Jimma University

College of Natural Sciences

Department of Biology

Diversity and Use Values of Plants in Hadero-Tunto Zuria District, Kembata-Tembaro Zone, Southern, Nations, Nationalities and Peoples Regional State, Ethiopia

By: Mekuria Tumebo

Main advisor: Kitessa Hundera (Professor)

Co-advisor: Netsanet Gonfa (MSc.)

March, 2021

Jimma, Ethiopia

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LIST OF ACRONYMS AND ABBREVIATIONS

FAO - Food and Agricultural Organization

GPS-Geographical Position System

HTZDOARD–Hadero-Tunto Zuria District Office of Agriculture and Rural Development

HTZDOFED- Hadero-Tunto Zuria District Office of Food and Economic Department

IBCR -Institute of Biodiversity Conservation and Research

Km- kilo meter

KT- Kembata-Tembaro

KTZFEDD –Kembata-Tembaro Zone Finance and Economic Development Department

MASL - meter above sea level

NGOs- None Governmental Organizations

SNNPR- Southern NationsNationalities and People'sRegion

SPSS- Statistical package for social sciences

M- Meter

MM- millimeter

ABSTRACT

The indigenous knowledge of plants is systematically and socially very crucial. This study was done ethnobotanical study of plant resources in Hadero-Tunto Zuria District, Kembata-Tembaro Zone, Southern Nations Nationalities and Peoples Regional State, Ethiopia. Survey was used to conductdatain the study District. The study was doneby identifying and documenting the plants thatwereused for food 49.3%, fodder 35.5%, medicine 63%, Construction 16.5*%, and several mixed uses including material culture. The sample size of the study Districtwas selected 186 respondents by Yamane (1967) formula. And the respondents were selected by lottery methods from three administrative towns of the study District. Various ethnobotanical methods wereused to collect and analyze the data such as semi- structured interview, participant observation, group discussion, guided field walk, preference ranking, direct matrix ranking, paired comparison, informant's consensus factor and reliability level combined with descriptive statistical analysis. In the study District, 73 different plant species with 42 family and 42 genera are identified. Poaceae stood first contributing 12(16.5%) species followed by Fabaceae and Solanaceae represented by 5(6.9%) species each and, Rosaceae and Rutaceae 4(5.5%), Asteraceae 3(4.4%), Zingiberaceae, Annacardiaceae, Lamiaceae, and Musaceae represented by 2(2.7%) species each. Based on the findings, those collected plant resources were mentioned in a minimum amount that shoud be preservedwere: Oleae europaea, Syzygium guineense, Prunes persica, Rhamnus prinoides, Ipomoeabatatas, Arundinaria alpina and some others eight plant species.*

Key words: *-Ethnobotanical, food, medicine, Plant resources*

ACKNOWLEDGEMENT

First of all, I would like to thank my almighty God who made things simple and is still in my side in all the tasks.

My warm feelings of thankfulness go to my advisors Kitessa Hundera (Prof.), Tamene Belude (Ass.prof) Netsanet Gonfa (MSc) and Desalegn Raga (MSc) for their guidance, support and useful comments during the thesis work starting from the draft proposal. Their serious review of the document and useful comments are highly respected. In addition to that, I would also like to give great gratitude and acknowledgement to my classmates due to wise share of ideas. Also, Iwould like to acknowledge the local community of Hadero-Tunto Zuria District people for their kindness, support, insightful acceptance and willingness during my data collection and also, I would like to give great appreciation to Jimma Herbarium during specimen identification.

I express my great feelings which I have for my Family: my father Tumebo Wadolo, my mother Bizunesh Edoto, and my brothers and sisters Tarekegn Tamire and Tadelech, Berhanesh, Taye and Genet, Tamenech, Habtenesh, and Degefe Tumebo and my uncle and friends who are found abroad are Tesfaye Wadolo, Abera Alemu, Tekile Delalo, Abebe Abemo, and Desta Anchiso, those who expense their economical help to and inspiring me by idea sharing. And again, my uncle Prayer Mekebo Wadolo, the priest Girma Abera and others their names not mentioned here are supported me by praying to the Lord for my success. My appreciations also go to Melaku Dessalegn who helped me by constructing map of the study area and all my esteemed friends.

Although many have contributed a lot during m y research thesis writing process, I hope that mentioning some may not hurt the feelings of those who are not mentioned here. My deepest appreciation still goes to them and my friend Deste wodajew and her families for their constructive ideas.

Lastly, I would like to give great thankfulness and acknowledgement to Mulusew Teshome (PhD) the leader of Christian fellowship here in Jimma and Meskello Tagesse (MSc.) because of their great and constructive advice next to God in my complicatin gtime

1. INTRODUCTION

1.1. Background of the study

Ethnobotany is the study of the relationship between plants and people: it originates from two words "ethno" - study of people and "botany" - study of plants. The focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies (Choudhary *et al.,* 2008). It mainly focuses on plants used for food, medicine, divination, cosmetics, dyeing, textiles, for building, tools, currency, clothing, rituals, social life and music (Gerique, 2006; Choudhary *et al.,* 2008). It is a broad term referring to the study of direct interrelations between humans and plants available around them" (Martin, 1995). It involves an interdisciplinary approach encompassing the fields of botany, chemistry, pharmacology and anthropology (Cotton, 1996). The use of plants in indigenous societies are multiple and diverse. It is reported that more than 3.5 billion people rely on plants for the treatment of both human and livestock diseases (FAO, 1997). Again Ethnobotany is the biological, economic, cultural inter-relationship that studies between people and plants living in the environment in which they exist (Allen, 2001).

In Ethiopia several published and unpublished emphasis has been given to ethnobotanical studies over the past decades and again Dawit Abebe (2001), but recently there has been some attempt in investigating medicinal plants and indigenous knowledge on sustainable use and management of plant resources. The institute of Biodiversity Conservation has pledged to do this in its long-range strategic research plan (IBCR, 2000).

Nowadays, important plant2 resources are declining in the study district because of less recognition of peoples about the plants and the perceptive of people of the study districts to the indigenous knowledge is less for the sustainability of ethnobotanical study of plantresources as the report of (HTZDOARD, 2019).

1.2. Statement of the Problem

Our country Ethiopia is one of the countries which have various varieties of plant species. Ethnobotany is a crucial instrument to identify and document plant species that have been below consumption by human beings for centuries for plentiful reasons (Teklehaymanot and Giday, 2007). Today, more plant species were threatened than ever before due to human unknown cutting off trees and limited technological development (Harris 1996). The lack of preservation actions and activities was observed in Hadero-Tunto Zuria District, KT Zone, and SNNPR which state of Ethiopia is similar to other areas in Ethiopia. Even though it was known that, the District had relatively better plant resources and hence, the associated traditional knowledge resource was more or less expected to be significant (HTZDOARD, 2019). Now a day's plant use practice in the study areas displayed that the local people were facing problems of many plants resource depletion and loss of indigenous knowledge up on plant resources mostly (HTZDOARD, 2019). Thus, careful ethnobotanical study plays a confident function to describe information on general plant resources and related indigenous knowledge for maintenance and sustainable consumption. Nevertheless, to have full picture of ethnobotanical knowledge of societies in the study District, overall an over geographical, cultural and botanical diversity studies wanted be included. Newly, some studies were done on some localities of Ethiopia. Yet, no study was done to collect and document the complete ethnobotanical aspects in the local communities of the study areas of Hadero-Tunto Zuria District (HTZDOARD, 2019). Therefore, this study was planned to study, gather and document ethnobotanical plant resources in the study District.

1. 3. Objectives

1.3.1. General Objective

The genetal objective of the study was: -

To assess ethnobotany of plant resources in Hadero-Tunto Zuria District, Kembata-Tembaro Zone, Southern Nations Nationalities and Peoples Regional State, Ethiopia.

1.3.2. Specific Objectives

The Specific objectives of the study were to:

- ✓ Identify plant species traditionally used by the local community
- ✓ Investigate the traditional knowledge related to the use values of the plan species in the study area
- ✓ Assess threatening factors related to plant species in the study area
- ✓ Assess the diversity and habitat of the plant species in the study District.

1.4. Scope of the Study

The study was demarcated in both content wise and geographically. The content was delimited to investigate the ethnobotanical study of plant resources variety and again identification of ethnobotanical plant species used by the local people. Geographically, the study was bordered in Hadero-TuntoZuria District because of time and financial shortage.

1.5. Significance of the study

The findings of this study in Hadero-Tunto Zuria District have helped to other researchers who may like to follow further research on ethnobotanical plant resources varieties with knowledge in the study area. Apart from adding to knowledge and literature on plant species diversity, the findings might be helped to policy maker, agrobiodiversity and traditional knowledge in research center, NGOs and development agents since it may show the different plant species on their environment. Complete collection, identification and documentation of ethnobotanical knowledge not yet been made in the study area too. Biodiversity loss is due to natural and manmade factors, distribution and undermining or discouragement of indigenous knowledge and traditional practices mainly in medicinal plants; this was because of what ever the study depended up on plant resources, the focus is up on medicinal plants mainly depended up on peoples use. In the study, the younger generation is becoming less evident due to limited integration of traditional practitioners in the study area. What was more is that, most of the natural vegetation and forests of the study area were almost totally going lost. No ethnobotanical data documentation on plant resources and indigenous knowledge of the local people found in the study District. Therefore, collecting and documenting ethnobotanical knowledge before it is lost forever is a fundamental crucial task. Hence, this study was designed incollecting, recording and documenting plant resources with indigenous knowledge and suggested ways of conserving those plant species.

2. LITERATURE REVIEW

2.1. Development of Ethnobotany

Ethnobotanical research can deliver prosperity of information regarding both previous and present relations between plants and the traditional societies. Investigations into traditional use and management of local flora have demonstrated the existence of extensive local knowledge of not only about the physical and chemical properties of many plant species, but also the phenological and ecological features in the case of domesticated species. In addition to its traditional roles in economic botany and exploration of human cognition, ethnobotanical research has been applied to current areas of study such as biodiversity prospecting and vegetation management. It is hoped that, in the future, ethnobotany may play an increasingly important role in sustainable development and biodiversity conservation (Choudhary *et al*., 2008).

Ethnobotany involves all studies that concern the common relationships between plants and traditional people (Cotton, 1996). Results of ethnobotanical research are used as a lead in development, sustainable consumption of plant resources and indigenous knowledge in particular and conservation of biodiversity in general Hunde (2001), Asfaw (2004) also noted that the ethnobotanical studies have played a key role in revealing and promoting traditional practices that have been found useful in maintaining or enhancing biodiversity and sustainable use of biological resources.

Harsher Barger in 1895 carried up the term ethnobotany for the first time (Cotton, 1996). He defined ethnobotany as “the use of plants by aboriginal people". Martin (1995) broadly defined “ethnobotany as the subject dealing with the study of direct interactions between humans and plants”. There are numerousmethods of investigation tools based on the aims and objectives of this ethnobotanical study at hand (Martin, 1995). These investigation techniques include participant observation, imitation, field interviews, and group discussion, checklist interview and market survey. Balick and Cox (1996) included the use of plants as food, medicinal, forage and for any other economic purpose within field of ethnobotany. There has been an ever-increasing interest by anthropologists, botanists and explorers of the world to document the potential use of plants used by indigenous people (Cotton, 1996). Christopher Columbus initiated this in 1442 when he discovered the use of tobacco plant (*Nicotiana spp*) by local

people of Cuba. Around 1858, British explorer, R. Spuce noted for the first time the psychoactive properties of the vine plant *(Banisteriopsiscappi*) (Cotton, 1996). Such works gradually yielded a firm base for the study of direct interactions between human and other organisms through documenting, analysis and use of indigenous knowledge of biological entity. Eventually, the work on ethnobotany promoted this subject to be an independent field of study in biological sciences. Since then, different authors used various ways of defining ethnobotany (Cotton, 1996). Work with communities to evolve improved methods of managing trees and other plants have many potential benefits for conservation and sustainable development (Hamilton *et al*., 2003). Ethnobotany is an indispensable tool to identify and document plant species that have been underutilization by human beings for centuries for various reasons Teklehaymanot and Giday, (2007). This ethnobotanical study on varied vegetation of forests as well as other vegetation types is very critical in order to taking in to consideration such wealth application of ethnobotany during plant species protection and usage. Research concerned with ethnobotany involves recording the knowledge on the cultural collaboration of people with plants, finding out in what way local people have traditionally used plants for many purposes, and in what manner they join plants into their cultural tradition and religion (Balick and Cox, 1996). To get more detailed and consistent information, ethnobotanical investigation needs to involve scholars from various streams such as plant taxonomy, plant ecology, anthropology, linguistic, economic botany, pharmacology and the like (Martin, 1995).

2.2. Ethnobotanical studies around the world

There is increasing evidence that wild food plants are an essential component of the global food basket (Bharucha and Pretty 2010), making a major contribution to the food security and dietary diversity of hundreds of millions of people around the world (Heywood, 1999). These plants are critical to the subsistence system of farmers (Ogle *et al.*, 2003; Aryaln *et al.*, 2009), improving the nutritional quality and micronutrient content of the rural diet (Grivetti and Ogle, 2000; Heywood, 2011) and providing secondary metabolites such as essential oils, alkaloids and phenolics (Heywood, 1999; Johns, 2007). Moreover, these plants are remarkable sources of medicine, fuel, animal feed and timber, and have multiple domestic and ritual uses. Farmer's main wild food plant gathering locations are increasingly from anthropogenic ecosystems rather than pristine environments, given the evident decline in forest

areas. Certainly, collection and consumption of wild food plants from anthropogenic ecosystems, such as agricultural fields and home gardens, have increasingly been demonstrating the use and importance of these plants among farming households all over the world (Bharucha and Pretty, 2010). Some plants constitute an essential food resource for the most vulnerable households, such as families with chronically ill members (Barany *et al.,* 2001; Johns and Eyzaguirre, 2006) and the poor (Daniggelis, 2003). Surely, the higher the diversification with in agro-ecosystems, the greater self-sustainability and self-reliance of the most vulnerable groups (Heywood, 2011).

Despite growing evidence of the importance of wild food plants for farming societies, the conservation of these food plants has received little attention from genetic resource agencies and seed-banks (Heywood 2011). Wild food plants are largely ignored by rural extension, agricultural programmers (Ogle *et al.,* 2003; Aryal *et al.,* 2009) and in land-use planning (Cunningham, 2000). Certainly, the major values of wild food plants are use values and cultural values, rather than monetary values (Howard, 2003).

