

JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCES

DEPARTMENT OF BIOLOGY



AN ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF ANUAK
AND NUER PEOPLES IN ITANG DISTRICT, GAMBELLA REGION,
ETHIOPIA

BY: Hanan Dires

Advisor: Dereje Denu (PhD)

A Thesis submitted to Department of Biology College of Natural Sciences Jimma
University, in partial fulfillment of the Requirement for the Degree of Master of
science In Biology

Oct, 2017

Jimma, Ethiopia

JIMMA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF ANUAK AND
NUER PEOPLES IN ITANG DISTRICT GAMBELLA REGION ETHIOPIA.

BY

HANAN DIRES

A Thesis presented to the School of Graduate Studies of Jimma
University in Partial fulfillment of the Requirements for the Degree of
Master of Science in Biology.

Oct, 2017

Jimma, Ethiopia

List of Tables

Table 1: Percentage of herbal drugs imported by various countries for drug preparation.	11
Table 2: Age ranges of informants in the study area.....	21
Table 3: Marital status of informants in Itang District.....	21
Table 4: Educational status of informants.....	22
Table 5: The family of medicinal plants collected and recorded from Itang District	22
Table 6: No of genera, family and species in the home garden	24
Table 7: part of medicinal plants used for human remedies... ..	26
Table 8: Comparing accessibility of medicinal plants with the previous year	29
Table 9: Threat factor of traditional medicinal plants in the study area.....	30
Table 10: Marketability of traditional medicinal plants.....	31
Table 11: List of some of plants species reported by more than nine informants	32
Table 12 (A): Preference ranking of six selected medicinal plants that used to treat malaria in Anuak keble.....	33
Table 12 (B): Preference ranking of four selected medicinal plants for treating malaria in Nuer keble	34
Table 13: Informant consensus factor (ICF)	34
Table 14 (A): Paired comparisons of nine medicinal plant species used to treat stomach ache in Anuak keble.....	36
Table 14 (B): paired comparisons of five medicinal plant species used to treat stomach ache in Nuer keble	36
Table 15: Major human ailments and plant species used for treatment by indigenous people in Itang district	37

List of Figures

Figure1:Map of Ethiopia Regions with Itang Distric and other four Neighbor districts....	15
Figure2:Growth form distribution of medicinal plantsin Itang District.....	24
Figure 3: Growth form distributions of plants in the home garden of Itang District.....	25
Figure 4: Roots of application of medicinal plants in the study area.....	Error!
Bookmark not defined.	
Figure 5: Mode of preparation of medicinal plants in the study area.	27
Figure 6: Condition during preparation of medicinal plants	28
Figure 7: Transferring knowledge of medicinal plants	31

List of Appendices

Appendix 1: List of some human ailments treated by medicinal plants in Itang District.	50
Appendix 2: List of medicinal plants recorded in Itang District	51
Appendix 3: Check list of semi structured questions used for interview for collection of..... diversity and conservation of medicinal plants.	55
Appendix 4: List of informants involved in medicinal plants study in Itang Distric	57
Appendix 5: List of medicinal plants used for treating human ailments.....	58
Appendix 6: Letter of Ethical Consideration	76
Appendix 7: List of some photos	77

Acronyms

CSA-	Central Statistics Agency
FAO-	Food and Agricultural Organization
IUCN-	International Union for Conservation Natural Resource
IWAOR-	Itang woreda agricultural office report
IWHOR-	Itang woreda health office report
IWADOR-	Itang woreda administrative office report
WHO-	World Health Organization

Acknowledgements

I would like to express the deepest thanks to my advisor Dr. Dereje Denu for continuous follow up, comments and invaluable suggestions from the start of proposal development to the completion of this work. I would like to thank Jimma University for financial support.

I also acknowledge Itang District Education and Administration offices, Agriculture and Health office for the support during data collection from the rural kebeles of the District.

I would also like to express my great thank to local people of the district for their hospitality and kind response to my inquiries. My Thank also go to Gambella Regional State Education Bureau sponsoring my postgraduate study.

I wish to express my appreciation and sincere thanks to my husband Habib Sultan, for his material and moral support during my study.

Abstract

Ethno botanical study was conducted to assess medicinal plants and associated indigenous knowledge in Itang District, Gambella region, Ethiopia. Forty traditional healers participated in the study, out of these fourteen key informants selected. Data were collected using semi-structured interviews, field observations and voucher specimens were brought to Jimma University Herbarium for identification. Informant consensus factors (ICF), preference ranking and paired comparison were used to analyze the data. A total of 57 medicinal plants belong to 36 families and 55 genera were recorded and identified. The most commonly used plant families include *Fabaceae*, *Euphorbiaceae*, *Solanaceae* and *poacea*. Medicinal plants mostly collected from the wild and trees accounted for the highest share. The medicinal plants of the study site were used to treat 27 ailments; about 13 were used for stomach ache treatment. Roots (26.06%) and fruits (24. 37%) were the most frequently used plant parts. Flowers were the least frequent plant part for medicinal purpose. Routes of administration of the traditional remedies were oral, dermal, nasal, eye, handle and ear. Itang District has considerable diversity of medicinal plants. However, expansion of agricultural land, bush fire and drought are the major threats to medicinal plants. Hence proper conservation measures need to be practiced for sustainability of the medicinal plants.

Key words: Conservation, Indigenous knowledge, Itang District, Medicinal plants.

Table of content

List of Figures	iii
List of Appendices	iv
Acronym	v
Acknowledgements	iv
Abstract	vii
Table of contents	viii
1. Introduction.....	1
1.1 Background of the Study.....	1
1.2 Statement of the problem.....	3
1.3 Research Question.....	3
1.4 Objective.....	4
1.4.1 General Objective	4
1.4.2 Specific objectives	4
1.5. Significance of the study	4
2 Literature Review	5
2.1 Indigenous knowledge on medicinal plants	5
2.2 Medicinal Plants in Public health care system.....	6
2.3 Medicinal plant, diversity and distribution in Ethiopia	7
2.4 Medicinal plants as the base for Development of Modern Drugs.....	8
2.5 Source of supply of medicinal plants in Ethiopia	10
2.6 Marketability of Medicinal Plants	10
2.7 Threats facing medicinal plants in Ethiopia	11
2.8 Conservation of medicinal plants.....	13
2.9. Medicinal Plants in Research	14

3. Materials and Methods	15
3.1 Description of Study Area	15
3.1.1. People and health status of the study area	16
3.1.2. Livestock population	16
3.1.3 Indigenous Knowledge on Health	16
3.1.4 Botanical and Ecological indigenous knowledge.....	16
3.1.5 Geological indigenous knowledge	17
3.1.6 Topographic land classification by local people of the study area.....	17
3.2 Methods of the study	18
3.2.1. Study period and site selection	18
3.2.2. Selection of informants.....	18
3.2.3. Data collection Method.....	18
3.2.3.1. Group discussion and semi-structured interview	18
3.2.4. Plant specimen identification	18
3.2.5. Ethical Considerations	19
3.2.6. Data analysis.....	19
3.2.6.1. Informant consensus factor (ICF).....	19
3.2.6.2. Preference ranking	20
3.2.6.3. Paired comparison	20
4. Result and Discussion	21
4.1. Information on the Informants of the study Area.....	21
4.1.1. Age of informants.....	21
4.1.2. Marital status of Informants in the study area.....	21
4.1.3 Educational status of informants	22
4.2. Diversity of medicinal plant Resources in the study Area	22
4.2.1. Plants in the Home gardens.....	24
4.2.2. Habitat of plants in home gardens	25
4.3. Plant parts used and mode of preparation.....	25
4.3.1. Routes of Application, Mode of preparation and Dosage	26
4.3.2. Mode of preparation of traditional medicine	27
4.3.3. Condition of plants during preparation of remedy	28

4.4. Side effect of the use of medicinal plants	28
4.5. Accessibility of medicinal plants in the study area when compared to the previous Year.....	29
4.6. Threats and Conservation of Medicinal Plants	29
4.6.1. Threats to medicinal plants in the study area.....	29
4.6.2. Conservation of medicinal plants	30
4.7. Transferring knowledge of use of medicinal plants	31
4.8 Marketability of medicinal plants	31
4.9. Ranking medicinal plants	32
4.9.1 Informant Consensuses	32
4.9.2. Preference ranking.....	33
4.9.3. Informant consensus factor (ICF)	34
4.9.4. Paired comparison	35
4.10. Major human ailments and plant species used by indigenous people	37
5. Conclusion and Recommendation	39
5.1 Conclusion	39
5.2. Recommendation.....	39
Reference	40

1. Introduction

1.1 Background of the study

Ethiopia is a country characterized by a wide range of climate and ecological conditions, possesses enormous diversity of fauna and flora. The country possesses a particularly wide range of potentially useful medicinal plants, more extensive indeed than available in many other parts of the world (Pankhurst, 2001). It is not unusual for people living in the country side to treat some common ailments using plants available around them (e.g. *Hagenia abyssinica* to expel tapeworm). About 80% of the Ethiopian population depends on traditional medicine for the treatment of different human ailments (Bekele, 2007).

Medicinal plants are useful for primary health care and as remedy for human and livestock ailments (Hunde, 2001). Moreover, traditionally they are used and which are believed that they are good for health; the medicinal plants include foods, drinks, herbs and species. The medicinal plant of Ethiopia and the developing countries play major supplementary roles to the limited modern health care available (Hunde *et al*, 2001). The development of useful not widely used drugs like Digoxin and Digtoxin, from *Digitalis* leaves; Quinine from the *cinchona* bark; reserpine from *Rauwolfia serpentina*; Morphine from *Papaver somniferum*; cocaine from *Erythroxzincoca* and the anticancer vincristiner and vinblastine from *Catharanthus roseus* of Madagascar and again anticancer compound, bruceatin, from the Ethiopian plant, *Brucea antidysentrica*, are example of the contribution of traditional pharmacopoeia.

World Health Organization said the significant role of medicinal plant in primary health care delivery in Ethiopia where 80% of human and 90% of livestock population depends on traditional medicine, again similar to many developing countries particularly that of sub Saharan African countries (Teklehymanote and Gidey, 2007; Ermias *et al.*, 2008). These plants are the part of the economic commodity for some members of the society which make their livelihood on their collection, trade and medicinal practice by practitioners or healers. It thus has a substantial potential to make contribution to the economic growth and alleviation of poverty in the country. According to Dessalgn (2001), Ethiopian plants have shown very effective contribution for some ailments of human and domestic animals, Such plants include *phytolacca*

dodecandra, many species of *phyllanthus* studied by National Cancer institute USA and many species that show anti-malarial. Medicinal plants and knowledge of their use provide a vital contribution to human and livestock health care needs throughout Ethiopia (Zemedede, 2001; Sori *et al.*, 2004). Africa attitudes towards traditional herbal medicines are very strong. One reason for this is the confusion between herbal medicine witchcraft (Bekele, 2007). The uses of medicinal plants is sometimes associated with superstition, and therefore rejected by some people in favor of western medicine. On the other hand; there are millions of Africans who prefer traditional methods of treatment. The valuable medicinal properties contained in certain plants are not, however, in doubt (WHO, 2002). In recent year for example the Chinese plant *Artemisia annua* has become the essential ingredient in a new generation of antimalarial drugs the plant is now being grown in East African countries to supply pharmaceutical manufactories in Europe.

Despite its significant contribution to society, traditional medicine has experienced very little attention in modern research and development, and less effort has been made to upgrade the practice. It is only recently (Dawit, 1986) that the Ethiopian health authorities have shown an interest in promoting and developing it. In 1979, a Coordinating Office for Traditional Medicine (recently promoted to the Research Department) was established under the Ministry of Health (Dawit, 1996). The aim of the Office among others, were to conduct chemical screening of medicinal plant, co-ordinate activities regarding traditional medical practices, as well as to evaluate traditional medicine (Shiferaw,1996).

The Drug Research Department had collected and documented over 600 medicinal plants in Ethiopia (Dawit, 1996). Today, continued deforestation and environmental degradation of habitats in many parts of the country have brought about the depletion of medicinal plant and associated knowledge. Medicinal plants such as *Hagenia abyssinica*, *Clerodendrum myricoides*, *Cucumis aculeatus*, *Warburgia ugandensis*, are among the threatened species in Ethiopia due to environmental degradation and over exploitation (Tesfu *et al.*, 1995). The actual part of the medicinal plants that is collected also poses a serious threat to the survival of the species. The species *Dracana steudneri* Engler, *Hagenia abyssinica* and *Securidac longepedunculata* are becoming scarce in the wild as a result of excessive harvesting their roots, bark of whole parts (Tesfu *et al.*, 1995). Loss of the associated knowledge has been aggravated by the expansion of

modern education, which has made the younger generation underestimate its and resettlement of people from drought-stricken regions to fertile areas have also resulted in the deterioration of traditional practices (Dawit, 1986). In countries like Ethiopia, where there are no adequate hospitals and formally trained doctors a weakening of traditional medical practices will greatly affect the national primary health care system. Recent works in the country have recorded medicinally important plants (e.g. Jansen, 2001; Gelahun, 1989; Tadesse and Demissew, 1992).

1.2 Statement of the problem

Like in many parts of Ethiopia, medicinal plants have been used by Anyuak and Nuer people in Gambella region. Ethno botanical study of medicinal plants of those people in the region has not been addressed and comprehensive account about their traditional medicinal knowledge has not been recorded. Medicinal plants and the associated indigenous knowledge are under threat mainly due to drought, uncontrolled bush fire and deforestation. Hence, the lack of conservation action and developmental activities is observed in Itang district, which is similar to other areas of Ethiopia. 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 concerned ethnobotanical research play an important role for conservation and sustainable utilization of these medicinal plants

1.3 Research Question

1. What kinds of medicinal plants are found in the study area?
2. Which parts of the plant are more frequently used for remedy preparation?
3. What is the indigenous medicinal knowledge of the people in the study area?

1.4 Objective

1.4.1 General Objective

The general objective of this study was to assess medicinal plants and the associated indigenous Knowledge of Anyuak, and Nuer people in Itang woreda

1.4.2 Specific objectives

1. To identify and record parts of the medicinal plants used, ways of remedy preparation and Route of application
2. To document the indigenous medicinal knowledge of the people in the study area.
3. To come up with recommendation for the conservation of medicinal plants

1.5. Significance of the study

The finding of the study will help for governmental and non-governmental organization to design appropriate conservation strategies and give attention for the problem. The study will also be used as a base for other researchers who are interested in the study of medicinal plants of Anyak and Nuer people.

2 Literature Review

2.1 Indigenous knowledge on medicinal plants

In developing countries, ethnobotanical research has a potential role of immense value to local communities, to regional and national stakeholders, by drawing attention to plants with markets potential that could generate sustainable income without damaging the environment (Oliveira *et al.*, 2009). Furthermore, over all popular knowledge of plants uses, accumulated over centuries often represents the only therapeutic resource for many communities and ethnic groups with very low disposable income and poor access to modern industry-based medicine. About 80% of Ethiopian population rely on traditional medicine to meet their health care needs (Bekele *et al.*, 2007). The wide spread use of traditional medicine could be attributed to cultural acceptability, perceive efficacy against certain types of disease, physical accessibility and affordability as compared to modern medicine (Bekele, 2007; Hunde *et al.*, 2006). Nevertheless, little effort has so far been made to properly document the associated knowledge base and conserve medicinal plants in the country (Mirutse *et al.*, 2009). Even though encouraging initiatives have emerged in recent years, studies conducted hitherto are far from complete owing to the multi-ethnic cultural diversity and the diverse flora of Ethiopia (Haile *et al.*, 2008). Medicinal plants and the associated knowledge are being threatened by ongoing deforestation, environmental degradation ``modernization`` (Bekele, 2007). All this necessitates the need to investigate the status of medicinal plant resource and knowledge base associated with it for successful resource conservation and development.

Ethiopia has their own set of written and oral pharmacopoeias with medicinal use of some species being restricted to each ethnic group. The cultural and indigenous knowledge of medicinal plants in Ethiopia is unevenly distributed among each community members. Peoples in different location linguistic and cultural background have their own specific knowledge about use of plants which in part has gradually entered wide circulation in the country. Large number of identified medicinal plants species are reported in Ethiopian Flora, however, many others are not yet identified. About 300 of these species are frequently mentioned in many sources. The great concentration of medicinal plants found in the South western part of the country, following the concentration of biological and cultural diversity (Edwards, 2001).

