Addis Ababa University

School of Graduate Studies

Study of Useful Plants in and Around GATE UDUMA **(*Traditional Gedeo Homegardens*) *in Kochere Wereda of Gedeo Zone, SNNPR, Ethiopia: an Ethnobotanical Approach***

By Solomon Tamrat Debessa

A thesis submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the degree of Master of Science in Biology; Botanical Studies

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ABSTRACT

This ethnobotanical study was conducted on useful plants in and around GATE UDUMA (traditional Gedeo homegardens) at Kochere Wereda of Gedeo Zone in South Ethiopia. It was aimed at documenting traditional ethnobotanical knowledge on use and management of plants in the culture of Gedeo people of the area. Data were collected using semi-structured interviews, free listing methods, guided garden tours, group discussions, preference rankings, paired comparisons and ranking using index of cultural significance (ICS). Totally, 165 plant species in 135 genera and 65 families were collected and identified as useful plants to the people of the Wereda from homegardens and the immediate surroundings. Useful plants recorded from homegardens were 45% herbaceous, 31% trees, 18% shrubs and 6% climbers. Fabaceae was the most represented family on use with 16 (9.6%) species, followed by Poaceae 11 (6.6%), Asteraceae 10 (6.0%), Lamiaceae 9 (5.4%) and Solanaceae 8 (4.8%) species. Cultivated plants make 92 species (56%) of which 54 (33% of the total) are edibles. The rest 73 species (44%) of the total are wild or semi-wild useful plants managed in and around homegardens that are tolerated, encouraged or deliberately planted. Among the total, 68 species (41%) were grouped as edibles, while 32 (19%) were medicinal plants. In addition, 34 (21%) species were ornamental and 40 (24%) species were used in the material culture of the Gedeo people. Moreover, there were 29 species (18%) in the forage plant category, 26 (16%) in live fences; 19 (12%) used as fire wood and 37 (22%) are miscellaneously used species. Multipurpose species encountered were added to 43 that are 26% of the total. Woody species were found the integral components of Gedeo homegardens and 81 species (49%) of the total were found trees and shrubs managed in and around homegardens for various purposes. Community matrix ranking and analysis of index of cultural significance showed that *Syzygium guineense, Cordia africana* and *Albizia gummifera* as the most culturally important plants in the category of multipurpose species. These results indicate that they are more vulnerable to exhaustion and hence they are at the highest rank of conservation priority. Similarly, *Ensete ventricosum, Zea mays* and *Brassica carinata* were found important food crops while *Coffea arabica* followed by *Catha edulis* were important cash crops of the Wereda. Considering threats to useful plants, cutting woody species for firewood, for construction and various crop diseases were found as the major threat factors for garden species. Gedeos practice agroforestry development, homegardening or field cropping to conserve and sustainably use agrobiodiversty of the area. Maintaining diverse specie of crops and landraces through selection, spatial and temporal crop arrangements and crop protection practices were found the basic garden management practices. Agroforestry is a traditional management practice

of agroecosystems in the area and homegardens were found to be differentiable from these systems in species and use diversities, fertility of soils and closeness to the dwellings. Therefore, such type of complimentary of *in-situ* and *ex-situ* conservation and agrobiodiversity management practices should be encouraged and strengthened by all stakeholders concerned. This research work ends in concluding about the important findings and forwarding important recommendations on conservation and sustainable use of homegarden components and ethnobotanical knowledge in the area.

Key words: **Ethnobotany, GATE UDUMA/Homegarden, Kochere Wereda, Gedeo Zone, Useful plants**

1 INTRODUCTION

1.1 Background

Ethnobotany, a recent discipline in science, is a branch of ethnobiology and ethnosciences that deals with the reciprocal relationship between plants, people and the way they live (Balick and Cox, 1996). Plants are invaluable and fundamental to almost all life on earth. They provide wide range of uses to human beings such as medicine, food, shelter, clothing, utensils as well as ritual and religious benefits. They also recycle essential nutrients of ecosystems, establishing soils and maintaining soil fertility in addition to protecting areas of water catchments. Moreover, they keep ecological and climatic balance, facilitate and control rainfall through the process of evaporative transpiration. Traditionally, these use values are obtained and maximized by local people of the tropical areas by cultivating plants in and around homegardens (Westphal, 1975; ICRAF, 1989 and Okigbo, 1990).

According to Fernandes and Nair (1990), homegardens are defined as land use practices involving deliberate management of multipurpose woody species in intimate association with annual and perennial horticultural crops and invariably, livestock within the living compound, the whole crop-tree-animal unit being managed by the household labor. It was thought that homegardens arose from shifting cultivations to overcome resource constraints and to ascertain rights to land resources by smallholder farmers (Fernandes and Nair, 1990; Reijntjes *et al*., 1992; Matson *et al.*, 2002). The integration of useful plants and animals around homegardens has gradually developed to small-scale plant and animal husbandry, whose time-to-time intensification ended in the emergence of full-scale agriculture in gardens and fields (Zemede Asfaw and Ayele Nigatu, 1995).

Even though the major benefit of homegardens is to provide food, they also provide medicinal plants (Zemede Asfaw, 2001a; Belachew Wassihun *et al.*, 2003) and other useful materials (Zemede Asfaw, 1997a). As humans and livestock are subject to some diseases and infections, the control of these using plants from homegardens in the past have played roles in the evolution and selection of plants. Moreover, plants also provide a range of beneficial aspects collectively known as material culture; which include uses of plants in construction, clothing and objects produced by a society such as tools and decorative arts and crafts (Cotton, 1996).

Additionally, as commented by many authors, homegardens are important for *in-situ* conservation of plant genetic resources. Altieri & Merrik (1987) and Feleke Woldeyes (2000) discussed the role of homegardens for *in-situ* conservation in preserving traditional agricultural systems, plant species and the indigenous knowledge from severe exploitation. It is pointed out by Agelet *et al*. (2000) that homegardens are useful mechanisms for conserving non-crop species and based up on the diversity present, can be considered as gene banks for primitive cultivars with potential values. In addition, as mentioned by Zemede Asfaw and Ayele Nigatu (1995) and Zemede Asfaw (2001a), homegardens are being used as informal experimentation plots for new varieties and exotic species.

Homegardens also provide a favorable and well-protected environment for local varieties that have had difficulties competing with introduced or genetically improved cultivars (Castineiras *et al*., 2002). However, these days' homegarden farming systems are undergoing a rapid change and transformation, which results from economic modernization and cultural changes (Lok, 2001). The well developed and managed homegarden systems in many regions are being replaced by financially more attractive cash crop plantations (Belachew Wassihun *et al*., 2003). Garden conversions often imply drastic modification of the traditional vegetation composition, which leads to serious problems like soil degradation and loss of diversity (Gonsalves, 1988).

Even if homegardens are old-aged agroforestry systems, the focus on them as development strategy started only recently (Millat-e-Mustafa, 1997a). Their importance in providing sustained subsistence on farming and biodiversity conservation are getting attention these days however. As Zemede Asfaw and Ayele Nigatu (1995) reported, homegarden practices in Ethiopia are as old as agriculture, though a few studies have been made (Westphal, 1975; Zemede Asfaw and Ayele Nigatu, 1995; Zemede Asfaw and Zerihun Woldu, 1997; Zemede Asfaw, 1997; 2001a, 2001b; Feleke Woldeyes, 2000, Tadesse Kippie, 2002, Belachew Wassihun *et al*., 2003).

The structure and function of homegardens was made in details only for some areas of Ethiopia until the past decade, like that of Wolaita & Gurage (Zemede Asfaw and Zerihun Woldu, 1997); Bonga (Feleke Woldeyes, 2000); Sidama (Tesfaye Abebe, 2005) and Wolaita (Talemose Seta, 2007). The people have a rich traditional knowledge transmitted orally from generation to generation. A wealth of information exists among these people on utility and management of plants in their localities. Therefore, the aim of this research is to fill this gap and to present the information concerning useful plants in homegardens and their surroundings in the study area.

1.2 Statement of the problem

The present study on traditional Gedeo Homegardens at Kochere Wereda of Gedeo Zone in SNNPR of Ethiopia will contribute to a better understanding of homegardens and plant use knowledge of the local people, and the traditional management practices on the agroecosystems of the area. Even if homegardens of southern Ethiopia are studies by Zemede Asfaw and Zerihun Woldu (1997), Feleke Woldeyes (2000), Belachew Wassihun *et al.* (2003) and Tesfaye Abebe (2005); ethnobotanical investigation of the ENSET-coffee based homegardens of the Gedeo people was an area so much has not been done before. Hence, it demands detailed study and analysis of homegarden species diversity and composition as well as the associated ethnobotanical knowledge. Therefore, based on the results of the current study, it would be possible for further development of Gedeo homegardens, and get more view points to forward recommendations to address threats to these systems.

Gedeos live in the escarpments of the southeastern Ethiopian highlands overlooking the rift valley, in the narrow strip of land running from north (Sidama Zone) to south (Oromia Region), from 1200-2993m above sea level (EMA, 1988). Diverse crop types were found managed by the traditional Gedeo people. Since animal rearing and bee keeping are integrated to the cropping system, the mode of development is not purely crop production, cattle rearing or forestry (Tadesse Kippie, 2002). With an approximate surface area of 1,329 km^2, the Gedeo lands are one of the most densely populated regions in the country (CSA, 2005). As time goes, population size increased and hence population pressure intensified. This had led to further fragmentation of already available cultivable land in to pieces and hence the local people are facing a problem to cultivate field crops intensively. Nair (2001) reported a similar cause as factors that contributed to and have accelerated the evolution of tropical homegardens. Therefore, Gedeo people in the study area are forced to depend on products of their homegardens for subsistence. However, not so much was done with regard to these systems for their composition, diversity, significance, associated traditional knowledge and their nature. Hence, this study focused attention to the homegardens of Gedeo people at Kochere area. The Wereda is preferred in this study for lack of ethnobotanical studies and its remoteness.