Home gardens are characterized by the presence of multiple purpose species (Galluzzi *et al.,*2010), given that an important factor to select the species for growing and maintaining in these ecosystems is their variety of uses and derived products (Gajaseni, 1999). This diversity of products is obtained with low labor and inputs (Kehlenbeck and Maass, 2004). The functionality of home gardens and multiple uses of their species have been reported around the world.

Daniel (1998) compiled various ethnobotanical works in America. Despite the American dominance in ethnobotany, ethnobotanists of Europe and Australia have made invaluable contributions in this field. Long before naturalists such as John Josslen began to compile herbals in the New World, Europe had a long tradition in the production of herbal pharmacopoeia, a tradition that dates back to the herbals of ancient Greece and reached its zenith in the medieval publication of some English Physicians John Jerard and Nicolas Culperar (Cotton, 1996). Philippines Holds worth and Lacanieanta (1981) documented the traditional medicinal plants of the Central Province of Papua New Guinea. Rahman and Yusuf (1996) worked on diversity, ecology and ethnobotany of the *Zingiberaceae* of Bangladesh. Several such studies are still being carried out in Asian and African countries to document the valuable Indigenous Knowledge practices. Jain (1996, 2000, 2002, and 2003) contributed for the ethnobotany of the India through his various publications.

2.3. Ethnobotanical studies in Africa

African continent is and bode of hundreds of indigenous communities who depending upon diverse plant resources to meet their multidivers requirements. Therefore, African countries were important study sites for many ethnobotanists of the twentieth century. David JS (2010) documented an ethnobotanical aspect in Northwest Region of Cameroon.

The origin, domestication and cultivation of yam and cultural practices associated with the staple food of the Africans were studied by Coursey (1975). Johnson and Johnson (1976) studied the economic plants in a rural Nigerian market. Fleuret (1979) studied the wild foliage plants, fruits and other uses of plants from Lushoto and Usambara of Tanzania. De Smet (1998) worked on the traditional ethnopharmacology of Africa with special reference to sub-Saharan art objects and utensils. There are hundreds of publications appeared on ethnobotanical use of African plants and from among the compilation of African plants used as medicine and poisons by different ethnic communities of Africa by Neuwinger (1996) act as monumental source on medicinal plants of Africa.

2.4. Ethnobotanical studies in Ethiopia

Ethiopia, situated in the Horn of Africa, has a total land area of 1.126 million Km^2 (Jonathan, 2007). According to Addis *et al.*, (2002) varied ethnobotanical knowledge of Ethiopian people is mainly attributed to the country's topographic, climatic, biological, ethnic, linguistic, and religious diversity and its long history, mosaic environment and social diversification. Many studies on ethnobotany of Ethiopia indicate that wild plants are mainly used for house building and household utensils, clothing, food, soap, medicine, and magic and ritual purposes. The usage of plants usually relates to people's conceptualization of the importance of plants including their use for food, medicine, cosmetics, dyeing, and textiles, for building tools, clothing and ritual. Therefore, plants which are familiar and recognized by the local people as having a beneficial use can be domesticated and cultivated on a large scale. Management and conservation of plants began with prehistoric human's endeavor of domesticating wild plants. It is a long and complex process and many plants are found in various stages of domestication as a result of human selection (FAO, 1999). Their research publications on ethnobotany of Ethiopia and majority were contributed more towards documenting ethnomedicinal plants used by the various ethnic

group followed by some food plants. There are few studies comprehensively documented the various ethnobotanical aspects other than food and medicinal plants. An ethnobotanical study of the semi Wetland vegetation of Chafe by Tamene *et al*.,(2000) brought the people's knowledge on 206 plant species which include 83 medicinal plants, 54 wild food plants, 38 fodder plants and 39 plants with other miscellaneous uses. Dalle *et al*., (2005) reported ethnobotanical information on 248 species among Borana pastoralists in southern Oromia, Ethiopia.

2.4.1. Ethnobotany of the food plants in Ethiopia

Plant products that are used as food can come from any part of the plant such as seed, fruit, leaf, stem, root and flowers. Such plant foods are largely obtained from the conventional crops that are purposely grown in gardens and fields. Food plants include those plants consumed by humans as major constituents of food preparations and clearly comprise the most important class economically. Asfaw, (1997) mentioned that there are more than 130 species of cultivated food plants distributed in about 35 angiosperm families in the whole of Ethiopia. Some study on wild flowering plants of Ethiopia and documented various information on 203 plant species used for food by the different communities (Asfaw and Tadesse, 2001).

Another study by Kebu and Fassil, (2006) resulted in the documentation of 66 wild edible plant species utilized by Derashe, Kucha and Gamo, Fentahun and Hager, (2009) reported 44 wild species producing edible fruit belonging to 30 genera and 24 families from among the people of Dejen, Debarik and Adiarkay in Amhara Region. Adekunle *et al*., (2009) reported 68 underutilized food plant species based on the ethnobotanical knowledge of Sekota District, Amhara Region of Ethiopia. Teklehymanot and Giday (2010) reported 58 wild plant species as sources of food in Debub Omo Zone, SNNPR by Kara and Kwego pastoral people.

2.4.2. Useful Plants and Use Categories

Plants are fundamental to almost all lives on the earth providing protection and nourishment for organisms ranging from bacteria to large mammals (Cotton, 1996). Humans derive food, medicines and a number of ecosystem services such as air purification, origin and recharge of water bodies, nitrogen fixation, cycling of nutrients as well as many more range of other products from plant biodiversity (Khanal, 2006). Wondimu *et al.,* (2006) in similar way explained that, plants serve as sources of drinking water, which is part of food. But, the perception and relative importance of useful plants are related to cultural factors such as human behavior, social and economic constraints, and several other factors. In addition, patterns of plant use by human communities may depend on environmental constraints. For example, some patterns of plant use can be related to local species richness, or to the regional abundance of some useful plants (Toledo *et al.*, 2007). While, the use of plants and plant products for different purposes such as food, wood, medicine, fiber, oil, fodder, aroma, ornamental and other miscellaneous uses could be traced as far back as the beginning of human civilization (Khanal, 2006). But, in this study overall focus is given for the useful plant sources provided mainly as medicine and wild foods.

2.4.3. Indigenous People and Indigenous Knowledge on Useful Plants

Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility (Khanal, 2006). Biodiversity and traditional knowledge of its various properties and uses have long provided and continue to provide vital resources for medicine discovery and health care (SCBD, 2010). In addition, indigenous knowledge can provide problem solving strategies for local communities, especially the traditional societies. For example, previous studies on medicinal plants (Balemie *et al.,* 2006; Giday and Ameni, 2003; Teklehaymanot and Giday, 2007; Yinger *et al.,* 2008) have shown that the traditional societies in Ethiopia have good plant use and management knowledge, which will have valuable contribution to conservation activities in the country. This knowledge is still underutilized resource in the development process of Ethiopia. But, Indigenous knowledge of medicinal plants in Ethiopia is unevenly distributed among community members (Asfaw,

2001). Therefore, special effort is needed to understand and disseminate this knowledge through ethnobotanical studies.

2.4.4. Plant resources as medicine

In Ethiopia, more than 95% of traditional medical preparations are of plant origin, and more than 80% of the people are dependent on plants for their health services. The wide spread use of traditional medicine among both urban and rural population in Ethiopia could be attributed to cultural acceptability, efficacy against certain types of diseases, physical accessibility and economic affordability as compared to modern medicine (Abebe, 2001). Bekele (2007) mentioned that the use of medicinal plants is a common phenomenon in Ethiopia, nearly 70% of humans and 90% of livestock population in the country use plant based traditional medicines as their major health care system. (Giday, 2001) had documented 33 medicinal plants used by the indigenous people in Zay Island, Lake Ziway East Shewa zone of Oromia regional state. Dawit *et al.,* (2003) compiled the various information associated with medicinal plants of Ethiopia including medicinal uses, poisonous effects and various biological properties. Tadesse *et al*. (2005) documented 39 medicinal plants from Seka Chekorsa District, Jimma Zone Oromia regional state. Hunde *et al*., (2006) identified 52 medicinal plants under 27 family and 43 genera in Boos at sub-district, East Shewa Zone Oromia regional state. An ethnobotanical study by Yineger and Yewhalaw (2007) on Sekoru District, Jimma zone Oromia Regional State resulted the documentation of 27 medicinal plants species under 18 families and 27 genera. 73 different plant species were documented in the study area studied in a similar way by Wondimu *et al*., (2007), Arsi Zone, Oromia Regional state. A study conducted by Yineger *et al*., (2007) on Bale Mountain result the documentation of 74 medicinal plants for curing 25 animal ailments.

2.4.5. Ethnobotanical information and other plant use of Ethiopia

Fodder or animal feed include those plant materials harvested and fed to domestic animals and grazed and browsed in wild. Now a day due to different reasons grazing pasture is scarce in highly cultivated areas and is less available during the prolonged dry seasons or when there is drought. There are also reports on some fodder plants of Ethiopia. Abebe *et al.,* (2013) on studied about some multipurpose

fodder trees in relations to farmers of Ethiopia. Mekonnen *et al.,* (2009) contributed for the fodder values of three indigenous and one exotic fodder plants of Ethiopia.

Plants is used for construction and are essential raw materials for fiber, timber, gums, resins and industrial and essential oils which support economic development of any country. Wood is not only the most suitable and most widely used materials for furniture, but it is also easily available and comparatively cheaper than metal. It is used for simple kitchen stool to the furnishings in average sitting-rooms, or the more sophisticated furniture for special occasions and state functions (Abbiw, 1990). The reports on material culture and other miscellaneous use on plat resources of Ethiopia are very scanty. There are also some publications leading knowledge on repellents plants among the ethnic groups of Ethiopia. A study onknowledge and usage custom of traditional insect and mosquito repellent plants among the Ethiopian Oromo ethnic group resulted the documentation of nine plant speciesby Karunamoorthy *et al*., (2009).Another study on Assessment of knowledge and usage custom of traditional insect and mosquito repellent plants in Addis Zemen Town, South Gonder, Northwestern Ethiopia resulted the documentation of 15 plants. Based on the various published information it is obvious that, more studies on comprehensive ethnobotanical aspects namely, food, fodder, medicine, material culture and several miscellaneous uses should be initiated in different parts of Ethiopia (Karunamoorthy *et al*.,2009).

2.5. Condition of Wild Food Plants in Ethiopia

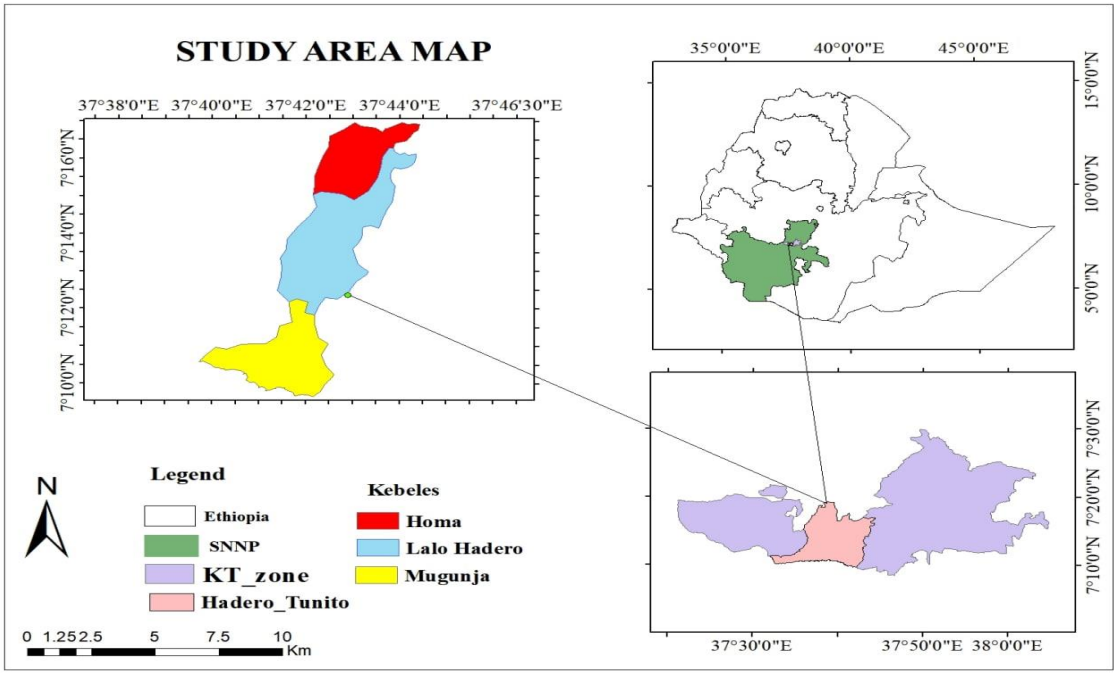
There are about 170 food plant species that are consumed in different parts of the country; including herbs, trees, shrubs, and climbers. But, most of the wild edible species are endangered due to genetic erosion (IBC, 2005). These phenomena are more pronounced in countries like Ethiopia where high rate of human population growth join up with insufficient documentation and conservation of biota, in particular safeguarding promising plant taxa (Asfaw and Tadesse, 2001). With the routine underestimation of wild foods comes the danger of neglecting the provisioning ecosystems and supportive local knowledge systems that sustain these food chains (Grivetti and Ogle, 2000; Mazhar *et al.*, 2007). Moreover, in spite of the role of edible wild plants in bridging periods of food shortages and providing dietary variety, very little attention has been given to the inventory and conservation of species (Addis *et al*., 2005).

Wild food plants are of high nutritional content such as protein, vitamin B2, and vitamin C, which used as alternatives to conventional vegetables in the human diet **(**Mengistu and Herbert, 2008). According to many sources, the number of vitamins, minerals and other nutrients in wild food is on the average greater in wild foods (Hinnawi, 2010)**.** Research supports that some of these foods, as part of an overall healthful diet, have the potential to delay the onset of many age-related diseases (Arnold, 1995 cited in Khanal, 2006).