2.2 Medicinal Plants in Public health care system

Plants have been used as a source of traditional medicine in Ethiopia from time immemorial to combat different ailments and human sufferings (Hunde *et al.*, 2001). According to Dawit (2001), there is a large magnitude of use and interest in medicinal plants in Ethiopia due to accessibility and biomedical benefits. In a study made by Ballemic *et al.*, (2004), the order of importance of the threat factors on medicinal plants were indicated in areas where harvest of medicinal plants for firewood, charcoal, drought, agriculture, house use and trade. The available modern health care services of the country are not only insufficient but also inaccessible and unaffordable to the majority (Haile *et al.*, 2008). This problem along with the rapidly increasing human population and cultural resistances towards the use of modern medicines means that the majority of the people in Ethiopia are dependent on traditional medicines of mainly plant origins to manage various human ailments (Dawit, 2001).

In addition to these factors, the fact that modern medical services are inaccessible to the vast majority of the populations due to their costs made herbal medicine more acceptable. The problem of ensuring equitable distribution of modern health care has become more serious, as the gap between supply and demand has continued to widen. Hence, in present day Africa, the majority of people lack access to health care and where available the quality is largely below standard (Abbiw, 1996). This is why Archer (1990) and stated that for most indigenous peoples and the local communities' reliance on plant resources accounts for anything up to 95% of their survival requirements. Therefore, herbal remedies are the world's therapeutic means to act against disease for a large population of people both rural and urban centers in developing countries like Ethiopia (Abbiw, 1996). According to Hamilton (2004), traditional medicinal system categorized into three; (1) traditional medicinal system, with written traditions of documentation of knowledge pharmacopeias for doctors and institutions for training doctors; (2) traditional medicinal knowledge (folk medicinal); which is orally transmitted and associated with households, communities or ethnic groups; and (3) shamanistic medicine, with a strong spiritual elements and which can only be applied by specialist practitioners.

2.3 Medicinal plant, diversity and distribution in Ethiopia

Conservation of plant diversity, at the level of ecosystems, landscapes, species, populations, individuals and genes is essential to sustain the health and vitality of ecosystems, thereby safeguarding their productive, protective, social and environmental functions. According to Pankhurst (2001), Ethiopia, is a country characterized by a wide range of climate and ecological conditions, possesses enormous diversity of fauna and flora. The country possesses a particularly wide range of potentially useful medicinal plants, more extensive indeed than available in many other parts of the world.

According to Edwards (2001), woodlands, mountain vegetation including grasslands and forests and the evergreen scrubs and rocky areas contain more medicinal plants with higher concentrations in the woodlands. She observed that the microphyllous vegetation of the woodlands listed more medicinal plants species followed by the Mountain-grassland and riverine vegetation while the afro alpine vegetation ranked last. The number of different languages spoken in Ethiopia approaches 90 (Maffi, 1999) and each corresponds to its unique socio-cultural population thus amounting to the high human cultural diversity. Each of these cultural domains has its own set of written and/or oral pharmacopoeias with the medicinal use of some species being restricted to that give culture. According to Jansen (1981), Ethiopia has rich medicinal plant lore and points out that almost all plants of the Ethiopian flora are used somewhere somehow medicinally. Other workers on the other hand estimated about 60% of the flora to be medicinal, and most sources given about 10% of the flora to be medicinal.

Environmental degradation, agricultural expansion, loss of forest and woodlands, overharvesting, fire, cultivation of marginal land, overgrazing and urbanization appear to be the major threats to the medicinal plants of Ethiopia (Balemie *et al*, 2004). Such a threat poses a significant threat to the future wellbeing of the human and animal population that has for generations relied on these resources to combat various ailments. Many species of Ethiopian medicinal plants have a long history of use as remedies (Fassil, 2001). The traditional medicinal systems in different parts of the world have some distinctive features (Bekele, 2007). Chinese traditional herbal medicine, the Indian Ayurvedic medicine, the Japanese traditional medicine system and the African system are recognized among others.

The Ethiopian traditional medical system is mainly a sub category of the African traditional medical system with some influence from Egypt and Greece and has its own characteristics features. Ethiopian traditional life is painted with the hallmark of widespread use of traditional medicinal plants with various level of sophistication within the indigenous medicinal lore. It is blended with religious thinking and various beliefs and need further investigation. According to health practitioners traditional practitioners are categorized into: Herbalists, Bone stallers, Traditional birth attendants, Spiritual healers, Diviners and magicians. Each of these categories is with mixed responsibilities and identities at times. Herbalists are considered to be the biggest group that uses medicinal plants. Practitioners use in one way or the other plants and plant products in their medical practices. Some have described the traditional medical system of Ethiopia as medico-religious system (Dawit and Ahadu, 1993). And others as Magical religious, such description is due to close interaction of the Christian, Islamic and indigenous religious with the traditional medical system in the country which sometimes displays features related to magic, beliefs and faith in some areas. According to Brehony (1998) there are two categories of healers in Borana namely Cirressa and Ayana. Cirressa or traditional healers have a knowledge formally passed on and different Cirressa have different specializations where Cirressa qoorsa specialize on medicinal plant. Here it is believed that all healers are descended from two clan namely Ali Rees family of Karayoo clan and Oborsa family of Dambitoo clan. These families believe that they received their knowledge from God and passed it on to generations. The family wait for their son's topic medicinal plants themselves before any one tells them.

2.4 Medicinal plants as the base for Development of Modern Drugs

Searching new drug from traditionally used medicinal plants can be shortest path to success (Weldegerima, 2009) and indigenous people remain the ultimate resource for retrieving this information for the purpose of application, particularly in modern medicine (MacDonald, 2009). The number of higher plant species (angiosperms and gymnosperms on this planets is estimated to be between 250,000- 500,000. Of these, only about 6% have been screened for biological activity. And a reported 15% have been evaluated photochemically (Fabricant and Farnsworth, 2001). Ethno-pharmacology is a highly diversified approach to drug discovery involving the observation, description, and experimental investigation of indigenous drugs and their biological activities. It is based on botany, chemistry, pharmacology, and many other disciplines

(anthropology, archeology, history and linguistics) that contribute to the discovery of natural products with biological activity. In addition, taxonomy and the newer discipline ethnobotany, have now an integral part of drug discovery from plants (Jachak and Sakalani, 2007).

Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drug (Wright, 2005). An average of 25% of modern drugs contains one or more active principles obtained from plants (Medhin *et al.*, 2002). Medicinal plants are the root for medicinal practice. Of the 12,807 species used in traditional Chinese medicine, 11,146 are plant species (Cunningham *et al.*, 2001). Plant based drugs provide outstanding contribution to modern therapeutics (Samy and Gopalakrishnakone, 2007). Various modern drugs were extracted from medicinal plants through the use of plant material as indigenous cure in folklore or traditional system of medicine (Verma and Singh, 2008) and it is believed that half of the top 25 bestselling medicine in the world originate from natural materials including plant materials (Ohigashi, 2008). In the United States, of the top 150 prescription drugs, at least 118 are based on natural sources.

Ethiopia is a rich source of medicinal plants, however, the knowledge and use of plants is an integral parts of many ethnic cultures, the extent of which has not yet been studied in depth (Abbink, 1995), and Perhaps the best known species is *Phytolacca dodecandra*. Extracts of the plant, commonly known as endod, are used as an effective molluscicide to control shistosomiasis and Maytansine, an active principle against cancer was isolated from *Maytenus* species (Demissew and Dagne, 2001), which was collected and studied by the National Cancer Institute (NCI) USA. The authors indicated that the result was hidden after 1972). Some plants having similar uses elsewhere can be taken as indicator of their pharmacological effectiveness has been tested in different area by different culture. Therefore, development of new drug is important research in order to alleviate the health problems. In United States of America, plant derived anti-cancer drugs save at least 30,000 lives per year (Roberson, 2008) and even drug for deadly diseases like HIV/AIDS could be discovered by ethnobotanical approaches, by taking indigenous knowledge as a base.

2.5 Source of supply of medicinal plants in Ethiopia

Home based medicinal plants use relies on plants of the home-garden crops, weeds and that grow wild around human habitation. The cultivated medicinal plants of home-garden are used either for medicinal or other purposes. Medicinal plants of home garden are known to the public as the knowledge on them is open or publicized (Zemedu, 2001). Medicinal plants obtained from wild habitat are found in different natural ecosystems of the forests, grasslands, woodlands, wetlands, in field margins and garden fences, as weeds and in many other microhabitats from where they are harvested when the need arises. Many medicinal-plants are also harvested for non-medicinal values such as for timber implements, fuel wood and other purposes and hence they are subjected to multiple pressures like *Hagenia abyssinica* and *Prunus africana* are facing at present. Conservation measures should target habitats of such vulnerable species. Most traders purchase medicinal plants from collectors. Consumers get their supply from different sources including from own garden, purchasing from traders and healer. Medicinal plants are also imported informally from traders e.g. Sudan through border towns like Assosa and Dire Dawa. The domestic supply sources are closely associated with the biodiversity and concentration of forest areas e.g. Jimma and Bale. Traders from Dire Dawa for example travel to Bale, Jimma, Gonder and Menz.

2.6 Marketability of Medicinal Plants

Medicinal plants trade has been practiced in the world. In 1998, the global market of phytomedicine was estimated at 250 million US dollar (Samy and Gopalakrishnakone, 2007). However, Andy (1999) estimated the international market of herbal products to be 62 billion US dollars, of which China`s share in the world herbal market is 6 billion US dollars and India`s share is one billion US dollars (Verma and Singh, 2008). There are medicinal plants exported from various countries. China takes the lead by importing the highest number of herbal drugs for drug preparation.

Table 1: Percentage of herbal drugs imported by various countries for drug preparation

Country	Percentage of herbal drug imported
China	45.0%
USA	15.6%
Australia	10.5%
Indonesia	4.1%
India	3.7%
Taiwan	1.7%
South Korea	1.4%

Ethiopia is not largely known exporting and importing medicinal plants and the only medicinal plants export from Ethiopia is *Catha edulis* (Dessalgn, 2001). Medicinal plants are also on sell in domestic markets; for instance, it accounts for an average of 5000 plant species (40%) of the medicine market in China, and in South Africa ,between 400 to 550 plant species are currently sold for use in traditional medicine (Medhin *et al.*,2001). India uses about 7000 plant species (Verma and Singh, 2008). According to Marshal (1998), Ethiopia had no legal export and import of products for medicinal use but plants of medicinal importance are exported to Djibouti and other countries as agricultural product. Another market study was directed to medicinal plants with other agricultural products in eastern, central and western Ethiopia (Letchamo and Storck, 2006).

2.7 Threats facing medicinal plants in Ethiopia

People use many wild species of plants for food, medicine, clothing, shelter, fuel fiber, income generation and the fulfilling of cultural and spiritual needs throughout the world (Asfaw, 2001). Ethiopia`s traditional medicine as elsewhere in Africa faced problems of continuity and sustainability (Ensermu *et al.*, 1992). The primary causes of this problem are loss of taxa of medicinal plants, loss of habitats of medicinal plants and loss of indigenous knowledge. Some studies have shown that most of the medicinal plants utilized by Ethiopian people are harvested

from wild habitats (Mirutse, 1999); Tesfaye and Zemedede, 1999) and hence this aggravates the rate of loss of taxa with related indigenous knowledge and loss of widely occurring medicinal plant species. There are two sources of threats to medicinal plants, i.e., manmade and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production over harvesting, destructive harvesting, invasive species, Commercialization, honey cut, 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 *et al.*, 1992). According to Hunde *et al.* (2004), modern education has an impact on the knowledge of medicinal plants. In another hand loss of indigenous knowledge is also aggravated by the expansion of modern education, making the younger generation underestimate its traditional values. He pointed out that those students who attended modern schools are showing unwillingness to learn from their parents, which is an evidence for the gradually disappearing traditional knowledge. As elsewhere in Ethiopia, the problem is manifested in Itang District due to the above mentioned factors. The most serious proximate threats generally are habitat loss, habitat degradation and over harvesting (Hamilton, 1997).

The majority of species of plants in traditional or herbal medicinal treatments are harvested in wild rather than cultivated. As a result, many plants species have become extinct and some are endangered. As population grow, demand for traditional medicines will increase and pressure on medicinal plant resource will become greater than ever (Hamilton, 2003), like other developing countries, the loss of valuable medicinal plant species in Ethiopia due to population pressure, loss of habitat, agricultural expansion and deforestations are widely reported by different researchers in Ethiopia (Ensermu *et al.*,1992; Sebssebe, 2001). Pressures from agriculture expansion, wide spread cutting for fuel wood combined with seasonal drought have been reported by (Fisseha *et al.*, (2009) and Ermias *et al.*, (2008) as main factors for environmental degradation as well as the depletion of medicinal plants. Most of medicinal plants have no protection since they are harvested from the wild.

2.8 Conservation of medicinal plant

According to Berhan and Dessie (2002), the knowledge of medicinal plants is commonly secretly passed orally from generation to generation. In this process valuable information can be lost whenever a medicinal plant is lost or when a traditional medical practitioner dies without passing his/her indigenous knowledge to others. Hence, documentation of indigenous knowledge and making herbaria for future use is also recommended to conservation of the declining medicinal plants and also to create awareness on the contribution of traditional medical practice to fulfilling the primary healthcare needs among the youth (Mirutse *et al.*, 2009). It was pointed out that young generation has no interest to know about medicinal plants and efforts should be made to incorporate traditional medicine in school curricula so that younger people appreciate its usefulness (Mirutse *et al.*, 2009). A traditional community has also contributed greatly in giving value to the biodiversity and maintaining the resource for generation (Medhin, 2002). Thus for the conservation of plants biodiversity, both in situ and ex-situ conservation methods can be applied (Frankel *et al.*, 1995). The growing recognition of the importance of medicinal plants in meeting local and global health care need provides an important opportunities for conservationists, traditional medicine practitioners, local communities and others to work together to develop mutually supporting solutions to problems associated with forests loss and biodiversity erosion.

In-situ conservation involves protection and establishment of plants and other biological resource in the location of their natural occurrence. In addition, tissue culture techniques are also important in ex-situ conservation of traditional medicinal plants (Sebssebe, 2001). This involves establishment of plantation, maintenance of living collections in farm fields, home gardens, botanical gardens, and arboreta in location outside the zone of their natural occurrence (Roche, 1992). The essence of ex-situ conservation is the rapid development of alternative supply sources of medicinal plants through cultivation in large enough quantities and at low enough price in order to compete with price obtained by gatherers of wild medicinal plants stocks (Cunningham, 2001). This will satisfy market demands, result in more secure jobs and provide fewer incentives to gather from the wild. According to Zemedu (2001), medicinal plants can be conserved using appropriate conservational method in gene banks and botanical gardens. This type of conservation of medicinal plants can also be possible in home gardens, as the home garden is

strategic and ideal farming system for the conservation, production and enhancement of medicinal plants.

2.9. Medicinal Plants in Research

According to Demissew and Dagne (2001), there is considerable global interest in tapping the accumulated knowledge of traditional medicine, and therefore, researches are being carried out in many countries with the aim of increasing the use of traditional medicine to the welfare of the human population. The same document also explains that basic and applied researches on medicinal plants are interconnected and the basic research is primarily important in realizing new knowledge and serving as bases for applied research.. Basic researches with special emphasis on systematic study and documentation of medicinal plants have been made in this country by few professionals like Amare (1976), Jansen(1981), Mesfin (1986), Dawit and Estifanos (1991), Mesfin and Sebssebe (1992), Dawit and Ahadu (1993), Abbink(1995), Mirutse (1999), Sintayehu (2000), Hunde (2001), Abiyot(2002), Balemie *et al.*,(2004), Ermias (2005), Teklehaymanot *et al.*(2007).

3. Materials and Methods

3.1 Description of Study Area

Gambella region is one of the regional states in Ethiopia, Located at about 776 km west of Addis Ababa. The region is divided into three administration zones again the zones are divided into eleven woreda. Because Itang is not part of any zone; it is considered as special woreda; which is 41km far from the capital city of the region (Gambella town). It is bordered on the south and southeast by the Anuak zone, on the west by Nuer zone, on the northwest by South Sudan and on the north by Oromiya Region (Figure 1). Itang has altitude of 480 m above sea level. The average annual temperature in Itang is 27.4 °c and in a year, average rainfall is 933mm (IWAOR).