1.2 Research questions used as guides for data collection

The following research questions were used as guides in collection of data for the study.

- What are the diverse crops and other components of Gedeo homegardens?
- How is diversity and sustainability maintained through use of homegarden components by farmers of the Wereda?
- What are the key or dominant crop components and their roles to the functioning of the Gedeo homegardens?
- What particular attributes of the agroecosystem design of Gedeo homegardens ensure continuity and stability in production?
- What are the spatial and temporal organizations of Gedeo homegardens?
- Why the Gedeos are close intimates with trees? Why do they intercrop ENSET and coffee with tree species?
- How do Gedeos exercise their influence on the components of their homegardens without undermining the integrity of the later?
- Do agroecological variations determine crop composition and diversity of homegardens in the Wereda?

2. OBJECTIVE OF THE STUDY

2.1 General Objective

The aim of this research is to conduct ethnobotanical study on useful plants and to collect, compile and document the indigenous knowledge on categorization, use and management of useful plants together with the plant specimens in and around home gardens at Kochere Wereda in Gedeo Zone of SNNPR, Ethiopia.

2.2. Specific Objectives

- To gather information on local perception of resources in general and categorization of landforms, arable lands, vegetation, soil types and seasons in particular,
- To gather and document indigenous knowledge towards use and management of useful plants in and around homegardens,
- To identify plant species that are the most important to the local people under various use categories,
- To collect, identify and document locally useful plants of homegardens (both cultivated and wild) and show their taxonomic diversity,
- To find out diversity at farming systems, species and individual crop/ landrace levels of homegarden useful plants and
- To find out threat factors on homegarden useful plants and gather local methods of crop management applied by the indigenous people.

3. LITERATURE REVIEW

3.1 Developmental history of ethnobotany

The term ethnobotany was for the first time used by Harshberger (Harshberger, 1896 cited in Cotton, 1996). He defined it as 'the use of plants by aboriginal people'. During the century, a considerable attention has focused not only on how plants are used, but also on how they are perceived & managed and the reciprocal relationships between human societies and the plants on which they depend (Shrestha *et al*., 1997). In the development of the field of ethnobotany, a gradual change from a narrow scope to a broader one is evident. The term ethnobotany was found a rather difficult one to define during the then times and a number of scholars attempted (Cotton, 1996; Alcorn, 1984). Following this, Harshberger and Robbins in 1925 redefined ethnobotany as the study of how plants are perceived and understood by the tribal people. In addition, Ford (1978) stated it as 'study of direct interaction between human beings and plants'. Furthermore, Martin (1995) conceptualized ethnobotany as the study of how local people classify, manage and use plants available in their surroundings; where as Balik and Cox (1996) defined it as a branch of ethnobiology and ethnosciences that deals with the reciprocal relationship between plants, people and the way they live.

Explorers, missionaries and immigrants have contributed a lot to the basis of ethnobotany; e.g., Christopher Columbus favored the exchange of plants from the Old World to the New World. Associated with exchange of the plant species there is an associated exchange of plant use and management knowledge from the traditional people of the two extremes. In the 16th century, increased interaction of people of the world led to exchange of plants and other products originally discovered through observations and use by indigenous people (Ford, 1978; Cotton, 1996).

Following Europeans arrival to the New World, changes observed on traditional life styles and practices of indigenous people that resulted in the suppression of indigenous languages and cultural practices in addition to neglect of some plants that have been important in the economies and culture of the local people. Traditional knowledge was transferred from generation to generation orally and hence it was forced to reside only in the memories of living persons that led to diminishing of it (Cotton, 1996; Mwilawa *et al.,* 2006).

However, interest developed among Europeans towards traditional people and their culture of plant use. Then anthropologists, ethnographers, linguists and biologists became more devoted and ethnobotanical information started to be available in a number of scientific reports (Cotton, 1996). By 1831, Charles Darwin gets interested in the indigenous uses of plants. Then the purpose of plant collection was shifted from economic to scientific investigations and a number of specimens flooded to museums and gardens in London. However, the then tremendous ethnobotanical knowledge remained scattered in the chronicles of 16th C Spanish missionaries, the diaries of European adventurers and the works of Native American herbal medicines. Edward Palmer in 1870 collected this disparate data in his book entitled 'food products of the northern American Indians' (Cotton, 1996).

In 19th century, ethnobotany expanded rapidly and is changed with the first doctoral dissertation on ethnobotany being presented by David Barrows at Chicago University. By 1916, the field expanded to include not only how indigenous people used plants but also how plants were perceived and understood within various cultures. The development of ethnobotany in Europe, Africa, Asia and Australia has its own peculiar history and pattern (Cotton, 1996; Zemede Asfaw and Tigist Wondimu, 2007).

3.2 Development of ethnobotany under Ethiopian context

The present day growth of ethnobotany in Ethiopia could be traced to travel reports of James Bruce around 1768, which documented drawings and seed collections of about 200 plants and to the collection and identification of these plants by G. W. Schimper in 1837. The extensive crop germplasm collections and analysis of Vavilov in addition, led to the identification of the country as an important global centre of crop origin and/or diversity. Economically and culturally important groups such as food crops, medicinal plants, stimulants, spices and gums get more attentions of the then explorers and merchants (Zemede Asfaw and Tigist Wondimu, 2007).

The works of a number of scholars from various fields including Aklilu Lemma in 1960s, Amare Getahun in 1974 and 1975 cited in Zemede Asfaw and Tigist Wondimu (2007), Westpal (1975) and Jansen (1981) are the foundations for development of ethnobotany in Ethiopia. Furthermore, publication of booklet entitled *useful plants of Ethiopia* in 1960 on some cultivated and wild plants, the ethnobotany of barley in the central highlands of Ethiopia by Zemede Asfaw (1990) and ethnobotany and economic role of selected plant species used in Gambella by Mengistu

Wube (1995) are others to mention.

According to Zemede Asfaw and Tigist Wondimu (2007), biology department of AAU offered courses entitled *ethnobiology* for M.Sc., *applied ethnobotany* for Ph.D., and *introduction to ethnobiology* for B.Sc. programs starting the 1996/97, 2002/03 and 2005/06 academic years respectively. Simultaneously research on ethnobotany rose at M.Sc. level and the number of resulting papers increased in the department. Furthermore, the institute of biodiversity conservation established department of ethnobotany that runs research and documents indigenous knowledge on biological resources (Zemede Asfaw and Tigist Wondimu, 2007; www.ibc-et.Org, 2010). In history ethnobotany developed methodologically from mere listing of species and vernacular plant names to purely qualitative approaches and then to a mix of both qualitative and quantitative approaches incorporating parameters such as use diversity, habitat distribution, and abundance (Cotton, 1996).

3.3 Indigenous knowledge associated with plant use and management

Vast amount of knowledge resides within the people living natively in a particular area on the way they perceive, use and manage their surroundings from long past to present; referred to as traditional knowledge (Stephen and Justin, 2003). It is 'traditional' because it is created, perceived and disseminated in the way it reflects the traditions of communities those maintained it.

From long past to present indigenous people have developed such wealth, i.e. traditional knowledge, and had been using and transferring it to the next generations for the betterment of their life. Indigenous knowledge is used to sustain the community's culture, religion and environments; and in connection to our aim to use and manage the floral diversity of a particular area (Cotton, 1996). Bannister and Hardison (2006) reported that exchange and collaboration between western scientists and indigenous people helped in management and conservation of biodiversity to achieve the goals of ethnobotanical studies.

Enormous agricultural knowledge resides within the cultures of Ethiopian farmers, on selection and domestication of wild foods or medicinal plants, adoption of important exotic species to cultivation and management of diverse varieties of cultivated plants and agrobiodiversity since time immemorial (Tadesse Kippie, 1994; 2002). Indigenous knowledge on wild edible plants

(Zemede Asfaw and Mesfin Tadesse, 2001), on traditional herbal medicines (Dawit Abebe, 1986; Asfaw Debela *et al.*, 1999; Endashaw Bekele, 2007 & many others) and cultivated plants (Zemede Asfaw, 1997a; Tesfaye Abebe, 2005; Tadesse Kippie, 2002 and others) are some to mention.

The convention on biological diversity article eight stated the need to establish mechanisms to ensure the effective participation of indigenous communities in decision-making and policy planning to respect, preserve and maintain traditional knowledge relevant to conservation and sustainable use of biodiversity. This was aimed to promote the wider application of traditional knowledge with the involvement of traditional people, and to encourage and ensure equitable sharing of benefits collected from utilization of traditional knowledge. Therefore, one of the specific objectives of this research is to collect ethnobotanical knowledge on use, conservation and management of homegarden useful plants by the local people of Kochere Wereda.

3.4 Features of tropical homegardens with emphasis on Ethiopia

Fernandes and Nair (1990) defined homegardens as 'land use practices involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses, the whole crop-tree-animal unit being managed by the family labor.' It is thought that homegardens arose from shifting cultivations to overcome resource constraints and to ascertain rights to use land resources for smallholder farmers (Fernandes and Nair, 1990). The association of useful plants and animals around homegardens has gradually led to small-scale plant and animal husbandry (Zemede Asfaw and Ayele Nigatu, 1995).