3. METHODS AND MATERIALS

3.1. Description of the Study Area

The study was conducted in Hadero-Tunto Zuria District, Kembata-Tembaro Zone, Southern Nations Nationalities and peoples Region, Ethiopia. The study District was geographically located located 390 km from Addis Ababa and168km from Hawassa, the capital of SNNPR. The geographical location of the District is $36^{0}58'$-$36^{0}86'$E longitude and $6^{0}10'$-$6^{0}34'$N latitude. The total land coverage of the District was about 49 km^{2}hectares, of which 40 km^{2} hectares (81.6%) are cultivated and 9 km^{2} hectares (18.4%) were not cultivated. Out of this total land, 6 km^{2} hectares were designed for grazing lands (HTZDOARD, 2019)



Map1: Location of Kembata-Tembaro Zone Hadero-Tunto Zuria District three study "Qabales" (Administrative towns)

3.2 Population topography and economic activity

According to Hadero-Tunto Zuria District report in 2019, the total population of the District was 135,000 from which 65,210 are males and 69,790 are females; and the households in the District were 16,413. Rural peoples of the District completely lead their life depending oncrop plants and plant products. Most of the people got income from trading plant products and the others from livestock production. The elevation of the study area ranges from 1000-3000m above sealevel. Geographically the study area was categorized by mostly mountainous in the North and at the West lowland in southern parts of the study area(HTZDOARD, 2019).

3.2.1 Climate

The study area had three climatic zones; high land (13%), Middileland (32%) and lowland (55%). The rainfall is not normally rain throughout the year. That means the rain is bi-modal and the little rains normally starts to rain from January to April. The main rainy season or summer starts in June and ranges to September but, the heavy rainfall happens in June to August. Though, the rainfall is unequal and is not evenly circulated. The quantity and the supply of the rainfall varied from place to place and season to season according to the weather conditions. The mean annual rainfall of the District ranges from 550mm-1000mm and the mean annual temperature general ranges from 18^0c-28^0c (HTZDOARD, 2020).

3.5. Data collection Methods

3.5.1 Plant data collection

The study performed based on information provided by informants; voucher specimens of each useful plant species were collected during field observation. Herbarium specimens of all useful plants were prepared following the standard herbarium methods (Brinson and Forman, 1998). Local names of plants were documented and later, their scientific names were identified by using different volumes of

Flora of Ethiopia and Eriteria, and the specimens deposited in the Jimma University Herbarium.During the actual work in the ethnobotanical study of plant resources used were: GPS, digital camera, tape recorder, Lap top, bag, pen, pencil, note book and questionnaires for data collection.

3.5.2 Ethinobotanical Data

Both qualitative and quantitative methods were sellected. Qualitative methods of survey included openended questions like interview in which the interviewee answered or gave their responses by words to the asked quations without the interviwer restriction. But quantitative methods used to idindicated how many of the respondents respond to the asked questions and that is shown innumber or in percent.

3.6. Field observation and Sampling the study sites

Research survey or investigation was directed to discover the study site, one week before the real data collection time. The thought was achieved with the help of local guides and interviewed informants. The factors like altitude or height above sea level, population concentration to now the amount of people that was used to take sample size, and ethnicity like background, patterns, duties and way of life, existence of aged and well-informed people was assessed during the survey. A purposive sampling was made in reflection of above-mentioned factors practically.

3.7. Sample size and Sampling techniques

In the study District, there are 15 different “Qabales” (small administrative towns). From those 15“Qabales, three were selected by lottery method from; highland, middile land and lowland, one each. The sampling size of each “Qabale” informants was gotten by applying the Yamane (1967) formula. The choice was done from an age setfrom 20 to 80 years old. The selection of the knowledgeable people was constructed on un-structured interviews with randomly come upon members of the society. Thus, one whose name mentioned by study area people at least three to five times or come up on peoples’ consideration as a knowledgeable person was selected as a key informant. The selected

"Qabales" had totally 2,105 households; from these, 186 households were obtained as a sample size by using Yamane (1967) formula to assess ethnobotanical plants. This Yamane formula mathematically is, $n=\frac{N}{1+N(e)^2}$. $n=\frac{2,105}{1+2,105(0.07)^2}$=186 informants were selected.

Where:

N= Total number of households

n= Sample size of households

e= margin of error (0.07) with 93% precision level.

Sample size of the study District each "Qabale" respondents was calculated by total households of each selected "Qabale 589, 695 and 821 respectively to total households of three selected "Qabales (Homa, Mugunja, and Lalo) 2,105 multiplied by sample size of informants 186 according to Yamane (1967) formula.

Sample size ofeach "Qabale" respondents = $\frac{\text{total households of each selected "Qabale"}}{\text{Total households of three selected "Qabales''}} \times 186$

Therefore, from Homa (589), Mugunja (695) and Laalo (821) households, 52, 61 and 73 respondents respectively were interviewed.

3.8. Ethnobotanical Data Collectionand analysis

3.8.1. Ethnobotanical Data Collection

Data was composed by using semi-structured interviews by open and closed ended questitions on paper to the informants to answer the given questions totally one hundred and eighty six informants, field observation of the study area to now the altitude and every important information, participant observation, and five group discussion and guided field walk with informants by protecting gap between one and other assessed the degree of effectiveness of plants fodder, medicinal, constructions,

and other multipurpose use were computed by preference ranking, paired comparison and direct matrix ranking following as per the standard methods of Martin (1995) and Cotton (1996).

Interviews and discussion were done based on a checklist of questions that has been prepared in English through translation to Amharic and Local language Kambaatissaa. Essential information about the plants such as local name, growth forms, and parts used degree of organization that means wild or cultivated, habitat, altitude and other related ethnobotanical data were noted. Furthermore, in the report method of research, added values of plants use, route or way of administration and application, current threats and indigenous knowledge transfer were contained within the study.

3.8.1.1. Market Survey method

This was directed in three major markets around the study District of the selected "Qabales" (the smallest administrative offices). The selected markets were Lalo-Hadero, Mugunja-Mazoria and Homa markets. The District people also use the largest market at Hadero town. Those three markets were also used by people that came from neighboring or near by "Qabales'' in the District showed to evaluate the varieties and amounts of plant resources and to determine income generated from such training by using semi-structured interviews method.

3.8.2. Data analysis

3.8.2.1. Descriptive statistics

In this method, percentage and frequency were employed to review the data on useful plants, medicinal plants, related knowledge, management methods, landscape use and conservation. The most useful information collected on useful and medicinal plants reported by local people: economic value, application, methods of preparation, route of application, threat of biodiversity, part and habit used were analyzed through descriptive statistical analysis. MS Excel sheet and SPSS version 2020 were used to draw tables and to determine proportions as well as to summarize the ethnobotanical information obtained from the informants.

3.8.2.2. Preference ranking

This method was conducted to rank some selected plant species based on the degree of their effectiveness in treating aparticular diseaseby following (Martin, 1995). Which was one of the simplest analytical tools, involved inquiring respondents; their favorite useful plants in the farming site are allowed them to preferentially rank a few items in the group. Preference ranking is based on one dimension. The number of multipurpose functional plant species was selected out of the total plants and used diversities of those plants were listed for some purposively selected key informants assigned use values to each species and gave the highest number for that they thought were the most effective in using and the lowest number for the least effective plant in treating ailments in their items of category (Lulekal *et al.*, 2008).

3.8.2.3. Direct Matrix ranking of multipurpose uses

According to Martin (1995) and Cotton (1996) particular plants were selected to compare with their uses based on their cultural value, strength, durability and their ability to protect them selves from diseases. This method was used to compare and assess the relative importance of valuable plants, medicinal plants and plants that are used as multi-purpose based on information gathered from informants. In this study, the respondents were asked to rank plants for making food, construction, fuel, forage, and medicinal plants and gave the highest number for that they thought were the most effective in using and the lowest number for the least effective plant. Each chosen key informants was asked to assign use values (5=best, 4=very good, 3=good, 2=less used, 1=least used and 0= not used). The values of each species were summed up and ranked in the table.

3.8.2.4. Paired comparison

Five Paired comparisons of five selected key ineormants were conducted to cure wound illness and evaluating the degree of levels of importance of selected plants Martin (1995). This method was computed to check the relationship of preference is challenger during the workout of the researcher. In paired comparison, selected informants were asked to choose the best item from every pair according to

personal perception. A total order was obtained by summing the number of items each time it is chosen. An item with the highest frequency of choices had the highest score.

3.8.2.5. Use value

This method is used to now plant species importance was estimated by using use value analysis of Philips (1996). In this the use value analysis; uses were considered in to three classes, no use, minor use, and major use. The use value scores assigned to these classes were, 0, 0.5, and 1 respectively (Philips, 1996). The plant use value was determined to evaluate the importance of each plant species to the ethnic people and calculated as the average of the use value of the species.

U v is= ΣU is / nis

Were,

Uis=the use value **(Uv)** attributed to a particular species (s) by one informant

ΣUis= summation of all the uses mentioned in each event by the informant

n is**=** total number of events in which that informants gave information on the species

4. RESULTS AND DISCUSSION

4.1 RESULTS

4.1.1 Indigenous vegetation classification systems in Hadero-Tunto Zuria District

The local people of the study District have indigenous categorization techniques that focus on various environmental components including plants, land and season. As the report of the

study area people, before now there were many vegetation and land covered by vegetation, but now because of population increment, people deforest or clear down most of vegetation, the amount of vegetation become decreasing. What ever the amount of vegetation is decreasing, the present amount of it become locally classified 'cari algoddata, cafi algoddata, hixe algoddata, lagi algoddata' and vegetation that grow wild with out peoles' plant as shown follows.

Table 1: Indigenous vegetation classification in Hadero-Tunto Zuria District, (2020)

Name of vegetation types	Types of vegetation cover	Locality in the study area
Forest vegetation "Cari algoddata"	Mainly forested land composed of ranges of large trees	Middle land and low land climatic zone
Wetland vegetation "Cafi algoddata"	Herbaceous vegetation growing in wetland	High land agro-climatic zone
Grasses "Hixe uullata"	An area dominated by grasses and other herbaceous plants.	In all climatic Zone
Reverine Forest "Lagi algoddata"	Reverine Forest	In all climatic Zone
Wild vegetation	The majority of plants	In all climatic Zone

“Hadahaqqita”	observed in these areas are herbs and shrubs	

According to indigenous vegetation classification or emic categorization, vegetation of the study District was categorized in to four major types. These include “Cari algoddata” natural vegetation cover known by somewhat dense plant species and composed of a range of larger trees. Now days, this type of vegetation has declined in the study area because of agricultural expansion and over harvesting. “Cafi algoddata” (wetland vegetation) in which some grasses and *cyperus* species is more frequent and it is ever green throughout the year. “Lagi algoddata” (reverine forest) was the area known among the local community with various plant species composition and with different species. "Annitee algoddata” (complex plant species associated in the wild), road sides as well as for those plants growing in garbage areas. The majority of plants observed in these areas were herbs and shrubs. According to informants, most plants growing in this area were medicinal plants and have medicinal value.

4.1.2 Local categories of plant resources growing land

The people of the study District used to classify plant resources growing land based on use of land such as: farm land “hogouullata” grazing land “gizza zei uullata”, residential land “galte uullata” river bank “lagi uullata” and plant resources growing land.

4.1.3 Valuable plant resources of the study District

As shown in (Appendix 1), a total of 73 plant species belonging to 42 genera and 42 families were collected and identified in the study area. Of these 73 plant species collected, 42 (57.5%) were from the wild vegetation and 31 (42.5%) were obtained from farm lands and home gardens of the study area. In terms of families *Poaceae* stood first contributing 12(16.5%) as shown in (table 2).

Table 2. Distribution of collected plant species in different family

Family	Number of species	Percent (%)
Poaceae	12	16.5
Fabaceae	5	6.9
Solanaceae	5	6.9
Rosaceae	4	5.5
Rutaceae	4	5.5
Asteraceae	3	4.1
Annacardiaceae	2	2.7
Malvaceae	2	2.7
Zingiberaceae	2	2.7
Musaceae	2	2.7
The remaining 32 species	1	43.8
Total	73	100

4.1.4 Major plant use categories

These plant species were grouped under major use categories such as food, fodder and medicine (table 3). Analysis of homogeneity of the ethnobotanical information following the factor of informant consensus (FIC) revealed that there is high reliability of plant use among informants (Appendix 2).

4.1.4.1 Food plants

The local communities of Hadero-Tunto Zuria District obtain a number of services from cultivated and wild food plants. Cultivated plants were documented from 15 genera and 36 species, which provide cash income 30(83.3%), food 23(63.9%), medicine 16(44.5%), stimulant 6(16.7%), forage 5(13.9%), and spices 4(11.1%). The amount and percentile of food plants are greater than that of total plant species in the study District. This is because of that of some plant species used for food are again used for medicine, fodder, stimulants again and vice-versa. For this reason, the summation of the total plants

used as food is greater than that of collected as shown in (table 4). Plant products that are used as food can come from any part of the plant such as seed, fruit, leaf, stem, root or flowers. Such plant foods are largely obtained from the usual crops that are knowingly grown in gardens and fields.

Table 4, Cultivated and wild plants

No.	Cultivated plants	Species	% of Species
1.	Cash income	30	83.3
2.	Food	23	63.9
3.	Medicine	16	44.5
4.	Stimulant	6	16.7
5.	Forage	5	13.9
6.	Spices	4	11.1

4.1.4.2 Major crops cultivated in Hadero-Tunto Zuria District

Hadero-Tunto Zuria District has an idea agro-ecology for agriculture such as crop production, livestock rearing and cultivating different annual and perennial plants such as coffee. The major food crops grown in the area are given in (appendix 4). Mixed farming is a common practice prevailing or existing in the District. As a result, a livelihood of the rural population is depended on serial crops like wheat production, teff production and livestock rearing. Priority marketable livestock supplies were: small ruminant fattening mainly goats and cattle fattening. Among these, livestock commodities have been suggested to be very important in the study District (Appendix 6).

4.1.4.3 Number of plant species in Hadero-Tunto Zuria District, (2020)

Table 5, Number of plant species

No.	Number of plant species	Species in %
1	Herbs	53.4
2	Trees	26

3	Shrubs	19.2
4	Epiphyte	1.4
	Total	100

The occurrence of such high number of plant species in Hadero-Tunto Zuria District mainly represented by 39(53.4%) species herbs, 19(26%) species trees, 14 (19.2%) species shrubs, and 1 (1.4%) species epiphyte. The farmers attempt to have as much as possible, high crop plant diversity in their gardens. This indicates that there are diverse plants that can be cultivated in the home gardens of the study *District*.

4.1.4.4. Edible wild plants

Wild plants are plants that are not cultivated, but are available from their wild natural habitat and used as source of food. In the researcher's study District, there were about, 16 wild edible plants belonging to 13 genera and 13 families were documented (table 8).