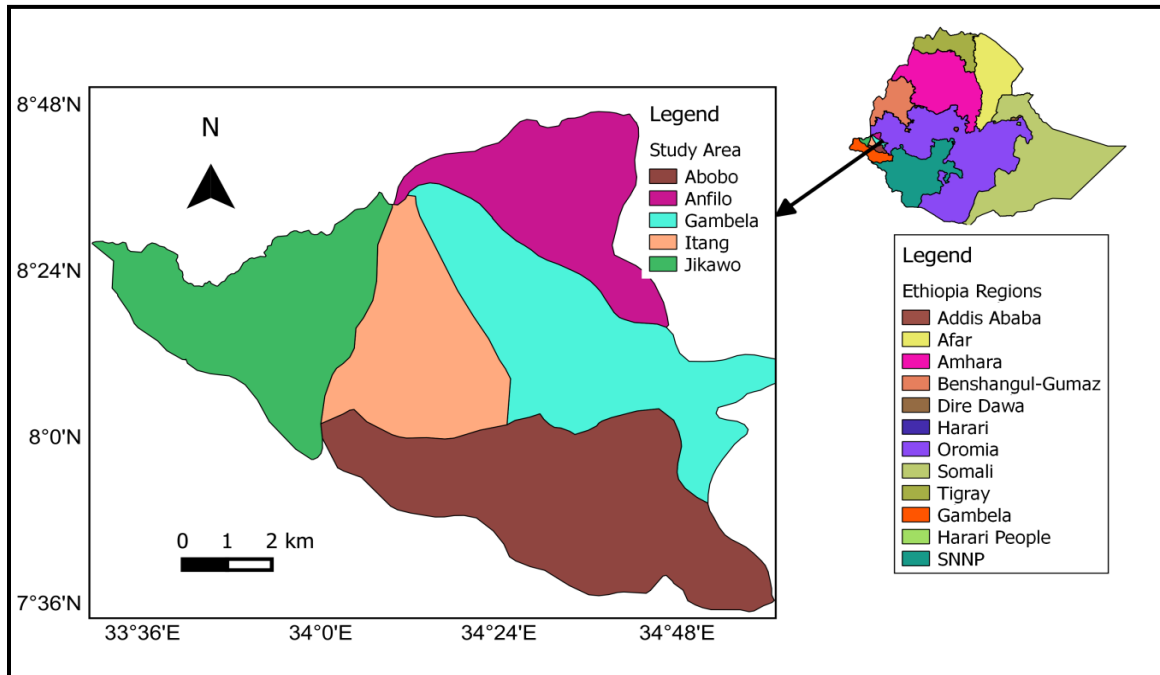


Figure 1: Map of Ethiopian Regions with Itang (the study District) and other four Neighboring Districts.

3.1.1. People and health status of the study area

According to the 2007 census result, the total population of the district is 35,686 (17,955 males, 17,731 females). Only 5,958 or 16.7% of the population are urban dweller and the remaining 29,728 (83.3%) were rural population (CSA, 2008). With an estimated area of 2,188.34 Km², Itang has a population density of 16 people per Km² of land. The communities based on production of crops and livestock. In the district there are 7 health centers, 3 Government and 2 private clinics, 1 legal private pharmacy (drug store) and 3 diagnostic laboratory services (IWHOR).

3.1.2. Livestock population

Itang District is rich in livestock population with 79,794 of cattle, 21,197 goats and sheep and 32,486 hens (IWAOR).

3.1.3 Indigenous Knowledge on Health

People of the study area confer value for their health, as their health is their life component and security. The local people call health “Dolwal” in Nuer and “Atjiat” in Anuak. In the study area most of the health problems of the community are solved by remedies obtained from plants. For instance disease like Tumors (nekersa), Tooth infection, Snake bite, Rabies, Malaria, Scorpion bite, liver disease, Spider poison, Bat infection are some of commonly treatable diseases by using medicinal plants. For instance, HIV/AIDS is the diseases that people prefer for modern medication.

3.1.4 Botanical and Ecological indigenous knowledge

People of the study area classify ecology of their surroundings, based on climate. The following are *Letlet*, *Mimor*, and *Mekochkoch* in Nuer and *Let*, *Dir*, and *Nech* in Anuak are equivalent to low land, mid land and high land respectively.

The local people have their own knowledge of vegetation, based on density of plant species that cover the land. Which are their classifications in Anuak (A) and Nuer (N) languages.

Rup (N), Lul (A):- is a type of forest with densely populated plant species and various larger plants also occur.

Rid (N), Gol (A) - is grass land vegetation

Budbud (N), Gola (A): is open woody and shrub land with patches of trees, bushes, shrubs and herbaceous species.

Duach (N), Aludi (A): is means marshy vegetation. Plant species of mostly Poaceae family grow. The place is unsuitable for plough but is suitable for grazing.

3.1.5 Geological indigenous knowledge

The local people of Itang District group soil on the basis of color, Miloal, Pin, and Leat in Nuer and Makuer, Machol and Akuwa in Anuak languages meaning red soil, black soil and sandy soil respectively. Among these soil types black soil is most abundant coverage of the District. It has better fertility and production in contrast to other soil type. Red has less fertility in comparison to the black soil but can enable to grow crops of various types by applying fertilizers and sandy soil is not suitable for crop production

3.1.6 Topographic land classification by local people of the study area

People of the study area classify landscapes based on elevation and suitability of the land for agriculture and grazing. Hence, they classify landscapes into three categories, namely Augam, Juwana and Dawalala in Anuak and Pam, Mun and Pam Mitot in Nuer languages.

Augam (A) Pam (N): refers to Mountain with high elevation and it can be seen easily from far. It is covered with larger trees, Shrubs and grasses. The land is not suitable for ploughing and grazing

Juwana (A) Mun (N): refers to plain land. Agricultural practice, grazing and settlement are practiced in this type of land.

Dawlala (A) Pam mitot (N): refers to smaller hills compared to mountain, sometimes on which agriculture, grazing and other practices be performed.

3.2 Methods of the study

3.2.1. Study period and site selection

Out of the 23 Kebles in the district, the study was conducted in two Kebles (namely Itang kier and Bazil), from March 28 ,2017 to May 15,2017 because these selected areas contain ethnic group especially the indigenous people that speak Anuakng and Nuerng language respectively and also near to the town.

3.2.2. Selection of informants

In this study, 40 traditional healers (24 males and 16 females) with the age between 30 and 80 years were purposively selected regardless of sex, social status and educational background from two kebles, Out of these, 14 key informants (8 males 6 females) were selected purposively based on recommendation from elders and local authorities.

3.2.3. Method of data collection

Semi-structured interview, group discussion and field observations by waking with translators were carried out between March 28 to May 15, 2017. The data collection on plants of local names, Site of collection (wild or home-garden), conservation practices, ailment and disease treated. Parts of plants used for treatments. Methods of preparation, dosage, effects of treatment and duration of treatment were recorded from respondents.

3.2.3.1. Group discussion and semi-structured interview

A brief group discussion was made at each site with seven informants prior to medicinal plant data collection in the study area and residents in seeking to understand the traditional medicinal system of the people and its management and to know how knowledge is maintained and transferred from one generation to other generations. Discussions took place based on the checklist of questions prepared.

3.2.4. Plant specimen identification

Medicinal plant specimens used by Anuak and Nuer ethnic group in Itang District were collected from various habitats of the study area. Once specimen was collected, local names, habits and use of plants were recorded for each of the species. For identification, the plants were taken to Jimma University Biology department Herbarium. Then these specimens were identified using

taxonomic key in the various volumes of Flora of Ethiopia and Eritrea with collaboration of my advisor.

3.2.5. Ethical Considerations

Data collection was performed after permission was obtained from Itang District Education and Administration offices and obtaining consents from the traditional healers who involved in the study.

3.2.6. Data analysis

Information of medicinal plants; reported by local people (Anuak and Nuer ethnic group). were analyzed through descriptive statistical method such as percentage and frequency. The degree of importance of medicinal plants was checked by conducting various exercises, For instance, Informant consensus factor, preference ranking and paired comparison.

3.2.6.1. Informant consensus factor (ICF)

In order to evaluate the reliability of information recorded 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 changed from the original information, it was rejected since it was considered as irrelevant information. Only the relevant ones were taken into account and statistically analyzed. The Informant Consensus Factor (ICF) was calculated for each category to identify the agreements of the informants on the reported cures for the group of ailments. The ICF were calculated as number of use citations in each category (nur) 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 arrange of 0 to 1, where a high value acts as a good indicator for a high rate of informant consensus.

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

Where, ICF=Informants Consensus Factor

Nur=number of use citation in each category

Nt= number of species used

3.2.6.2. Preference ranking

Preference ranking was conducted by following Martin (1995). It was performed using seven selected key informants of the most important medicinal plants first on the basis of healing power of malaria and secondly on the basis of healing several ailments. Accordingly six medicinal plants were selected in Anuak keble and four in Nuer keble and ranked by the seven key informants in each keble on the basis of healing malaria by giving the highest value (6), high (5), medium (4), low (3) the least (2) and (1) for the first keble and (4), (3), (2) and (1) for the next keble (Table 12). These values were summed up and ranked for each plant species.

3.2.6.3. Paired comparison

This analytical method can be used for evaluating the degree of preference or levels of importance of certain selected plants (Nemarundwe and Richards.2002). Paired comparisons to indicate the effectiveness and popularity of 13 medicinal plant species used to treat stomach ache were employed as described by Martin (1995). In such a way that seven key informants were selected and allowed to show their responses independently for pairs of nine traditional medicinal plants in Anuak people and five in Nuer peoples that are noted for stomach ache. A list of the pairs of selected items with all possible combinations was made and sequence of the pair and the order within each pair was randomized before every pair is presented to selected informants and their responses were recorded, total value summarized and rank made based on the report of the informants. The most effective plant is stated by highest value while the least important is stated by least value.

4. Result and Discussion

4.1. Information on the Informants of the study Area

4.1.1. Age of informants

From the total of 40 informants, 24 (60%) were male, whereas the remaining 16 (40%) were female. The distributions of informants with respect to age class showed that, majority of the informants were elder peoples (Table 2).

Table 2: Age ranges of informants in the study area.

Age	No of informants	Percentage (%)
30-40	4	10
41-50	6	15
51-60	7	17.5
61-70	13	32.5
71-80	10	25
Total	40	100%

4.1.2. Marital status of Informants in the study area

Of the total informants majority of them were married, (Table 3).

Table 3: Marital status of informants in Itang District

Marital status	Sex		Percentage total
	Female	Male	
Married	13	22	87.5%
Single	3	2	12.5%
Total	16	24	100%

4.1.3 Educational status of informants

With respect to education status, majority of informants were unable to read and write (Table 4).

Table 4: Educational status of informants

Educational status	No of informant	Percentage total
Illiterate	34	85%
<5	0	0%
5_8 Grade complete	5	12.5%
>8	1	2.5%
Total	40	100%

4.2. Number of medicinal plant Resources in the study Area

A total of 57 medicinal plants were collected and identified in the study area. These plants are distributed under 36 families and 55 genera. Of these, 25(43.9%) species were obtained from home-gardens and 32 (56.1%) from the wild. Some studies have also shown that most of the medicinal plants used in Ethiopia are harvested from the wild (Mirutse and Tolasa 2007). Family *Fabaceae* was represented by 10 (17.54 %) species, followed by *Euphorbiaceae* 6 (10.5%) species, (Table5). The large number of medicinal plants belongs to *Fabaceae* this is in agreement with the finding Tesfaye (2007), Haile and Demissew (2007), Amenu (2007) which *Fabaceae* contributed to the highest number of plant species.

Table5. The family of medicinal plants collected and recorded from Itang District.

No	Family	No of Sp	Percent of Sp	No of genera	Percent of genera
1	<i>Solanaceae</i>	3	5.26%	2	3.63%
2	<i>Menispermaceae</i>	1	1.75%	1	1.8%
3	<i>Polygonaceae</i>	1	1.75%	1	1.8%
4	<i>Oleaceae</i>	1	1.75%	1	1.8%
5	<i>Passifloraceae</i>	1	1.75%	1	1.8%
6	<i>Poaceae</i>	3	5.26%	3	5.45%
7	<i>Malvaceae</i>	1	1.75%	1	1.8%
8	<i>Urticaceae</i>	1	1.75%	1	1.8%
9	<i>Ulmaceae</i>	1	1.75%	1	1.8%
10	<i>Euphorbiaceae</i>	6	10.5%	6	10.9%
11	<i>Asparagaceae</i>	1	1.75%	1	1.8%

12	<i>Zingiberaceae</i>	1	1.75%	1	1.8%
13	<i>Caricaceae</i>	1	1.75%	1	1.8%
14	<i>Meliaceae</i>	1	1.75%	1	1.8%
15	<i>Myrtaceae</i>	1	1.75%	1	1.8%
16	<i>Fabaceae</i>	10	17.54%	9	16.4%
17	<i>Commelinaceae</i>	1	1.75%	1	1.8%
18	<i>Antherericeae</i>	1	1.75%	1	1.8%
19	<i>Amaranthaceae</i>	1	1.75%	1	1.8%
20	<i>Asteraceae</i>	1	1.75%	1	1.8%
21	<i>Burseraceae</i>	2	3.5%	2	3.63%
22	<i>Balanituceae</i>	1	1.75%	1	1.8%
23	<i>Vitaceae</i>	1	1.75%	1	1.8%
24	<i>Rhamnaceae</i>	1	1.75%	1	1.8%
25	<i>Asclepiadaceae</i>	1	1.75%	1	1.8%
26	<i>Geraniaceae</i>	1	1.75%	1	1.8%
27	<i>Bignoniaceae</i>	1	1.75%	1	1.8%
28	<i>Rubiaceae</i>	2	3.5%	2	3.63%
29	<i>Santalaceae</i>	2	3.5%	2	3.63%
30	<i>Elatinaceae</i>	1	1.75%	1	1.8%
31	<i>Lamiaceae</i>	1	1.75%	1	1.8%
32	<i>Convolvuiaceae</i>	1	1.75%	1	1.8%
33	<i>Clusiaceae</i>	1	1.75%	1	1.8%
34	<i>Longanaceae</i>	1	1.75%	1	1.8%
35	<i>Boraginaceae</i>	1	1.75%	1	1.8%
36	<i>Anacrdiaceae</i>	1	2.77%	1	2.77%

Regarding habit groups; trees were the most frequent plant growth forms and herbs are the least growth form, the results of growth form analysis (Figure2) implies that majority of the medicinal plants in the study area are woody species. This is similar to finding of Zenebe, *et al.* (2012). An Ethno botanical study of Medicinal plants noted to treat human ailments. The existence and utilization of such a large number of medicinal plants by people in the study area indicates that the majority of the people used and continued to use indigenous medicinal practices for many ailments.

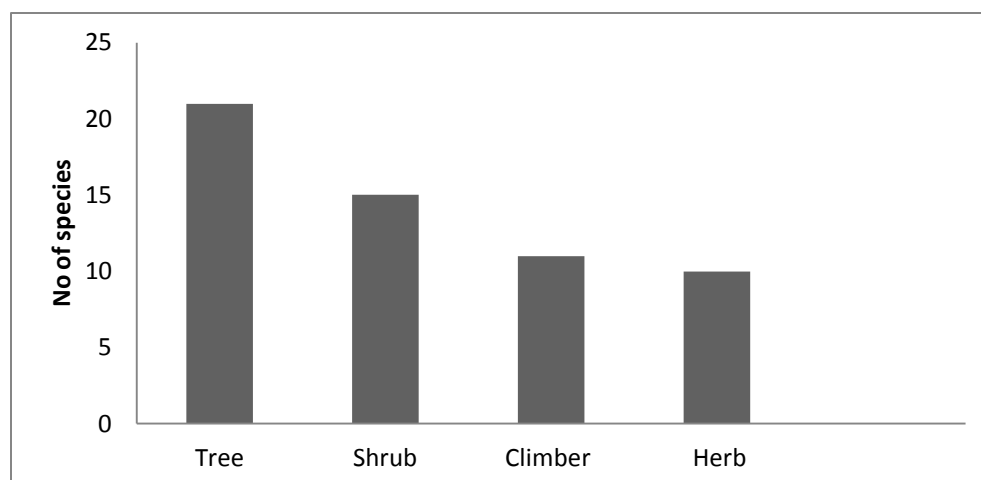


Figure 2: Growth form distribution of medicinal plants in Itang District

4.2.1. Plants in the Home gardens

The local communities of Itang obtain many services from homegardens. They provide food, medicine, shade 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 treatment of different human ailments. The number of plants recorded was 25 species in 24 genera and 18 families. In terms of species, *Euphrbiaceae* and *Fabaceae* contain the most species (Table 6).

