tella' | Oral |
| <i>Helinus mystacinus</i> (Ait.) E. Mey. ex Steud. | Rhamnaceae | Omaachisaa/ Hida gundoo | Cl | Ls | L | 'Dhora jabbii' | Squeezed & 1 glass cup is given to cattle | Oral |
| <i>Indigofera arrecta</i> A.Rich. | Fabaceae | Gerewda | H | Hu | L | Evil eye | Crushed and smoked | Nasal |
| <i>Indigofera spicata</i> Forrsk. | Fabaceae | Qoricha hadha | Cl | Hu | L | Insect allergy | Crushed and tied on the area | Dermal |
| <i>Indigofera vohemarensis</i> Baill. | Fabaceae | Heenaa | S | Hu | L | Toothache | Covered by leaves and placed on fire and put on | Tooth surface |
| <i>Ipomoea cairica</i> (L.) Sweet | Convolvulaceae | Kalaalaa | Cl | Hu | L | Fibril illness | Washed by crushing with <i>Ocimum gratissimum</i> | Dermal |
| | | | | Hu | L | Warts | Crushed and painted | Dermal |
| | | | | Ls | R | Wound | Crushed and painted | Dermal |
| <i>Ipomoea tenuirostris</i> | Convolvulaceae | Nisbaa | Cl | Hu | L | Insect allergy | Placed on fire and tied on the area by | Dermal |

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| Choisy | | | | | | | cloth | |
| <i>Jatropha curcas</i> L. | Euphorbiaceae | Beeroo faranji | T | Hu | Se | Liver problem | 3 Seeds for children and 6 seeds for adult crushed, powdered and mixed with cheese and given | Oral |
| | | | | Hu | Se | STDs | 5-10 internal parts of seeds are powdered and 1 glass cup is taken with tea | Oral |
| <i>Justicia diclipterooides</i> Lindau | Acanthaceae | Togo | S | Hu | L | Anaemia | Boiled with sugar, drunk 1 glass cup | Oral |
| | | | | Hu | L | Eye infection | Crushed and washed | Optical |
| <i>Justicia schimperiana</i> (Hochst. ex Nees) T.Anders. | Acanthaceae | Dhumugaa/ Halaltu | S | Hu | L | Rabies | Crushed , squeezed, mixed with milk given 1/2 coffee cup | Oral |
| | | | | Hu | L | Rheumatism | Mixed with <i>Brucea antidysenterica</i> , <i>Croton macrostachyus</i> , <i>Clausena anisata</i> , <i>Pycnostachys abyssinica</i> boiled and washed for 3 days. | Dermal |
| <i>Kalanchoe petitiiana</i> A.Rich. | Crassulaceae | Bosoqe | H | Hu | L | Wound | Placed on fire put on the area | Dermal |
| | | | | Hu | L | Hemorrhoids | Squeezed and drunk 1 glass cup | Oral |
| | | | | Hu | L | Ascaries | Squeezed and 1/2 coffee cup is given | Oral |
| | | | | Hu | L | Insect allergy | Crushed and tied on the area | Dermal |
| | | | | Hu | L | Swelling | Crushed, boiled and placed on the area | Dermal |
| <i>Laggera crispata</i> (Vahl) Hepper & Wood | Asteraceae | Tambo | H | Hu | La | Stabbing pain | crushed and sniffed | Nasal |
| <i>Lawsonia inermis</i> L. | Lythraceae | Hinaaye | T | Hu | L | Headache | Crushed and put on head with butter | Dermal |
| | | | | Hu | L | Rheumatism | Boiled and 1 glass cup will be taken with sugar | Oral |
| <i>Lepidium sativum</i> L. | Brassicaceae | Fexo/Shinfaa | H | Hu | Se | Malaria | Smoked with <i>Echinops Kebericho</i> and leaves of <i>Croton macrostachyus</i> | Nasal |
| <i>Leucas martinicensis</i> (Jacq.) R.Br. | Lamiaceae | Segere/ Raas kimir | H | Hu | L | Blood pressure | Crushed, squeezed and drunk 1/2 coffee cup | Oral |
| <i>Leucas stachydiformis</i> (Hochst. ex Benth.) Briq., | Lamiaceae | Qumudu | H | Hu | Wp | Malaria | Boiled with <i>Ocimum lamiifolium</i> and the vapour is inhaled. | Nasal |

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| <i>Lycopersicon esculentum</i> Mill. | Solanaceae | Timaatimii | H | Hu | L | Spider poison | Chewed and put on | Dermal |
| <i>Maesa lanceolata</i> Forssk. | Myrsinaceae | Abayi | T | Hu | L | Rabies | Crushed, squeezed and taken | Oral |
| | | | | Hu | L | Urine of bat | Crushed, covered with leaves, placed on fire and put on the area | Dermal |
| <i>Melia azedarach</i> L. | Meliaceae | Mim | T | Hu | L | Malaria | Squeezed and 1/4 coffee cup is taken | Oral |
| | | | | Hu | L | Abortion | Squeezed and drunk | Oral |
| <i>Mentha spicata</i> L. | Lamiaceae | Naanaaye | H | Hu | L | Headache | Crushed and sniffed | Nasal |
| | | | | Hu | L | Vomiting | Squeezed and taken by mixing with coffee | Oral |
| | | | | Hu | R | 'Harqansu' | Squeezed with leaves of <i>Thymus schimperi</i> and drunk 1/4 coffee cup | Oral |
| <i>Momordica foetida</i> Schumach. | Cucurbitaceae | Minaan loa | Cl | Ls | R | Evil eye | Crushed and Washed | Dermal |
| | | | | Hu | L | Evil eye | Squeezed and 1/2 coffee cup is given | Oral |
| | | | | Hu | L | Wound | Crushed, washed and the area is covered with the leaves overnight and again washed with hot water in the morning. | Dermal |
| | | | | Hu | L | Stomachache | Squeezed with leaves of <i>Ruta chalepensis</i> and drunk 1 coffee cup | Oral |
| | | | | Ls | L | Blotting | Squeezed and 1/2 litre is given to cattle | Oral |
| | | | | Hu | R | Toothache | Boiled with salt and mouth is rinsed | Tooth surface |
| <i>Nicotiana tobaccum</i> L. | Solanaceae | Timbaho | H | Hu | L | 'Naqarsa' | Placed on fire and put on the area | Dermal |
| | | | | Ls | L | Cough | Squeezed and 1/2 litre is given to cattle | Oral |
| | | | | Hu | L | Toothache | Placed on fire and put on the tooth | Tooth surface |
| | | | | Ls | L | Leeches | Squeezed and 1 coffee cup is given to cattle | Oral |
| <i>Ocimum basilicum</i> L. var. <i>basilicum</i> | Lamiaceae | Keffoo | S | Hu | L | Headache | crushed and sniffed | Nasal |
| <i>Ocimum gratissimum</i> L. | Lamiaceae | Kefo saree | S | Hu | L | Fibril illness | Crushed and washed by adding leaves of <i>Ocimum lamiifolium</i> and <i>Croton</i> | Dermal |