Table 6: List of wild edible plants species

No.	**Botanical name**	**Family**	**Vernacular name**	**Habit**
1.	*Albizia schimperiana*	Fabaceae	Giraaraa	T
2.	*Cajanus cajan*	Fabaceae	Ciiaa atara	Sh
3.	*Carissa spinarum*	Apocynaceae	Yumeetaa	T
4.	*Cordia africana*	Boraginaceae	Waanzaa	T
5.	*Dovyalis abyssinica*	Flacourtiaceae	Kooshiimaa	H
6.	*Schinus molle*	Annacardiaceae	Tonkoso babbaruaa	Sh
7.	*Ficus sur*	Moraceae	Odeechchuta	T
8.	*Ficus vasta*	Moraceae	Odeechchuta	T
9.	*Justicia*	Acanthaceae	Gulbaanaa	Sh

	schimperiana			
10.	*Lagenaria siceraria*	Cucurbitaceae	Lelleetaa	Sh
11	*Moringa stenopetala*	Moringaceae	Shifarraat	T
11.	*Phoenix reclinata*	Arecaceae	Saleeniaa zanbaatta	Sh
12.	*Phytolaca dodecandra*	Phytolacaceae	Haraanjaa	Sh
13.	*Rosa abyssinica*	Rosaceae	Tsigeeradaa	Sh
14.	*Psidium guajava*	Myrtaceae	Zayitoonaa	T
15.	*Solanum nigrum*	Solanaceae	Shuunaa	Sh
16.	*Syzygium* guineense (wild)	Myrtaceae	Yumeetaa/Gootteet aa	T

4.1.4.5 Fodder plants

Hadero-Tunto Zuria District had mainly the fodder plants located from December to February. This is because of these months mainly are harvesting seasons of different cereal plants like teff, wheat, maize and the likes. During these months, people used variety of habitats and plant species for their livestock feed. The most common species used as fodder were various leaves, roots, stems and branches of the non-cultivated plants of *Acacia abyssinica, Justicia schimperiana*, and also the cultivated plant residues of *Eragrostis tef, Sorgihum bicolor, Ensete ventricosum, Triticum aestivum, Ipomia batatas, Musa paradisiaca, Hordium vulgare, Saccharum officinarum, Cucurbita pepo*, and *Zea mays were* plant species used as fodder in the study District. Data collected from information showed about 12 genera belonging to 23 species. The most important forage plant species of the study District was *Poaceae* followed by *Fabaceae* which represents 8 and 4 species respectively; and *Araceae* and *Musaceae* represents 2 each and the rests contain one each. An important plant resources mentioned in the study District to give food for livestock were 23 plant species. Depending on the season as reported by informants, the residue of *Triticum aestivum* believed to have low quality or minimum feed value. This is because of low

productivity with respect to livestock production. These and other wet land grasses are also known to anchor disease causing parasites and worms during summer season, but they are valuable feed in the winter.

4.1.4.6. Ethnomedicinal plants

A total of 46 medicinal plants were gathered and documented for the treatment of both human and livestock ailments. From these, 25(54.35%) species were used as human medicine, 21(45.65%) species as livestock medicine. These plants were distributed in 26 genera and 38 families. Of these medicinal plants collected, 20 plant species were occurring in the wild and 26 plant species were reported from cultivated land. The results of growth form analysis of the reported medicinal plant species reveal that trees constitute the largest category, with 18 (39.1%) species followed by herbs 15(32.6%) species, shrubs represented by 9(19.6%) species, seed represented by 3(6.5%) species and climbers represented by 1(2.2%) species. The dominance of trees is due to easily available to local people and their abundance in the area because of local people of the study District practiced planting such plants mainly in their garden.

4.1.4.7. Medicinal plant species used to treat human ailments

In the study District, 25 medicinal plant species that are used to treat 17 human ailments represented by 20 genera and 20 families. What ever the study of the researcher is about ethnobotanical study, mainly the people of the study area are rural lived and they mainy using medicinal plants indigenously and the researcher concentrated on medicinal mainly. So, Allium sativum and Eucalyptus globules were the most frequently used plant and reported to beused for headache, Mitch, stomach ache, coughing, and common cold in the researcher's study. Regarding the families of medicinal plants; family *Solanaceae, Boraginaceae, Cucurbitaceae, Rosaceae* and *Rutaceae* ranked first represented by two (8%) equal species each and the remaining 15 families with one (4%) species each. These show that large numbers of diseases have treated by traditional medicine in the study District.

4.1.5. Habits, parts used, method of preparation, application and plants for various uses

4.1.5.1 Habits

The current study showing that medicinal plants used to treat human ailments constitute herbs and trees that accounted for 10(38.5%) species each, shrubs 5(19%) species, and lianas 1(4%) species. From these, 13(50%) species were collected from wild habitat including the existence of demands on wild plants and the rest 13(50%) species were from cultivated. This finding shows that the most represented life forms of medicinal plants in the study area were herbs and trees. This could be due to the fact that naturally there were more herbs than woody plants and herbs are relatively rich in bioactive constituents. Whatever this is obvious, in the study District trees and shrubs existed in almost equal number and equal amounts according to the respondents. The analysis of the data also showed that the majority of medicinal plants in the home gardens were herbs. It might also indicate that the threats exist on other growth form particularly trees and shrubs.

4.1.5.2 Plant parts used for medicines

Table 7. Plant parts used for medicines

No.	Plant parts used for medicines	In percent (%)
1	Leaves	44
2	Fruit	16
3	Stem	16
4	Bark	12
5	Root	8
6	Rhizome	4
	Total	100

The results here showed that the local people of the study District use different parts of a medicinal plant to prepare remedies. From the above plant parts used for preparation of medicines includes leaves were the most widelyused part represented by 11 species, and rhizomes the least which represented by 1 species**.**

4.1.5.3. Method of preparation

The local community of Hadero-Tunto Zuria District people employs various methods of preparation of traditional medicines for different types of ailments. The preparation varies based on the types of disease treated and the actual site of the ailment. With regard to preparation methods of traditional medicines used by the Hadero-Tunto Zuria District people, medicines were prepared by employing several methods. These were: hammering, crushing and squeezing juice, powder, smoke bath and mixture, stem bath, cold mixture, decoction, and cream, solidified/dried sap or juice and others. After herbal medicines are prepared, different routes of administration like oral, dermal and nasal were utilized by the internal and external administrations.

4.1.5 .4.Medicinal plant species used to treat livestock health problems

Medicinal plants of veterinary use were also documented for their veterinary uses by the medicinal practitioners to treat livestock were 21(28.8%) species (Appendix 8). They consist of 18 genera and 21 families. Families *Fabaceae, Euphorbiaceae, Solanaceae* and *Asteraceae* consists two species each and the rest of families consist one species each. In the current study, traditional healers follow the patterns of cattle grazing and identify those plants ignored (due to their taste or smell) by cattle and try out these plants to treat 15 different ailments. The majority of these plants 12(57.1%) species were collected from the wild and 9(42.9%) species were collected from cultivated field. Concerning the plant habits for veterinary uses; 8(38.1%) species were trees, 5(23.8%) species were herbs, 5(23.8%) species were shrubs and 3(14.3%) species were Seeds.

4.1.5.5 Plant parts used to treat livestock ailments

Table8, Plant parts used livestock ailments

No.	Plant parts used	Species in %
1	Leaves	38.1%
2	Stem	33.3%
3	Bark	14.3%
4	Fruits	9.5%
5	Root	4.8%

In the study area of Hadero-Tunto Zuria District, medicinal plants that were used for treating livestock ailments, the largest proportion of plant parts consumed for medicinal preparations were different leaves. This may be due to the availability of leaves in different seasons unlike fruits, seeds, and others. For livestock health treatments in the area leaves accounts for 38.1%, stem 33.3%, bark 14.3%, fruits 9.5% and root 4.8%. Like that of human medicine, leaves were the most harvested plant part for remedy preparation for livestock ailments.

4.1.5.6 Forms of preparation of medicines for livestock treatment

Habitually, medicinal practitioners use different forms of remedy preparations and applications depending up on health problem type in the livestock. Regularly, the medicinal plants were used in three different forms: fresh only, dried only, and both in fresh and dried forms. In the majority of preparations, the mixture was not causing another problem depending on the condition on the patient except for pregnant livestock. For instance, the constituents of remedies preparation for anthrax containing: *Phytolacca dodecandra* and *Ricinus communis* in the study District is not recommended for pregnant Cows even though the plants are effective for the treatment and allowed for livestock; because it may cause abortion.

4.1.5.7 Plants used in material culture

In Hadero-Tunto Zuria District, the majority of inhabitants or populations relay on wild plants species for multi-purpose use value. Of the 73 plant species documented in the study District, most plants were used in material culture other than food, fodder and medicine. The uses reported of miscellaneous plants in the study area showed that the plants were used for fire wood or charcoal, detergent, construction of houses and fences, furniture, musical instruments, for baskets making, fibers, house hold furniture, shades, insect repellent and farm implements which received the highest reports.

4.1.5.8. Plants resources as construction and raw materials

Wood is the most suitable and most widely used material for furniture and it is also easily available and comparatively cheaper than metal. Not only plants were used for construction and essential raw materials for fiber or thread, timber, gums, industrials but also essential for oils which report economic development of any country. It is also used for simple kitchen stool to furnishing in average sitting-rooms, or the most sophisticated furniture for special occasions and state functions (Abbiw, 1990). For example, in the study area people use plants for building their houses, sidewalls which are made from *Eucalyptus camaldulenses, Allophylus abyssinicu, Cordia africana, Ekebergia capensis, Eucalyptus globulus,* and *Juniperus procera.* The root parts are held together by cordage made from *Cordia africana*, *Ficus sur*, and *Juniperus procera* which are very important to carry pole to build house and to tie broken things and build fences around homes (Appendix 9).

Mainly fibers are mainly obtained from *Ensete ventricosum* in the study District. Nextly, *Cordi aafricana, Acacia spp., Hibiscus macranthus, Ficus vasta, Dombeya torrida, Ficus thonningii, Clematis simensis, Giardinia bullosa, Grewia ferruginnea, Urera hypselodendron* and *Cynodon dactylon* were very important to weave or unite and make bee hives, to make traditional farm implements to make house furniture, to hold roof parts together and to construct houses.

4.1.5.9 Resources of Plants used as fuel wood charcoal

Hadero-Tunto Zuria District populations live in rural areas. Most of those populations used fuel wood for their life sustainability. As in many other parts of the country fire wood is a severe problem. To overcome this problem, Plants used for fuel and charcoal include with more traditional source of fuel. The plant species used as fuel and charcoal were *Accacia sp*., *Cordia africana*, *Eucalyptus globules, Eucalyptus camaldulensis* and *Zea mays* stems.

4.1.5.10 Plant resources as fences (live or dry)

In the study District home gardens were generally fenced with dry wood materials. In other cases, live plantsmainly that were very often thorny shrubs grown or used as reinforcement. In rural villages, plant species like *Cordia africana*, *Eucalyptus globulus,* and *Juniperus procera* were growing in home garden fences almost always contain live plants which provide additional benefits to families as food, medicine, material for construction, farm and house hold implements and cordage.

4.1.5.11 Individual plants for multipurpose uses

Multipurpose trees, besides the normally expected products and services such as wood, microclimate influences, soil improvement, provides significant additional products such as nitrogen fixation, fodder or forage, edible products for humans, gums, resins, fibers and medicinal products (Appendix 10). Plants, which are used as laundry and cleaning, fumigation, fragrance or perfume and aromatic characters of the area, were documented. For example, fruits of *Acacia abyssinica*, leaves of *Croton macrostachyus* and *Ocimum lamiifolium* roots are collected to have good perfume to the local or surrounding and they provide multiple economic out puts and combine, both economically and ecologically at the same time.

4.1.5.12.Plants in rare amounts

According to respondants, some plants which are rarein amount but have many functions which are listed were *Oleae europaea, Syzygium guineense, Prunes persica, Rhamnus prinoides, Ipomoea batatas, Zingibel officinale, Lablab purpures, Cucurbita pepo, Phytolacca dodecandra, Dovyalis abyssinica, Capsicum frutescens, Ruta chalpenis, Aframom corrorima* and *Arundinaria alpine.* These plants were very important for different functions like medicinal value, constructional purpose, ritualvalue, food value and many otherdifferent functions.

4.1.6.Preference ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of 8 medicinal plants in the study District that were reported for Evil eye was conducted after selecting 7 key informants. Preference ranking for 7 medicinal plants used to treat Evil eye (Table 9) showed that *Acokanthera schimperi* ranked first and hence is the most effective medicinal plant to cure it. The second, third, fourth and fifth most preferred medicinal plants against this disease were *Gossypium hirsutum, Hibiscus micranthus, Rhamnus prinoides, and Ricinus communis* while, the least preferred species compared to the other seventh and eighth species are *Ruta chalepensis* and *Aframomum corrorima.* According to informants who were asked to compare the given medicinal plants based on their efficacy, and to give the highest number 7 for the medicinal plant which they thought with most effective in treating Evil eye and the lowest number one for the least effective plant in treating it.

Table 9. Preference ranking for medicinal plants used for Evil eye

No. of Infor.	*Ruta chalepensis*	*Aframomum Corrorima*	*Rhamnus prinoides*	*Gossypim hirsutum*	*Ricinus communis*	*Hibiscus micranthus*	*Vernonia amygdalina*	*Acokanthera schimperi*

A	4	4	5	5	5	5	4	6
B	5	4	6	6	4	5	5	7
C	4	3	5	5	5	4	5	6
D	5	5	4	4	4	4	4	6
E	3	3	4	6	5	5	5	5
F	4	4	5	6	4	4	4	6
G	3	4	5	5	5	4	4	5
Tot	28	25	34	37	32	31	31	46
Rank	7th	8th	3rd	2nd	4th	5th	5th	1st

4.1.7 Direct matrix ranking of the most important multipurpose plants

In this study, a number of plants were found to be multipurpose species being utilized for a variety of uses. The common uses include medicinal, fodder, food, fire wood, construction, charcoal, fencing and furniture making. Seven commonly reported multipurpose species and seven use categories were involved in direct matrix ranking exercise in order to evaluate their relative importance to the local people and use values (Table 10). As shown in table 10, *Eucalyptus globulus* and *Cordia africana* were ranked 1st and 2nd and hence are the most preferred plants by local people for various use values and multipurpose ranking; and *Crotom macrostachyus*, *Prunes africana*, and *Juniperus procera* were 3rd, 4th, and 5th species ranked respectively. The least ranked species in multipurpose characteristic were *Grevillea robusta* and *Arundinaria alpine*.