Even though the major benefit of homegardens is provision of food, in addition they provide medicinal plants for human beings and livestock that are subject to some parasitic and/or infectious diseases (Zemede Asfaw, 2001a; Belachew Wassihun *et al.*, 2003). Moreover, homegardens are important for *in-situ* conservation of plant genetic resources and they preserve traditional agricultural systems and the indigenous knowledge from severe exploitation (Altieri & Merrik, 1987; Bennett-Lartey *et al.*, 2002; Trinh *et al.*, 2002). It is pointed out by Agelet *et al.* (2000) that homegardens are useful mechanisms for conserving non-crop species and based up on the diversity present, can be considered as gene banks for primitive cultivars with a potential value. Furthermore, as mentioned by Zemede Asfaw and Ayele Nigatu (1995) and Zemede

Asfaw (2001b), homegardens are being used as informal experimentation plots for new varieties and exotic species. They also provide a favorable and well-protected environment for local varieties that have had difficulties competing with introduced or genetically improved cultivars (Castineiras *et al*., 2002).

However, these days' homegarden farming systems are undergoing rapid changes and transformation that results from economic modernization and cultural shifts (Lok, 2001; Fernandes *et al.*, 1985). The well developed and managed homegarden systems in many regions are being replaced by financially more attractive cash crop plantations. Garden conversions often imply drastic modification of the traditional vegetation composition, which leads to serious problems like soil degradation, loss of agrobiodiversity and traditional knowledge diversity (Gonsalves, 1988).

The focus on homegardening as a development strategy started only recently (Millat-e-Mustafa, 1997a). Their importance on providing sustained subsistence on farming and biodiversity conservation are getting attention recently. As Zemede Asfaw and Ayele Nigatu (1995) reported, homegardening practices in Ethiopia are as old as agriculture; however, few studies have been made on Ethiopian homegardens (Westphal, 1975; Okigbo, 1990; Zemede Asfaw and Ayele Nigatu, 1995; Zemede Asfaw, 1997a; 1997b; Zemede Asfaw, 1998; Zemede Asfaw, 1999a; 1999b; Zemede Asfaw; 2000; Zemede Asfaw, 2001a and 2001b).

The structure and function of homegardens was made in details only for some areas of Ethiopia: Bonga (Feleke Woldeyes, 2000), Wolaita (Talemos Seta, 2007), Wolaita & Gurage (Zemede Asfaw and Zerihun Woldu, 1997) and Sidama (Okigbo, 1990; Tesfaye Abebe, 2005). The tribal people have wealth of traditional knowledge transmitted orally from generation to generation, on utility, management and conservation of plants in their localities. Therefore, the purpose of this research work is to fill the research gap and to present the information concerning useful plants in homegardens and their surroundings in the study area. For these studies, data is usually collected through field observation, administration of semi-structured interviews and data collection formats as well as discussions with household members and key informants. In addition, method such as asking elderly garden owners about unique and rare crops and traditional practices, tracing garden crops through market surveys of garden products, observing seeds and seedlings of garden crops, homegarden sketching & photographing as well as plant collection and herbarium studies are also used.

3.4.1 Origin and evolution of homegardens

There is no direct evidence as to when people began the practice of homegardening in Ethiopia (Zemede Asfaw, 1997a; 2001a). However, a long history is postulated based on the antiquity of agriculture, crop composition, oral literature and rich vernacular designations (Zemede Asfaw, 2002; Tadesse Kippie, 2002; SLUF, 2006). The history of homegardening in Ethiopia is believed to have link with the beginning of agriculture in the country, which dates back 5000-7000 years (Ehret, 1979). Ethiopian homegardens are unique in their architecture, crop mix and the key species which include a significant number of indigenous crop taxa and some that are truly endemic such as *Coffea arabica, Ensete ventricosum* and many others (Zemede Asfaw, 1997a; Zemede Asfaw, 2002; SLUF, 2006).

In Ethiopia homegardens come into existence under different modes of initiation influenced by biotic, abiotic, socioeconomic and cultural factors. In central Ethiopia, farmers establish living quarters usually in highly degraded and overgrazed areas. However, in the forested areas of southwest, homegardens are started in the forest (Zemede Asfaw, 2001a; SULF, 2006). Traditionally people consult knowledgeable elders who visually identify a suitable area and give advice for establishment of homegardens. Selective clearing of the forest is undertaken while leaving useful species such as *Coffea arabica, Rhamnus prinoides, Aframomum corrorima, Piper capense* and many shade trees like *Cordia africana* and *Millettia ferruginea* which will be parts of the future homegarden shade and live fence species (Zemede Asfaw, 2001a; Tesfaye Abebe, 2005, SLUF, 2006).

Homegardens originate, develop gradually and undergo subtle changes towards maturity and relative stability at their climax with highest productivity (Fernandes and Nair, 1990). The different stages are distinguishable by the extent of plant diversity and species composition, phenological variation, intensity of agricultural activities and diversity of functions. Hence, homegardens came into existence and evolve over time and space influenced by biophysical and agroclimatic regimes, growing conditions and management practices (Zemede Asfaw, 2001b). In a study investigating developmental stages of homegardens in central and southwestern Ethiopia, it was found that 5%, 20% and 75% of the homegardens were found at the pioneer, intermediate and climax stages respectively (Fernandes and Nair, 1990; Zemede Asfaw, 2001b).

3.4.2 Structure and crop arrangement of homegardens

The backyards being the major ones (48%), front yards (26%), side yards (13%) and those encircle the house (13%) were found as common garden locations in Ethiopia (Zemede Asfaw, 2001b). A clean green meadow as a family resting and social gathering place was observed in front of houses. In some areas, live and/or dry fences confine gardens while in others they simply merge with crop fields and may be fenced together (Zemede Asfaw, 1997a). The living house, animal pens, grain stores, drying places and plots of garden plants are components of garden areas in Ethiopia. It is usually fenced and the fence is frequently reinforced with multipurpose live trees and shrubby species. Common garden sizes range from about 100 m^2 to more than 2000 m^2, but in extreme cases, sizes as low as 20 m^2 and as high as 6000 m^2 has been recorded. Larger gardens, approaching the upper limit, are more frequent in the southwest Ethiopia (Zemede Asfaw, 1997a; 2002).

When crop composition is considered, Ethiopian gardens are typically of the mixed type, a case also reported for the Tanzanian and Javanese homegardens in northern Tanzania and Java respectively (Fernandes *et al.*, 1985; Soemarwoto *et al.*, 1985). Major garden types are distinguished based on the major crop types or the key species, such as in the case of the ENSET-related homegardens of south and central Ethiopia. In such gardens, ENSET occurs with many other crops in different combinations including a variety of root/tuber crops, coffee, KHAT, and various vegetables and spices (Zemede Asfaw and Ayele Nigatu, 1995; Zemede Asfaw, 2001a; SLUF, 2006).

Indigenous people select crops that are co-adapted and output aggregated benefits. They managed homegardens to allow optimal harvest of solar energy through the strategy of fitting phenological classes and life forms together in space and time (Fernandes *et al.*, 1985; Zemede Asfaw, 2001a). For instance, considering dietary criteria, each homegarden portrays a kind of nutritional calculus (Marten, 1990) wherein starchy, proteinaceous, oil bearing, leafy and other categories of crops are proportionally mixed to serve its primary home use function (Zemede Asfaw and Zerihun Woldu, 1997).

A general structure could be drawn for the sake of comprehension and modeling, although crops in homegardens appear to be arranged in chaotic random pattern. Some crops are always planted in regular patterns, while others are planted wherever space is available (Zemede Asfaw, 2002).

In case gardens are located adjacent to a stream, section next to the stream is usually planted with banana, sugarcane, citruses and other perennial crops that require more water. Perennial tree crops such as citruses are planted far apart while the space in between is used for lower crops. In most gardens crops like *Arundinaria alpina, Arundo donax, Otostegia integrifolia*, and *Rhamnus prinoides* are planted on the inside margins next to the fence and others like *Agave* species on the outer margins as reinforcements for fences (Zemede Asfaw, 1997a; 2001b).

Walking away from houses, garden crops gradually increase in vertical height making their inspection easier. No matter how, there is usually a mixture of tall, medium and short sized plants in association. The average plant size successively increases with distance from the house while biological diversity gets the highest near homes and reduces further, on matured homegardens of the southwest (Zemede Asfaw, 2001b). Zonation of crops was observed on cross-sectional transects made walking from the house to the end of gardens. A small circle immediately behind the house in a special horizon mostly contains many low species within a relatively small area such as *Ruta chalepensis, Cymbopogon citratus* and *Ocimum basilicum* usually represented by only one or two individuals in the entire garden and hence many species are maintained in a small space. The next zones account for about 90% of the species in the entire homegarden while the last circle has only a few species but a larger population of each species (Zemede Asfaw, 2001b).

3.4.3 Plant composition and crop diversity of homegardens

Tropical homegardens are important in contributing biodiversity conservation services at ecosystem, species and infraspecific levels and they provide complex multi-story niches in which farmers could maintain large number of useful plant species over decades or century (Hodgkin, 2002). Ethiopian homegardens collectively maintain a larger proportion of the country's useful plants (Zemede Asfaw and Ayele Nigatu, 1995; Zemede Asfaw, 1997a; Tesfaye Abebe, 2005). Cultivated plants in homegardens include medicinal plants, traditional vegetables and fruits as well as live fence species. Totally; 135 herbs, 146 shrubs, 123 trees and 25 climbers or trailers have been recorded from Ethiopian homegardens; many introduced ornamentals excluded and multipurpose species recounted (Zemede Asfaw, 1997a; 2002).