Table 6: Numbers of family, genera and plant species in the home-gardens

Family	NO of genera	Percent	No of Species	Percent
<i>Solanaceae</i>	2	8.3%	3	12%
<i>Asparagaceae</i>	1	4%	1	4%
<i>Balanitaceae</i>	1	4%	1	4%
<i>Rhamnaceae</i>	1	4%	1	4%
<i>Euphrbiaceae</i>	3	12.5%	3	12%
<i>Fabaceae</i>	3	12.5%	3	12%
<i>Rubiaceae</i>	1	4%	1	4%
<i>Urticaceae</i>	1	4%	1	4%
<i>Poaceae</i>	2	8.3%	2	8%
<i>Santalaceae</i>	1	4%	1	4%
<i>Elatinaceae</i>	1	4%	1	4%
<i>Loganaceae</i>	1	4%	1	4%
<i>Myrtaceae</i>	1	4%	1	4%
<i>Meliaceae</i>	1	4%	1	4%
<i>Caricaceae</i>	1	4%	1	4%

<i>Anacardiaceae</i>	1	4%	1	4%
<i>Zingiberaceae</i>	1	4%	1	4%
<i>Commelianaceae</i>	1	4%	1	4%
Total	24	100%	25	100%

4.2.2. Habitat of plants in home gardens

Analysis of growth forms of these medicinal plants in the home gardens reveals that trees constitute the largest category with 10 species (40%) and minimum value for climbers with 3 species (12%) (Figure3). The analysis of the data also showed that the majority of medicinal plants in the home gardens are trees. It might also indicate that the threats that exist on other growth forms particularly herb, climbers and shrubs. Similar findings were also reported in earlier works in Ethiopia in which trees are the dominant growth form for human health treatment Amenu (2007); Etana (2007).

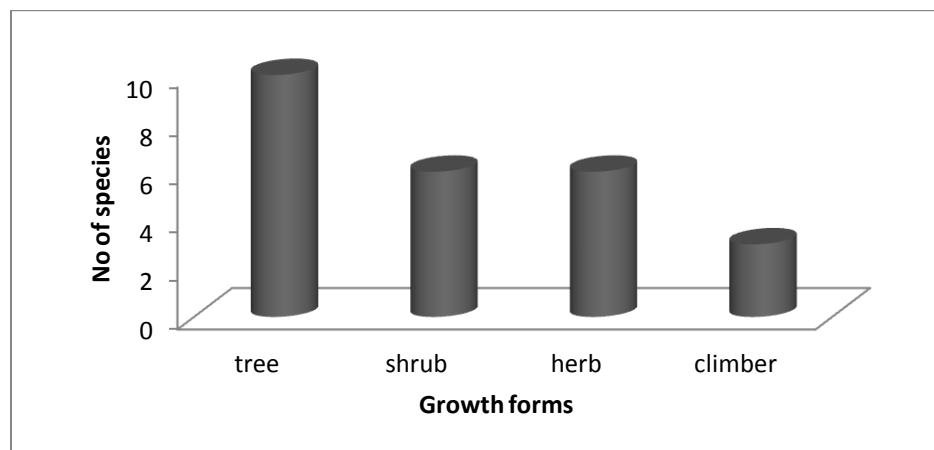


Figure 3: Growth form distributions of plants in the home garden of Itang District.

4.3. Plant parts used and mode of preparation

All parts of various plants are used in the traditional medication of different ailments. However, the most frequently used plant parts for remedy preparations were roots and the least frequent was flowers. This agrees with the research done by Fisseha (2007). Root is one of the most extensively used plant part in the preparation of traditional herbal medicine, the use of root has significant implications in the destruction of plant species and attention should be given to

preserve these plants whose roots are extensively used. The next most widely used plant parts are fruit and leaf. In some cases the whole plant including the roots was utilized (Table7).

Table 7: part of medicinal plants used for human remedies

No	Plant part used	Percent (%)
1	Root	26.06
2	Stem	5.37
3	Fruit	24.78
4	Flower	1.79
5	Seed	5.34
6	Leave	17.11
7	Whole	16.11
8	Bark	5.34

4.3.1. Routes of Application, Mode of preparation and Dosage

There are various ways of administration of traditional medicine prepared from medicinal plants; the major routes of administration in the study area are oral, dermal, tooth, nasal, handling (tied) and ear. In the study area oral administration is the dominant route, followed by dermal (Figure4). Similar results were obtained by Ermias (2005), Dawit (2011), Yirga (2009).

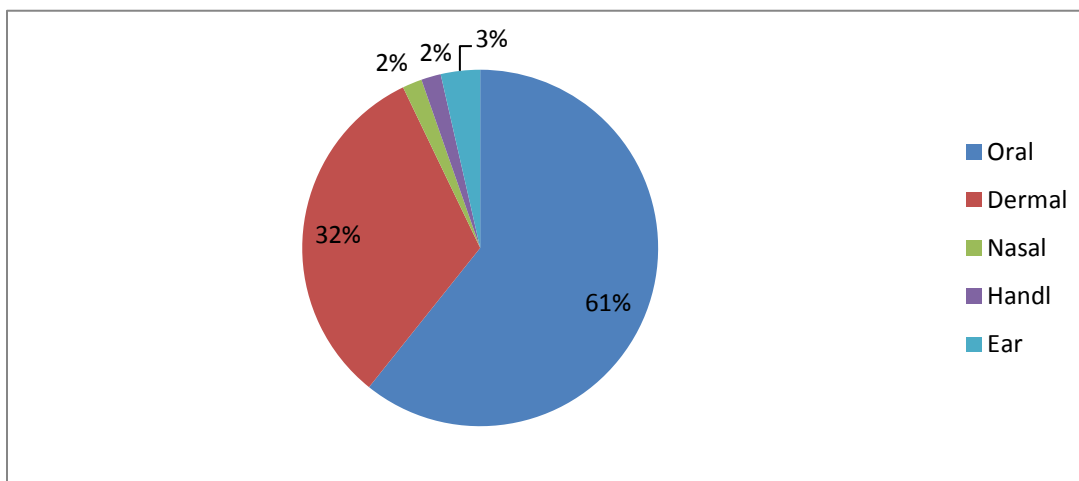


Figure 4: Routes of application of medicinal plants in the study area.

4.3.2 Mode of preparation of traditional medicine

Regarding the preparation of medicine for human ailment, the local community employs various methods of preparation of traditional medicine for different types of ailments. The preparations vary based on the type of ailment treated and the actual site of the ailment. In the study area, popular method of preparation of traditional medicine is crushing (Figure5).

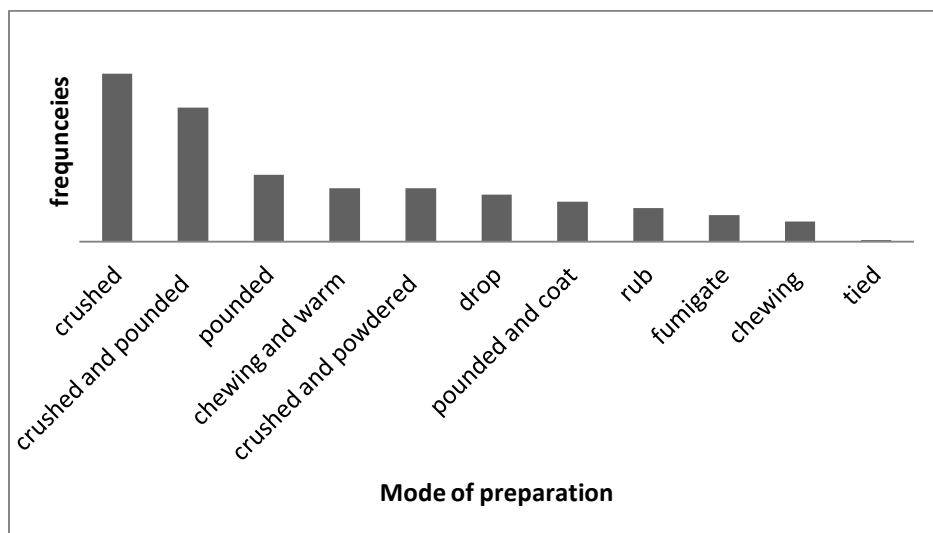


Figure 5: Mode of preparation of medicinal plants in the study area.

The dosage varied between age and patients` capacity. Traditional ways of dosage determination included measurements, namely, tea cup, coffee cup, glass and finger stripe/line, mostly of the small finger referring to the length of the plant part finger stripe/ line,) as well as number of droplets of plant parts. Finger stripe or line were used to determine dosages of some plants including *Sida rhombifolia*, *Jatropha curcas*, *Stereospermum kunthianum*, *Indigofera hochstetteri*, *Cassia tora*, and *Balanites rotundifolia* are used for oral administration of medicine for the treatment of diarrhea, delivery, teeth problem, malaria, snake bite and rabies and snake bite of human ailment respectively. Glass, tea cup and coffee cup were prescribed for plants that were diluted with water and dosages prescribed as half, one, two, and so on of materials used per day based on the nature of plants and patient`s age and general condition (body weight).

4.3.3. Condition of plants during preparation of remedy

Local people of the study area prepare their remedy for ailments while medicinal plants are in the form of fresh or dried. Large number of medicinal plants was reported to be used in fresh (81%) form (Figure 6). Similarly, a study conducted by Sori *et al.* (2004) in Borana, Oromia Regional State and Showed that using fresh materials for different health problems is more than dry materials or dry or fresh.

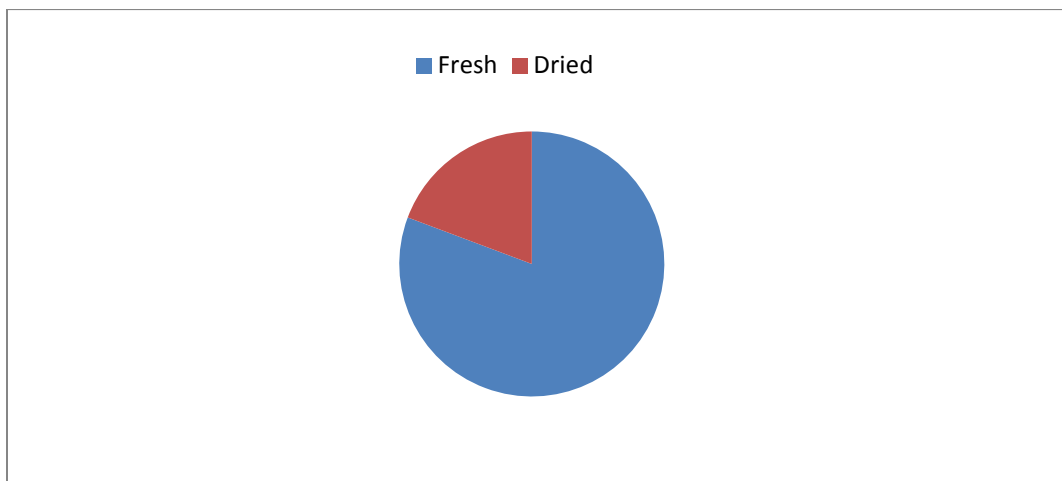


Figure 6: Condition during preparation of medicinal plants

4.4. Side effect of the use of medicinal plants

In the study area the major problems are burning, vomiting, diarrhea, vomiting and diarrhea and sweating also indicated as side effect by some healers. For example medicinal plants used for liver disease *Persicaria setosula* (*Polygonaceae*), *vernonia grantii* (*Asteraceae*) and for malaria and liver disease *Gardenia ternifolia* (*Rubiaceae*) and *Indigofera hochstetteri* (*Fabaceae*) causes severe diarrhea and vomiting. Therefore, side effects of the plants should be closely observed and documented (Addis, *et al.*, 2001), in Shirka District, Arsi zone.

4.5. Accessibility of medicinal plants in the study area when compared to the previous year

The information gathered from the respondents revealed that the medicinal plants highly reduced from time to time due to multiple problems (Table 8).

Table8: Comparing accessibility of medicinal plants with the previous year.

When compared to the previous	Frequency	Percent (%)
The same	9	22.5
Medium	12	30
Reduced	19	47.5
Total	40	100

4.6. Threats and Conservation of Medicinal Plants

4.6.1. Threats to medicinal plants in the study area

The cause of threats to medicinal plants can be generally grouped into natural and human induced factors. However, as reported in the study area most of the causes for the threats to medicinal plants and the associated indigenous knowledge are the anthropogenic factors such as deforestation due to over exploitation of plants for different uses including fire wood collection, cutting and burning of plants and agricultural expansions. According to the information gathered from informants major threats to traditional medicinal plants are uncontrolled bush fire, followed by agricultural expansions and drought (Table9). Most informants perceived that timber production and constructions are least destructive factors of the total information gained. Similar study by Fisseha,(2007) in Wonago District showed that there were different threats in medicinal plants such as agricultural expansion and fire wood collection. Negative impact of deforestation on medicinal plants was also reported by Mirutse (1999), Zerihun and Mesfin (1990). The death of old people with particular indigenous knowledge on cultural requirement and medicinal uses of some plants is one of the major threats to indigenous knowledge, because there is no documented indigenous knowledge of the use of traditional medicines in the area. Indigenous

knowledge on medicinal plants is gradually disappearing due to secrecy of medicinal plants, unwillingness of young generation to gain the knowledge and influence of modern education.

Table9: Threat factor of traditional medicinal plants in the study area.

Threaten factors	<u>No</u> of informants	Percent (%)
Un controlled fire bush	28	23
Over grazing	17	13.9
Agricultural expansion	26	21.3
Fire wood	15	12.3
Drought	23	18.9
Death of knowledgeable person	13	10.65
Total	122	100%

4.6.2. Conservation of medicinal plants

The result of the study showed that about 83% of the respondents explained that there was no effort for conservation of medicinal plants. Whereas about 17% of them said that there is general conservation method on natural resources which also include medicinal plants, conservation of medicinal plants is also underway by cultivating in home gardens and farm land. This has an indirect contribution to the conservation of plants of medicinal importance, since they limit excessive harvesting of these plants in one way or another. Cotton (1996) indicated that beliefs in the local people do have roles in the use and management of plant species. Thus, these beliefs could be considered as the major part of traditional use by medicinal plant conservation activities of the local people. Hundes (2001) from other parts of Ethiopia have reported similar result.

4.7. Transferring knowledge of use of medicinal plants

In Ethiopia, there is rich knowledge of traditional medicinal plants, but the knowledge is transferred from generation to generation verbally. Indigenous knowledge develops and changes with time and space (Alcorn, 1984). The acquisition and transfer is done verbally as top secret in the presence of only the healer and his family or with a close relative with strong promise training. Most traditional practitioners of the study area give priority to the son (elder son), followed by other children (Figure7).