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| | | | | | | | <i>macrostachyus</i> | |
| <i>Ocimum lamiifolium</i> Hochst. ex Benth. | Lamiaceae | Daamaakase | S | Hu | L | Fibril illness | Squeezed and washed | Dermal |
| | | | | Hu | L | Headache | Squeezed and taken | Nasal |
| | | | | Hu | L | Mouth smell | Squeezed and 1 glass cup is given | Oral |
| | | | | Hu | L | Common Cold | Squeezed and 1 glass cup given | Oral |
| | | | | Hu | L | Eye infection | Squeezed and painted with leaves of <i>Justicia diclipteroides</i> | Optical |
| <i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall. ex G.Don) Cif. | Oleaceae | Ejarsaa | T | Hu | La | 'Naqarsaa' | The oil is extracted and painted on the area | Dermal |
| | | | | Hu | La | Headache | The oil of <i>Olea</i> mixed with powdered <i>Echinops kebericho</i> and placed on head | Oral |
| | | | | Hu | La | Asthma | The oil of <i>Olea</i> , stem of <i>Croton macrostachyus</i> cooked together, mixed with honey and 1/2 coffee cup is taken | Oral |
| <i>Oxalis corniculata</i> L. | Oxalidaceae | Sidisa | H | Hu | L | Urine of bat | Placed on fire and put on the area | Dermal |
| <i>Pennisetum thunbergii</i> Kunth | Poaceae | Marga abaaboo | H | Ls | Wp | Weight loss | Squeezed with leaves of <i>Thymus schimperii</i> and salt is added and 1 litre is given to cattle | Oral |
| <i>Phytolacca dodecandra</i> L. Herit | Phytolacaceae | Andode | Cl | Hu | R | Poisoning | Crushed and taken with boiled coffee and butter | Oral |
| | | | | Hu | R | Abortion | Crushed and taken | Oral |
| | | | | Hu | L & S | Rabies | Crushed, dried, powdered, mixed with milk ('Aguat') 2 spoon is given | Oral |
| | | | | Hu | L | Scabies | Pounded, mixed with leaves of <i>Vernonia amygdalina</i> and washed | Dermal |
| | | | | Hu | R | Gonorrhea | Squeezed and 1cc is injected in to the urethra by syringe | Penus |
| <i>Plantago lanceolata</i> L. | Plantaginaceae | Qorxib | H | Hu | L | Blood clot | Crushed and added on the area | Dermal |
| | | | | Hu | L | Wound | Crushed and put on | Dermal |
| <i>Plectranthus punctatus</i> | Lamiaceae | Dabase | H | Hu | L | Headache | Crushed and sniffed | Nasal |

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| (L.f.) L'her. | | | | | | | | |
| <i>Plumbago zeylanica</i> L. | Plumbaginaceae | Ameeraa | H | Hu | S | Glandular swelling of children | Stems cut in to 3 pieces and tied on neck with Seed of coffee | Neck |
| | | | | Hu | R | 'Naqarsa' | Powdered with dried leaves of <i>Cordia africana</i> and mixed with butter and put on the area | Dermal |
| <i>Premna schimperi</i> Engl. | Lamiaceae | Qooraasumaa | T | Hu | L | Toothache | Crushed and put on | Tooth surface |
| | | | | Hu | L | Fibril illness | Crushed and washed | Oral |
| | | | | Hu | L | Pancreatic problem | Crushed, squeezed and taken | Oral |
| <i>Psidium guajava</i> L. | Myrtaceae | Zayitunaa | T | Hu | Bu | Toothache | Crushed and put on | Tooth surface |
| <i>Pycnostachys abyssinica</i> Fresen. | Lamiaceae | Xurooftu/ Yerio | S | Hu | L | Fibril illness | Boiled and washed with leaves of <i>Croton macrostachyus</i> and <i>Ocimum lamiifolium</i> | Oral |
| | | | | Hu | L | Eye problem | Crushed and put on the leaves on the eye | Optical |
| | | | | Hu | L | Stomach problem of child | Boiled on fire and the sap is given to children. | Oral |
| <i>Ranunculus multifidus</i> Forssk. | Ranunculaceae | Misinga | H | Hu | L | Urine of bat | Crushed and put on | Dermal |
| | | | | Hu | L | Nose smell | Squeezed and taken | Oral |
| <i>Rhamnus prinoides</i> L 'Herit. | Rhamnaceae | Gesho | S | Hu | Br | Tonsillitis | 7 small branches are crushed and chewed | Oral |
| | | | | Hu | Br | 'Allaatii' | 7 branches are cut, mixed with leaves of <i>Clerodendrum myricoides</i> and a child is washed for 3 days or for 7 days | Dermal |
| <i>Ricinus communis</i> L. | Euphorbiaceae | Qobo | S | Ls | R | Stomachache | Dried, powdered and mixed with leaves of <i>Momordica foetida</i> 1/2 litre is given | Oral |
| | | | | Hu | Se | Wound | The oil is painted | Dermal |
| | | | | Ls | R | Black leg | Crushed, powdered, mixed with soap and | Oral |

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| | | | | | | | 1/2 litre is given | |
| | | | | Ls | L | Blotting | Crushed with leaves of <i>Croton macrostachyus</i> and sniffed. | Nasal |
| | | | | Hu | S | Tonsillitis | Tied on neck | Neck |
| <i>Rosa x rehardii</i> Rehd. | Rosaceae | Urji | S | Hu | F | Eye problem | Squeezed and dropped | Optical |
| <i>Rumex abyssinicus</i> Jacq. | Polygalaceae | Momoqo | H | Hu | R | Liver problem | Powdered and drunk 1 tea cup with coffee or tea | Oral |
| | | | | Hu | R | Asthma | Powdered, boiled for 3 days on fire, taken by mixing with tea | Oral |
| | | | | Hu | R | Blood pressure | Powdered and drunk with tea | Oral |
| <i>Rumex nepalensis</i> Spreng. | Polygonaceae | Baaruda | H | Hu | L | Blood clot | Squeezed | Dermal |
| | | | | Hu | R | Stomachache | Squeezed and drunk 1 soup spoon | Oral |
| | | | | Hu | R | Abortion | Placed in vagina | Vaginal |
| | | | | Hu | R | Toothache | Crushed, put on | Tooth surface |
| <i>Rumex nervosus</i> Vahl | Polygonaceae | Harqasis | S | Hu | l | Stomachache | Squeezed with leaves of <i>Artemisia abyssinica</i> and 1 glass cup is taken | Oral |
| | | | | Hu | S | Toothache | Brush up | Tooth surface |
| | | | | Hu | L | Evil eye | Squeezed with leaves of <i>Ruta chalepensis</i> and drunk 1/2 coffee cup | Oral |
| <i>Ruta chalepensis</i> L. | Rutaceae | Teenaadaama | H | Hu | L | Stomachache | Chewed and eaten or Squeezed and 1/2 glass cup is taken | Oral |
| | | | | Hu | L | Epilepsy | Squeezed, added to syringe up to 1 cc and added drop by drop on the left ear for 40 days. | Auricular |
| <i>Santolina chamaecyparissus</i> L. | Asteraceae | Odoo gifti faatumaa | S | Hu | L | Stomach problem of child | Squeezed, mixed with <i>Ruta chalepensis</i> and <i>Foeniculum vulgare</i> and given to children | Oral |
| <i>Sapium</i> | Euphorbiaceae | Bosoqa | T | Hu | L | Weight loss | Cooked and 1 glass cup of the sap is | Oral |