Table 10. Direct matrix ranking of plants with different uses in the study District

	Use categories								
Plant species	Medicine	Firewood	Charcoal	Construction	Food	Fence	Forage	Total	Rank

Arundinaria alpine	4	5	3	3	0	4	3	22	7th
Cordia africana	5	5	5	6	0	5	4	31	2nd
Crotom macrostachyus	7	6	5	4	0	5	0	27	3th
Eucalyptus globules	4	7	5	7	0	7	2	32	1st
Grevillea robusta	0	6	5	5	0	4	3	23	6th
Juniperus procera	0	5	5	7	0	7	0	24	5th
Prunes africana	7	6	5	5	0	3	0	26	4th

4.1.8 Paired comparison of medicinal plants

In this study, ten key informants were selected to conduct pairwise ranking exercise of 5 medicinal plants used to treat Wound illness. The result of this comparison shows that *Acokanthera schimperi* preferred (24x) and ranked 1st, *Gossypium hirsutum* (22x) and ranked 2nd, *Ruta chalepensis* preferred (20x), *Rhamnas prinoides* preferred (19x) and *Dovyalis abyssinica* preferred (15x) for the treatment of Wound illness. Paired comparison of 5 selected medicinal plants species used to treat Wound illness was based on the group informants' perception in the study area. The one preferred over the other indicated by the first letter of their specific description name is shown in the following table 11.

Table 11. Paired comparison of 5 selected medicinal plant species of 5 selected key informants used to treat Wound illness in the study District

List of medicinal plants	*Dovyalis abyssinica*	*Gossypium hirsutum*	*Acokanthera schimperi*	*Rhamnus prinoides*	*Ruta chalepensis*	Total	Rank
Dovyalis abyssinica		Da	As	Da	Rc	15x	5th
Gossypium	Da		As	Gh	Gh	22x	2nd

hirsutum							
Acokanthera schimperi	As	As		Rp	As	24x	1st
Rhamnas prinoides	Rp	Rp	As		Rc	19x	4th
Ruta chalepensis	Rc	Rc	As	Rc		20x	3rd

4.1.9 Marketability of plants resources

In the study area, interviews and market assessment at three local markets namely: Laalo-Hadero, Muguunja-Mazoria and Homa markets indicated that the majority of plants resources were not available for sale in formal markets. Plants were collected and used for the purpose of remedies from their localities when they were needed for use. However, some of the plant resources were widely traded and used for many additional purposes other than for their medicinal uses. In this case only 43 plant species (58.9%) were found to be traded at local markets primarily for food (edible), medicinal, ornamental, spice, fodder, stimulant, cloth making, and local alcohol preparation and others (Appendix 10).

4.1.10 Threats of plant resources

In Hadero-Tunto Zuria District various factors considered the main threats for plant resources that were recorded by interviewing the informants. The major factors claimed during data gathering was the anthropogenic factors such as deforestation, agricultural expansion, fire, over grazing, drought and trading charcoal, timber and fire wood (Figrure 2).

Table 12. Priority ranking on perceived threat factors to plant resource

Factors	Respondents (R)							Total	%	Rank
	R 1	R 2	R 3	R 4	R 5	R 6	R 7			
Agricultural expansion	6	7	7	6	7	7	7	47	21.4	1st
Deforestation	6	5	6	6	6	5	6	40	18.2	3rd
Construction purpose	6	5	6	6	6	7	6	42	17.3	2nd
Fire wood/charcoal	6	5	6	5	5	6	5	38	19.1	4th
Over grazing	6	5	4	4	5	5	5	34	15.5	5th
Urbinization	4	3	2	2	4	2	2	19	8.6	6th
Total	34	30	31	29	33	32	31	220	100	

`The results of present study showed that, agricultural expansion, Construction purpose and deforestation were ranked 1st, 2nd and 3rd factors respectively.

4.2. DISCUSSION

The study carried out with indigenous vegetation classificationof the study District, in a similar way that of the local people of Konso special Wereda, SNNPR, and Ethiopia that classify plants, land form, soil in to different categories (Gebre, 2005). This emic categorization is also true for the indigenous people in Gimbi Wereda, Western Wellega, Ethiopia (Tolossa, 2007). This indicated that local people have an accumulated knowledge of their own that they use to classify, use manage and conserve the natural resources.

Plant resources classification growing land based on use of land was studied in asimilar manner carried out by Amen (2007) the local people of Jimma Arjo District classify land forms depending on grazing land, agricultural and, forest land, river bank, residential area, and marsh land, which shows the same bases for classification of land forms in for example from the given land form classification “hogo uullata”, “gizza zei uullata”, “galte uullata’’ and “lagi uullata” have been expressed in the same way by the same groups of people.

A number of services studiedinthe local communities of the area that obtained from cultivated and wild food plants were studied almost in a similar way of that of Asfaw (1997), who mentioned that there are more than 130 species of cultivated food plants distribution in about 35 angiosperm families in the whole of Ethiopia. In this study the plant from cultivation that are used as food were collected from 43 species belonging to 19 genera.

An agricultural production like livestock rearing and cultivating different annual and perennial plants such as coffee of the study District has carried out in a similar way in Gimbi District by Tolasa (2007) came up with 52 species that were collected from home gardens. This number is comparable with the number obtained from the present study. So, these two groups of people have good practice of cultivating crops in their home gardens. The study also indicated that the largest group is made up of cultivated vegetation including the medicinal species grown close to the house, with an overall representation of about 16 species (44.5%) by cultivated species and the natural species accounted for about 7 species (19.5%).

Again, this finding is more or less similar to wassihum *et al*., (2003) that reported 133 plant species grown in the ‘Arjo gardens of which 18 were medicinal plants. The local community

obtains various uses from the plants in the home gardens. In this study 23(63.9%) species of the garden plants have only food value, 16 (44.5%) species are used as both medicine and food, and 4 (11.1%) species are used as cash income and food and others do have different uses. The majority of the home garden or cultivated plants do have more than one use. This result agrees with the finding of researchers lie Tolasa (2007) and Amenu (2007) in which most of the plants obtained from home gardens are food plants.

There were about, 16 wild edible plants belonging to 13 genera and 13 families were documented. Similrly, in addition to their role in closing food gaps during periods of drought or scarcity, wild edible plants play an important role in maintaining livelihood security for many people in developing countries (Afolayan and Jimoh, 2009).

A considerable amount of research has been conducted world wide on wild edible plants ethnobotany with an emphasis on field surveys and documentation, to cite but a few (Zemede Asfaw and Tadesse, 2001; Balemi and Kibebew, 2006; Giday *et al*., 2009; Teklehymanot and Giday, 2010) growth form analysis of Arjo District edible plants indicates that trees and shrubs contribute 7 species and they were the dominant growth form, followed by herbs and climbers 1(0.6%)speciesrespectively.Fruits were the most commonly reported edible parts; about 12 species of plants are reported for food, followed by nectar two species leaf and gum one species.

Because of the harvesting seasons of cereal crops availabiliuty, the study District district mainly extends from December to February was studied in a similarly with the Tamene *et al*., (2000) who conducted a study on semi-wetland vegetation of "Cafaa" for fodder plants. Similar study again with present study reports also reported three important indigenous fodder plants by Mekonnen *et al.,* (2006) such as *Dombeya torrida, Hagenia abyssinica* and *Buddle japolystachya.* This indicates the knowledge associated with potential fodder plants species among the local people of the study District.

Because of the environmental change, the total plant species of 46 medicinal plants were gathered and documented for the treatment of human and livestock ailments in the District disagrees with the work of Amenu (2007), in which the wild sources of plants leadfor the treatment of both human and livestock ailments. In his study, 14 species collected from the wild

vegetation and ten species are from homegarden from a total of 24 species of medicinal plants in his study area.

To treat 17 different human ailments, 25 medicinal plant species were used were represented by 20 genera and 20 family's studies were more or less similarly carried by different scientists with like Amenu (2007 reported 47 human diseases treated by 48 plant species, Tolasa (2007) reported 77 plant species used to treat 49 diseases of humans reported by Getaneh (2009), 78 plant species that were used to treat 50 diseases of humans. The main feature of medicinal plant species and medicinal use in the study area are documented in Appendix 6. According to the families, family *Solanaceae* led similar studies both in this study and Amenu (2007)**.** Similarly, *Eucalyptus globulus* has been reported for common cold and influenza in Wayu Tuka district Megersa M. *et al.,* (2013), Gimbi District Abera (2014), and Dawuro zone Andarge E. (2015). Regassa (2013) reported this plant use for malaria, typhoid, Ascarsis, and acute sickness in Hawassa city. This finding also agreed with the study conducted in, Wonago district Mesfin F. *et al.,* (2009), Mirab Badawacho Tamiru (2016), Kembata District Melesse (2015), and Amaro district Getu A. (2017).

But, in the study of Amenu (2007), the dominant family for the treatment of human diseases that reported contradicts this study which was *Asteraceae* in the work, but in the study District *Solanaceae* led the first.

Herbs were the leading habit in the study District, also similar findings were reported in earlier works in Ethiopia by (Giday *et al*., 2009, Tamene, 2000 and Amenu, 2007 in which herbs were the dominant growth form for human health problems. This finding is again in line with most medicinal plant inventories in Ethiopia (Hunde, 2001; Lulekal, 2005; in which herbs are the dominant growth form of medicinal plants. Again, similar findings were also reported in earlier works in Ethiopia in which herbs are the dominant growth form for human health treatment (Amenu, 2007).

In addition, relatively high number of herbs and shrubs for medicinal purpose were also previously reported in Ethiopia (Tamene, 2000; Njau (2001) in Tanzania also found similar finding and again, Mesfin *et al*., (2009) and Giday (2007) also reported that the dominant medicinal plants were herbs.

In contrast, Regassa (2013) in Hawassa city indicated that the majority of the collected medicinal plants there were trees, followed by shrubs this was because of the environmental variation.

Leaves are the most widely usedparts of a medicinal plant to prepare remedies is studiedin line with the results of other ethnomedicinal studies who reported in Ethiopia have shown that leaves are the most common and cited plant parts used in remedy preparations and to treat various health problems followed by roots (Abebe, 1991; Tamene, 2000; Amenu, 2007; Tolassa, 2007; Yineger *et al.,* 2008 and Giday, 1999).

In the same way, Berhane (2014) reported leaves as the predominant plant part used by the Maale and Ariethnic communities. Ketema (2013) also noted leaves were the most commonly used plant part in a study focusing on South Omo. The majority of medicinal plants were harvested for their leaves by the Sheko as well Giday. (2007).

But this study disagrees with the report of Habtamu *et al.,* (2014) and Assegid A, (2014) Tesfaye A (2014), the most frequently used plant parts were roots for both livestock and human in the Hadiya zone and Amenu (2007) in Ejaji Area (Chelya Wereda) in which roots are the major plant part used for livestock remedy preparation followed by leaf.

The local community of Hadero-Tunto Zuria District people employs various methods of preparation of traditional medicines for different types of ailments. Similarly, researchers elsewhere in Ethiopia such as (Giday, 1999; Debela, 2001; Getachew *et al.,* 2001; and kebu *et al.,* 2004) reported oral administrations are the predominant route of application. Again, this finding agrees with the work of Sori *et al*., (2004) and Amenu (2007) who reported that oral administration is the most common route of medicine entry.

Medicinal plants of veterinary use were also documented in the study area for their veterinary uses is studied in asimilar finding with the work of (Regassa, 2013, Tamene, 2000 and Amenu, 2007) in which trees are the dominant habits for the treatment of livestock ailments. This indicates as most informants in the study District agreed; even though the areas have high number of livestock population the local people do not have good knowledge of ethnoveterinary compared to unlike that of human medicine the local community uses more tree species for

livestock health treatment. Mostly they use modern relevant clinics for the treatment of their livestock.

The largest proportion of plant parts consumed for medicinal preparations of livestock ailments where different leaves is in line with the results of other ethnomedicinal studies Amenu (2007); Tolasa (2007); and Yineger (2005) who reported that leaves were the most cited plant parts used in remedy preparations. This disagrees with reports of (Tamene, 2000; and Yineger*et al*., 2008) in which roots were the major plant part used for livestock remedy preparation followed by leaves.

Wood is the most suitable and most widely used material for furniture and it is also easily available and comparatively cheaper than metal. The present study also agrees with many miscellaneous aspects of plants with the study of Tamene (2000) and studies on Bussmen*et al.,* (2011) plant use in Oldo Bulu and Demaro of Bale region. Again, Tamene, (2000) on ethnobotany of semi wetland vegetation of Cheffa, reported 39 species with miscellaneous uses which include repellents, fire wood, construction, tooth brush and cleaning agents.

Home gardens are generally fenced with dry wood materials in the study District and also similar findings were carried by (Asfaw, 2001).

The resources of plants are used for multipurpose uses in the study district were also reported in Similar studies with in the context of Agroforestry, they provide multiple economic out puts and combine, both ecologically and economically at the same time (Carlowitz, 1983) and (Carlowitz, 1984).

During preference ranking of 7 medicinal plants to treat Evil eye displayed that *Acokanthera schimperi* graded first to cure it, but this finding disagrees with the study showed in other areas because of the environmental variation, which stated the plant use for bone breakage, herpes, liver ailments wound, and acute sickness Reta R. (2013), Kassa Z.*et al*., (2016), Amenu E. (2007), and Suleman S.*et al*., (2012). *Dodonaea viscose* sub sp. angustifolia was the most regularly used plant for evil eye and diarrhea in this study.

During pairwise ranking exercise to treat Wound illness, *Acokanthera schimperi* preferred (7x) and ranked 1st in the study District. Some studies made in Ethiopia (Tamene, 2000; Hadera,

2000; Hundei, 2001; Berhanu, 2002) have used the method of pair wise ranking where informants made their choices on individual basis. For example, Berhanu (2002), employed pair wise ranking to tell the most chosen traditional medicinal plants used by the local people to treat malaria in Jabitehnan Woreda, West Gojjam; quantitatively showing that *Allium sativum* was the most preferred Anti malarial plant.