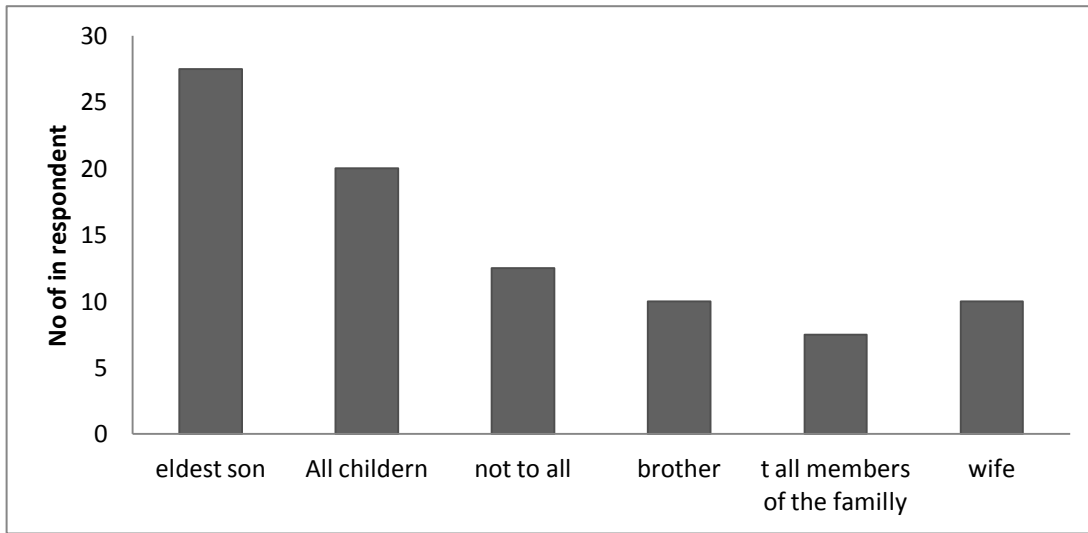


Figure 7: Transferring of knowledge of traditional medicinal plants

4.8 Marketability of medicinal plants

The result of the study showed that most of the medicinal plants are not widely traded for medicinal value but mainly used for other purposes such as food and spices (Table10). Example *Sida rhombifolia*, *Merremia gallabatensis*, *Zingiber officinale*, *Carica papaya*, *Zea mays* and *Solanum tuberosum* are sold in the market.

Table 10: Marketability of traditional medicinal plants

How much sold	Number of informants	Percent (%)
More often	6	15
Some times	9	22.5
Less regularly	25	62.5

4.9. Ranking medicinal plants

4.9.1 Informant Consensuses

The informant's consensus obtained during this study showed that some plants were cited by 22% and above informants (Table 11). *Chasmanthera Dependens* scored high followed by *Solanum terminale*.

Table 11: List of some of medicinal plants species reported by more than nine informants

Local name	Scientific name	No of informants	Percent of informants
Magak (N)	<i>Solanum terminale</i>	21	52.5%
Kolpiyo (N) Cikaya (A)	<i>Chasmanthera dependens</i>	25	62.55%
Abuia (A)	<i>Persicaria setosula</i>	11	27.5%
Abutuang (A)	<i>Physalis peruviana</i>	15	37.5%
Tundid (N)	<i>Jasminum streptopus</i>	11	27.5%
Tongedid (N)	<i>Adenia venenata</i>	13	32.5%
Dijoy (A)	<i>Sida rhombifolia</i>	9	22.5%
Bohoy (A)	<i>Phyllanthus amarus</i>	10	25%
Tenone (N)	<i>Chlorophytum tuberosum</i>	11	27.5%
Jaa (Jaha) (A)	<i>Boswellia neglecta</i>	14	35.5%
Towu (N)	<i>Balanites rotundifolia</i>	18	45
Tunchar (N)	<i>Cayratia Ibuensis</i>	9	22.5%
Atew (A) Codi (N)	<i>Tamarindus induce</i>	16	40%
Teap (N)	<i>Entada abyssinica</i>	18	45%
Tore (N)	<i>Pterolobium stellatum</i>	8	20%
Auped (A)	<i>Bauhinia ellenbeckii</i>	12	30%
Chipolo (A)	<i>Stereospermum Kunthianum</i>	17	42.5%
Pute (N) Dong (A)	<i>Gardenia ternifoli</i>	13	32.5%
Anid (Anino) (A)	<i>Osyridocarpus schimperanus</i>	9	22.5%

Jat-arawa (A)	<i>Bergia suffruticosa</i>	12	30%
Nemlogn (N)	<i>Osri quadripartite</i>	17	42.5%
Lual (N)	<i>Bauhinia purpurea</i>	16	40%
Jattul (A)	<i>Merremia gallabatensis</i>	11	27.5%

4.9.2. Preference ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking for six medicinal plants in Anuak and four in Nuer kebles that used to treat malaria (Table 12 A) shown that, *Chasmanthera dependens* ranked first and hence it is the most effective medicinal plants to cure malaria while, *Zea mays* is the least. The informants were asked to compare the given medicinal plants based on their efficiency and give the highest number for the medicinal plant which they have most effective in treating malaria and the lowest number for the least effective plant in treating malaria. *Chasmanthera Dependens* scored 37 ranked first indicating that it is the most effective in treating malaria.

Table 12 (A): Preference ranking of six selected medicinal plants that used to treat malaria in Anuak Keble.

Species	Respondents								Rank
	R1	R2	R3	R4	R5	R6	R7	Total	
<i>Chasmanthera dependens</i>	6	5	6	6	3	5	6	37	1 st
<i>Gardenia ternifolia</i>	3	4	4	5	6	3	4	29	3 rd
<i>Zea mays</i>	1	1	2	1	2	2	1	10	6 th
<i>Physalis peruviana</i>	5	6	5	3	1	6	5	31	2 nd
<i>Melia azadarach</i>	2	2	1	2	4	1	2	14	5 th
<i>Indigofera hochstetteri</i>	4	3	3	4	5	3	3	26	4 th

In the same cause preference ranking of four selected medicinal plants for treating the same disease (malaria) as perceived by informants in Nuer Keble. Similar result also observed. *Chasmanthera dependens* ranked first followed by *Osyris quadripartita*.

Table12 (B): Preference ranking of four selected medicinal plants for treating malaria in Nuer Keble.

Species	Respondents								Total	Rank
	R1	R2	R3	R4	R5	R6	R7			
<i>Osyris quadripartita</i>	2	3	2	4	3	2	3	19	2 st	
<i>Chasmanthera dependens</i>	3	4	3	3	4	3	4	24	1 nd	
<i>Tragia plukenetii</i>	4	1	4	2	1	4	1	17	3 rd	
<i>Mangifera indica</i>	1	2	1	1	2	1	2	10	4 th	

4.9.3. Informant consensus factor (ICF)

The result of the study showed that, diseases that are repeated in the study area have higher informant Consensus Factor. Medicinal plants that are effective in treating certain disease and well known by community members also have higher ICF value (Table13), Malaria the highest ICF value (0.89) due to the high incidence of the disease in the area. Whereas, Spider poison, Tuberculosis, ear, teeth infection (0.67) and Tumor as well as Blood pressure (0.50), had the lowest ICF value. This may be due to the rate occurrence of the disease and the disease is mainly treated by healers.

Table 13: Informant consuens factor (ICF)

Category	No_of species	Use citation	ICF
Wound	9	32	0.74
Gastritis and cold	8	48	0.85
Stomach	13	66	0.82
Delivery	5	27	0.83
Diarrhea	12	69	0.84
Malaria	9	73	0.89
Snake bite	7	42	0.86
Sorption bite	4	15	0.79
Neck problem	4	9	0.63
Liver disease	5	16	0.74
Spider poison	5	13	0.67
Body wound and Rabies	4	14	0.77
Common cold and Cough	6	23	0.78

Tetanus	3	11	0.80
Tumor and blood pressure	3	5	0.50
Tuberculosis, Ear and teeth problem	6	16	0.67
Head ache	4	21	0.850
Eye disease	7	26	0.76
Bone dislocation, parasite and bat infection	3	11	0.80

Malaria –This category had the highest ICF value, Nine species were reported with 73 use citations. Plant species used in the treatment of this disease are *Chasmanthera dependens*, *Zea mays*, *Gardenia ternifolia*, *Physalis peruviana*, *Melia azadarach*, *Indigofera hochstetteri*, *Osyris quadripartita*. *Mangifera indica* and *Tragia plukenetii* have higher informant consensus in the study area.

Snake bite -This category had the highest ICF value next to the above category. There were 42 use citations for seven plant species. Medicinal plants reported for these diseases were, *Chasmanthera dependens*, *Entada abyssiniac*, *Geraniun trilophum*, *Merremia gallabatensis*, *Cassia tora*, *Tamarindus indica* and *Balanites rotundifolia* have the highest informants` consensus.

Tumor and blood pressure- This category had the least ICF value. There were five use citations (one for tumor and four for blood pressure) for three medicinal plants (one for tumor and the rest to blood pressure). Plant species used in this category include *Girardinia diversifolia* and *Tragia plukenetii* are medicinal plants for blood pressure as well *Psychotria kirkii* is used to treat tumor.

4.9.4. Paired comparison

A paired comparison made to determine the most preferred medicinal plants among the nine species in Anuak people and that were used to treat stomach ache, the responses of seven key informants, showed that *Chasmanthera dependens* ranked first followed by *Physalis peruviana* (Table 14 A). Therefore, this result indicated that *Chasmanthera dependens* is the most preferred while *Solanum tuberosums* is least favored over the other plant species cited to treat stomach ache in this Keble.

Table 14 (A): Paired comparisons of nine medicinal plant species used to treat stomach ache in Anuak kebele.

Species	Respondents								
	R1	R2	R3	R4	R5	R6	R7	Total	Rank
<i>Chasmanthera dependens</i>	7	4	5	5	4	5	4	34	1 st
<i>Physalis peruviana</i>	5	3	5	4	3	4	5	29	2 nd
<i>Celtis zenkeri</i>	2	4	3	3	4	3	5	24	3 rd
<i>Boswellia neglecta</i>	4	3	2	3	2	4	1	23	4 th
<i>Sesbania microphylla</i>	2	2	4	5	1	2	3	19	5 th
<i>Hyparrhenia rufa</i>	2	4	1	2	3	2	2	18	6 th
<i>Carica papaya</i>	1	4	4	4	2	1	1	17	7 th
<i>Zea mays</i>	4	3	3	2	1	1	1	15	8 th
<i>Solanum tuberosum</i>	1	2	1	1	1	2	1	10	9 th

As the response of informants in Nuer kebel, similarly, *Chasmanthera dependens* ranked first as observed in Anuak peoples, and *Tamarindus indica* was ranked last (Table 14B).

Table 14 (B): paired comparisons of five medicinal plant species used to treat stomach ache in Nuer people.

Species	Respondents								
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	Total	Rank
<i>Chasmanthera dependens</i>	4	5	4	3	5	4	5	30	1 st
<i>Jasminum streptopus</i>	4	4	5	4	4	3	4	26	2 nd
<i>Zizphus mucronata</i>	3	2	2	3	2	2	4	16	4 th
<i>Tamarindus indica</i>	1	2	1	1	2	1	3	11	5 th
<i>Basilicum polystachyon</i>	3	4	4	5	2	3	2	23	3 rd

4.10. Major human ailments and plant species used by indigenous people

In the area, a total of 27 human ailments are treated with a total of 57 plant species, where one species can treat a single ailment or a number of ailments. Similarly, one ailment can be treated with combination of plant species or single plant (Table 15). For example, stomach ache is treated with 13 species of plants; diarrhea with 12 plant species, malaria nine species, snake bite and eye problems with seven species each. The fact that the above ranked diseases being treated by a number of species is coupled with the frequent occurrence of the diseases and ease of accessibility of plant species for treatment. In turn, these factors widen the popularity of these species among the informants and indigenous knowledge for treating these diseases. About only (3.5% human ailments) are treated by one species of medicinal plants. This indicated that the chance of healing a certain health problem in the area is only by one medicinal plant species. While seven diseases were treated by two species of medicinal plants, three diseases were treated by three species of medicinal plants and 13 ailments were treated by more than three to 13 medicinal plant species. This shows that there is high chance of healing a certain diseases by a number of medicinal plant species in the study area. Treatment of a disease by using a number of medicinal plants indicates that there is easy availability of medicinal plants in the study area; similar result was obtained by Amenu (2007), who conducted a study in West Shoa Zone and showed the use of largest number of medicinal plants for treatment of different ailments. Placenta retention was treated by using more than one plant species in Ejaji area, West Shoa.

Table15: Major human ailments and plant species used for treatment by indigenous people of Itang District.

Name of disease	No of plant species	% of plant species
Gastritis	4	3.5
Wound	9	7.8
Cold	4	3.5
Stomach ache	13	12.2
Delivery	5	4.3

Diarrhea	12	10.4
Malaria	9	7.5
Snake bit	7	6
Scorpion bite	4	3.5
Liver disease	5	4.3
Neck problem	4	3.5
Tetanus	3	2.6
Body wound	2	1.7
Rabies	2	1.7
Cough	3	2.6
Bat infection	1	0.9
Tuberculosis	2	1.7
Eye problem	7	6
Teeth problem	2	1.7
Ear	2	1.7
Head ache	2	1.7
Spider poison	5	4.3
Bone dislocation	1	0.9
Blood pressure	2	1.7
Parasite	1	0.9
Common cold	3	2.6
Tumor(Nekersa)	1	0.9

5. Conclusion and Recommendation

5.1 Conclusion

The study revealed that there are considerable numbers of medicinal plants and associated indigenous knowledge in Itang District. Fifty seven medicinal plants were recorded from the study area. Hence, these plants have an immense contribution to the health care of Nuer and Anuak people. Most of the medicinal plants were harvested from the wild. Overall 27 ailments were reported to be treated by medicinal plants of the area, trees constituted the main source of traditional remedies. Roots were also found to be the most frequently used plant part followed by fruits. Traditional medicine preparation mostly involved by single plant mainly by crushing the part used. Oral administration was the common rout followed by dermal. Although the reason for the loss of medicinal plants and associated indigenous knowledge are many, uncontrolled bush fire, drought and agricultural expansion are the most visible one.

5.2. Recommendation

Based on the research result, the following recommendations are forwarded.

- Recognition rights should be given to traditional healers either through certification or organizing them to create way of benefit from their work.
- The individual knowledge and skill of traditional medicinal practitioners must be encouraged and protected.
- Conservation of medicinal plants should be incorporated into the curriculum of formal education.
- Environmental impact assessment should be conducted before any development or investment activities in the region.
- The species that are at risk should be given attention and transplant here and there to save their gene from fire bush and drought.
- People should be encouraged to grow medicinal plant in their home garden and their farm lands.

Reference

- Abbink, J. (1995). Medicinal and other plants: a contribution to southwest Ethiopian ethnobotany. *Journal of Ethiopian studies*, 24:1-21.
- Abbiw, O.K., (1996). Misuses and Abuses in Self-Medication with Medicinal plants, The Case of *Erythrophelum* in Ghana. In: G Masen, X.M. Burger and J.M Rooy (eds.), *Biodiversity of African plants*, Kluwer Academic Publisher, Netherlands, pp: 700-720.
- Abebe (2001). Biodiversity conservation of medicinal plants problems and prospects. In: *conservation and sustainable use of Medicinal plants in Ethiopia*, 28 April-01 may 1996, pp.56-64.
- Abiyot (2002), Use and conservation of human traditional medicinal plants by indigenous people in Jabtechnan District, West Gojam, M.Sc. thesis (unpublished).
- Abiyot, Zemedede and Ensermu (2006). Ethnobotany of plants by indigenous people in Jabtechnan District, West Gojam, M.Sc. thesis (unpublished).
- Addis, Abebe and Urga (2001). Survey of traditional medicine in Shirka District, Arsi Zone Ethiopia *Ethiop pharm J.* 19:30-47.
- Aketch, C.A. (1992). Apreliminary survey of conservation status of some plant species in Kenya. In: Edwardes.S.and Asfaw.Z. (eds). *The status of some plant resources in parts of Tropical Africa.* Botany 2000: East and Central Africa NAPRECA monograph series No 2, pp, 54-65. Addis Ababa University, University, Addis Ababa, Ethiopia.
- Amare (1976), some common medicinal and poisonous plants used in Ethiopian folk medicine, Addis Abeba University.
- Amenu (2007). Use and management of Medicinal plants by indigineouse people of Ejaji Area, West Shewa, An Ethnobotanical Approach, M.Sc Thesis. Addis Abeba University, Addis Abeba, Ethiopia.
- Andy, C. (1999), *Methods on the move. A review of veterinary uses of participatory approaches and methods focusing on experiances in dry land Africa.* London. 97pp.