| | | | | | | | | |
|--|--------------|-------------------|---|----|--------|--------------------|---|--------|
| <i>ellipticum</i> (Krauss) Pax | | | | | | of children | given to children | |
| <i>Senna didymobotrya</i> (Fresen.) Irwin & Barneby. | Fabaceae | Sanaa maki arabaa | S | Hu | se | Headache | Mixed with seed of <i>Senna petersiana</i> boiled with coffee and taken | Oral |
| | | | | Ls | L | Black leg | Crushed with root of <i>Ricinus communis</i> and given to cattle | Oral |
| <i>Senna petersiana</i> (Bolle) Lock | Fabaceae | Sanaa maki | S | Hu | L | Fibril illness | crushed and Painted on the area | Dermal |
| | | | | Ls | L | Rabies | Squeezed and given with food to cattle | Oral |
| | | | | Ls | L | Black leg | Squeezed and mixed with soap and given 1/2 litre to cattle | Oral |
| | | | | Hu | L | Snake bite | Squeezed and 1/2 coffee cup is given for 2-3 days | Oral |
| <i>Sesbania sesban</i> (L.) Merr. | Fabaceae | Ambaltaa | T | Hu | L | Wound | Crushed and added on the area | Dermal |
| <i>Solanecio angulatus</i> (Vahl) C.Jeffrey | Asteraceae | Aqarqaraa | H | Hu | L | Headache | Crushed and tied on head with butter | Dermal |
| | | | | Hu | L | Madness | Crushed, tied on head with butter in 3 times for 3 days | Dermal |
| <i>Solanum anguivi</i> L. | Solanaceae | Hidi | H | Ls | Se | Ticks | Crushed and added | Dermal |
| <i>Solanum dasyphyllum</i> Schumach. | Solanaceae | Hidi waraabasaa | S | Ls | Se & R | Common Cold | squeezed and given with nose to cattle | Nasal |
| | | | | Ls | Se & R | Rabies | Squeezed and 1/2 coffee cup is given to the animal | Oral |
| <i>Solanum incanum</i> L. | Solanaceae | Hidi/enbuay | S | Ls | Se | Pancreatic problem | Placed on water for one day, filtered and 1 glass cup is given for 3 days | Oral |
| | | | | Ls | Se | Common cold | Filtered with cloth and given | Oral |
| | | | | Hu | R | Stomachache | Chewed | Oral |
| | | | | Hu | Se | 'Lemerate tinfash' | The seeds are squeezed, mixed with goats milk and 1/2 size of small nail is given | Oral |
| | | | | Hu | Se | Tonsillitis | The seed are squeezed and the sap is taken | Oral |
| <i>Sonchus asper</i> (L.) Hill | Asteraceae | Attuchi | H | Hu | L | Tinea versicolor | Crushed and painted | Dermal |
| <i>Stereospermum</i> | Bignoniaceae | Botoro | T | Ls | L | Snake bite | Squeezed with leaves of <i>Asparagus</i> | Oral |

| | | | | | | | | |
|--|---------------|------------------|--|------|----|---------------------|---|---------------|
| <i>kunthianum</i> Cham. | | | | | | | <i>africanus</i> and given to cattle | |
| <i>Syzygium guineense</i> (Wild.) DC. | Myrtaceae | Baddeessaa | T | Ls | Ba | Stomachache | Crushed, squeezed and 1 glass cup is given | Oral |
| <i>Tagetes minuta</i> L. | Asteraceae | Chiibo | H | Ls | L | Black leg | Squeezed and 2 glass cup is given | Oral |
| <i>Thalictrum rhynchocarpum</i> Dill. & A. Rich. | Ranunculaceae | Inchiilaal badaa | H | Hu | L | Swelling | Crushed and washed | Dermal |
| | | | | Hu | L | Epilepsy | Crushed and smoked | Nasal |
| <i>Thymus schimperi</i> Ronninger | Lamiaceae | Xasse | H | Hu | L | Kidney problem | Squeezed and taken with tea | Oral |
| | | | | Hu | R | Vomiting | Crushed and taken with sugar | Oral |
| | | | | Hu | L | Stomachache | Boiled With leaves of <i>Foeniculum vulgare</i> and 1 tea cup is taken | Oral |
| <i>Tragia mixata</i> M.Gilbert | Euphorbiaceae | Gugubdu | Cl | Hu | R | Rheumatism | Powdered, mixed with milk and 1 coffee cup is taken | Oral |
| | | | | Hu | L | Spider poison | Placed on sun light and painted | Dermal |
| <i>Trichilia dregeana</i> Sond. | Meliaceae | Anunu | T | Hu | S | Toothache | Soaked, cooked & put on | Tooth surface |
| | | | | Hu | R | 'Naqarsa' | Powdered & 1 tea spoon is taken early in the morning and then much food is eaten. | Oral |
| | | | | Hu | Ba | Nose smell | Powdered and sniffed | |
| | | | | Hu | R | Glandular swelling | Powdered and 1/2 cup of tea is taken | Oral |
| | | | | Hu | S | Warts | Powdered, mixed with honey and oil, and tied | Dermal |
| | | | | Hu | S | Wound | Powdered and tied with oil in the area. | |
| | | | | Hu | S | Intestinal parasite | Dried, powdered & eaten with raw meat from 3-5 times | Oral |
| Ls | R | Mastitis | Dried, powdered, baked with teff flour and given to cattle | Oral | | | | |
| <i>Verbena officinalis</i> L. | Verbenaceae | Attuchi | H | Hu | R | Stomachache | Chewed and swallowed | Oral |
| | | | | Hu | R | Evil eye | Squeezed and taken | Oral |
| | | | | Hu | R | Amoeba | Squeezed and taken | Oral |

| | | | | | | | | |
|--|------------|----------|---|----|----|----------------|--|--------|
| <i>Vernonia amygdalina</i> Del. | Asteraceae | Ebicha | S | Hu | L | Mouth sore | Squeezed and mouth is rinsed | Oral |
| | | | | Hu | L | Heart problem | Squeezed and drunk 1 coffee cup | Oral |
| | | | | Hu | L | Poisoning | Squeezed and drunk 1 coffee cup | Oral |
| | | | | Hu | L | Gastritis | Chewed and the sap is swallowed | Oral |
| | | | | Hu | L | Malaria | Squeezed and drunk 1 glass cup | Oral |
| | | | | Hu | La | Dandruff | The stem is harvested and the latex is painted on head | Dermal |
| | | | | Hu | L | Cough | Squeezed and drunk 1/2 coffee cup | Oral |
| | | | | Ls | L | Wound | Squeezed and painted | Dermal |
| <i>Vernonia species</i> | Asteraceae | Reji | S | Hu | L | Wound | The leaf is squeezed in the area | Dermal |
| | | | | Hu | L | Blood clot | Squeezed in the area | Dermal |
| <i>Withania somnifera</i> (L.) Dunal in DC. | Solanaceae | Gizaawaa | S | Hu | L | Evil eye | Squeezed with leaves of <i>Ruta chalepensis</i> and drunk 1 soup spoon | Oral |
| | | | | Hu | L | Insect allergy | Crushed and tied by cloth in the area | Dermal |