Interviews and market assessment at several markets indicated that, to now varieties of plant resources studied in a similar reported by Regassa (2013) in Limu District that, only 18.75% of plants were found to be traded at local markets for multiple uses,but more of the local people prefer medicinal plants bypreferring either from their surrounding or collecting these plants by themselves from the available areas.Again this result agreed with the study reports of Tolasa (2007) in Gimbi District, 17.8% of plants were found to be traded at local markets for medicinal uses,butother plants are widely traded and used for many additional purposes other than theirmedicinal uses.

By interviewing the informants, various factors that were considered the main threats for plant resources in the District results similarly were obtainin different investigations in Ethiopia; For example, Amenu (2007) showed that the need for agricultural land and population pressure severally threatened plant species in general and medicinal plants in particular.

An increase in the human and livestock population have contributed to the ever-increasing threats to the natural vegetation as a whole. The unwise use and over exploitation of plants resources slowly eliminates these plants from local environment (Quanash, 1988: Iwu, 1993). Nowadays, the world is losing plants every minute due to deforestation, for agriculture, fire wood, timber, construction materials, over looking and over grazing (Seyani and Chikuni, 1997). These common anthropogenic factors and also some natural factors resulted in loss of plant genetic diversity and threatening the very existence of human kind with destruction of some medicinal plants of wild genes and indigenous knowledge associated with plants (Sofoware, 1982). Again, similar study studied by Mesfin (2007) in Wonago District showed that, again there are different threats in medicinal plants such as agricultural expansion, fire wood collection and others. Furthermore, thenegative impact of deforestation on medicinal plants was also reported in Giday (1999).

5. CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

An Ethnobotanical study on plant resources of Hadero-Tunto Zuria District 73 plant species, 42 were from the wild and 31 from farm lands and home gardens were collected. Concerning the various use categories such as food, medicine and income creating *Poaceae* stood first contributing 12 species followed by *Fabaceae*, and *Solanaceae* characterized by 5 species each. Regarding to the habit, herbs and trees were the most common and raised first with described for 10 species each, shrubs 5 species, and lianas 1(4%) species. Regarding 46 medicinal plant species, 25 were noted for the treatment of human health problems, and 21 were for livestock. These plant species were used for treating 38 different for both human and cattle ailments. The most and least frequently used plant parts were leaves and roots respectively. The most widely used methods of preparation was crushing, squeezing and burning. The way of administration noted was oral, dermal and nasal. Direct matrix ranking showed *Eucalyptus globulus* as the most utilized species by the community according to various uses.

In the study area, traditional knowledge on plants through generations permitted them to use many variations of wild and cultivated plants for various or versatile uses and elders are more knowledgeable than youth in traditional knowledge practices. This was because of Younger'shade no more consideration and willingness to accept elder's idea positively. The environment of those plants was reported to be increasingly becoming endangered due to anthropological factors like: agricultural increase, population increase, overgrazing, and urbanization, increased need for farmlands because of the increment of peoples, fuel woods, and construction materials in the area, less willingness for re-plantation instead of removed plants and the likes were the main causes for decrease in quality and quantity of plants resources and associated knowledge. Therefore, awareness should be raised among the study area people so as to avoid less carelessness on removed plant species, indigenous knowledge and to safeguard its maintainable use. Additional biotic studies should also be conducted on

the reported plant resources species of the study area so as to use them. Educating the local people according to the present amounts of plant species in participatory way is important to manage, taking awareness and maintainable use of plants.

5.2. RECOMMENDATIONS

Based on the research results, this study would have important influence towards conservation of plant resources and conservation of traditional knowledge. So, depending up on the research findings the following recommendations are forwarded:

- Inspiring the study District people to take attention for plants that are distributed in a minimum amount.
- Educating the local people to grow plants in their home gardens.
- Including the local people in participation during responsiveness construction through training or education on maintainable use and management of plant resources.
- Local community of the study area should be involved in conservation and management of plant resources and their indigenous knowledge in their locality.
- Creating local herbal plant practitioners to enhance the use of plants.
- Certifying and giving reward to model people who are volunteers to nurser sparsily distributed plants in their garden to increase their moral and to inspire others motives.
- Focused efforts should be needed by research institutions and other government and non-government organizations by providing the local communities energy well-organized technologies to minimize fuel wood, fire wood, construction and charcoal consumptions.
- Educating the local people about plant impoprtance logically and explain or discribe threatened plants being to have consideration to multiply in their surrounding.
- Giving consideration about the importance of plants dependind up on telling with out plants life in this planet is nothing, so telling truth that protecting plants means protecting every one’s life.

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Appendix 1: List of plant species used by the people of Hadero-Tunto Zuria District

Ha=habit, T=tree, Sh=shrub, H=herb, T/S=tree/shrub=S/T, L=liana, Cl=climber, G=grass, Ep=epiphyte, F=fern, Ver.name=vernacularname in kambaatissaa, W=Wild, C=cultivated, W/C=wild/cultivated, F=food, Lf=live fence, Fi=fire wood, Ch=charcoal, Fo=forage/fodder, Co=house construction Fr=furniture, M=medicine, S=shade, Mp=multipurpose use, St=Stimulant, Sp+M=Both Spice and Medicinal, Orn=Ornament, occ. =occurrence.

No	Scientific name	Family	Ver. Name	Hab.	Occ.	Use	Coll.no
1	*Acacia abyssinica*	Fabaceae	Giraaraa	T	W	Fo, Fw, S	LX2435
2	*Ruta chalepensis*	Rutaceae	Xalachchuta	H	C	Orn, M	LX 2451
3	*Acokanthera schimperi*	Apocynaceae	Tontoonaa	Sh	C	Fu, Fw	LX 2427
4	*Aframom corrorima*	Zingiberaceae	Wokashiaa	H	C	Sp+M	LX 2407
5	*Allium sativum L.*	Alliaceae	Sunkuttata	H	C	Sp+M	LX 2496
6	*Arundinaria alpine*	Poaceae	Leemaa	T	W	Fw, Lf, Fu, Co	LX 2464
7	*Arundo donax*	Poaceae	Shomboquaa	T	C	F, w, Co	LX 2461
8	*Avena*	Poaceae	Margaa	H	C	Fo	LX 2472

	vaviloviana L.						
9	*Borassus aethiopum*	Arecaeae	Zanbaattaa	H	W	Fw, M	LX 2396
10	*Brassica oleraceae*	Brassicacea e	Hamiiluaa	H	C	Food	LX 2353
11	*Brassica carinata*	Brassicacea e	Hamiilita ill	H	C	Fo	LX 2323
12	*Cajanus cajan.*	Fabaceae	Ciiaatara	H	W	M, Fo	LX 2470
13	*Capsicum frutescens L.*	Solanaceae	Babbaruaa	H	C	Sp	LX 2452
14	*Casimiroa edulis.*	Rutaceae	Kaazmiira a	T	C	Fw, M	LX 2411
15	*Citrus limon L.*	Rutaceae	Loomita	Sh	C	Sp	LX 2466
16	*Citrus simensis L.*	Rutaceae	Burtukaan uaa	Sh	W	M	LX 2467
17	*Coffea arabica L.*	Rubiaceae	Bunaa	Sh	C	St	LX 2432
18	*Colocasia esculenta L.*	Araceae	Gabizaa	H	C	Food , M	LX 2438
19	*Cordia africana*	Boraginace ae	Waanzaa	T	W	M	LX 2414
20	*Cucuribita pepo L.*	Cucuribitac eae	Lelleetaa	H	C	F, M	LX 2432
21	*Discopodiump enninervum*	Solanaceae	Reejjaa	H	C	Fo, Orn	LX 2374
22	*Dovyalis abyssinica*	Falcataceae	Kooshiima a	T	C	Sp, Cl	LX 2454
23	*Englerina*	Loranthace	Haliilaa	Ep	W	M	LX 2385

	woodfordioies	ae				BD2 391	
24	*Ensete ventricosum*	Musaceae	Weesita	H	C	M,fo od	LX 2391
25	*Eragrostis tef*	Poaceae	Xaafaa	H	C	Food	LX 2388
26	*Eucalyptus globulus*	Myrtaceae	Bullaa baarzaafa	T	W	M, Fw, Lf	LX 2444
27	*Ficus vasta*	Moraceae	Waarkaa	T	W	Lf, Fw, S	LX 2430
28	*Girardinia bullosa.*	Urticaceae	Doobbeeta	H	W	M	LX 2401
29	*Gossypium hirsutum*	Malvaceae	Xixaa	Sh	C	M	LX 2457
30	*Grevillea robusta*	Proteaceae	Giraaveela a	T	C	Fo, Lf, Fw, Co	LX 2364
31	*Pennisetum sphaecelatum*	Poaceae	Duffaa	H	W	Fo	LX 2418
32	*Guizotia abyssinica.*	Asteraceae	Nuugaa	H	C	Food	LX 2492
33	*Hibiscus micranthus*	Malvaceae	Ciinceetaa	H	W	M, Fw	LX 2442
34	*Hordeum vulgare L.*	Poaceae	Soaa	H	C	Food	LX 2423
35	*Ipomoe batatas L.*	Convolvula ceae	Shukkaarit a	H	C	F, Cl	LX 2434
36	*Jacaranda*	Boraginace	Jakaranda	T	C	Lf,	LX 2483

	mimosifolia	ae	a			Fw, S, Co	
37	*Juniperus procera.*	Cupressaceae	Hoomaa	T	C	Fw, Fu, Lf, o	LX 2443
38	*Justicia schimperiana*	Acanthaceae	Gulbaanaa	Sh	W	M, Lf, Fw, Mp	LX 2355
39	*Lablab purpureus L.*	Fabaceae	Boloqita	H	C	Food	LX 2446
40	*Linumus itatissimum*	Linaceae	Talbaa	H	C	Food	LX 2493
41	*Lycopersicon esculentum*	Solanaceae	Timaatimaa	H	C	Food	LX 2460
42	*Malus domestica*	Rosaceae	Appilaa	T	C	Food, M	LX 2400
43	*Mangifera indica L.*	Anacardaceae	Manguta	T	C	Food	LX 2459
44	*Maytenu ssenegaliensis*	Celastraceae	Wojjuaatara	T	W	Lf,Fw	LX 2380
45	*Musa paradisiaca L*	Musaceae	Muuzita	H	C	Food	LX 2442
46	*Nicotiana tabacum L.*	Solanaceae	Tumbeeuaa	H	C	M, St	LX 2437
47	*Ocimum basilicum L.*	Lamiaceae	Bassobilaa	H	C	Sp+M	LX 2429
48	*Olea europaea*	Oleaceae	Weeraa	T	W	Lf,Fw,	LX 2434

49	*Psidium guajava*	Myrtaceae	Zayitoona a	T	W	M,F o	LX 2463
50	*Pennisetum clandestinum.*	Poaceae	Qorxuuaa	H	W	Fo.	LX 2477
51	*Persea americana.*	Lauraceae	Abokaatut a	T	C	M, Fo	LX 2393
52	*Phoenix reclinata.*	Arecaceae	Saleeniaza nbaatta	T	C	Lf, Fu, Orn	LX 2456
53	*Phytolacca dodecandra*	Phytolacca ceae	Haraanjaa	Sh	W	M	LX 2362
54	*Pinus patula*	Pinaceae	Shuwshuw weet	T	C	Fw, S, Lf, Or	LX 2487
55	*Pisum sativum L.*	Fabaceae	Ataraa	H	C	Food	LX 2497
56	*Podocarpus falcatus.*	Podocarpac eae	Zagibaa	T	W	Fw, Fu,	LX 2424
57	*Prunus africana*	Rosaceae	Garbaa	T	W	Fw, Fu, Mp, Co	LX 2382
58	*Prunus persica L.*	Rosaceae	Kookita	T	W	Food	LX 2359
59	*Rhamnus prinoides.*	Rhamnacea e	Geeshshaa	Sh	C	M	LX 2356
60	*Ricinus communis L.*	Euphorbiac eae	Ceennaa	Sh	C	M, Lf, Fw	LX 2384

61	*Rosa abyssinica.*	Rosaceae	Tsigeerada a	H	C	Orn, Lf	LX 2354
62	*Sacchharum officinarum*	Poaceae	Shonkoora a	H	C	Food	LX 2410
63	*Schinus molle*	Annacardia ceae	Tonkosob abbaruaa	Sh	W	M, Lf	LX2435
64	*Solanum tuberosum L.*	Solanaceae	Dinnnichc haa	H	C	Food	LX 2392
65	*Sorghum bicolor L.*	Poaceae	Bashinqaa	H	C	Food	LX 2499
66	*Sorghum vulgare*	Poaceae	Soaa	H	C	Food	LX 2488
67	*Syzygium guineense.*	Myrtaceae	Gooteetaa	T	W	Mp, Fw, Fu, co	LX 2471
68	*Triticum aestivuum L*	Poaceae	Alasuaa	H	C	Food	LX 2386
69	*Vernonia amygdalina*	Asteraceae	Heebichch uaa	T	W	M, Lf, Fw, Mp	LX 2351
70	*Vernonia auriculifera*	Asteraceae	Reejjaa	Sh	W	M,F w	LX 2371
71	*Vicia faba L.*	Fabaceae	Baaqeelaa	H	C	Food	LX 2489
72	*Zea mays L.*	Poaceae	Boqqollaa	H	C	Food	LX 2462
73	*Zingiber officinale*	Zingiberace ae	Jaanjibeel uaa	H	C	Food	LX 2500

Appendix 2. Major plant use categories

Quantitative ethnobotanical analysis of nine groups of plant uses in the study District

No.	Use category	Species	% of Species
1.	Medicine	46	63
2.	Food	36	49.3
3.	Fodder	26	35.6
4.	Various uses	12	16.4
5.	Construction	12	16.5
6.	Fence making	10	13.7
7.	Timber	5	6.8
8.	Fuel wood and charcoal	2	2.8
9	Basket making	2	2.8

Appendix 3: List of plants used as a source of food.

(Ht: Habit, B=bulb, L=leaf, F=fruit, S=seed, R=root, W=wild, Cl=cultivated, W/Cl=plant species recorded in both garden and wild, Pu=part used, Occ=Occurrence).