- Archer, F.M., (1990). Planning with people, Ethno botany and African Uses of plants in Namaqualand (South Africa). In: Peters, C.R. and J. Jejoy (Eds.), Proceedings of the 12th plenary meeting of AETFAT. Mitt. Institute, Allg. Bot. Hamburg, pp: 959-972.
- Balemie, Ensermu and Zemedu (2004). Conservation of Indigenous medicinal plant utilization, management and threats in Fentale area, East Shewa, Ethiopia. Ethiopian Journal of Biological Sciences. 3: 37-58.
- Bekele (2007). Study on Actual Situation of Medicinal plants in Ethiopia: pp.54-60. [Http://www.endashaw.com](http://www.endashaw.com).
- Brehony, E.G. (1998). A study to determine a methodology for linking indigenous community practice in East Africa with outside development intervention strategies. Ph.D. Thesis submitted to National University of Freeport, Department of Agricultural extension, Agro business and Rural Development, faculty of Agricultural, University College of Dublin.
- Cotton, C.M. (1996). Ethno botany: principles and application. John, Wiley and Sons Ltd., Chichester, England.
- Cunningham AB. (2001). Applied ethnobotany: people, wild plant use and conservation. Earth scan Publishers Limited, London.
- CSA (2008). Summary and Statistical Report of the 2007 population and Housing Census, population size by age and sex. Federal Democratic Republic of Ethiopia Population Census Commission, Ethiopia.
- Dawit and Estifanos (1991) Plants as a primary source of drugs in the traditional health practice of Ethiopia. In: Engles, J. M.M., Hawkes, J.G and Melaku Worede (eds.), Plant Resource of Ethiopia. Cambridge University Press.
- Dawit and Ahadu (1993). Medicinal plants and enigmatic health practices of Northern Ethiopia. B.S.P.E Addis Ababa, Ethiopia. Dawit Abebe (1996). Proceedings of the on Development Utilization of Health practice of Ethiopia (preface).

- Dawit (2001). The role of medicinal plants in Health care coverage of Ethiopia, the possible benefits of integration. In (Medhin Zewdu and Abebe Demissie workshop on biodiversity Conservation and Sustainable use of medicinal plants in Ethiopia), IBCR, Addis Ababa, Ethiopia.
- Demissew and Dagne (2001). Basic and Applied Research in Medicinal Plants. In: Conservation and Sustainable Use of Medicinal plants in Ethiopia proceeding of The National Workshop on Biodiversity Conservation and sustainable Use of Medicinal plants in Ethiopia, 28 April-01 May 1998, pp. 29-33.
- Dessalgn (2001). A preliminary economic valuation of medicinal plants in Ethiopia: Trade volume and price. In: Conservation and sustainable use of medicinal plants in Ethiopia, proceeding of The National Work shop on Biodiversity and Sustainable USE OF Medicinal Plants In Ethiopia, 28 April-01 May 1998, pp176-197.
- Debela, Zemedede and Ensermu (2004). Use and management of ethnoveterinary medicinal plants by indigenous people in Boosat, Welenchi area. *Ethiop. J. Bio. Sci* 3 (2); 113-132. Edwards, S.(2001).The ecology and conservation status of medicinal plants on Ethiopia. What do we know? In: conservation and sustainable use of medicinal plants in Ethiopia. Pp.46-55,(Medhin Zewdu and Abebe Demissie (eds.)
- Etana (2007).Use and conservation of Traditional medicinal plants by indigenous people in Gimbi Woreda, Western Wolega, Ethiopia.
- Ermias (2005). Ethnobotanical study of medicinal plants floristic composition of Manna Angetu Moist Montane forest, Bale, Ethiopia. MSc thesis. Department of Biology, Addis Abeba Ethiop.*J. Bio. Sci.*31)37-58.
- Ermias, Ensermu and Haile (2008). An ethnobotanical study of medicinal plants in ManaAngetu District, Southeastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 4:10.doi.org/10.1186/1746-4269-10.
- Ensermu, Sebssebe, Zerihun and Edward S. (1992). Some threatened Endemic plants of Ethiopia. In: Conservation and sustainable Use of Medicinal plants in Ethiopia .pp46-55,(Medhin Zewdu and Abeba Demissie(eds

- Fabricant, D.S. and Farnworth, N.R. (2001). The value of plants used in traditional medicine for drug discovery. *Environmental Health Perspectives* 109: 69-75.
- Fisseha (2007). An Ethno-botanical Study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. M.Sc. Thesis Addis Abeba University, Ethiopia.
- Fisseha, Sebsibew and Teklehaymanot. (2009). An ethnobotanical study of medicinal plants MSc Thesis, Addis Abeba University, Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 5:28 1-18. [dx.doi.org/10.1186/1746-4269-5-28](https://doi.org/10.1186/1746-4269-5-28).
- Frankel, O., Brown, H. and Burdon, J.J. (1995) *the conservation of plant biodiversity*. Cambridge University Press, Britain.
- Fassil (2001). The status and availability of data of oral and written knowledge on traditional health care in Ethiopia. A base line study. In: *conservation and sustainable use of medicinal plants in Ethiopia*, IBCR.
- Gelahun (1989). *EtseDabdabe (Ethiopia Traditional Medicinal)(In Amharic)* –Addis Ababa University, Addis Ababa
- Gelahun and Sebsibew (2002). Medicinal Plants in Bonga Forest and Their Uses. In *Biodiversity Newsletter* 1:9-10, IBCR, Addis Abeba.
- Hunde (2001). Use and management of Traditional Medicinal plants by Indigenous People of Boosat Woreda, Wolenchiti Area: An Ethnobotanical Approach. M.Sc. Thesis, Addis Abeba University.
- Haile (2005). A study of the Ethno-botany of medicinal plants and floristic composition of the dry afro-montane forest at Bale Mountains National Biology, Addis Abeba University.
- Haile and Demissew (2008). Plants of veterinary importance in Southwestern Ethiopia: the case of Gilgel Ghibe area. *Forests Trees Livelihoods*, 18(2):165-181.
- Haile and Demissew (2007). Traditional medicinal plant knowledge and by local healers in Sekoro Jimma zone, SouthWestern Ethiopia. *Journal of Ethno-biology and Ethno-medicine* 3:24. [dx.doi.org/10.1186/1746-4269-324](https://doi.org/10.1186/1746-4269-324).

- Hamilton, A.C., peishengii, Kessy,J., Khan, Ashif A.,Lagos, Wotte,S. and Shin Wari, Z.K (2003).The purposes and teaching of Applied Ethinobotany. People and plants working paper 11WWF Godolming. UK. Harborne.
- Heinirich, M., A.Ankli, B. Frei, C. Weimann and O.Sticher (1998). Medicinal plants in Mexico: Healers consensus and cultural importance. *Social science and Medicine* 47:1859-1871.
- IUCN (1996). *Plant Resources of East Africa. Activities and Sources of Information.*
- IWAOR (2015). *Agroecological Zone and Livestock population annual report in the study area.*
- IWHOR (2015). *Number of Health centers in Itang District annual report.*
- Jackak, S.M. and Saklani, A. (2007). Challenges and opportunities in drug discovery from plants. *Current Science.* 92 (9): 1251-1257.
- Jansen, P. C.M. (1981). *Spices, Condiments and medicinal plants in Ethiopia, Their Taxonomy and Agricultural Significance.* –Centre for Agricultural Publishing, Wageningen.
- Kupchan, S.M., Komoda, Y., Court, W.A. Thomas, G.J., Smith, R.M., Karin, A., Gilmore, C.J., Haliwagner, R.C. and Bryan, R.F. (1972). Maytanisine, a novel anti-Leukemia Ansa macrolide from *Maytenus ovatus*. *Journal of the American Chemical Society* 94: 1354-1356.
- Lechamo, W. and Storck, H. (2006). Spices, aromatic and medicinal plants trade in eastern Ethiopia. *Acta Horticulturae* 270 (1).
- Lemordant, D. (1960). *Les plantes ethiopiennes.* Addis Abeba, Central printing press.
- MacDonald, I. (2009). Current trends in ethno-botany. *Trop, J. Pharm. Res.* 8(4): 295-297
- Maffi, L. (1999). Linguistic Diversity. Pp19, In: *Cultural and spiritual values of Biodiversity.*
- Marshall, N.T. (1998). Searching for a cure, conservation of medicinal wild life resource in East and Southern Africa. TRAFFIV network report.
- Martin, G.J. (1995). *Ethno botany; a method Manual* Chapman and Hall .London, pp. 267.

- Medhin (2002). Sustainable Development in Ethiopia, Report of Assessment of Activities Issues relevant to the review process of the Earth Summit 2002 in Ethiopia for Heinrich Boell Foundation; Institute of Biodiversity Conservation and Research, Addis Abeba, Ethiopia
- Mesfin (1986). Some medicinal plants of central Shao and southwestern Ethiopia. SINET 9(suppl.):143-167.
- Mesfin and Sebssebe (1992). Some medicinal plants of Ethiopia.-In: the status of some plant resource in part of tropical Africa. Botany 2000: East and central Africa: NAPRESA, Addis Ababa University, Addis Ababa.
- Messay (2015), Ethno-botanical study on traditional medicinal plants in degadamot Woreda, amhara region, north Ethiopia, URPC 2015, 5(2), 258-27.
- Mengistu (1998). The state of forestry in Ethiopian. *Mother Earth (Newsletter)* 2:18-28.
- Mercier, J. (1979). Approche de la medicine des debteras. *Abbay* 10: 11-127.
- Mirutse (1999) An Ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. M.Sc. Thesis. Uppsala, Sweden.
- Mirutse, Zemedede and Zerihun (2009). Medicinal plants of the Meinit ethnic group of Ethiopia: an Ethno-botany study. *J. Ethno-pharmacol.* 124(3):513-521.
- Mirutse (2007). Medicinal plants of the Bench, Meinit and Sheko cultural groups in Ethiopia with emphasis on use diversity, information consensus, abundance and habitat. Ph. D Thesis submitted to Addis Abeba University.
- Mirutse, Zemedede, Thomas and Zerihun (2003). An ethno-botanical study of medicinal plants used by the Zay people in Ethiopia *Journal of Ethno-pharmacology* 85(1): 43-52.
- Ministry of Health (1995). Health Sector strategy. Ministry Health, Ethiopia, Addis Abeba.
- Mulugeta and Demel (2003). Frankincense and myrrh resource of Ethiopia: 2. Medicinal and industrial uses. *Ethiopian Journal of Science* 26(2): 161-172.

- Nemarundwe N, Richards M.(2002). Participatory methods for exploring livelihood values derived from forests: potential and limitations. In: B.M. Campbell and M.K. Luckert (eds.), *Uncovering the Hidden Forest valuation Methods for Woodland and Forest Resource*. Earthscan Publicatios Ltd, London.
- Nhunya, M.H.H. (1992). Progress in the search for antimalarial. NAPRECA Monograph series No. 4. Published by NAPRECA, Addis Abeba University, Addis Abeba northern Ethiopia, BSPE, Addis Abeba.
- Oliveira FC, Albuquerque UP, Fonseca-kruel VS, Hanazaki N, (2009). Avancosna pesquisas Ethnobotanicas no Brazil. *Acta Bot .Bras.*23 (2):590-605.
- Pankhurst, R.(2001). The status and availability of oral and written knowledge on traditional health care.
- Roche L (1992). Guidelines for the Methodology of conservation of Forest Genetic Resources. In: the Methodology of conservation of Forest genetic Resources-Report on a Pilot Project. FAO.Rome.pp.201-203.
- Roberson, E.(2008). Medicinal plants at risk. A native plant conservation campaign report. 16pp.
- Samy, R.P. and Gopalakrishnakone, P. (2007). Current status of herbal and their future perspectives. *Nature precedings* 1176: 1-13.
- Sebssebe, Ensermu and Vivero (2003). The red list of endemic trees and shrubs of Ethiopia and Eritrea. IUCN.
- Shiferaw (1996). The role of health professionals in the development of Traditional medicine Proceeding of the workshop on Development Utilization of Herbal Remedies in Ethiopia, *Ethiopian Health and Nutrition Institute, Addis Ababa*. pp. 15-18.
- Sori, Bekana, Adugna, Kelbessa (2004). Medicinal plants in the ethnoveterinary practice of Borena Pastoralists, Southern Ethiopia. *Int J Appl Res Vet Med*, ;2 (3):220-225.
- Sintayehu (2011). An ethno-botanical study of Medicinal plants in Wondo Genet Natural Forest and Adjacent Kebeles, Sidama Zone, Snp region, Ethiopia.

- Tesfaye and Zemedede (1999), Ethno botany of nation's nationality and people of Gambella Benishagul-Gumuz and southern region Ethiopia. Resources of Ethiopia, Ed.J.M.M.Engengles,J.G.Hawke and Melaku worede,pp.75-81.Cambridge University Press,Cambridge.
- Tesfu and Wolde Aregay (1995). Women Lead in protecting food Germplasm and Herbs for Health in Ethiopia. Report submitted to Earth Care Africa, Nairobi, Kenya (unpublished). Google Scholar.
- Teklehaymanot and Giday (2007). Ethinobotanical and Ethinoparmaceutical studies on Medicinal plants of Chifra District, Afar region Northeastern Ethiopia. Ethiopian Pharm.J.24:41-58.
- Teklehaymanot, Giday, Medhin, Mekonnen (2007). Knowledge and uses of medicinal plants by people around Debre Libanos monastery of Ethiopia. J, Ethnopharmacol, 111(2):271-283.
- Verma, S. and Singh, S.P (2008). Current and future status of herbal medicines. Veterinary world.
- Vivero, Ensermu and Sebssebe (2003). The red list of endemic trees and shrubs of Ethiopia and Eritrea. IUCN.
- WHO (2002). Planning for cost effective traditional health services in the new century discussion paper. <http://www.who.or.jp/tm/research/bkg/index.html>.
- Wright CW (2005). Plant derived antimalarial agents: new leads and challenge. Phytochemistry. 4:55-61
- Yirga (2009). Assessment of indigenous knowledge of medicinal plants in central zone of Tigray, Northern Ethiopia African journal plant Science 4(1):6-11.
- Yirga (2010 a). Assessment of indigenous knowledge of medicinal plants in central zone of Tigray, Northern Ethiopia. African Journal of plant science 4,006-001.
- Zemedede (1999) Ethinobotany of Nations Nationalities and peoples in Gambella, Benishangul Gumuz and Southern regions of Ethiopia pp.172.
- Zemedede (2001). The Role of Home Garden in production and conservation of Medicinal plants. In: Conservation and sustainable use of medicinal plants in Ethiopia. Proceeding of the National workshop in biodiversity conservation and sustainable use of medicinal plants in Ethiopia, 28 April 01 may 1998, pp.76-91,(Medhin Zewdu and Abebe eds.) Institute of Biodiversity conservation and Research, Addis Abeba.

Zenebe, Zerihun and Solomon (2012). Ethnobotanical study of medicinal plants in Asgede Tsimbila district, Northwest Tigray, northern Ethiopia. *Ethnobotany Res Appl.* 10: 305-320.

Zerihun and Mesfin (1990). The status of the vegetation in the lake Region of the Rift Valley of Ethiopia and possibilities of its Recovery. *SINET: Ethiop.J.Sci.*392:97-120.

Appendices

Appendix 1: List of some human ailments treated by medicinal plants in Itang District.

No of disease	Local name		In English
	Anuak	Nuer	
1	Tawafatach	Gastry	Gastritrite
2	Achuwada	Bod	Wound
3	Towkoch	Joykoch	Stabbing
4	Towach	Ngogn	Stomach ache
5	Lual	Dap	Delivery
6	Nuwealache	Begeg	Diarrhea
7	Adriy	Malaria	Malaria
8	Jattul	Kochechol	Snake bite
9	Ageraf	Kochjiat	Scorpion bite
10	Towtanh	Joychwan	Liver disease
11	Nghut	Joyngok	Neck problem
12	Shuwaf	Tem	Tetanus
13	Towbugndal	Bodpagn	Body wound
14	Danoachamgukki	Joyjok	Rabies
15	Wallo	Kill	Cough
16	Adliga	Nafrokedod	Bat infection
17	Tuberculosis	Tuberculosis	Tuberculosis
18	Towwang	Bagwang	Eye problem
19	Akogo	Joylege	Teeth problem
20	Towyit	Joyjote	Ear problem
21	Towwich	Bak	Head ache
22	Towautiheno	Kerker	Spider poison
23	Chohontur	Cholchi	Bone dislocation
24	Dongrim	Dotrim	Blood pressure
25	Aunmi	Kwahamjat	Parasite
26	Kad	Tuntun	Common cold
27	Cancer	Cancer	Tumor(Nekersa)

Appendix 2: List of medicinal plants recorded in Itang District.