Appendix 2 List of human diseases which are treated by medicinal plants in the study area

| No. | Local Name | English Name |
|-----|--------------------------------------|------------------------------|
| 1 | Afura bofaa | Snake breath |
| 2 | Allaatii | xxxxxx |
| 3 | Ameebaa | Amoeba |
| 4 | Asmi | Asthma |
| 5 | Busaa | Malaria |
| 6 | Ciinina terbi | Insect bite |
| 7 | Ciitoo | Scabies |
| 8 | Coobxo | Gonorrhea |
| 9 | Hypertension | xxxx |
| 10 | Dhadhabina laphe | Heart failer |
| 11 | Dhadhabina qunamti saalaa | Male sexual impotency |
| 12 | Dhibaa dhiga | Blood pressure |
| 13 | Dhiga adafii dhaabu diide | Excessive menstrual bleeding |
| 14 | Dhiga dhaabu | Blood clot |
| 15 | Dhita miilaa | Swelling of leg |
| 16 | Dhitoo | Swelling |
| 17 | Dhukuba garaa | Stomach problem |
| 18 | dhukuba gatuu | Epilepsy |
| 19 | Dhukuba guraa | Ear problem |
| 20 | Dhukuba ijaa | Eye problem |
| 21 | Dhukuba ilkaani | Toothache |
| 22 | dhukuba kallee | Kidney problem |
| 23 | Dhukuba lafaa | xxxxxx |
| 24 | Dhukuba laphe | Heart problem |
| 25 | Dhukuba saree | Rabies |
| 26 | Dhukuboota qunamti saalaan dadarbanu | STDs |
| 27 | Fooroforii | Dandruff |
| 28 | Funuuna | Nasal bleeding |
| 29 | Garaacha | Gastritis |

| | | |
|----|-----------------|---------------------|
| 30 | Garaa ciininaa | Stomachache |
| 31 | Googinsa garaa | Constipation |
| 32 | Gubaa ebidaa | Fire Burn |
| 33 | Hadha | Insect allergy |
| 34 | Harqansu | xxxx |
| 35 | Hida boofaa | Snake bite |
| 36 | Hirina dhigaa | Anaemia |
| 37 | Huba qoonqo | Tonsillitis |
| 38 | Ija namaa | Evil eye |
| 39 | injiraan | Ecto-parasite |
| 40 | Kaasaa | Diarrhea |
| 41 | Kintaarotii | Hemorrhoids |
| 42 | Koosoo | Tapeworm |
| 43 | Kormomu | Warts |
| 44 | Maagaa | Ascaries |
| 45 | Madaa afaani | Mouth sore |
| 46 | Maddaa | Wound |
| 47 | Maraasisa | Madness |
| 48 | Mataa bo'u | Headache |
| 49 | Michi | Fibril illness |
| 50 | Naqarsaa | xxxxx |
| 51 | Nyaataa | Rheumatism |
| 52 | Oldeebisaa | Vomiting |
| 53 | Qoricha dhuge | Poisoning |
| 54 | Quffaa | Cough |
| 55 | Raamoo garaa | Intestinal Parasite |
| 56 | Rojjii | Ringworm |
| 57 | Sabata waaqayoo | Liver problems |
| 58 | Seexaana | Evil spirit |
| 59 | Shereriti | Spider poison |
| 60 | Sibiji/ shife | Skin rash |
| 61 | Simbiroo alkani | Urine of bat |

| | | |
|----|--------------------|-------------------------|
| 62 | Soonoo | Tinea versicolor |
| 63 | Sukuar beshitaa | Diabetes |
| 64 | Tetaanosii | Tetanus |
| 65 | Ulfa baasu | Abortion |
| 66 | Uqachu | Weight loss of children |
| 67 | Utaaloo | Common Cold |
| 68 | Utaaloo | Influenza |
| 79 | Waraansa | Stabbing pain |
| 70 | Xanacha | Glandular swelling |
| 71 | Xiira'a afaanii | Mouth smell |
| 72 | Xiiraa miilaa | Foot smell |
| 73 | Xiiraa sagaraa | Snef of faeces |
| 75 | Xiiraa'a miilaa | Smell of foot |
| 76 | xiiraa'a funyaanii | Nose smell |
| 76 | Xooroo | xxxx |
| 77 | Yetafiya Beshita | Pancreatic problem |

Appendix 3 List of livestock diseases which are treated by medicinal plants in the study area

| No. | Local name | English name |
|------------|-------------------|------------------------|
| 1 | Bookaksaa | Blotting |
| 2 | Busaa gaange | Malaria of mule |
| 3 | Desta | Rinderpest |
| 4 | Dhora jabbii | xxxxx |
| 5 | Dhukuba ijaa | Eye problem |
| 6 | Dhukuba muchaa | Breast problem |
| 7 | Dhukuba saree | Rabies |
| 8 | Furrii | Cough |
| 9 | Garaa cininaa | Stomachache |
| 10 | Golobaa | xxxx |
| 11 | Hida bofaa | Snake bite |
| 12 | Huqisa | Weight loss |
| 13 | Ija namaa | Evil eye |
| 14 | Injiraan | Ecto-parasite |
| 15 | Lemiyanketekit | Shivering of livestock |
| 16 | Madaa | Wound |
| 17 | Mooraa ijaa | Eye cataract |
| 18 | Qoricha dhugee | Poisoning |
| 19 | Raamoo garaa | Internal parasite |
| 20 | Silmi | Ticks |
| 21 | Sinchi | Black leg |
| 22 | Ulaandhula | Leeches |
| 23 | Utaaloo | Common cold |
| 24 | Yeanget mefak | Infection |
| 25 | Yetafiya beshita | Pancreatic problem |

Appendix 4 List of Plants encountered in the study area from wild Vegetation

| Scientific Name | Family | Local Name | Ha | V. no. |
|--|---------------|-----------------------|----|--------|
| <i>Acacia abyssinica</i> Hochst. ex Benth. | Fabaceae | Lafto | T | BE 097 |
| <i>Achyranthes aspera</i> L. | Amaranthaceae | Cagogit/xalanji/gerbi | H | BE 047 |
| <i>Acmella caulirhiza</i> Del. | Asteraceae | Yamidir barbare | H | BE 045 |
| <i>Ageratum conyzoides</i> L. | Asteraceae | Tuffoo cabii | H | BE 136 |
| <i>Albizia grandibracteata</i> Taub. | Fabaceae | Anbabesa arbaa | T | BE 094 |
| <i>Albizia gummifera</i> (J.F. Gmel.) C.A.Sm. | Fabaceae | Anbabeesaa | T | BE 080 |
| <i>Albizia schimperiana</i> Oliv. | Fabaceae | Ca'o | T | BE 093 |
| <i>Arundinaria alpina</i> K. Schum. | Poaceae | Lemen | H | BE 151 |
| <i>Asparagus africanus</i> Lam. | Asparagaceae | Sarriiti/qastanicha | H | BE 095 |
| <i>Bidens biternata</i> (Lour.) Merr. & Sherff | Asteraceae | Maxane | H | BE 081 |
| <i>Bidens pilosa</i> L. | Asteraceae | Maxanee | H | BE 025 |
| <i>Bidens prestinaria</i> (Sch.Bip) cufod. | Asteraceae | Kello | H | BE 075 |
| <i>Brucea antidysenterica</i> J.F.Mill. | Simaroubaceae | Qomonyoo | S | BE 024 |
| <i>Buddleja polystachya</i> Fresen. | Loganiaceae | Cocco | T | BE 044 |
| <i>Calpurnia aurea</i> (Ait.) Benth. | Fabaceae | Cekaa | S | BE 003 |
| <i>Caylusea abyssinica</i> (Fresen.) Fisch. & Mey. | Resedaceae | Aranci | H | BE 058 |
| <i>Celosia trigyna</i> L. | Amaranthaceae | Dagiso | H | BE 015 |
| <i>Celtis africana</i> Burm.f. | Ulmaceae | Cayi | T | BE 129 |
| <i>Centella asiatica</i> (L.) Urban | Apiaceae | Tussee | H | BE 004 |
| <i>Cirsium englerianum</i> O.Hoffm. | Asteraceae | Umbahoo | H | BE 091 |
| <i>Clausena anisata</i> (Willd.) Benth. | Rutaceae | Ulmaayii | S | BE 053 |
| <i>Clematis hirsuta</i> Perr. & Guill. | Ranunculaceae | Fiitii | Cl | BE 069 |
| <i>Coffea arabica</i> L. | Rubiaceae | Buna | S | BE 042 |
| <i>Combretum collinum</i> Fresen. | Combretaceae | Dabaqaa | T | BE 141 |
| <i>Combretum molle</i> R.Br. ex G.Don | Combritaceae | Abalo | T | BE 145 |
| <i>Cordia africana</i> Lam. | Boraginaceae | Wadeesaa | T | BE 037 |
| <i>Croton macrostachyus</i> Del. | Euphorbiaceae | Makanisaa | T | BE 010 |
| <i>Cuscuta australis</i> R. Br. | Cuscutaceae | Sabata waaqayoo | H | BE 138 |
| <i>Cyanotis species</i> | Commelinaceae | Araman dawaa | H | BE 133 |
| <i>Cyathula cylindrica</i> Mog. | Amaranthaceae | Maxanee | H | BE 050 |