No	Plant Botanical name	Family	Local. Name	Habit	Pu	Mode of preparation	Occ.
1	*Allium sativum L.*	Alliaceae	Sunkuttata	H	B	Crushed and eaten in wat	Cl
2	*Brassicaceae carinata*	Brassicaceae	Hamiilitaill	H	L	Crushed and eaten	Cl
3	*Brassicaceae*	Brassica	Hamiiluaa	H	L	Crushed	Cl

	oleraceae	ceae				and eaten	
4	*Capsicum frutescens L.*	Solanaceae	Babbarua	H	F	The seed is eaten with the fleshy part	Cl
5	*Catha edulis*	Celastraceae	Caataa	Sh	L	Tender leaves chewed	Cl
6	*Cicer arietinum L.*	Fabacee	Sumburua	H	S	The grain roasted by using hot clay	Cl
7	*Citrus limon L.*	Rutaceae	Loomita	Sh	F	Boiled wild sugar and eaten	W /Cl
8	*Citrus sinensis L.*	Rutaceae	Burtukaaa naa	H	F	Boiled with sugar and eaten	W /Cl
9	*Cajanus cajan.*	Fabaceae	Ciiaatara	H	S	Roasted and eaten	Cl
10	*Coffea arabica L.*	Rubiacea e	Bunaa	Sh	F	Roasted, powdered, mixed with water	W /Cl
11	*Colocasia esculenta*	Araceae	Gabizaa	H	R	Roasted and eaten	Cl
12	*Cucurbita pepo L.*	Cucurbiceae	Lelleetaa	H	F	Roasted and eaten	Cl
13	*Elusine coracana L.*	Poacea	Faggajjita	H	S	Eaten with roasted	

						barley	
14	*Ensete ventricosum*	Musaceae	Weesita	H	L	Roasted and eaten with salt	W /Cl
15	*Eragrostis tef*	Poaceae	Xaafaa	H	S	Adding water to the flour to makee 'Injera'	Cl
16	*Guizotia abyssinica*	Asteraceae	Nuugaa	H	F	Fried and eaten with "kolo''	Cl
17	*Hordeum vulgare L.*	Poaceae	Soaa	H	F	Roastr and grained to make 'Basso'	Cl
18	*Ipomoea batatas L.*	Convolvulaceae	Shukkaarita	Cl	R	The fresh root is eaten	Cl
19	*Lablab purpureus L.*	Fabaceae	Boloqita	H	F	Roasted and eaten with Injera	Cl
20	*Linumus itatissimum L.*	Linaceae	Talbaaa	H	S	Powdered and mixed with water	Cl
21	*Lycopersicon esculentum*	Solanaceae	Timaatimaa	H	F	The fresh fruit is eaten	Cl
22	*Mangifera indica L.*	Anacardiaceae	Manguta	T	F	The leaves boiled with	Cl

						tea	
23	*Musa paradisiaca L.*	Musaceae	Muuzaa	H	F	The fresh fruit is eaten	Cl
24	*Nicotiana tabacum L.*	Solanaceae	Tumbeeuaa	H	L	Crushed and sniffed	Cl
25	*Ocimum basilicum L.*	Lamiaceae	Bassobilaa	H	S	Theseed served as a spice in 'Shiro'preparation	Cl
26	*Pisum sativum L.*	Fabaceae	Ataraa	H	S	Boiled alone or with chick pea	Cl
27	*Prunus persica*	Rosaceae	Kookita	Sh	F	Its fresh fruit is eaten	Cl
28	*Saccharum officinarum L.*	Poaceae	Shonkooraa	H	S	The fresh stem is eaten	Cl
29	*Solanum tuberosum L.*	Solanceae	Dinnichchaa	H	R	Fresh grain roasted by using hot metal	Cl
30	*Sorghum bicolour*	Poaceae	Bashinqaa	H	F	Same method as for INJERA or tef making	Cl

31	*Sorghum vulgare*	Poaceae	Soaa	H	F	Fresh grain roasted by using hot metal	Cl
32	*Schinus molle*	Annacardiaceae	Tonkosob abbaruaa	Sh	F	Mixed with other ingredients for the preparation of "berbere''	Cl
33	*Triticum aestivum L.*	Poaceae	Alasuaa	H	S	Preparation of bread	Cl
34	*Vicia faba L.*	Fabaceae	Baaqeelaa	H	F	The seed are boiled alone/with chick pea	Cl
35	*Zea mays L.*	Poaceae	Boqqollaa	H	F	Fresh grain roasted by using hot metals	Cl
36	*Zingiber officinale*	Zingiberaceae	Jaanjibeeuaa	H	Rhiz	Dried and powdered withother ingredients.	Cl

Appendix 4: List of Plants collected from home garden

Key: F-Family, Var-Vernacular name, Ln-local name, Ht-Habitat, M-Medicinal, FW-Fire wood, LF-Live fence, C-Charcoal, Fu-Furniture, Co-Construction, Food, Fe-Fencing, Fo-Forage, Or-ornamental, Sp-Spice, Cl-Cash income, St-stimulant, Ha-Habit

No	Botanical name	Family	Local name	Habit	Use
1	*Allium sativum L.*	Alliaceae	Sunkuttata	H	M ,F
2	*Brassica carinata*	Brassicaceae	Hamiiluaa	H	M ,F
3	*Brassica oleraceae L*	Brassicaceae	Hamiiluaa	H	F
4	*Capsicum annuum L.*	Solancea	Mixmixuaa	H	F
5	*Citrus limon L.*	Rutaceae	Loomita	S	F, M
6	*Citrus sinensis L.*	Rutaceae	Burtukaanuaa	T	F
7	*Coffea arabica L.*	Rubiaceae	Bunaa	S	Cl, St
8	*Colocasia esculentaL.*	Araceae	Gabizaa	H	M, F
9	*Cucuribita pepo L.*	Cucuribitaceae	Lelleetaa	H	F, M
10	*Ensete ventricosum*	Musaceae	Weesita	H	M, F
11	*Ipomoe batatas L.*	Convolvulaceae	Shukkaarita	C	F Cl
12	*Lablab purpureus L.*	Fabaceae	Woita	H	F
13	*Lycopersicon esculentum*	Solanceae	Timaatimaa	H	M, F
14	*Mangifera indica L*	Anacardiacea e	Manguta	T	Lf, F, Cl
15	*Musa paradisiacal L.*	Muscaceae	Muuzaa	H	Fo, F, Cl
16	*Nicotiana tabacum L.*	Solanceae	Tumbeeuaa	H	M, Cl
17	*Ocimum basilicum L.*	Lamiaceae	Bassobilaa	H	Sp
18	*Prunus persica L.*	Rosaceae	Kookita	S	F
19	*Rhamnus prinoides L'*	Rhmanaceae	Geeshshaa	H	M, Cl

20	*Sacchharum officinarium L.*	Poaceae	Shonkooraa	H	Fo, F, Cl
21	*Sorghum vulgare*	Poaceae	Bashinqaa	H	F
22	*Vicia faba L.*	Fabacea	Baaqeelaa	H	F
23	*Zea mays L.*	Poaceae	Boqqollaa	H	F
24	*Zingiber officinale*	Zingiber officinale	Jaanjibeeluaa	H	Sp, M, Cl

Appendix 5: List of cultivated and wild plants resources traded in the market

Key: Botanical name, Var-Vernacular name, Ln-local name, Ht-Habitat, M-Medicinal, FW-Fire wood, LF-Live fence, C-Charcoal, Fu-Furniture, Co-Construction, F- Food, Fe-Fencing, Fo-Fodder, Or-ornamental, Sp-Spice, Cl-Cash income, Ha-Habit, St-stimulant

No	Botanical name	Family	Local name	Habit	Occurane	Use
1	*Allium sativum L.*	Alliaceae	Sunkuttata	H	Cl	M, F
2	*Brassica carinata*	Brassicaceae	Hamiiluaa	H	Cl	M, F
3	*Capsicum annuum L.*	Solanaceae	Miximixaa	H	Cl	F
4	*Citrus limon L.*	Rutaceae	Loomita	S	W/Cl	F, M
5	*Citrus sinensis.*	Rutaceae	Burtukaanuaa	T	W/Cl	F

6	*Coffea arabica L.*	Rubiaceae	Bunaa	S	Cl	Cl, St
7	*Colocasia esculentaL.*	Araceae	Gabizaa	H	Cl	M, F
8	*Cucuribita pepo L.*	Cucuribitacea e	Lelleetaa	H	Cl	F, M
9	*Ensete ventricosum*	Musaceae	Weesita	H	W /C l	M, F
10	*Eragrostis tef*	Poaceae	Xaafaa	H	Cl	F
11	*Ipomoe batatas L.*	Convolvulace ae	Shukkaarita	C	Cl	F, Cl
12	*Lablab purpureus L.*	Fabaceae	Boloqita	H	Cl	F
13	*Lycopersicon esculentum*	Solanceae	Timaatimaa	H	Cl	M, F
14	*Mangifera indica L*	Anacardiacea e	Manguta	T	W /C l	Lf, F, Cl
15	*Musa paradisiacal L.*	Muscaceae	Muuzaa	H	Cl	Fo, F, Cl
16	*Nicotiana tabacum L.*	Solanceae	Tambeeuaa	H	Cl	M, Cl
17	*Ocimum basilicum L.*	Lamiaceae	Bassobilaa	H	Cl	Sp
18	*Pisum sativum L.*	Fabaceae	Ataraa	S	Cl	F
19	*Prunus persica L.*	Rosaceae	Kookita	S	W /C l	F
20	*Rhamnus prinoides L*	Rhmanaceae	Geeshshaa	H	W /C l	M, Cl
21	*Saccharum officinarium L.*	Poaceae	Shonkooraa	H	Cl	Fo, F, Cl
22	*Sorghum vulgare.*	Poaceae	Bashinqaa	H	Cl	F

23	*Triticum aestivum L*	Poaceae	Alasuaa	H	Cl	F
24	*Vicia faba L.*	Fabacea	Baaqeelaa	H	Cl	F
25	*Zea mays L.*	Poaceae	Boqqollaa	H	Cl	F
26	*Zingiber officinale*	Zingiber officinale	Jaanjibeeluaa	H	Cl	Sp, M, Cl

Appendix 6: Major Food crops grown in the study District

Crop category	**Scientific name**	**English name**	**Local name**
Cereals	*Sorghum bicolor L.*	*Sorghum*	*Bashinqaa*
	Zea mays L.	Maize	*Badalaa/Boqqollaa*
	Eragrotis teff L.	Teff	*Xaafaa*
	Eleusine coracan L.	Finger millet	*Xaguta*
	Hordeum vulgare L.	Barely	*Soaa*
	Triticum aestivum L.	Wheat	*Alasuaa*
Fruits	*Citrus sinensis L.*	*Citrus*	*Burtukaanuaa*
	Citrus lemon L.	*Lemon*	*Loomita*
	Musa parsdisiaca L.	*Banana*	*Muuzaa*
	Mangifera indica L.	*Mango*	*Manguta*
	Persia americana	*Avocado*	*Abokaatuta*
Pulses	*Pisum sativvum L.*	*Field peas*	*Woshaatara*
	Paseolus vulgaris L.	*Haricot beans*	*Woita*
	Vicia faba L.	*Horse beans*	*Baaqeelaa*
Cash crops	*Coffea arabica L.*	*Coffee*	*Bunaa*
	Nicotiana tabacum L.	*Tobacco*	*Tumbeeuaa*
	Sacchharuum officinarum L.	*Sugare cane*	*Shonkooraa*

	Catha edulis L.	*Khat*	*Caataa*
Oil crops	*Linumus itatissimum L.*	*Lin seed*	*Talbaa*
	Guizoia abyssinica L.	*Niger seed*	*Nuugaa*
Vegetables	*Brassica napus L.*	*Kale seed*	*Hamiiluaa*
	Capsicum frutescens L.	*Pepper*	*Babbaruaa*
	Allium cepa L.	*Shallot*	*Sunkuttaa sheefa*
	Lycopersicon esculentum L.	*Tomato*	*Timaatimaa*
	Cucurbita pepo L.	*Pumpikin*	*Lelleetaa*
	Allium sativum L.	*Garlic*	*Biishshata sunkutta*
	Brassica oleraceae L	*Cabbage*	*Hamiiluaa*
Root crop	*Ipomoea batatas L.*	*Sweet potato*	*Shukkaarita*
	Solanum tuberosum	*Potato*	*Dinnichchaa*
	Colocacia esculenta	Araceae	*Gabizaa*
	Zingibel officinale	*Ginger*	*Jaanjibeeluaa*

Source: Hadero-Tunto Zuria District agricultural and rural development office, (2019)

Appendix 7: List of Plants used as fodder

Key: T=Tree, H= Herb, Sh=Shrub, L=Leaf, S=Stem/Leaf, Fr=Fruit, PU= Part used, W=Wild, Cl=Cultivated, Ver.name=Vernacular name, Occ=Occurrence

No	Botanical name	Family	Vernacular name	Habit	PU	Occ.
1	*Acacia abyssinica*	Fabaceae	Giraaraa	T	L	W
2	*Aframom corrorima*	Zingiberaceae	Wokashiaa	H	L	C
3	*Cajanus cajan*	Fabaceae	Ciiaaatara	T	L	W
4	*Arundo donax*	Poaceae	Shomboquaa	T	L	W
5	*Cordia africana.*	Boranginaceae	Waanzaa	T	L	W

6	*Cynodon dactylonL.*	Poaceae	Margaa	H	L	W
7	*Cyperus rotundus L.*	Cyperaceae	Shankuta	H	L	W
8	*Grevillea robusta*	Proteceae	Giraaveelaa	T	L	C
9	*Pennisetum clandestinum.*	Poaceae	Qorxuaa	H	L	W
10	*Persea americana*	Lauraceae	Abokaatuta	T	L	W
11	*Ensete ventricosum*	Musaceae	Weesita	Sh	H	C
12	*Musa parisdisaca*	Muscaceae	Muuzaa	Sh	Fr	C
13	*Zea mays*	Poaceae	Boqqollaa	Sh	Fr	C
14	*Eragrostis tef*	Poaceae	Xaafaa	Sh	Fr	C
15	*Hordeum vulgare*	Poaceae	Soaa	Sh	Fr	C
16	*Triticum aestivum*	Poaceae	Alasuaa	Sh	Fr	C
17	*Mangifera indica*	Anacardiaceae	Manguta	T	Fr	C
18	*Pisum sativumt*	Fabaceae	Ataraa	Sh	Fr	C
19	*Colocasia esculenta L.*	Araceae	Gabizaa	H	Fr	C
20	*Vicia faba*	Fabaceae	Baaqeelaa	Sh	Fr	C
21	*Saccharuum officinalum*	Poaceae	Shonkooraa	T	S	C
22	*Cucurbita pepo*	Cucuribitaceae	Lelleetaa	H	Fr	C
23	*Ipomia batatas*	Convolvulaceae	Shukkaarita	H	R	C

Appendix 8: List of Plant used as a source of human medicine

Key: Ha=Habit, (H-Herb, Sh-Shrub, T-Tree, and Cl-Climber, (R_Root, B-Bark, Fr-Fruit, L-Leaves, and S-Seed), Occur-Occurrence, W-Wild and Cult-cultivated).