M=only medicine; F=food; Sh=live shade; Co=construction; Fw= fuel wood; Ht=house holdtool,

Nos	Local name	Scientific Name(Spp)	Family	Growth	Resource	Main use
1	Magak(N)	<i>Solanum terminale</i>	<i>Solanaceae</i>	Shrub	Home	M,Ls
2	Kolpiyo(N) Cikaya(A)	<i>Chasmanthera dependens</i>	<i>Menispermaceae</i>	Climber	wild	M
3	Abuia(A)	<i>Persicaria Setosula</i>	<i>Polygonaceae</i>	Shrub	Wild	Fw, M
4	Abutuang(A)	<i>Physalis peruviana</i>	<i>Solanaceae</i>	Herb	Home	M,
5	Tundid(N)	<i>Jasminum streptopus</i>	<i>Oleaceae</i>	Climber	Wild	M
6	Tongedid(N)	<i>Adenia venenata</i>	<i>Passifloraceae</i>	Climber	Wild	M
7	Dijoy(A)	<i>Sida rhombifolia</i>	<i>Malvaceae</i>	Shrub	Wild	Ht, M
8	Learo(A)	<i>Celtis zenkeri</i>	<i>Ulmaceae</i>	Tree	Wild	Ht, Fw, M
9	Bohoy(A)	<i>Phyllanthus amarus</i>	<i>Euphorbiaceae</i>	Tree	Wild	Fw, Co, M
10	Bod(N)	<i>Asparagus flagellaris</i>	<i>Asparagaceae</i>	Shrub	Home	M,Ls
11	Ngoke(N)	<i>Commelina petersii</i>	<i>Commelinaceae</i>	Climber	Home	M
12	Tenone(N)	<i>Chlorophytum tuberosum</i>	<i>Anthericeae</i>	Tree	Wild	M, Co, Ht,
13	Reap(N)	<i>Cyathula cylindrical</i>	<i>Amaranthaceae</i>	Shrub	Wild	Fw, M
14	Gola(A)	<i>Vernoniaeae grantii</i>	<i>Asteraceae</i>	Climber	Wild	M
15	Jaa(Jaha(A)	<i>Boswellia neglecta</i>	<i>Burseraceae</i>	Tree	Wild	Fw, M Co
16	Towu(N)	<i>Balanites rotundifolia</i>	<i>Balanitaceae</i>	Tree	Home	Ls, M, Co
17	Tunchar(N)	<i>Cayratia Ibuensis</i>	<i>Vitaceae</i>	Climber	Wild	M

18	Cod(N)	<i>Zizphus mucronata</i>	<i>Rhamnaceae</i>	Climber	Home	M
19	Pake(N)	<i>Calotropis procera</i>	<i>Asclepiadaceae</i>	Tree	Wild	Co,M
20	Atew(A) (Codi)(N)	<i>Tamarindus indica</i>	<i>Fabaceae</i>	Tree	Home	Ls,M,F
21	Teap(N)	<i>Entada abyssinica</i>	<i>Fabaceae</i>	Tree	Home	Ls,M
22	Tore(N)	<i>Pterolobium stellatum</i>	<i>Fabaceae</i>	climber	Wild	M
23	Keat (N)	<i>Sena ruspolti</i>	<i>Fabaceae</i>	Shrub	Wild	Fw,M
24	Auped(A)	<i>Bauhinia ellenbeckii</i>	<i>Fabaceae</i>	Tree	Wild	Co,Fw, M
25	Awik (A)	<i>Sesbanimicrophyla</i>	<i>Fabaceae</i>	Tree	Wild	Ht,
26	Jiate (A)	<i>Geranium trilophum</i>	<i>Geraniaceae</i>	Shrub	Wild	M,Fw
27	Chipolo(A)	<i>Stereospermum Kunthianum</i>	<i>Bignoniaceae</i>	Tree	Wild	M,Ls,Fw
28	Wamech(N)	<i>Tragia plukenetti</i>	<i>Euphorbiaceae</i>	Herb	Home	M
29	Pute(N) Dong(A)	<i>Gardenia ternifolia</i>	<i>Rubiaceae</i>	Tree	Home	Ls,M,Ht
30	Anid (Anino)(A)	<i>Osyridocarpus schimperanus</i>	<i>Santalaceae</i>	Shrub	Home	Fw,M,
31	Alwaa(A)	<i>Commiphora guidottii</i>	<i>Burseraceae</i>	Herb	Wild	M
32	Ngom(N) Auliro(A)	<i>Ricinus communis</i>	<i>Euphorbiaceae</i>	Tree	Home	M,Ht
33	Jat-arawa(A)	<i>Bergia suffruticosa</i>	<i>Elatinaceae</i>	Shrub	Home	M,Ls,Fw
34	Gar(N)	<i>Mangifera indica</i>	<i>Anacrdiaceae</i>	Tree	Home	Ls,M,Ht
35	Lual(N)	<i>Bauhinia purpurea</i>	<i>Fabaceae</i>	Tree	Wild	Co,M Ls

36	Tearo(A)	<i>Hyparrhenia rufa</i>	<i>Poaceae</i>	Shrub	Wild	M
37	Golgul (N)	<i>Bridelia cathartica</i>	<i>Euphorbiaceae</i>	Climber	Wild	M
38	Shagi (N)	<i>Basilicum polystachyon</i>	<i>Lamiaceae</i>	Shrub	Wild	M, Ht,fw
39	Gaebe (A)	<i>Jatropha curca</i>	<i>Euphorbiaceae</i>	Herb	Home	M
40	Nemlogn (N)	<i>Osyris quadripartita</i>	<i>Santalaceae</i>	Shrub	Wild	M,Fw
41	Jattul (A)	<i>Merremia gallabatensis</i>	<i>Convolvulaceae</i>	Herb	Wild	M
42	Adgera (A)	<i>Cassia tora</i>	<i>Fabaceae</i>	Shrub	Wild	M,
43	Lear (A)	<i>Psychotria kirkii</i>	<i>Rubiaceae</i>	Tree	Wild	Co, Ht, M
44	Autit (A)	<i>Indigofera hochstetteri</i>	<i>Fabaceae</i>	Climber	Wild	M
45	Cheak	<i>Hypericum annulatum</i>	<i>Clusiaceae</i>	Herb	Wild	M
46	Read (A)	<i>Nuxia oppositifolia</i>	<i>Loganaceae</i>	Tree	Home	Ls, M
47	Dolmay (N)	<i>Trichodesma zeylanicum</i>	<i>Boraginaceae</i>	Herb	Wild	M
48	Leal (A)	<i>Desmodium velutinum</i>	<i>Fabaceae</i>	Climber	Home	M
49	Acltew (A)	<i>Eucalyptus rubida</i>	<i>Myrtaceae</i>	Tree	Home	Fw, Co, M, Ls
50	Baye-baye (A)	<i>Melia azadarach</i>	<i>Meliaceae</i>	Tree	Home	Ls, M
51	Aulilo (A)	<i>Carica papaya</i>	<i>Caricaceae</i>	Tree	Home	F,LS, M
52	Zingibil(A)	<i>Zingiber officinale</i>	<i>Zingiberaceae</i>	Herb	Home	F,M

53	Bul (N)	<i>Euphorbia candelabrum</i>	<i>Euphorbiaceae</i>	Tree	Wild	M
54	Onemach(N)	<i>Girardinia diversifolia</i>	<i>Urticaceae</i>	Herb	Home	M
55	Abach (A)	<i>Zea mays</i>	<i>Poaceae</i>	Shrub	Home	F,M
56	Ajawala (A) Dinch (N)	<i>Solanum tuberosum</i>	<i>Solanaceae</i>	Herb	Home	F,M
57	Mono (A) Mot (N)	<i>Cynodon plectstachyus</i>	<i>Poaceae</i>	Herb	Home	M, F

Appendix 3: Check list of semi structured questions used for interview for collection of diversity and conservation of medicinal plants.

I .General information of respondents

1. Kebelesvillage/specific locality/.....Date
2. Name, Agesex..... Marital status.....Educational Status ...Occupation...
Ethnic..... for how long you lived in the area.
3. Tell me the most common disease of humans in your area.....
4. How local people prevent and control a given diseases in your area?
5. Which part of plant is collected for medicinal use?.....Andtelltheir local name.
(leaf (L), bark (B),root(R) flower (FI), Seed (S), stem (St), fruit (F), sap (SP), whole plant (WP)
6. Where do the medicinal plants can be obtained?.....
A from the natural habitat B. from home garden C. both from wild and home gardens
D. from harvested crops
7. Are the medicinal plants marketable?
8. Is the medicinal plant easily accessible and affordable? If not, why?.....
9. Which one is common rout of application (Rout) and preparation of traditional medicinal plants.....? A/Application rout/oral, nasal, dermal, handle/ B/Preparation/powder, crushing and pounding, chewing, warming and others
10. Are there community members who frequently depend on traditional medicinal plant as compared to modern medicine? What members of the communities?.....Why?
11. Are there any restrictions associated with collection of medicinal plants? What is that? ...
- 12 Are there restriction the use of medicinal plants in locality? What is the implication of the restriction?

13. State the major problems regarding medicinal plants in the area?
 14. How is the accessibility of medicinal plants compared to the past year?
 15. What are the threats to the medicinal plants in the area?
 16. Is there any effort made on the management and conservation of medicinal plants in your area? If no, what is the problem?
 17. If you say yes in Q 16, how are medicinal plants conserved in your area?
 18. Is the plant currently cultivated in the study area?
 19. How the indigenous knowledge of medicinal plants use transferred generation to generation in the community?
 20. Which of the following medicinal plants are the most preferred in your area?
- A/tree B/shrubs C/climber D/herb
21. Which of the following medicinal plants are uses for multipurpose?
 22. How much sold now compared to in the past: more, someless.....

Appendix 4: List of informants involved in medicinal plants study in Itang District
 Key-marital status; M- married, S-single; level of Education; 0-can't read and write; and
 (1,2,3,4,5, etc.) indicate grade level.

No	Name	sex	age	Marital status	Level of Education	Kebele	Job
1	Chan Tarjat	M	45	M	7	Bazil	Farmer
2	Wiwal Ruat	M	67	M	0	Bazil	Farmer
3	Puat Ngoam	M	56	M	0	Bazil	Farmer
4	Kuat Gatluack	M	76	M	0	Bazil	Farmer
5	Nglian Baboat	F	42	S	0	Bazil	No
6	Toach Wuar	M	70	M	0	Bazil	Farmer
7	Book Ngan	F	54	M	0	Bazil	No
8	Gatluack Tuat	M	36	S	6	Bazil	Farmer
9	Nyabong Jua	F	75	M	0	Bazil	No
10	Book Ngoam	F	56	S	0	Bazil	No
11	Bazil Kach	M	31	S	9	Bazil	No
12	Gatwach Liwal	M	61	M	0	Bazil	Farmer
13	Ruach Kaek	M	48	M	0	Bazil	Farmer
14	Nyajima Kuat	F	75	M	0	Bazil	Farmer
15	Nyaboal Chuol	F	63	S	0	Bazil	No
16	Chuol Tut	M	69	M	0	Bazil	Farmer
17	Chan Gambel	M	39	M	0	Bazil	Farmer
18	Biel Gatwiech	M	64	M	0	Bazil	Farmer
19	Jemies Kong	M	57	M	0	Bazil	Farmer
20	Nail Reath	M	74	M	0	Bazil	Farmer
Anuak kebel							
No	Name	sex	year	Marital status	Level of Education	Kebele	Job
1	Ugalu Aguwa	M	45	M	0	I/Kier	Farmer
2	Aujulu Aukalo	M	56	M	0	I/kier	Farmer

3	Abala deng	F	65	M	0	I/Kier	Farmer
4	Aukung Autow	F	78	M	0	I/Kier	Farmer
5	Abala Aupiw	F	54	M	5	I/Kier	Farmer
6	Aushen Aupiew	M	71	M	0	I/Kier	Farmer
7	Aukalo Aukumu	M	35	M	5	I/Kier	Farmer
8	Agagno Aujulu	F	62	M	0	I/Kier	No
9	Adangi Audel	F	66	M	0	I/Kier	No
10	Aujulu Audum	F	77	M	0	I/Kier	No
11	Tata Gnegom	M	72	M	0	I/Kier	Farmer
12	Kuwal Aukalo	M	76	M	0	I/Kier	Farmer
13	Ajulu Aubang	F	68	M	0	I/Kier	Farmer
14	Ariyat Audagn	F	80	M	0	I/Kier	Farmer
15	Augatuw Aukugn	M	48	M	0	I/Kier	Farmer
16	Ajulu Cham	M	68	M	0	I/Kier	Farmer
17	Akana Ajulu	F	46	M	0	I/Kier	Farmer
18	Aukalo Aubur	M	52	M	6	I/Kier	Farmer
19	Agagnahu Bach	F	67	M	0	I/Kier	Farmer
20	Omode Aubang	M	64	M	0	I/Kier	Farmer

Appendix 5: List of medicinal plants used for treating human ailments Scientific name; family; local name; habit; part used; disease treated; methods of preparation with dosage used and route of application.

Key: Anuak (A), Nuer (N), Habit (Ha): Herb (H); Shrub (Sh); Tree (T) ; Climber (cl);

Parts used (Pu): (Bark,B; Root, R; Leaf, L; Fruit, Fu; Flower, Fw; Seed, se; stem, St, Sap;Sa, Root and leaf, LR.

No	Local name	Scientific Name(Spp)	Family	Ha	Pu	Disease treated	Mode of preparation	RA
Magak (N)		<i>Solanum terminale</i>	<i>Solanaceae</i>	T	R	Gastritis	Crushed and pounded the root in water, drink a half of glass	Oral
					L	Wound	Crush, creamed the juice to wound	Dermal
					R	cold	Crushed the root and mixed with water then drink a coffee cup for 2-3 days	Oral
Kolpiyo (N)		<i>Chasmanthera dependens</i>	<i>Menispermaceae</i>	Cl	wp	Gastritis	Pounded in water for times, drink a half of glass	oral
					St	Stomach ache	Crush, pound, drink a tea cup at the time	Oral
						Delivery	Crush, mix in water, drink a half of glass	Oral

Cikaya (A)				Wp	Diarrhea	Crushed and boiled, then drink a cup of tea at the time	Oral
					Malaria	Crush, pound in water drink a cup of tea for 2-days	oral
				St	Malaria	Crush the stem, boil and drink after cool a glass for 2-days	Oral
					Stomach ache	Crushed, boiled and drink a cup of tea	Oral
					Snake bit	Crushed, boil and drink a half of glass at the time	Oral
Abuia (A)	<i>Persicaria Setosula</i>	<i>Polygonaceae</i>	Sh	L	Liver disease	Crush the leaves and mix in water, clarify it then drink a cup of tea to 4-6 days before breakfast	Oral
					cold	Crushed and powdered the leaves pound in water, clarify then drink a coffee cup.	Oral

Abutuang(A)	<i>Physalis peruviana</i>	<i>Solanaceae</i>	Sh	R	Malaria	Boil the root part, cool and drink a half of glass for 2- days after eat	Oral
					Stomach ache	Boil the root, cool and drink a cup of tea	Oral
					Delivery	Crush and boil the root, drink a glass of warm at that time	oral
Tundid (N)	<i>Jasminum streptopus</i>	<i>Oleaceae</i>	Cl	Fu	Stomach ache	The fruit cooked with cabbage, mix with porridge then eat	oral
					Teeth problem	Boil leaves and fumigate the smoke as well put a piece of leaf on the in infected teeth	Dermal
Tongedid (N)	<i>Adenia venenata</i>	<i>Passifloraceae</i>	Cl	Fu	Neck problem	Creamed the fruit to the wound	Dermal
Dijoy (A)	<i>Sida rhombifolia</i>	<i>Malvaceae</i>	Sh	R	Diarrhea	Wash the root and chew a finger strep at that time	Oral
Learo (A)	<i>Celtis zenkeri</i>	<i>Ulmaceae</i>	T	L	Stomach ache	Boil the leave and drink a coffee cup of it	Oral
Bohoy (A)	<i>Phyllanthus amarus</i>	<i>Euphorbiaceae</i>	T	L	Wound	Crushed and powdered the leaves after dry, then cover the wound	Dermal