| | | | | |
|--|-----------------|---------------------------|----|--------|
| <i>Cyathula uncinulata</i> (Schrad.) Schinz | Amaranthaceae | Maxane hoollaa | S | BE 027 |
| <i>Cynoglossum amplipholium</i> Hochst. ex A.DC. in DC | Boraginaceae | xxx | H | BE 158 |
| <i>Cynoglossum densefoliatum</i> Chiov. | Boraginaceae | xxx | H | BE 159 |
| <i>Cyperus alopecuroides</i> Rottb. | Cyperaceae | Cafe | H | BE 154 |
| <i>Cyperus distans</i> L.f. | Cyperaceae | Caffee | H | BE 155 |
| <i>Cyphostemma adenocaula</i> (Steud. ex A.Rich.) Desc. ex Wild & Drummond | Vitaceae | Aserkush tebetebkush | Cl | BE 146 |
| <i>Cyphostemma cyphopetalum</i> (Fresen.) Discoings ex Wild & Drummond | Vitaceae | Hida reenfaa | Cl | BE 121 |
| <i>Datura stramonium</i> L. | Solanaceae | Asangiraa | H | BE 026 |
| <i>Dracaena steudneri</i> Engl. | Dracaenaceae | Gido/Algee | T | BE 033 |
| <i>Drymaria cordata</i> (L.) Schultes | Caryophyllaceae | Sayidasajal | H | BE 012 |
| <i>Ehretia cymosa</i> Thonn. | Boraginaceae | Ulaagaa | T | BE 059 |
| <i>Ekebergia capensis</i> Sparrm. | Meliaceae | Sombo | T | BE 122 |
| <i>Erythrina brucei</i> Schweinf. | Fabaceae | Walleensu | T | BE 031 |
| <i>Eucalyptus species</i> | Myrtaceae | Baarzaafi | T | BE 137 |
| <i>Euphorbia abyssinica</i> Gmel. | Euphorbiaceae | Adaami | T | BE 112 |
| <i>Falkia canescens</i> C.H.Wright | Convolvulaceae | Gura hantutaa | H | BE 030 |
| <i>Ficus ovata</i> Vahl | Moraceae | Qilinxo | T | BE 142 |
| <i>Ficus sur</i> Forssk. | Moraceae | Arbu | T | BE 124 |
| <i>Ficus sycomorus</i> L. | Moraceae | Odaa | T | BE 123 |
| <i>Ficus vasta</i> Forssk. | Moraceae | Qilxu | T | BE 125 |
| <i>Gardenia ternifolia</i> Schumach. & Thonn. | Rubiaceae | Gambela | T | BE 126 |
| <i>Guizotia scabra</i> (Vis.) Chiov. | Asteraceae | Tuffoo | H | BE 062 |
| <i>Hagenia abyssinica</i> (Brace) J.F.Gmel. | Rosaceae | Koso | T | BE 130 |
| <i>Helinus mystacinus</i> (Ait.) E. Mey. ex Steud. | Rhamnaceae | Omaachisaa/ Hida gundo | Cl | BE 089 |
| <i>Impatiens rothii</i> Hook. f. | Balsaminaceae | xxx | H | BE 157 |
| <i>Indigofera arrecta</i> A.Rich. | Fabaceae | Gerewda | H | BE 079 |
| <i>Indigofera spicata</i> Forssk. | Fabaceae | Qoricha hadha | Cl | BE 127 |
| <i>Indigofera vohemarensis</i> Baill. | Fabaceae | Heenaa | S | BE 086 |

| | | | | |
|---|----------------|--------------------|----|--------|
| <i>Ipomoea cairica</i> (L.) Sweet | Convolvulaceae | Kalaalaa | Cl | BE 029 |
| <i>Kalanchoe petitiiana</i> A.Rich | Crassulaceae | Bosoqe | H | BE 014 |
| <i>Laggera crispata</i> (Vahl) Hepper & Wood | Asteraceae | Tambo | H | BE 096 |
| <i>Leucas martinicensis</i> (Jacq.) R.Br. | Lamiaceae | Segere/ Raas kimir | H | BE 077 |
| <i>Maesa lanceolata</i> Forssk. | Myrsinaceae | Abayi | T | BE 046 |
| <i>Mentha aquatica</i> L. | Lamiaceae | xxx | H | BE 156 |
| <i>Mentha spicata</i> L. | Lamiaceae | Naanaaye | H | BE 066 |
| <i>Millettia ferruginea</i> (Hochst.) Bak. | Fabaceae | Asgiraa | T | BE 143 |
| <i>Momordica foetida</i> Schumach. | Cucurbitaceae | Minaan loa | Cl | BE 011 |
| <i>Nicotiana tobaccum</i> L. | Solanaceae | Timbaho | H | BE 013 |
| <i>Oxalis corniculata</i> L. | Oxalidaceae | Sidisa | H | BE 116 |
| <i>Pennisetum thunbergii</i> Kunth | Poaceae | Marga abaaboo | H | BE 063 |
| <i>Persicaria senegalensis</i> (Meisn.) Sojak | Polygonaceae | Asaangira | H | BE 147 |
| <i>Phytolacca dodecandra</i> L. Herit | Phytolacaceae | Andode | Cl | BE 009 |
| <i>Piliostigma thonningii</i> (Schumach.) Milne-Redh. | Fabaceae | Lilu | T | BE 144 |
| <i>Plantago lanceolata</i> L. | Plantaginaceae | Qorxobi | H | BE 064 |
| <i>Plumbago zeylanica</i> L. | Plumbaginaceae | Ameeraa | H | BE 088 |
| <i>Premna schimperi</i> Engl. | Lamiaceae | Qoorasumaa | T | BE 021 |
| <i>Pycnostachys abyssinica</i> Fresen. | Lamiaceae | Xurooftu/Yerio | S | BE 068 |
| <i>Ranunculus multifidus</i> Forssk. | Ranunculaceae | Misinga | H | BE 148 |
| <i>Ricinus communis</i> L. | Euphorbiaceae | Qobo | S | BE 052 |
| <i>Rumex nepalensis</i> Spreng. | Polygonaceae | Baaruda | H | BE 005 |
| <i>Rytigynia neglecta</i> (Hiern) Robyns | Rubiaceae | Mixoo | S | BE 117 |
| <i>Sapium ellipticum</i> (Krauss) Pax | Euphorbiaceae | Bosoqa | T | BE 105 |
| <i>Senna didymobotrya</i> (Fresen.) Irwin & Barneby | Fabaceae | Sanaa maki arabaa | S | BE 038 |
| <i>Senna petersiana</i> (Bolle) Lock | Fabaceae | Sanaa maki | S | BE 016 |
| <i>Sesbania sesban</i> (L.) Merr. | Fabaceae | Ambaltaa | T | BE 085 |
| <i>Snowdenia polystachya</i> (Fresen.) Pilg. | Poaceae | Mujjaa | H | BE 118 |
| <i>Solanum anguivi</i> L. | Solanaceae | Hidi | H | BE 070 |
| <i>Solanum dasyphyllum</i> Schumach. | Solanaceae | Hidi waraabesaa | S | BE 019 |