Not less than 172 crop species distributed in 121 genera and 50 plant families have been recorded in Ethiopian homegardens (Zemede Asfaw, 1997a). Fabaceae, Lamiaceae, Poaceae, Rubiaceae, Asteraceae and Brassicaceae exhibited the highest species diversity (Zemede Asfaw,

2002). The role of homegardens in household food security is illustrated by the fact that about 90% of their produce is used for household consumption. Agroecosystems integrity relies on the natural plant reservoirs found in forests, woodlands and grasslands. Some crops of homegardens are in the forests such as *Coffea arabica, Aframomum corrorima* and *Piper capense*. Providing another pool of genetic resources, wild relatives of many crops are in turn found in the forests and wastelands providing more integrity to these systems (Zemede Asfaw, 2001b).

The homegardens are widely distributed throughout the country and are home to a range of taxa of cultivated perennial and annual crop species and varieties (Belachew Wassihun *et al.*, 2003; Gbremedihin Teklehaymanot and Mulubrehan Haile, 2007; Talemos Seta, 2007; Alemtsehay Teka, 2008; Habtamu Hailu, 2008). According to survey by Zemede Asfaw (1997a), 52% of 172 homegarden crops were categorized as typical garden species, while 28% found to be common to gardens and fields with 20% typical field crops. About 74% of the crops documented in gardens were food crops while 26% were non-food crops that exhibit the significance of gardens in household food supply (Zemede Asfaw, 1997). About 127 food crops (6 cereals, 14 pulses, 13 root tuber crops, 36 fruits, 30 vegetables, 12 oils, nuts, sugars and 16 spices and herbs); and 45 non-food plant species in various use categories have been identified by the same author considering use categories of garden plants in Ethiopia.

About 64 species of shrubs and trees are maintained as live fence and shade plants that are intentionally planted, encouraged or left there during forest clearing. Common live fence species that also give edible fruits include *Carissa edulis, Opuntia ficus-indica, Dovyalis abyssinica* and many others (Zemede Asfaw and Mesfin Tadesse, 2001). In the dry lands, the usual live fence plants are among species of *Euphorbia, Ziziphus, Agave* and *Acacia* (Zemede Asfaw, 2002). Based on findings of the same author, 148 weedy species were used as food during times of stress when crops are scarce, or for medicines and other uses. Many grass species, perennials and annuals that frequently grow in homegardens are also used for various purposes including erosion control, as fodder plants, as bee forages, fumigation materials and thatch.

Homegardens provide an important avenue to conserve crop biodiversity since 85% of crops; crop relatives and wild useful plants are maintained in (Shrestha *et al.*, 2002). Many taxonomic groups, horticultural categories and different growth forms are cultivated in homegardens together with those known economically and culturally important to local communities. Some

are obligate homegarden crops, while others also grown in fields in some parts of the country (Zemede Asfaw, 1997a; Zemede Asfaw, 2001a).

3.4.4 Indigenous management practices on homegardens

The highly complex structure of homegarden architecture as well as the patterning of plant categories in it has been designed and developed by indigenous skills and practices (Fernandes *et al.*, 1985; Tadesse Kippie, 1994; Zemede Asfaw, 1997a; Shrestha *et al.*, 2002). The culture of homegardening has developed a general structure that allows owners to produce crops of their choice and they manage and direct much of the development process for their gardens. There is free exchange of germplasm among relatives, friends, neighbors and acquaintances. Traditional ways of restricting uncontrolled transfer of germplasm from homegardens developed by households was also observed (Zemede Asfaw, 2001a; Bennett-Lartey *et al.*, 2002; Shrestha *et al.*, 2002).

Considering ownership, individual families own most gardens, the head being in charge of the overall management. Management of garden space and plant components fall on shoulders of the male family head in addition to designing the structure, identifying appropriate locations for positioning major crops, and monitoring the structure and direction of garden development (Bennett-Lartey *et al.*, 2002, Fernandes *et al.*, 2002). The contribution of males is more important in large gardens and gardens dominated by cash crops such as KHAT and coffee in addition to banana and ENSET gardens that require arduous work (Fernandes *et al.*, 2002; Zemede Asfaw, 2002).

Even though their role is unrevealed because of the prevailing cultural attitude; i.e. gender inequality, women have a major share in homegarden management. They manage minor plants like vegetables, spices and medicinal plants and also collect herbaceous forages, carry and add manure to garden plants, manage domestic animals and their products (Zemede Asfaw, 2002; SLUF, 2006). Excess produce from homegardens is sold on roadsides or at nearby markets by women and sometimes children. The income generated from minor crops like *Brassica* species, spices and the likes goes to women (Zemede Asfaw, 2002). Children work in homegardens and get instant supplementary food. They eat some fruits and other edible parts instantly, while they consume the rest after brief cooking in pits under soil or roasting directly on fire. (Zemede Asfaw, 2002).

3.4.5 Threats to homegarden farming systems

Although it has been sustainable for centuries, the homegarden agroecosystem is under threat due to environmental degradation, replacement of traditional crops or land races, change of garden design and architecture facilitated by population pressures and the monoculture 'syndrome' of modern agriculture as well as cultural dilution and shift (Fernandes *et al.*, 1985; Soemarwoto *et al.*, 1985; Zemede Asfaw, 2002). Recently introduced crops threaten the culturally and economically valued crops of homegardens in Ethiopia (Zemede Asfaw, 2002). Concern about biodiversity conservation and utilization will be delusive without proper attention to traditional systems (Altieri and Merrick, 1987).

Ethnobotanical research is important to understand the plant use patterns of local people in order to develop conservation strategies of traditionally used plants. It also reveals locally important species, destructive harvesting methods and species of high conservation value; i.e. over exploited species and species whose harvesting mode is not sustainable as well as that with narrow range of distribution and used in higher preference to others that calls alarm for conservation measures.

4. MATERIALS AND METHODS

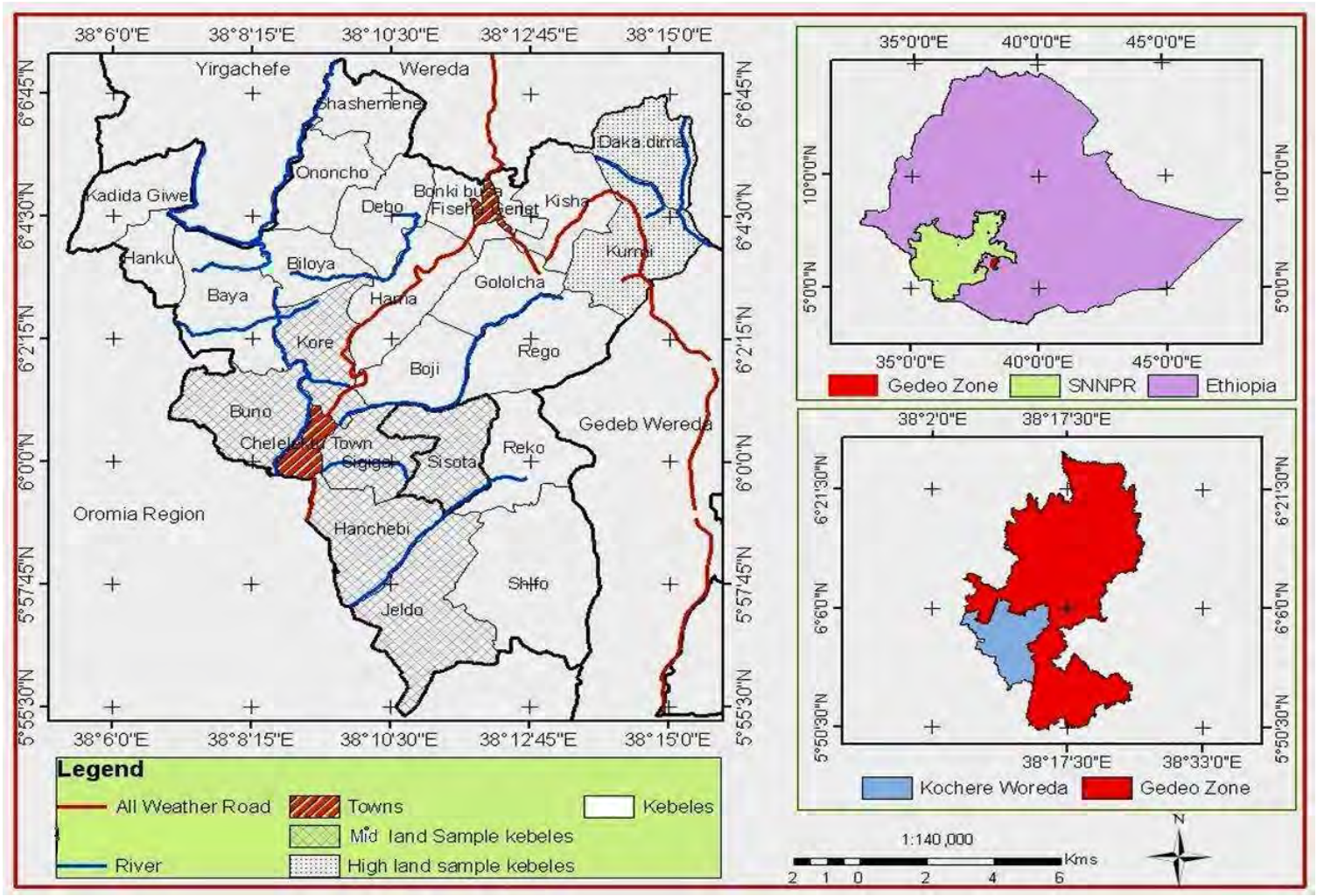
4.1. Materials

The study area with all its resources, i.e. the land and its components (cultivated, wild or semi-wild useful plants in and around homegardens), basic data providing offices of the Wereda administration were important inputs used for the study. Moreover, digital camera with memory cards and alkaline dry cell batteries, Sony walk-man tape, Geographical Positioning System (GPS), administrative map of the Wereda, field plant presses and research tools (checklists of questions for collecting data through semi-structured interviews) were used. Furthermore, authenticated herbarium specimens from the National Herbarium (ETH) were importantly used for identification of plant specimens during the study.