No	Botanical name	Family	Vernacular name	Habit	PU	Disease treated	Mode of preparation
1	*Allium sativum L.*	Alliaceae	Sunkuttata	H	Bu	Malaria, commoncold	Bulbs crushed and eaten
2	*Capsicum frutescens*	Solanaceae	Babbaruaa	Sh	Fr	Corona Virus -tooth decay and mouth	-Cup of coffee -fruits either crushed with soap or eaten simply -resist tooth decay and blood mouth
3	*Catha edulis*	Celastracea e	Caataa	T	L	Cough	Leaves crushed, boiled in water and administered orally
4	*Citrus limon L.*	Rutaceae	Loomita	T	F	Gum	Crush the fruit and applied on bleeding gum

5	*Coffea arabica L.*	Rubia ceae	Bunaa	S	F	Diarrhea	Fruit powdered, mixed with honey and eaten in the morning
6	*Colocasia esculenta L.*	Arace ae	Gabizaa	H	R	Ascaries	Cooked and eaten
7	*Cordia africana*	Borag inace ae	Waanza a	T	L	Spider position	Burned and remaining ash is mixed with butter and creamed on affected part
8	*Croton macrostac hyus*	Euph orbiac eae	Masana a	T	B	Mosquito repellent	Put on fire and the smoke used to protect mosquito bite
9	*Cucurbita pepo L.*	Cucur bitace ae	Lelleeta a	H	S	Tape worm	The dried seed roasted and eaten
10	*Ecucalyptu s globules*	Myrta ceae	Wojju baarza afa	T	L	Headach Common cold	Fresh leaves boiled in water
11	*Ehretiacy mosa*	Borag inace ae	Ulaagaa	T	L	Tooth ache	Chewed
12	*Ensete ventricoss um*	Musa ceae	Weesita	H	L	Stomach ache	The latex half cup of tea taken to get relief from stomach ache
13	*Psidium*	Myrta	Zayitoo	T	L	Tooth	Washed tooth as soap

	guajava	ceae	naa				
14	*Hagenia abyssinica*	Rosaceae	Xeemmata	T	S	Tape worm	A dried seed powdered is added salt eaten and treat
15	*Justicia schimperiana*	Acanthaceae	Gulbaanaa	Sh	L	Headache	Leaves put on fire and rubbed on head
16	*Linumus itatissimum L.*	Linaceae	Talbaa	H	S	Dandruff	Washed the hair as soap
17	*Lycopersicon esculentum*	Solanceae	Timaatimaa	H	L	Spider position	Chewed and put on
18	*Nicotiana tabacuum L.*	Solanceae	Tumbeeuaa	H	L	Snake bite	Crushed and mixed with water and drunk
19	*Phytolacca dodecandra*	Pytolaccaceae	Haraanjaa	H	R	Liver disease	Powdered and h taken with waterkookii
20	*Prunus persica L.*	Rosaceae	Kookita	T	S	Toothache	Fire and hold on affected tooth for a while
21	*Rhamnus prinoides L.*	Rhamanaceae	Geeshshaa	Sh	B	Tonsillitis	Crushed and chewed
22	*Ruta chalepensis L.*	Rutaceae	Xalachchuta	H	L	Evil eye	Squeezed with leaves of rutachalepensis and drunk a coffee

23	*Schinus molle*	Anna cardia ceae	Tonkos obabbar uaa	S h	F	tooth bleading	Crushed and eaten
24	*Vernonia auriculifer a*	Aster aceae	Reejjaa	S h	L	Bleeding wound	Crushed and paint on wound
25	*Zingiber officinale*	Zingi berac eae	Jaanjibe eluaa	H	R h i z o	Asthema, gastrite	In fussion is made and drunk as illness starts.

Appendix 9: List of Plants used as sources of treating livestock aliments

(Key: Ha=habit (H-Herb, Sh-Shrub, T-tree and Cl-Climber), (R-Root, B-Bark, Fr-Fruit, St-Steam, L-Leaves, and S-seed), Occur-Occurrence, W-wild and Cult-Cultivated).

No	Botanical name	Family	Vernacular name	Ha bit	PU	Disease treated	Mode of preparation	Route
1	*Albizia gummiff era*	Fabacea e	Giraa raa	T	B	Retaine d fees	Powdered and mixed with water then given for cattle	Oral
2	*Allium sativum*	Alliacea e	Sunk uttata	H	S	Swell	Pounded together with	Oral

	L.						bark of Dracaena steudneri and given twice.	
3	*Bruceae antidysenterica*	Simaroubaceae	Qoomuuaa	T	L	To cure kaafira	Leaves crushed and rubbed on leap of donkey	Dermal
4	*Citrus limon L*	Rutaceae	Loomita	Sh	S	Eye cataract	Squeezed and added on eye	Dermal
5	*Colocasia esculenta L.*	Capparia ceae	Gabizaa	Sh	L	Delayed placenta	Leaves crushed and mixed with water then given to the cow.	Oral
6	*Croton macrostachyus*	Euphorbiace	Masanaa	T	R	Rabies	Dried root and powdered given to dog with injera	Oral
7	*Cucurbita pepo L.*	Cuccurbitace	Lelleetaa	H	Fr	Treattick	Cooked and rubbed on affected part	Dermal
8	*Ehretiacymosa*	Boraginaceae	Ulaagaa	T	L	Shievering	Crushed and squeezed	Dermal
9	*Acokanthera schimperi*	Apocynaceae	Tontoonaa	Sh	B	Trypsis (Gandii)	Crushed along with roots of phytolaccadodecandra	Oral
10	*Erythrina brucei.*	Fabacea e	Welaahaa	T	L	Eye problem	Squeezed and added in the eye	Dermal
11	*Justicia*	Acantha	Gulba	S	H	Internal	Pounded added	Oral

	schimperiana	ceae	aniaa	h		parasites	to barley malt powdered	
12	*Linumstitatissimum*	Linaceae	Talabaa	H	S	Treat breast swelling	Powdered and given by mixing in water	Oral
13	*Nicotiana tabacum L.*	solanaceae	Tambeeuaa	H	L	Snake position	Crushed and tied on affected part	Dermal
14	*Phytolacca dodecandra L.*	Phytolaccaceae	Haraanjaa	Sh	R	Treat hyena bite	Powdered and mixed with water and drunk	Oral
15	*Prunus africana*	Rosacea e	Hoomaa	T	B	Wound	Powdered and added directly on wound of donkey, mule, and horse	Dermal
16	*Rhmanusprinoides L.*	Rhmanaceae	Geeshshaa	S	S	Bloody urine	Ground along with leaf of solanum anguivi	Oral
17	*Ricinuscommunis L*	Euphobiaceae	Ceennaa	Sh	Fr	Anthrax	Powedered and mixed with water	Oral
18	*Rutachalepensis*	Rutaceae	Xalachchuta	H	L	Common cold and evil eye	Filtered with cloth and given	Oral
19	*Sorghum*	Poaceae	Bashi	H	S	Retaine	Dry seed mixed	Oral

	bicolour L.		nqaa			d placenta	with salt, water and given to cattle	
20	*Vernonia amygdalina*	Asteraceae	Heebichuaa	T	L	Wound	Squeezed and painted	Dermal
21	*Vernonia auriculifera.*	Asteraceae	Reejjaa	S	S	Infected wound	Ground along with tip shoot of Entada abyssinica and directly sprayed on the wound	Dermal

Appendix 10: List of plant Species used for construction

No	Botanical name	Family	Hab	Vernacular name	PU	Uses of the species
1	*Phoenix reclinata.*	Arecaceae	T	Saleeniaz anbaatta	St	For fence construction
2	*Cordia africana*	Boraginiceae	T	Waanzaa	St	For fence, timber, andhousconstructio n
3	*Persea americana.*	Lauraceae	T	Abokaatuta	C	House, fence and musical instrument
4	*Eucalyptus globules*	Myrtraceae	T	Wojjuaab aarzaafa	St	House, fence, house construction and firewood
5	*Ecucalyptus*	Myrtaceae	T	Biishshaa	St	Construction of

	camaldulensis			baarzaafa		house and fence
6	*Ficus sur*	Moraceae	T	Odeechchuta	St	Fence, fire wood and building
7	*Grevillea robusta.*	Proteaceae	T	Giraaveelaa	St	For fence construction
8	*Hagenia abyssinica*	Rosaceae	T	Xeemmata	St	For house hold construction
9	*Juniperus procera*	Cupressaceae	T	Hoomaa	St	House hold construction
10	*Podocarpus falcatus*	Podocarpaceae	T	Zagibaa	St	House construction and fire wood
11	*Prunus africana*	Rosaceae	T	Hoomaa	St	House hold, furniture and wood
12	*Syzygium guineense*	Myrtaceae	T	Gooteetaa	St	House construction and for furniture

Appendix 11: List of Plant Species used for multipurpose activities

(Key: Hab=Habit (H-Herb, Sh-Shrub, T-Tree, and Cl-Climber, (R-Root, B-Bark, Fr-Fruit)

No	Botanical name	Family	Hab	Vernacular name	PU	Used for
1	*Acacia abyyssinica*	Fabaceae	T	Giraaraa	Stem	For fence, firewood and fodder
2	*Borassus aethiopum*	Arecaeae	H	Zanbaattaa	Stem	For decoration and fence making
3	*Brassica*	Brassicace	H	Hamiilit	Stem	For Injera

	carinata	ae		a ill		mitadbrushand as medicine
4	*Cordial africana*	Borangini ceae	T	Waanzaa	Stem	For furniture, fence, house hold and fire wood
5	*Croton macrostach yus*	Euphorbia ceae	T	Masanaa	Stem	For medicine, firewood
6	*Eucalyptus globules.*	Myrtaceae	T	Wojjuaa baarzaaf a	S/Le aves	As medicine, construction and firewood
7	*Eucalyptus camaldulen sis*	Myrtaceae		Biishshs haabaarz aafa	Stem	House construction, fence and firewood
8	*Ficus sur*	Moraceae	T	Odeechc huta	Stem	House construction, shade and firewood
9	*Grevillea robusta*	Proteaceae	T	Giraavee laa	S/Le aves	As ornament, shade and construction
10	*Hagenia abyssinica*	Rosaceae	T	Xeemma ta	Stem	As medicine, construction material
11	*Jacaranda mimosifolia*	Boraginice ae	T	Jaakaran daa	S/Le aves	Ornament, shade and construction
12	*Persea americana*	Lauraceae	T	Abokaat uta	S, Fr and stem	For furniture, food and house hold
13	*Phoenix reclinata*	Arecaceae	T	Saleeniz anbaatta	L /Ste m	Household materials and brushing teeth
14	*Podocarpu s falcatus*	Podocarpa ceae	T	Zagibaa	Stem	For Construction, furniture fence and firewood

15	*Prunus africana*	Rosaceae	T	Hoomaa	Stem	Construction, furniture fence and firewood
16	*Vernonia amygdalina*	Asteraceae	T	Heebichuaa	S /Leaves	Used for fence, medicine and firewood

a. For charcoal

b. For fire wood

a. For house construction

d. For timbe work

Figrure 2, Different threats on plant resource in the study District

APPENDIX I

Questionnaire for collecting comprehensive Ethnobotanical information

I Personal information

1. Date _____Residence Kebele_____
2. Nameof respondents _____sex_____Age_____

2.1 Occupation _____2.4Marital status _____

2.2 Source of income 2.5Ethnicity----------

2.3 Religion _____2.6 Educational background_____

3. For how long have you lived in the area?

a. Since birth ☐ b. For the last20 years…☐c. For the last 10years d. Less than 10years ☐

II. Ethnobotanical Information

4. Do you aware about the use of any plant species growing around your home? Yes☐ No ☐

5. If your answer is yes can you contribute information for the following utilization aspects on plants?

A. Plants used as source of food
B. Fodder plants
C. Plant used as a source of Human medicine
D. A. Component plants if any

A. Plants used as a source of animal medicine

6. Do you have any knowledge on plants which are used other than food, fodder and medicine? Yes ☐ No☐

7. If your answer is yes, please sating your knowledge on following miscellaneous aspects?

A. Fiber yielding plants

B. Plants for Fish stupefaction

C. Plants as repellent

D. Plants as soaps and shampoo

E. Plants for coagulating milk

F. Plants in Beliefs (taboos, evil eye, prosperity, etc)

G. Plants in worships and religious rituals

H. Plants mentioned in traditional songs

I. Plants in proverbs

J. Plants with Ecological importance (Soil binding, prevent erosion, etc)

B. Plants in material culture

a. Musical instruments
b. Basketries
c. Ornaments
d. Traditional marks
e. Tooth cleaner
f. Cloths
g. Bathing brush
h. Traditional
i. Household article
j. Brooms
k. Cooking Utensils
l. Water bottles and storing bottles
m. Plates for serving food
n. Vessel cleaning

8. How do you classify plants traditionally?

9. How do you classify the land and vegetation?

10. Do you have any idea on some useful plants which are not commonly occurring in your locality?

11. What measures will adopt for the conservation and sustainable utilization of such plants?

12. Can you tell the name for any such rare useful plants that are being conserved in your home garden?

III. Market survey

1. Location of market place _____collection no_____Date_____

Collector_____

IV. Information from vendor or seller

1. Name_____

2. Type of vendor: A/permanent stall B/temporary stall C/ ambulatory

3. Village of vendor_____Gender_____Age_____

V. Information on market data collection

1. Local name_____Habit_____

2. Cultivation status: A/cultivated B/Managed C/wild

3. Marketing status: A/ gathered by vendors B/Resold

4. Condition of the plant: A/fresh B/dry

5. Price/unit_____Brought to market: A/daily B/weekly C/occasionally

6. How much sold now compared to in the past: A/ more B/same C/less

7. If less why? A/less available for the market B/less demanded by buyers

8. Use of the plant_____

9. Plant part used_____

10. Preparation_____

11. Note_____