| | | | | |
|---|------------------|------------------|----|--------|
| <i>Solanum incanum</i> L. | Solanaceae | Hidi/enbuay | S | BE 035 |
| <i>Sonchus asper</i> (L.) Hill | Asteraceae | Attuchi | H | BE 139 |
| <i>Stereospermum kunthianum</i> Cham. | Bignoniaceae | Botoro | T | BE 119 |
| <i>Syzygium guineense</i> (Wild.) DC. | Myrtaceae | Baddeessaa | T | BE 120 |
| <i>Tagetes minuta</i> L. | Asteraceae | Chiibo | H | BE 090 |
| <i>Thalictrum rhynchocarpum</i> Dill. & A. Rich. | Ranunculaceae | Inchiilaal badaa | H | BE 054 |
| <i>Thelypteris confluens</i> (Thunb.) Morton | Thelypteridaceae | Hexo | S | BE 160 |
| <i>Tragia mixata</i> M.Gilbert | Euphorbiaceae | Gugubdu | Cl | BE 055 |
| <i>Trichilia dregeana</i> Sond. | Meliaceae | Anunu | T | BE 002 |
| <i>Verbena officinalis</i> L. | Verbenaceae | Attuchi | H | BE 020 |
| <i>Vernonia amygdalina</i> Del. | Asteraceae | Ebicha | S | BE 032 |
| <i>Vernonia ieopoldii</i> (Sch. Bip. ex Walp.) Vatke | Asteraceae | xxx | T | BE 132 |
| <i>Vernonia species</i> | Asteraceae | Reji | S | BE 001 |

Key: In **bold** are medicinal plants

Appendix 5 List of plants collected from home gardens in the study area

Key : M- Medicinal, FW-Fire wood, LF- live fence, C-Charcoal, Fu- Furniture, Co-Construction, Ed-edible, Fe-Fencing, Fo-Forage, Or-ornamental, Sp-spice, CI- cash income, St-stimulant, Ha-Habit, V. No.- Voucher number.

| Scientific Name | Family | Local name | Ha | Other use | V. no. |
|--|----------------|---------------------------|----|-----------|--------|
| <i>Ajuga integrifolia</i> Buch,Ham | Lamiaceae | Harma bussee/ Anaamiro | H | M | BE 114 |
| <i>Allium sativum</i> L. | Alliaceae | Qullubi adii | H | M, Ed | BE 049 |
| <i>Aloe kefaensis</i> Gilbert & Sebsebe | Aloaceae | Argisaa/Arkiso | H | M, Or | BE 018 |
| <i>Ananas comosus</i> (L.) Merr. | Bromeliaceae | Anaanaasii | H | M, Ed | BE 103 |
| <i>Artemisia abyssinica</i> Sch. Bip. ex A.Rich | Asteraceae | Sukundee | H | M | BE 078 |
| <i>Artemisia afra</i> Jacq. ex willd | Asteraceae | Godoo guraachaa | H | M | BE 057 |
| <i>Beta vulgaris</i> L. | Chenopodiaceae | Qosta | S | Ed | BE 100 |
| <i>Brassica carinata</i> A.Br. | Brassicaceae | Ija raafu | H | M, Ed | BE 072 |
| <i>Brassica oleracea</i> L. | Brassicaceae | Raafu | H | Ed | BE 110 |
| <i>Canavalia ensiformis</i> (L.) DC. | Fabaceae | Foolfolli | CI | Ed | BE 092 |
| <i>Capsicum annum</i> L. | Solanaceae | Qaaraa | H | Ed | BE 104 |
| <i>Carica papaya</i> L. | Caricaceae | Papaye | T | M, Ed | BE 061 |
| <i>Catha edulis</i> (Vahl) Forssk. ex Endl. | Celastraceae | Caati | S | M, CI, St | BE 115 |
| <i>Citrus limon</i> (L.) Burn.f. | Rutaceae | Lomi | S | M, Ed | BE 041 |
| <i>Citrus medica</i> L. | Rutaceae | Tiringo | T | M, Ed | BE 084 |
| <i>Citrus sinensis</i> (L.) Osb. | Rutaceae | Birtukani | T | Ed | BE 109 |
| <i>Clerodendrum myricoides</i> (Hochst.) Vatke | Lamiaceae | Maraasisa/ Misirich | S | M | BE 043 |
| <i>Colocasia esculenta</i> (L.) schott | Araceae | Godare | H | M, Ed | BE 067 |
| <i>Crotalaria species</i> | Fabaceae | Yeayit shimbraa | S | M, Ed | BE 082 |
| <i>Cucurbita pepo</i> L. | Cucurbitaceae | Buqee/dubaa | H | M, Ed | BE 040 |
| <i>Cymbopogon citratus</i> (DC.) Stapf. | Poaceae | Taj sar | H | Sp | BE 128 |
| <i>Cyperus species</i> | Cyperaceae | Qunnii | H | M | BE 071 |