4.1.1 Description of the study area

4.1.1.1 Location, climate and agroclimatic characterstics

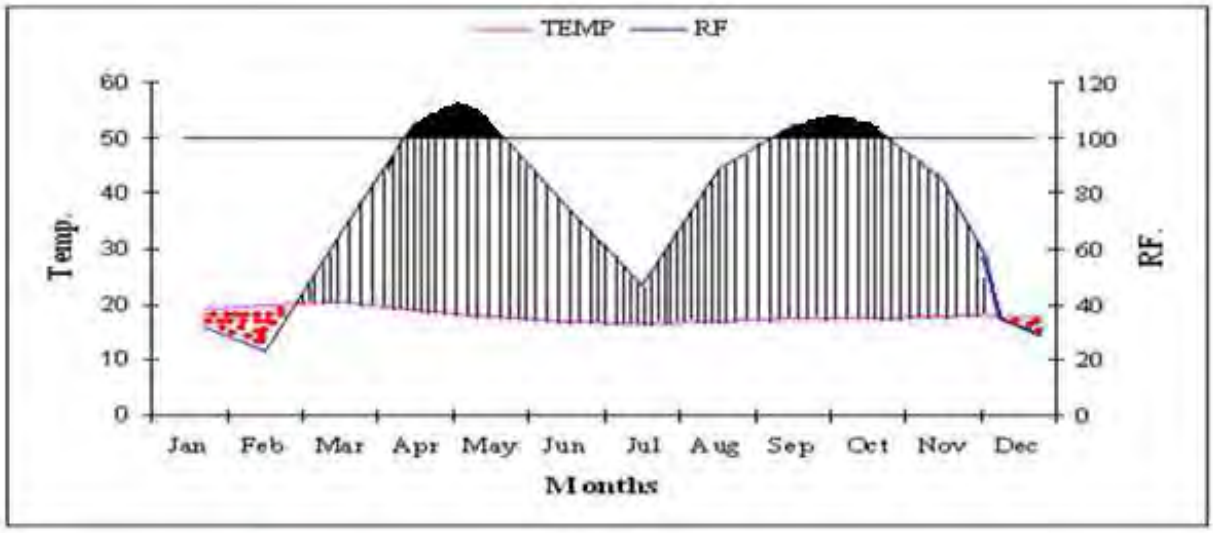
Kochere Wereda is situated at *ca* $05^0$55'-$06^0$07'N latitudes & $038^0$5'-$038^0$15'E longitudes. It is geographically located in the Gedeo Zone of the Southern Nations, Nationalities and Peoples Region of Ethiopia (Figure-1). Chelelektu town, which is located at *ca* $06^0$04'N, $038^0$12'E and *ca* 1700 m above sea level, is the center of the Wereda administration. It is situated at *ca* 420 km southeast from the capital city, Addis Ababa; 150 km south of regional town Awassa and 67 km east of Zonal town Dilla. The Wereda is sub-divided into 23 peasant associations (PAs) or administrative kebeles and two urban centers, Chelelektu and Fisehagenet. The Yirgachefe and Gedeb Weredas of Gedeo Zone at north and east respectively and the Oromia National Regional State at the south & west are boarders to Kochere Wereda.



Source: Ethio_GIS

Figure 1 Location and administrative map of Kochere Wereda of Gedeo Zone, SNNPR, Ethiopia

The average annual temperature of the Wereda ranges between 13-24 ^{o}C and the average annual rainfall is measured from 760-1500 mm. Rain fall is bimodal in its pattern, the maximum amount measured in April, May, September and October; based on ten years climate data obtained from the National Metrological Service Agency (KWARDO, 2009; NMSA, 2009). The wettest months were found to be May (245 mm) and October (223 mm) indicating bimodal rainfall pattern with the former taking the highest amount. The driest months in turn are February (23 mm), January (34 mm) and December (36 mm), the former being critically dry. Moreover, the coolest month was found to be July (11.7 and 21.7 ^{0}C is the mean monthly minimum and maximum temperature respectively) where as March was found to be the hottest month (14.0 ^{0}C and 26.7 ^{0}C is the mean monthly minimum and maximum temperature respectively). Generally, the area is wet region that receives mean annual rainfall of 1228 mm, with mean annual average temperature of 18.2 ^{0}C. The climadiagram of the study Wereda is presented in figure 2.



Data source: NMSA (2010)

Figure 2 Climadiagram of the area based on climate data from 2000-2009 at Fiseha Genet station (*ca* 2500 m above sea level)

Note: Temp=Temperature in ^{o}C; RF=Rain fall/ precipitation in mm_{s}; Dry periods are dotted while wet periods are shaded black

Traditionally, the Wereda is divided into two agroclimatic types as SUBBO the equivalent of highlands and DHI'IBATA for the midlands. From the Wereda's total land cover (*ca* 50,400 ha), 76% (*ca* 38,304 ha) belongs to the midlands while the rest 24% (*ca* 12,096 ha) represents the highland agroclimatic areas (CSA, 2005; KWARDO, 2009).

4.1.1.2 Topography, soil types, vegetation and land cover

Topography of the Wereda is mainly a rugged terrain; i.e. full of hills and valleys, the valleys between hills occupied by locally important streams and rivers. The soil type mostly is red clay loam, red brown clay loam and black grey loam (Tadesse Kippie 1994; KWARDO, 2009). Geologically, the soil emerged from the prehistoric volcanic parent matter through the biogeochemical processes. Local watersheds like river GELANA at the west, river KONGA at the northeast and river JIRMI at the south being the major, several lesser watersheds and springs are found in the Wereda that are the potential and actual benefit providers for the Wereda people (KWARDO, 2009).

Natural forest is not observed in the area and only remnant trees and shrubs are observed that show the former forest type. The major vegetation type of the Wereda according to Sebsebe Demissew *et al.* (1996), EPA (1997), Zerihun Woldu (1999) and Friis and Sebsebe Demissew (2001) is moist evergreen montane forest. In addition, well developed agroforestry systems together with manmade state and community forests at Bunno and Chelelektu areas are some to mention. Perennial crops such as coffee and ENSET are the major components while annual crops, manmade state forest and community forests comprise the next orders of land use classes (Table 1; KWARDO, 2009).

Table 1 Land covers share of Kochere Wereda

No	Land cover	Hectare	%
1	Total land area	30, 903	100
2	Perennial crops	22, 595	73.0
3	Annual crops	3, 563	11.5
4	Uncultivated land	921	3.0
5	Non cultivable lands	303	1.0
6	State forest	108	0.4
7	Pastoral land	48	0.2
8	Community forest	20	0.1
9	Other holdings	3, 344	10.8

Source: (KWARDO, 2009)

4.1.1.3 Population, ethnicity, education and livelihood systems

The total population of the Wereda is about 230, 276; with 50.2 to 49.8 % males to females ratio and the majority of the population (*ca* 91%) living in the rural kebeles and the rest in urban centers. The estimated population density of the Wereda is 457 people per square kilometers on total area of 504 square kilometers (CSA, 2005). The dominant ethnic group of the area being the Gedeo people, the Oromos and other ethnic groups are dwelling in addition. The major language spoken in the Wereda is GEDE'UFFA or Gedeo language followed by AFAN OROMO or Oromo language and others. Bilingualism was observed among the Gedeo and Oromo people that speak the two languages to certain degrees.

Education is low in the Wereda both in quality and in quantity, exhibiting high rate of illiteracy. Moreover, women education is little because of the prevailing cultural attitude on women that resulted in less enrolment and early school dropouts reflecting high gender imbalance (KWARDO, 2009). There are no kindergartens and the number of 1st and 2nd cycle schools is low. In addition, there is no preparatory school in the Wereda and students go to the nearby urban centers for preparatory education (KWARDO, 2009). The community livelihood is dependent on rain-fed agriculture. Coffee is the major cash crop and ENSET is the basic staple food crop. In addition, annual crops are also important food sources of the small landholder peasants of the Wereda (KWARDO, 2009).

4.1.1.4 Forest development and threats

The Bunno PA and Chelelektu urban center have afforestation development areas. The Bunno Forest is a state forest of about 180 hectares. The dominant plant species includes *Juniperus procera*, *Cupressus lusitanica*, *Cordia africana* and *Grevillea robusta*, 107 hectares of which is demarcated and protected while the Chelelektu Forest is dominated by *Eucalyptus* species (KWARDO, 2009). The dominant type of land use system (agroforestry) is well maintained in the Wereda that provides ecological, economic & cultural benefits to the local people. Overpopulation, land fragmentation, overexploitation of components of homegarden agroforestry systems, clearing land for intensive agriculture and use of marginal lands are the major challenges observed in land use systems of the Wereda (KWARDO, 2009).