Bod (N)	<i>Asparagus flagellaris</i>	<i>Asparagaceae</i>	Sh	Fu	Wound	Crushed powdered, add to wound	Dermal
					Tetanus	Crushed and powdered the fruit, add to the injured part	Dermal
Ngogn (A)	<i>Commelina petersii</i>	<i>Commelinaceae</i>	Cl	Fu	Body wound	Dry, Crush, powder, mix with water and rub on the body for a few days	Dermal
Tenone (N)	<i>Chlorophytum tuberosum</i>	<i>Anthericeae</i>	T	B	Wound	Dry the bark, powdered it then cover the wound	Dermal
					Gastritis	Crush, boil drink a glass	Oral
Reap (N)	<i>Cyathula cylindrical</i>	<i>Amaranthaceae</i>	Sh	Fu	Diarrhea	Crushed and boiled the fruit, drink a coffee cup	Oral
Gola (A)	<i>Vernonia grantii</i>	<i>Asteraceae</i>	Cl	Fu	Liver disease	Creamed the fruit, take a cup of juice before breakfast for 7-days	Oral
Jaa/Jaha (A)	<i>Boswellia neglecta</i>	<i>Burseraceae</i>	T	Fu	Stomach ache	Eat 1-2 piece of the fruit	Oral
				L	Teeth problem	Boil the leaves, drink a coffee cup	Oral
				Fu	Wound	Peel and crushed the fruit in fresh form then add to the wound	Dermal

Towu (N)	<i>Balanites rotundifolia</i>	<i>Balanitaceae</i>	T	R	Snake bit Dog bit	Chew a finger strip of 2- piece of the root	Oral
				L	Stomach		
				R	cough	Crushed the root and boil it, then drink a cup of tea until treated	
Tunchar (N)	<i>Cayratia Ibuensis</i>	<i>Vitaceae</i>	Cl	R	Bat infection	Boil to 2-hr, cool then washed by it	Dermal
Cod (N)	<i>Zizphus mucronata</i>	<i>Rhamnaceae</i>	Cl	Fu	Tuberculosis	Creamed the fruit, mix with water drink a tea cup before breakfast for 15 days	oral
				Fu	Stomach ache	Crushed the fruit pounded in water, drink a coffee cup	Oral
					Eye	Boil the fruit, washed by it after cooled	Dermal
					Neck problem	Add the juice of the fruit to the wound	Dermal
Pake (N)	<i>Calotropis procera</i>	<i>Asclepiadaceae</i>	T	St	Ear	The stem will be dry, crushed, powdered mix in water, drop 2-3	Drop

						droplets at evening and washed at morning	
Atew (A)	Tamarindus indica	Fabaceae	T	L	Snake bit	Eat a few leaves at the time	Oral
Codi (N)				Fu	Diarrhea	Fruit squeeze by water, drink a cup of tea at a time	Oral
Teap(N)	Entada abyssinica	Fabaceae	T	Ba	Dog bit	Metal burn by fuel, the bark pound in water, add the burned metal to it, washed by that.	Dermal
					Snake bit	Dig the stem of the plant crushed and pounded in warm water then drink a cup of tea in time	oral
Tore (A)	<i>Pterolobium stellatum</i>	Fabaceae	Cl	L	Teeth	Put leaves on fire, fumigate the smoke	Oral
Keat (N)	<i>Sena ruspolti</i>	Fabaceae	Sh	L	Head ache	Boil the leave, drink a glass at a time	Oral
				Fu	Eye	Boil the fruit and washed by the water	Dermal

Auped (A)	<i>Bauhinia ellenbeckii</i>	<i>Fabaceae</i>	T	R	Scorpion bite	Crushed the root powdered and drink a half of cup the remaining washed the part of wound	Oral and Dermal
				Fu	Spider	Dry the fruit, grind and cover the infected part by the powder	dermal
				R	Neck	Crush root, boil, cool and drink a half of tea cup for 5-days	Oral
				Ba	Dis located bone	The injured bone tied by the bark of this plant	Dermal
Awik (A)	<i>Sesbania microphylla</i>	<i>Fabaceae</i>	T	L	Stomach ache	Crushed and pounded in water and drink a cup of tea	Oral
Jiate (A)	<i>Geranium trilophum</i>	<i>Geraniaceae</i>	Sh	R	Liver disease	The root will be washed, crushed pounded for days in water, boil clarify, then drink before breakfast a tea cup to 7-days	oral

				L	Snake bite	Crushed, pounded the leaves and washed as well as stay in that water the injured part	derma l
Chipolo (A)	<i>Stereospermum Kunthianum</i>	<i>Bignoniaceae</i>	T	St	Spider bite	crushed and boil a broken stem, cool, after that washed the infected part at evening until treated	derma l
				R	Teeth problem	Wash and break the root, put a thin part of on the infected teeth	oral
Wamech (N)	<i>Tragia plukenetii</i>	<i>Euphorbiaceae</i>	H	Fu	Blood pressure	Boil the fruit and eat with something at the time of ill	oral
					Malaria	Powdered the fruit homogeneous with water, clarify and drink a cup of tea for 2-3 days	
					Parasite	Boil the fruit ,eat 2-3 piece of it	Oral

Pute (N)	<i>Gardenia ternifolia</i>	<i>Rubiaceae</i>	T	Ba	Diarrhea	Crushed the bark pounded in water and drink a cup of tea	Oral	
					Scorpion	Grind the bark and boil with water, drink a glass of it at time		
Dong (A)					R	Malaria	Crush, pound in water and drink a cup of coffee	Oral
						Liver disease	Crush and pounded in water for 2-days then drink a glass of it for 7- days	
Anid (Anino) (A)	<i>Osyridocarpus schimperanus</i>	<i>Santalaceae</i>	Sh	Fl	Eye	Add the flower in boiled water then after cool wash by it	Dermal	
					Spider bit			
Alwaa (A)	<i>Commiphora guidottii</i>	<i>Burseraceae</i>	H	Wp	Wound	Burn the whole part and grinded then add the powder to the wound	dermal	
Ngom (N)	<i>Ricinus communis</i>	<i>Euphorbiaceae</i>	T	Sa	Eye problem	Collect, the sap mix with water, wash by it	Dermal	
				L	Wound	Dry the leaves crushed and powdered it then add to the wound	dermal	
Auliro (A)								

Jat-arawa (A)	<i>Bergia suffruticosa</i>	<i>Elatinaceae</i>	Sh	L	Diarrhea	Boil the leaves and drink a cup of tea at a time	Oral
Gar(N)	<i>Mangifera indica</i>	<i>Anacardiaceae</i>	T	Fu	malaria	Eat the fruit 2-3 for 3-days	Oral
					Cough	eat the fruit 1-2 for some days	
Lual(N)	<i>Bauhinia purpurea</i>	<i>Fabaceae</i>	T	Fu	Wound	Dry, crush, powder, add to the wound	Dermal
				Fu	Cold	Crushed and Pounded the fruit in water, drink a tea cup	Oral
				L	Delivery	Pounded in water, boil and drink a glass of it	oral

Tearo(A)	<i>Hyparrhenia rufa</i>	<i>Poaceae</i>	Sh	R	Stomach ache	Cut a small piece of root washed and Chewing	Oral
					Common cold		
					Cold	Boil the root, take the water part a glass	
Golgul(N)	<i>Bridelia cathartica</i>	<i>Euphorbia ceae</i>	Cl	L	Eye	Boil the leaf, wash by it	Dermal
Shagi (N)	<i>Basilicum polystachyon</i>	<i>Lamiaceae</i>	Sh	R	Stomach ache	Washed, crushed pounded to water, drink a glass at the time	Oral
Gaebe (A)	<i>Jatropha curca</i>	<i>Euphorbia ceae</i>	H	R	Delivery	If the day passed, wash and chew the root	Oral
Nemlogn (N)	<i>Osyris quadritite</i>	<i>Santalaceae</i>	Sh	R	Malaria	Crush the root pounded in warm water then drink 2-cup of coffee when it cool	Oral
				R	Head ache	Pounded the whole root in warm water and drink a cup of tea	Oral
Jattul(A)	<i>Merremia gallabatensis</i>	<i>Convolvulaceae</i>	H	Fu	Snake bit	Swallow 2-3 fruit at that time	Oral
Adgera(A)	<i>cassia tora</i>	<i>Fabaceae</i>	Sh	R	Snake bit	Chewing a piece of the root when biting	Oral

Lear(N)	<i>Psychotria kirkii</i>	<i>Rubiaceae</i>	T	R	Tumor	The root crush, pounded for a day, add to ear, noise and drink a cup of tea for some days	Oral and drop
					Gastritis	Crushed and boil the root then take a half of glass for 2-days	Oral
Autit	<i>Indigofera hochstetteri</i>	<i>Fabaceae</i>	Cl	R	Malaria	Chew 2/3 piece of the root, take liquid part before eating	Oral
					Liver disease	Crushed and pounded the root in the water for a day, then drink a cup of tea before breakfast to a week	Oral
Cheak (N)	<i>Hypericum annulatum</i>	<i>Clusiaceae</i>	H	Sa	Wound	Break the stem, add the liquid to the wound some droplets	Dermal
				L	Tetanus	Crushed the leave, creamed to the wound	Dermal
				Wp	Cold	Dry, crushed, powdered and mix in water, drink in a glass for 3-days	Oral

Read(A)	<i>Nuxia oppositifolia</i>	<i>Loganaceae</i>	T	Ba	Diarrhea	Boil the bark, cool and drink a cup of coffee	Oral
					Scorpion infection	Crushed the bark pounded to water boil and drink after cool a glass	Oral
Dolmay(N)	<i>Trichodesma zeylanicum</i>	<i>Boraginaceae</i>	H	Wp	Spider poison	Crushed, mixed to sap, rub the wound	Dermal
					Body wound	Pounded to water, wash the body by fluid	
Leal(A)	<i>Desmodium velutinum</i>	<i>Fabaceae</i>	Cl	R	Delivery	Wash the root peel, chewed	Oral
					Diarrhea		
Actew(A)	<i>Eucalyptus rubida</i>	<i>Myrtaceae</i>	T	L	Common cold	Boil the leaves and take the smoke	Oral
Baye-baye(A)	<i>Melia azadarach</i>	<i>Meliaceae</i>	T	R	Snake bite	Crush root, pound in water for a hrs. Then drink a cup of tea at the time .	Oral
				L	Malaria	Crushed the leaves mix in water clarify and drink a cup of tea before eating	oral
Bay-bay(N)				Fu	Eye problem	Boil the fruit, washed by it	Dermal

Aulilo(A)	<i>Carica papaya</i>	<i>Caricaceae</i>	T	R	Tetanus	Broke the root and drop the juice on the injured part of body	dermal
					Stomach Ache	The root boil, take a cup of tea at that time	Oral
Zingibil (A)	<i>Zingiber officinale</i>	<i>Zingiberaceae</i>	H	Sd	Common cold	Peel the seed after washed, crushed and boil then drink a cup of tea	Oral
Bul (N)	<i>Euphorbia candelabrum</i>	<i>Euphorbiaceae</i>	T	Sa	TB	Dig the stem collect the juice drink a spoon for some days	
					Ear problem	Crushed the bark, collect the liquid and drop 2-3 droplets in the ear for 3-5 days	drop
Onemach (N)	<i>Girardinia diversifolia</i>	<i>Urticaceae</i>	H	Sd	Blood pressure	Break the stem, take the seed, boil and eat also bit the body by the stem	Oral
Abach (A)	<i>Zea mays</i>	<i>Poaceae</i>	Sh	Sd	Malaria	Make a soup of the powder, drink a glass of it for 2-3 days	
					Stomach ache	Warm water, mix the powder with it then eat	Oral
Ajawala (A)	<i>Solanum tuberosum</i>	<i>Solanaceae</i>	H	Sd	Stomach ache	Wash, Cooked the seed and eat after peel	Oral
Tac (N)					Head ache	Wash, cooked, peel and chewed	

Mono(A)	<i>Cynodon plectstachyus</i>	<i>Poaceae</i>	H	Wp	Spider poison	Crushed and powdered after Burn the whole part by fire, mix with water, homogeneous it then cover the infected part	dermal
					Wound	Burn the whole part of plant by fire, grinded then add to the wound	
					Eye	After burn, line the sap on the affected eye	
					Mot (N)	St	Neck swallow

Appendix 7: Some photos of medicinal plants that taken during field observations in the study area.



Photo of Kolpiyo (N) Cikaya (A) *Chasmanthera dependens*



Tiding of Mot (N) Mono (A) *Cynodon plectstachyus* on the neck

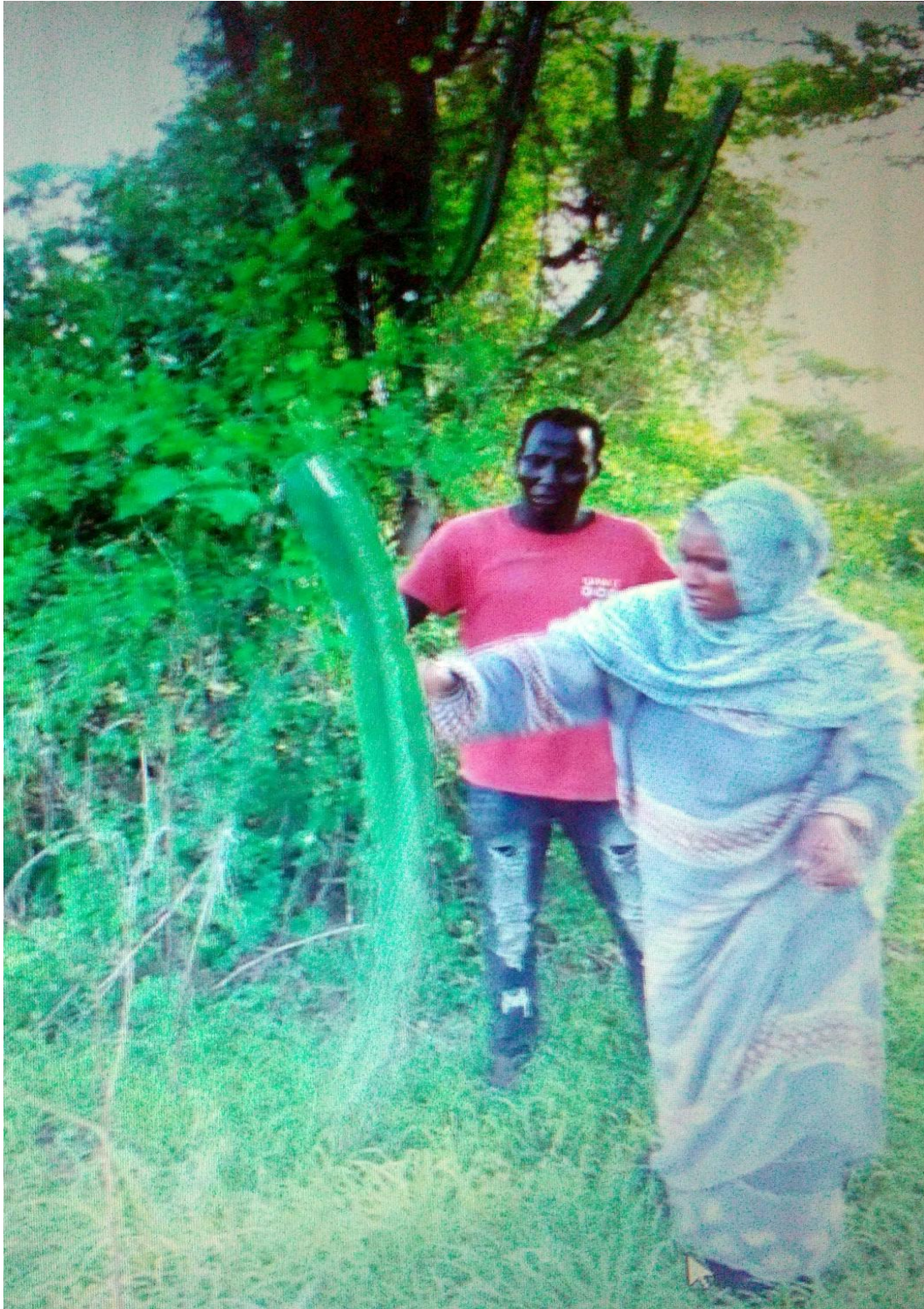


Photo of Bul (N) *Euphorbia candelabrum*



Photo of Atew (A) Codi (N) *Tamarindus indica*