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|---|----------------|----------------------|----|-----------------------|--------|
| <i>Datura metel</i> L. | Solanaceae | Qoricha bofaa | H | M | BE 017 |
| <i>Dioscorea praehensilis</i> Benth. | Dioscoreaceae | Wacino | Cl | M, Ed | BE 034 |
| <i>Ensete ventricosum</i> (Welw.) Cheesman | Musaceae | Qocho | S | M, Ed | BE 101 |
| <i>Eucalyptus globulus</i> Labill. | Myrtaceae | Baarzaafii adii | T | M, FW,C, LF,Fe, Co | BE 051 |
| <i>Euphorbia tirucalli</i> L. | Euphorbiaceae | Cadaa | S | M, LF | BE 039 |
| <i>Foeniculum vulgare</i> Mill. | Apiaceae | Wallaago | H | M | BE 022 |
| <i>Gossypium hirsutum</i> L. | Malvaceae | Jirbi | S | CI | BE 098 |
| <i>Ipomoea batatus</i> (L.) Lam. | Convolvulaceae | Sikuar dinch | S | Ed | BE 099 |
| <i>Ipomoea tenuirostris</i> Choisy | Convolvulaceae | Nisbaa | Cl | M | BE 149 |
| <i>Jatropha curcas</i> L. | Euphorbiaceae | Beeroo faranji | T | M,FW,LF , Fo, Fe | BE 140 |
| <i>Justicia diclipteroides</i> Lindau | Acanthaceae | Togo | S | M | BE 007 |
| <i>Justicia schimperiana</i> (Hochst. ex Nees) T.Anders. | Acanthaceae | Dhumugaa/ Halaltu | S | M, LF | BE 023 |
| <i>Lawsonia inermis</i> L. | Lythraceae | Hinaaye | T | M, FW, LF | BE 087 |
| <i>Lepidium sativum</i> L. | Brassicaceae | Fexo/Shinfaa | H | M, Ed | BE 106 |
| <i>Leucas stachydiformis</i> (Hochst. ex Benth.) Briq. | Lamiaceae | Qumudu | H | M | BE 152 |
| <i>Lycopersicon esculentum</i> Mill. | Solanaceae | Timaatimii | H | M, Ed | BE 083 |
| <i>Mangifera indica</i> L. | Anacardiaceae | Mango | T | LF,Ed, CI | BE 111 |
| <i>Melia azedarach</i> L. | Meliaceae | Mim | T | M,FW, Fe | BE 065 |
| <i>Morus alba</i> L. | Moraceae | Enjori | T | FW, LF, Fo, Ed, Fe | BE 131 |
| <i>Musa x paradisiaca</i> L. | Musaceae | Muzi | H | Fo, Ed, CI | BE 108 |
| <i>Ocimum basilicum</i> L. var. <i>basilicum</i> | Lamiaceae | Keffoo | S | M, Sp | BE 073 |
| <i>Ocimum gratissimum</i> L. | Lamiaceae | Kefo saree | S | M, Sp | BE 135 |
| <i>Ocimum lamiifolium</i> Hochst. ex | Lamiaceae | Daamaakase | S | M | BE 006 |

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| Benth. | | | | | |
| <i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall. ex G.Don) Cif. | Oleaceae | Ejarsaa | T | M, FW | BE 113 |
| <i>Persea americana</i> Mill. | Lauraceae | Avocado | T | LF, Ed, CI | BE 102 |
| <i>Plectranthus punctatus</i> (L.f.) L'her. | Lamiaceae | Dabase | H | M | BE 150 |
| <i>Psidium guajava</i> L. | Myrtaceae | Zayitunaa | T | M, Fo, Ed, CI | BE 048 |
| <i>Rhamnus prinoides</i> L 'Herit. | Rhamnaceae | Gesho | S | M, CI | BE 056 |
| <i>Rosa x recharidii</i> Rehd. | Rosaceae | Urji | S | M, Or | BE 036 |
| <i>Rumex abyssinicus</i> Jacq. | Polygalaceae | Momoqo | H | M, Ed | BE 028 |
| <i>Rumex nervosus</i> Vahl | Polygonaceae | Harqasis | S | M | BE 074 |
| <i>Ruta chalepensis</i> L. | Rutaceae | Teenaadaama | H | M | BE 060 |
| <i>Saccharum officinarum</i> L. | Poaceae | Shenkora | H | Fo, Ed, CI | BE 107 |
| <i>Santolina chamaecyparissus</i> L. | Asteraceae | Odoo gifti faatumaa | S | M | BE 134 |
| <i>Solanecio angulatus</i> (Vahl) C.Jeffrey | Asteraceae | Aqarqaraa | H | M | BE 153 |
| <i>Thymus schimperi</i> Ronninger | Lamiaceae | Xasse | H | M | BE 076 |
| <i>Withania somnifera</i> (L.) Dunal in DC | Solanaceae | Gizaawaa | S | M | BE 008 |

Key: In bold are medicinal plants

Appendix 6: Format for collecting ethnobotanical information. Serial No. _____

Date _____

1. Information on respondents:

Name _____ Age _____ Sex M or F

Religion _____ Marital status _____ Ethnicity _____

Educational status _____ Occupation _____ Locality _____

For how long you have lived in the area _____

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

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

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

4.1 Plants used to treat human diseases

| Name Plant | Disea se | Pu | Ha | Habitat | Appl. | Prep. | Dosage | Side effects & antidotes | Other uses | Coll. no. |
|---------------|-------------|----|----|---------|-------|-------|--------|-----------------------------|---------------|--------------|
| | | | | | | | | | | |
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4.2 Plants used to treat animal diseases

| Name Plant | Disea se | Pu | Ha | Habitat | Appl. | Prep. | Dosage | Side effects & antidotes | Other uses | Coll. no. |
|---------------|-------------|----|----|---------|-------|-------|--------|-----------------------------|---------------|--------------|
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5. List traditional way of classifying soil, landscapes and vegetation in your area?

6. How do you preserve/ conserve traditional medicines?

7. Are there restrictions /taboos in collecting medicinal plants? Are there taboos in the utilization of some medicinal plants in the locality?
8. Are medicinal plants marketable?
9. Is the medicinal plant easily accessible? If not, why?
10. Are there threats to those medicinal plants?
11. Is there any effort made to conserve medicinal plants in the area?
12. How is the knowledge of traditional medicine passed to a family member/younger generation?
13. How dose modernizations interfere with traditional medicine application and use?
14. Are there conditions that forbid taking the medicine such as pregnancy and others?
15. Are there members of the community who frequently use the medicinal plant?
16. Is the plant currently cultivated in the study area?

Appendix 7 List of informants participated in ethnobotanical study

| | Name | S | Age | Kebele | Occupation |
|----|----------------------|----------|------------|---------------|-------------------|
| 1 | Aba Ali Aba Gero | M | 75 | Beshasha | Farming |
| 2 | Aba Bulgu Aba Gero | M | 78 | Beshasha | Farming |
| 3 | Aba Dega Balto | M | 60 | Cami-cego | Farming |
| 4 | Aba Diga Aba Gisa* | M | 71 | Keso-heti | Farming |
| 5 | Aba Dilbi Aba Sinbo | M | 75 | Omo-gurude | Farming |
| 6 | Aba Fira Aba Milki | M | 55 | Beshasha | Farming |
| 7 | Aba Fita Aba Megal | M | 72 | Genji-elbu | Farming |
| 8 | Aba Gero Aba Dilbi* | M | 73 | Omo-gurude | Farming |
| 9 | Aba Gero Aba Waji* | M | 70 | Koye-seja | Farming |
| 10 | Aba Gisa Aba Gero* | M | 68 | Beshasha | Farming |
| 11 | Aba Jihad Aba Simel* | M | 56 | Genji-elbu | Farming |
| 12 | Aba Keno Aba Gisa | M | 60 | Genji-elbu | Farming |
| 13 | Aba Maca Aba Godu | M | 72 | Bulado-coche | Farming |
| 14 | Aba Meca Haji | M | 75 | Dalecho | Farming |
| 15 | Aba Nebso Aba Gisa | M | 64 | Cami-cego | Farming |
| 16 | Aba Temam Aba Fogi | M | 70 | Beshasha | Farming |
| 17 | Aba Temam She Dawd | M | 50 | Omo-gurude | Farming |
| 18 | Aba Zinab Aba Gisa | M | 50 | Dalecho | Farming |
| 19 | Aba Zinab Aba Dilbi | M | 75 | Cami-cego | Farming |
| 20 | Aba Zinab Aba Dula | M | 45 | Bulado-coche | Farming |
| 21 | Aba Zinab Xaha | M | 62 | Cami-cego | Farming |
| 22 | Abaru Wereta* | M | 80 | Didesa | Healer |
| 23 | Abdela Aba Maca | M | 45 | Cami-cego | Farming |
| 24 | Abebaw Getahun* | M | 62 | Beshasha | Merchant |
| 25 | Abreham Woldu | M | 62 | Didesa | Farming |