4.2 Methods

4.2.1 Data collection methods

4.2.1.1 Ethical clearance

Before progress of ethnobotanical and botanical data collection, reconnaissance survey was made to get the general impression on the topography, vegetation types and farming practices in the area. Following this contact was made with the offices of the Wereda after which the purpose of the study, the possible results and benefits from the results were presented to the Wereda's agriculture and rural development office and to offices of the kebele administrations of each sampled PA. The Wereda Agriculture and Rural Development Office facilitated attachments with the kebele administrators through letters of introduction. In addition, discussions were made with the well-known persons in each sample PA and they were used as entry doors for development of positive relationships with the local people after they themselves were assisted to understand the purpose of the study and the possible outcomes and benefits of it, to the local people and to the environment. Finally after agreement was achieved and positive attitudes were developed, data collection was started.

4.2.1.2 Site selection, sampling of informants and homegardens

Eight PAs were selected, two from the highlands (Kurumi and Daka Dima), three from the midlands (Bunno, Kore and Sigiga) and three from the southwestern parts of midlands (Hanchebi, Jeldu and Sisota) for sampling. The selection was done making the number of informants and homegardens proportional to the agroclimatic conditions of the Wereda's overall. Kurumi site is situated at *ca* $06^0$02'-$06^0$06'N latitudes and $038^0$13'-$038^0$16'E longitudes, with an altitudinal range of *ca* 2008-2606 m above sea level. The Bunno site is found at *ca* $05^0$59'-$06^0$03'N and $038^0$07'-$038^0$11'E, from 1685-2078 m; while the Hanchebi site is located at *ca* $06^0$55'-$06^0$01'N latitudes and $038^0$09'-$038^0$12'E longitudes, from 1716-2146 m above sea level. These PAs represent about 35% of the total number of PAs in the Wereda. Kurumi, Bunno and Hanchebi were taken as major study sites while the rest PAs were sampled to see some additional information to represent the Wereda's total agroclimatic variation and useful plant diversity as well as diversity of traditional knowledge on plant use. The process of site selection was made during reconnaissance survey.

Depending on the situation, 45 informants (11 from the highlands, 19 from the midlands around Chelelektu and 15 from midlands at the southern parts of the Wereda were chosen. These are 38 males and 7 females between the ages of 22 to 80, two third of whom have accessed modern education to various extent and all of them got married. The less number of female informants resulted due to high prevalence of gender inequity and hence the females were not willing to talk about their homegarden composition and plant use tradition, while the males were at the forefront and responsible of information delivery. From the 45, ten (six male and four female) key informants were selected based on prior information from development agents, local elders, authorities and religious leaders (Appendix I). Moreover, 90 houses with their homegardens were visited and 45 of them were selected from the three study sites along with their owners as informants (the above-mentioned 45 informants) and were preferentially used for data collection and analysis. The gardens were selected based on observation to include the diverse types of homegardens and hence purposive sampling methods were followed for data collection in general.

4.2.1.3 Ethnobotanical data collection methods

Various anthropological methods were employed as described in Martin (1995), Cotton (1996) and Vogl *et al.* (2004). The methods used for qualitative and quantitative data collection were semi-structured interviews, open-ended interviews, direct field observation, guided garden tour, group discussions, pair wise ranking and ICS ranking.

4.2.1.3.1 Semi-structured and open-ended interviews

Checklist of topics or open questions were scheduled (Appendix-II) and forwarded to the informants in a semi-structured way. The interview focused on basic questions concerning the informant's knowledge on uses of local plants, their management and conservation practices. Since the interview is semi-structured more questions were asked in addition to ones presented on appendix two to collect data such as sources of planting materials, seed preservation mechanisms, parts of planting materials used and so on. Moreover, the interview also helped to achieve the specific objectives and hence used to measure them.

Open-ended interview is a type of interview set held with informants following Cotton (1996), when the researcher feels that there exists information gap on data collected and hence further

relevant data collection through interviews is required. This method was used to collect some important data after field observation coming back to home with the owner of the garden and to include the participation of the other family members. The researcher assumed that it could help him to see if there is additional information, get consensus and measure to some extent reliability of formerly collected information in the field.

4.2.1.3.2 Direct field observation and guided garden walk

The direct field observation was used to observe the interaction between local people and plants on their surroundings. Hence, it is used to investigate traditional management and conservation practices on useful plants such as the polyculture management in homegardens and the agroforests. In addition; soil protection works, water harvesting and traditional hillside plowing practices were observed and recorded using this method.

Guided garden tour is a method that involves the combination of observations and interviews while walking in the garden. Hence, it involves recording the habitat, the habit and characteristics of plants known to be lost after specimens are dried such as flower, fruit and leaf color; leaf scent and any other important characteristic feature expected to be difficult to observe, know or guess from the dried specimen and the associated voucher specimen collection.

4.2.1.3.3 Group discussions and pair wise ranking

Group discussion is a method used to reach at consensus on the local categorization of resources, to ensure the consistency of local names and use values of plants and to consolidate and verify all the cultural information related to plant use patterns and conservation issues of the study area. Informal groups set during data collection in the field works set for coffee drinking or family members as well as formal groups were used for data collection on plant use and management on the study area.

Pair wise ranking was done to know the most important wild or semi-wild edible fruits, purposes of managing trees in the homegardens or crop fields and factors that bring about threats to garden plants. In the process, lists of wild fruits, purposes of managing trees and causes of threats frequent and importantly mentioned were presented in pairs using half data matrix to collect the preferences done by the key informants. Following this, the ranks given by each informant for a

species, a purpose or a threat factor were added and the same was done for all the lists. Finally, based on the sum of ranks mentioned; a species, a purpose or a threat factor with the highest score was given the first rank and the rest took the next ranks accordingly.

4.2.1.3.4 Index of cultural significance (ICS) ranking

According to Turner (1988), cultural significance of a plant taxon is defined as the importance of the role that it plays within a particular culture. Accordingly, the more widely or intensively a plant is used, the greater is its cultural significance. ICS were used to determine culturally the most important multipurpose plant species and food plants for the local people of the area. Three variables are combined to generate ICS data; namely *use quality*, *use intensity* and *use exclusivity*. The quality of uses were rated and assigned numerical values by the key informants from five to one; five for primary foods, four for secondary foods and primary materials, three for medicinal, ritual, mythological and recreational; two for other use types and one for mere recognition of a plant species. Use intensity were also rated and assigned values from five to one; five for very high use intensity, four for moderately high use intensity, three for medium use intensity, two for low use intensity and one for minimal use intensity. In addition, use exclusivity was also rated as two for preferred use exclusivity, one for an average and 0.05 for less.

The data were collected using table that lists Gedeo and/or scientific names of each species selected for comparison along with the three values of quality, intensity and exclusivity for each species at the left and the key informants at the top of the table. The right part of the table was used to put the sum of the products of the three values for each species and use types and to put the ranks of ICS values. Therefore the three values were multiplied together for each type of ‘‘use’’ for each species and the values of all the uses were added to get the final ICS value. Based on the final ICS value for a species, ranking was done giving the highest priority for a species with the highest value and the least for a species with the least value. The following formula could be used to compute ICS value: $ICS = \sum \{(Q \times I \times E)\ Ui\}$ where: Q is the quality, I is the intensity and E is the exclusivity of the i^{th} use, Ui.

4.2.1.3.5 Market survey

According to Martin (1995), conducting a survey of useful plants in a market place is similar to carrying out an ethnobotanical inventory in a community. Market is a place where plant use

culture and agricultural innovations as well as plant germplasm is shared among people from each and every corner of the area. Hence, they complement to ethnobotanical studies of a community and are important components of ethnobotanical data collecting procedures.

Simple market survey was done on Chelelektu and Fisehagenet urban centers, set on Mondays and Thursdays. Various garden products were observed being exchanged; including local food from ENSET plant called QOCHO, honey, various vegetables, fruits, spices and condiments as well as medicinal plants and others. Children and women were important participants responsible to play roles in the marketing of garden products and this was concluded because of the dominant population of these in the market places. Photographs were taken for important ones to the study and some of these were presented on result section as was found appropriate.

4.2.1.4 Botanical data collection

Following Martin (1995), Balick and Cox (1996), Cotton (1996) and Vogl *et al.* (2004), specimens of useful plants of homegardens of the area were collected using appropriate plant specimen collection methods. Specimens containing flowers and/or fruits were collected as far as possible. Simultaneously collection numbers, habitats, habits and all the information about the plant specimen considered important to the study were recorded on notebook. When the condition allows duplicate specimens were collected to minimize or avoid loss of data due to fungal infection, burning or physical damage. For locally rare species, care was taken not to remove a considerable amount of plant materials from the area.

Plant materials collected were pressed using plant presses and allowed to take a form of flat sheet and were put in a drier to facilitate drying using blotters and news papers to absorb the moisture associated with the specimens and corrugated card board that facilitates ventilation to remove moisture. Finally, the dried specimens were kept in the deep freezer to kill or remove fungi and/or insect pests (Abebe demissie, 2006), after which they are transferred to the national herbarium for identification. Identification was done using the Flora of Ethiopia/ and Eritrea books (volumes 1-8), and assistance from the technical stuff of the National Herbarium. After confirmatory check-up on the identification by a taxonomist, voucher specimens were mounted, labeled and incorporated in to herbarium collections.

The number of useful plant species in each garden was recorded to know the similarity and variation in homegarden agrobiodiversty along the three study sites found on highlands (Kurumi area) and midlands (Bunno and Hanchebi areas) of the study Wereda. This was done by listing all plant species the owner of a garden or a person responding to interviews or somebody walking with the researcher in guided garden tours mentioned useful to household members or the local people.

4.2.2 Methods for data analysis

Analytical tools for ethnobotanical data manipulation were used to process data collected through semi-structured interviews, guided garden tours and group discussions. These analytical methods are free listing of plant species with their local names and traditional uses, preference and direct matrix rankings as well as paired comparisons as described in Martin (1995) & Cotton (1996). Community ranking and ICS were calculated and analyzed for the most important food plants and multipurpose species for the local people of the area. Computer software such as Excel 2007, computer graphics and ARC-GIS as well as percentages were importantly used in data manipulation analysis and presentation techniques.

4.2.2.1 Free listing and preference ranking methods

Free listing was a method used to list all plant species mentioned by informants for certain use category. The list contains local names, scientific names, uses with the parts used and hence various use categories were identified. The informants were asked to mention locally useful plants in their surroundings using local names starting from their homegardens together with their uses and any other associated ethnobotanical knowledge. Informants encountered at the later times were asked the same thing and plant species and ethnobotanical knowledge the previous informant (s) did not mention were added to the list. This process continued to the end until all of the 45 informants' plant use knowledge was exhaustively collected.

Preference ranking was a method used to estimate the most important food crops, medicinal plants, forages and live fence species, plants used in firewood, construction and beehive making as well as trees used for shade. List of useful plants that were most frequently mentioned and found important by almost all informants for a particular use were presented to the key informants so that they order them using their personal preferences. A species was selected for a

particular rank based on frequency of informants' mention for that specific use category. A plant species with the highest sum of mentions received the first rank and others took the rest successive ranks accordingly.

4.2.2.2 Direct matrix and pairwise ranking methods

Direct matrix ranking is an advanced form of preference ranking through which an informant ranks a plant species considering multiple criteria of comparison. Under the current study, ten of the important multipurpose species were ranked based on ten use criteria by the key informants. List of useful plants that are most frequently mentioned and found important for the majority of informants as food crops and multipurpose species were presented to the key informants so that they rank them using their personal preferences. The informants were asked to assign the highest integer for use quality they considered the best, one for the least and zero for use not known for that particular plant species. The results from the ten key informants were added together to create a matrix that is representative of the community. Based on sum of the ranks by the ten informants, species with the highest aggregated score (sum of preferences) took the first rank while others took the rest successive ranks accordingly.

Pair wise ranking was a method used to know the most preferred wild/ semi-wild edible fruits, identify the most important purpose(s) of managing trees in homegardens or crop fields and the most important causes of threats on garden components in the area. The number of possible pair wise comparisons *[n (n-1)/2]* were computed for the three sorts of comparisons, *n* being the number of items ready for a particular comparison. The possible pair wise combinations for comparison were identified using a half data matrix of items arranged in the upper most rows and the left most columns. Items were arranged in sets of two randomly (using coded pieces of papers) and then pairs were randomized. Then the pairs were presented to the key informants so that they mention their preferences, while the responses were recorded using a data matrix simultaneously. Following this, the number of times an item is repeated by the key informants was added in any of the matrices and then all the matrices filled by informants were added for the same quantity similarly. Based on these values ranks were assigned to items on comparison. Accordingly, the highest rank were taken by wild edible plant species, tree managing purpose or cause of threat that received the highest sum while others took the rest successive ranks accordingly.

4.2.2.3 ICS ranking and Jaccard's coefficient of similarity

Following a system established by Turner (1988), the key informants assigned components of ICS values for important food crops and multipurpose woody species. The result will be used to estimate culturally the most significant plant species used as food and multipurpose woody species most important in the plant use culture of the local people in the area. In the case of multipurpose woody species, not only the degree of their cultural importance but also ICS ranks show plant species with the highest use pressure and hence locally scarce due to overexploitation. Moreover, the ICS ranks are important indicators of species of the highest conservation priority for the study area.

Following Magurran (1988), Jaccard's coefficient of similarity was computed to determine the similarity in species composition of the study area with other study areas done by other researchers. Results of research works done at Bonga, Wolaita, Sebeta, Eza and Arbaminch were used for comparison. In the process, the total number of species was counted and the common species between the current study area and each of the study areas under comparison were enumerated and recorded. Finally using the formula: $Sj = [c /(a + b - c)]$; where *Sj* is Jaccard's similarity coefficient, '*a'* is the number of species found in area-*A*, *'b'* for that are found in area-*B* and '*c'* for the number of species common to both areas, were computed following Magurran (1988). The resulting values multiplied by 100 provide the percent similarity in species composition between any one of the study areas and the current study area. The results were discussed to show the possible reasons of similarities or differences observed between the study area and any ones under comparison.

5. RESULTS AND DISCUSSION

5.1 Local categorization of environment and resources by traditional people

The current study has identified four types of landforms, three categories of soil types, two sorts of arable lands, five groups of vegetation types and two classes of seasons. In addition, it also identified more than 10 major use categories of useful plants in the area. The results are shown under each subcategory below.

5.1.1 Local categorization of landforms

There are four types of landforms identified or recognized by the local people in the area based on relative degree of elevation and relative hydrological content. These are TARBBA BONCHO, DAGALE BONCHO, WODE GIDDO and CHAFFA in Gedeo language.

TARBBA BONCHO refers to land of elevated altitude or hilly areas that are covered with afforestation development in some PAs or are stony with shrubs that are more disturbed and some grasses on other areas. Portions of these landforms are also cultivated because of shortage of arable land in the area.

DAGALE BONCHO refers to open fields with grasses and scattered large shade trees that is used as communal grazing land for the domestic animals (Figure 3). Such areas are used for cultivation of field crops like maize, TEFF, coffee and ENSET. This area is also used as community-gathering sites for social affairs; e.g. for GEDA traditional cultural, social and political organizational ceremony and SONGO or traditional meetings of Gedeo people. The later is local court that resolves disagreements on land holdings or assesses cases of murder, theft made on ones cattle, garden product or other properties in the locality, which helps to know the criminal or someone responsible for committing it.

Figure 3 Communal grazing lands (DAGALE) at Bunno PA-Photo by Solomon Tamrat (2010)

WODE GIDDO refers to river gorges that contain riverside trees and shrubs following the major and minor rivers in the area. Such type of landform is observed at the border between Kurumi and Daka Dima PAs following KONGA local water shade. Apart from the small water shades and rivers, river GELANA, JIRIMI and KONGA according to their local names are the major ones in the Wereda.

CHAFFA refers to wet lands mostly covered with cyperaceous herbs and eucalypt trees (*Eucalyptus camaldulensis* and *Eucalyptus globulus*) planted to manage the wet land area.

5.1.2 Local categories of soil types

Three categories of soil types were identified by local people of the area based on their color, suitability for cultivation and the degree of relative productivity as; XILLOKE BUTINA, DIMOKE BUTINA and BULULANJO BUTINA in Gedeo language.

XILLOKE BUTINA refers to black soil that is found at the midlands of the Wereda. It does not require so much treatments and it is naturally productive. The black color comes from the organic matter accumulated from fallen leaves that decompose below trees and cattle dung applied from cattle pens.

DIMOKE BUTINA refers to reddish soil that is found at the highland areas which is leached and hence requires further treatments for good yielding. The local people use various techniques to increase productivity of such soils by mulching, crop rotation and composting. Soil type around Daka Dima PA is the best representative of this local soil category and the prefix/suffix 'DIMA' refers to something reddish in Gedeo language and the local people have reported that it has something to do with the reddish color of soils observed in the PA.

BULULANJO BUTINA refers to grayish soil type found at some parts and hilly sides of the Wereda that is used to grow crops applying soil management techniques and to grow *Eucalyptus camaldulensis* and *Cupressus lusitanica* man made forest plantations.

5.1.3 Local categories of arable lands

Two types of arable lands have been recognized and reported by the local people of the area; based on relative distances from the living house, the degree of management by the household members and the relative fertility and productivity of soils. These are referred to as GATE UDUMA and FICHA in Gedeo language.

GATE UDUMA refers to arable land close to home that is managed by the family labor. It was mentioned by informants that GATE UDUMA is the local equivalent of the term homegarden. This land is more fertile and productive due to continuous application of animal manure and household wastes. The homegardens contain more diverse taxa of useful plants under smaller area of land as found by observation during guided garden tour.

FICHA refers to crop fields that are distant from home and contains lesser number of plant species but with more number of representatives of a species than that of garden crops. The soils of crop fields are less fertile than that of the homegardens as observed during garden visit and reported by the local people. The most important field crops of the area include *Hordeum vulgare, Zea mays, Triticum aestivum, Coffea arabica, Ensete ventricosum, Ipomoea batatas* and *Catha edulis.*

5.1.4 Local categories of vegetation types

The local people were found grouping vegetation types in their surroundings into five as BADICHA BOGA, HANJAXA KARA, GATE KARA, MANJI HUJEXA HAKE and DADATIXA HAKE; based on the size of prominent plants or vegetation components and the degree of management by human beings.