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|----|------------------------|---|----|--------------|------------|
| 26 | Adisu Abdela | M | 35 | Genji-elbu | Merchant |
| 27 | Ahmed Meca | M | 40 | Coche | Farming |
| 28 | Alima Mohamed | F | 48 | Coche | House wife |
| 29 | AlimaTemam | F | 35 | Omo-gurude | Farming |
| 30 | Anberu Aba Fita | F | 45 | Coche | House wife |
| 31 | Asefa Abay | M | 40 | Didesa | Farming |
| 32 | Asha Sherif | M | 45 | Koye-seja | Farming |
| 33 | Ayalew Sisay* | M | 70 | Coche | Farming |
| 34 | Bekele Busho | M | 48 | Dalecho | Farming |
| 35 | Bekele Mekuria | M | 64 | Keso-heti | Farming |
| 36 | Bultu Aba Negash | F | 55 | Cami-cego | House wife |
| 37 | Dafis Aba Gisa | M | 42 | Coche | Farming |
| 38 | Demekech Nigusse | F | 33 | Dalecho | House wife |
| 39 | Engida Asefa * | M | 40 | Cami-cego | Farming |
| 40 | Fami Jihad | M | 25 | Genji-elbu | Student |
| 41 | Fatuma Aba Gumbul | F | 35 | Dalecho | Farming |
| 42 | Fatuma Abdo | F | 35 | Didesa | Farming |
| 43 | Fedila Mohammed | F | 30 | Dalecho | Farming |
| 44 | Gomiti Aba Zinab | F | 40 | Dalecho | House wife |
| 45 | Hada Kuma Aba Rago | F | 50 | Beshasha | House wife |
| 46 | Hada Sufiyan Aba Meca* | F | 68 | Keso-heti | House wife |
| 47 | Hadha Gidii Abdo | F | 45 | Koye-seja | Farming |
| 48 | Hadha Qoro Aba Jobir | F | 55 | Bulado-coche | Farming |
| 49 | Halefom Arguy | M | 65 | Didesa | Farming |
| 50 | Hassen Aba Fita | M | 28 | Didesa | Farming |
| 51 | Hussein Aba Kelbi | M | 32 | Genji-elbu | Merchant |
| 52 | Jaallee Kumsa | F | 75 | Omo-gurude | House wife |
| 53 | Jibril Aba Dura* | M | 38 | Genji-elbu | Farming |

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|----|---------------------------|---|----|--------------|------------|
| 54 | Kadir Haji* | M | 30 | Genji-elbu | Farming |
| 55 | Kaliti Aba Dega | F | 35 | Bulado-coche | Farming |
| 56 | Kaliti Aba Jihad | F | 50 | Bulado-coche | Farming |
| 57 | Kalusa Aba Dega | M | 70 | Koye-seja | House wife |
| 58 | Kedija Ahmed* | F | 60 | Bulado-coche | House wife |
| 59 | Kedija SheJemal | F | 45 | Cami-cego | Farming |
| 60 | Kedir Jibril | M | 45 | Omo-gurude | Farming |
| 61 | Kelifa Aba Biya | M | 22 | Dalecho | Farming |
| 62 | Lemlem Ali | F | 20 | Keso-heti | Student |
| 63 | Lubaba Aba Dima | F | 65 | Cami-cego | House wife |
| 64 | Mekiya Aba Meca | F | 50 | Omo-gurude | House wife |
| 65 | Melaku Getahun* | M | 50 | Didesa | Healer |
| 66 | Melka Burayo* | M | 75 | Dalecho | Farming |
| 67 | Mohammed Hussein* | M | 50 | Bulado-coche | Farming |
| 68 | Mohammed Jamal | M | 55 | Didesa | Farming |
| 69 | Mohammedamin Aba Nebso | M | 44 | Koye-seja | Trader |
| 70 | Muhaba Aba Milki | M | 30 | Omo-gurude | Farming |
| 71 | Mulgeta Aba Meca | M | 36 | Keso-heti | Farming |
| 72 | Nasir Aba Meca | M | 40 | Keso-heti | Farming |
| 73 | Nasir Mohammed | M | 30 | Koye-seja | Farming |
| 74 | Nebso Aba Gero | M | 52 | Coche | Farming |
| 75 | Nebso Aba Rago | M | 45 | Cami-cego | Farming |
| 76 | Negash Aba Gero Aba Waji* | M | 42 | Koye-seja | Farming |
| 77 | Negash Aba Gero* | M | 60 | Cami-cego | Farming |
| 78 | Negati Aba Nura | F | 52 | Genji-elbu | Farming |
| 79 | Nezif Aba Simel | M | 36 | Beshasha | Farming |
| 80 | Rabiya Aba Zinab | F | 40 | Koye-seja | Farming |
| 81 | Sabir Shafi | M | 21 | Beshasha | Farming |

| | | | | | |
|-----|------------------------------|---|----|--------------|------------|
| 82 | Seifu Temam | M | 25 | Omo-gurude | Farming |
| 83 | She Edris Suleman * | M | 45 | Beshasha | Vendor |
| 84 | Shekedir Aba Bekir* | M | 76 | Keso-heti | Healer |
| 85 | Shekemal Haji Mohamed Sayid* | M | 75 | Bulado-coche | Farming |
| 86 | Shemsiya Aba Oli | M | 70 | Koye-seja | House wife |
| 87 | Sherefte Aba Wari | F | 70 | Keso-heti | House wife |
| 88 | Shishig Bargu | F | 40 | Didesa | Farming |
| 89 | Sisay Aba Gochu | M | 45 | Coche | Farming |
| 90 | Staz Tijani Suleman* | M | 61 | Omo-gurude | Farming |
| 91 | Suleman Bushira | M | 47 | Bulado-coche | Farming |
| 92 | Teha Aba Jebel | M | 35 | Keso-heti | Merchant |
| 93 | Temam Aba Dura | M | 42 | Coche | Farming |
| 94 | Tigabu Zinabu | M | 38 | Didesa | Farming |
| 95 | Tijani Aba Fogi | M | 34 | Keso-heti | Farming |
| 96 | Tsega Mitiku* | F | 26 | Coche | Student |
| 97 | Xayibo Aba Meca * | M | 25 | Dalecho | Farming |
| 98 | Yeshi Girma | F | 27 | Bulado-coche | Student |
| 99 | Yesuf Aba Fita | M | 45 | Didesa | Herder |
| 100 | Zinabu Aba Simel | M | 45 | Beshasha | Farming |

Key: With * are key informants