BADICHA BOGA refers to grazing areas used as communal grazing lands or as sources of grass for touching local houses or huts. In addition, forage grasses for cut and carry feeding is collected from such areas.

HANJAXA KARA refers to bush lands found on the surrounding wild areas dominated with shrubs and also contain an association of grasses. Such type of vegetation is used as forage sources for sheep and goats. Sometimes it is burned to make clear for crop farming.

GATE KARA refers to agroforestry vegetation types that contain multipurpose woody species, especially trees and perennial as well as annual crops managed for their economic, cultural and ecological services. These are the dominant types of vegetation in the area and human management and interference were found the highest of all for these systems.

MANJI HUJEXXA HAKE belongs to vegetation of manmade forests that are different from the agroforests in the dominance of a few species such as *Cupressus lusitanica* or *Eucalyptus camaldulensis* primarily used for timber products.

DADATIXXA HAKE belongs to natural forests that are dense with large trees, shrubs, grasses and stratified with lianas. Such types of vegetation is reported to be the least in cover in the area as a result of anthropogenic impacts of cutting forest trees for construction, firewood and other purposes.

5.1.5 Local categories of seasons

Farmers of the Wereda have reported two major and two transitional seasons known for cropping, harvesting and preparatory activities for these as HARSO, BONO, ADOLESSA and BA'ALESSA in local language. The categorization is based on the relative temperature and

moisture as well as the basic agricultural practices performed.

HARSO refers to the major rainy season used to plant perennial crops such as coffee ENSET and multipurpose tree species. Temperature is low where as relative humidity is the highest and the season is known for crop planting in the area. It lasts from mid of March to mid of May with about two months of rain fall period. This is equivalent to KIREMT in Amharic.

BONO refers to warm and moist season in which temperature and moisture gets an average value. The period is used to collect crops planted during the previous wet season. It lasts from mid of August to mid of December for four months. This could be referred to as MEHER in Amharic.

Another sorts of seasons used for doing transitional activities called ADOLESSA and BA'ALESSA were found among farmers of the Wereda. ADOLESSA means BELG in Amharic, which is a season with intermittent rain and dry periods. It lasts for three months from mid of May to mid of August and used for preparation to harvest farm and garden products planted on HARSO. In addition, it is used to plant annual crops in gardens and fields. On the other hand, a season of cracking sun and the least rainfall is called BA'ALESSA and it lasts from mid of December to mid of March. It is the driest season of all for about two months and used for preparation of farms for planting on the next wet season. This season is equivalent to the Amharic season called BEGA.

A better way to start ethnobotaical study is to know the local categorization of environment by traditional people (Martin, 1995). The range of categories of components of the environment identified revealed the depth of traditional knowledge about components of nature in their surroundings. Studies made by Tadesse Duressa (2003), Talemos Seta (2007), Ashenafi Ayenew (2009) and many other researchers had recorded local categories of landforms, soils and vegetation types. The findings of the current study substantiate findings of Cotton (1996) that the human tendency to categorize and organize their knowledge and experience is universal throughout the world.

5.2 Plant categories according to known and mentioned use values

In this study, totally 165 useful plant species in 135 genera and 65 families were recorded from homegardens and the immediate surroundings (Appendices III and IV). These include 74 herbs (45%), 51 tree (31%), 30 shrubs (18%) and 10 (6%) climbers (Figure 4). Among the total plant

species collected, 92 (56%) species were found cultivated (Appendix V) while the rest 73 (44%) were wild or semi-wild useful plants managed to various degrees in and around homegardens. About 54 of the 92 cultivated plant species were crops managed for food. Analysis of the habit of useful plants of Gedeo people in the area is in agreement with the results reported by Belachew Wassihun *et al.* (2003) for Arbaminch, Tadesse Duressa (2003) for Silti Zone and Habtamu Hailu (2008) for Sebeta area. However, it only resembles in the proportion of herbs and climbers to the results of Talemos Seta (2007) for Wolaita homegardens, herbs being the highest and climbers the least.

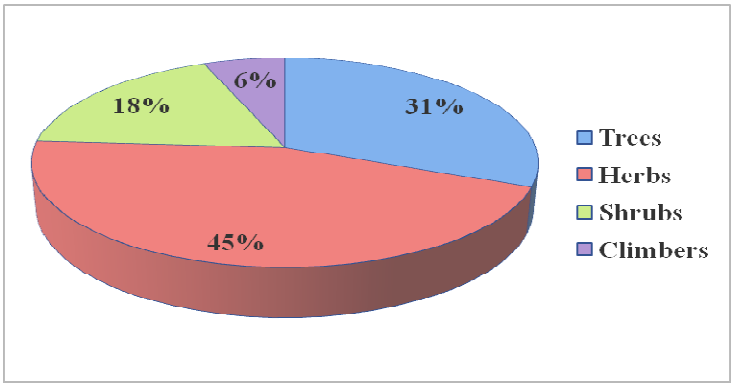


Figure 4-Growth forms of useful plants in percentages from homegardens and crop fields

Fabaceae was the most represented family with 16 species (10%) followed by Poaceae with 11 (7%) and Asteraceae with ten (6%). Following these Lamiaceae and Solanaceae with nine and eight species, respectively represent 5.4 and 4.8 percent of the total number of plant species encountered. Euphorbiaceae, Rosaceae and Rutaceae with six species each take a share of 3.6% while Meliaceae and Moraceae with four species received a share of 2.8% of the total number of plant species recorded (Figure 5, Appendix IV).

This result was found similar with the one reported by Zemede Asfaw (2002) and Tadesse Duressa (2003) in the fact that families that contribute more useful plant species for the local people in the area were included in the first five dominant plant families by these authors. Family Fabaceae, Poaceae and Asteraceae for the former author while Fabaceae, Poaceae, Asteraceae, Lamiaceae and Solanaceae for the latter were found to contribute more number of useful plant species. In addition, Habtamu Hailu (2008) reported that Fabaceae and Asteraceae are among the first three families that contribute more number of useful plant species to the local people of Sebeta area, while Belachew Wassihun *et al.* (2003) reported Fabaceae to be the first and

Solanaceae, Poaceae and Asteraceae under the top five irrespective of their rank order. The result indicated that the three most diverse plant families (Fabaceae, Poaceae and Asteraceae) presented by Flora of Ethiopia/ and Eritrea were the highest number of useful plant species contributors to the ethnobotanically important plants of Gedeo people in the area.

The useful plant species identified by the local people were placed into various use categories (Figure 6; Appendix III) as; 68 (41%) edible species, 32 (19%) medicinal plants, 40 (24%) used in material culture, 34 (21%) ornamentals, 29 (18%) forage species, 26 (16%) live fences, 19 (12%) used in firewoods. In this case, plant species with more than one use values have been recounted under each use category. The miscellaneous use category (37 species *ca* 22% of the total) includes those use values represented by less than ten species. These include fragrance, farming implements, beehive makers, forages for honey bees, soil fertilizers, stimulants and narcotic species, tooth brushes, traditional cleaning agents, stiffening material for mattress, craft making species, income sources (cash crops), fumigants, trees for wet land management and so on. About 77 species (46%) were recorded to have multiple uses while about 43 of these (26% of the total) have three or more number of use categories and these were grouped as multipurpose species.

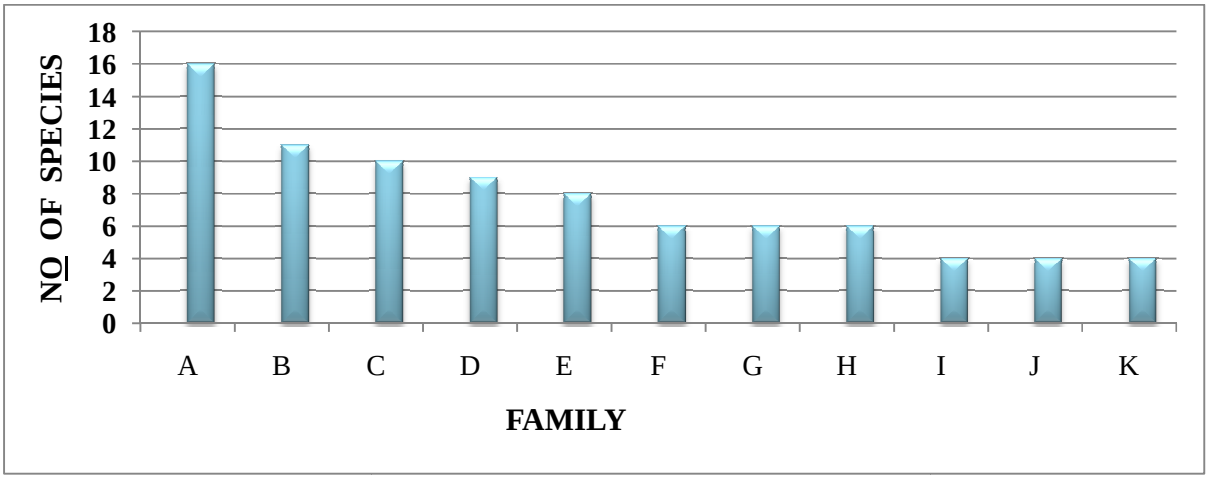


Figure 5 Plant species contribution of major plant families in the area

Note: **A**= Fabaceae **E**=Solanaceae **I**=Meliaceae
B= Poaceae **F**=Rutaceae **J**=Moraceae
C = Asteraceae **G**=Euphorbiaceae **K**=Myrtaceae
D=Lamiaceae **H**=Rosaceae .

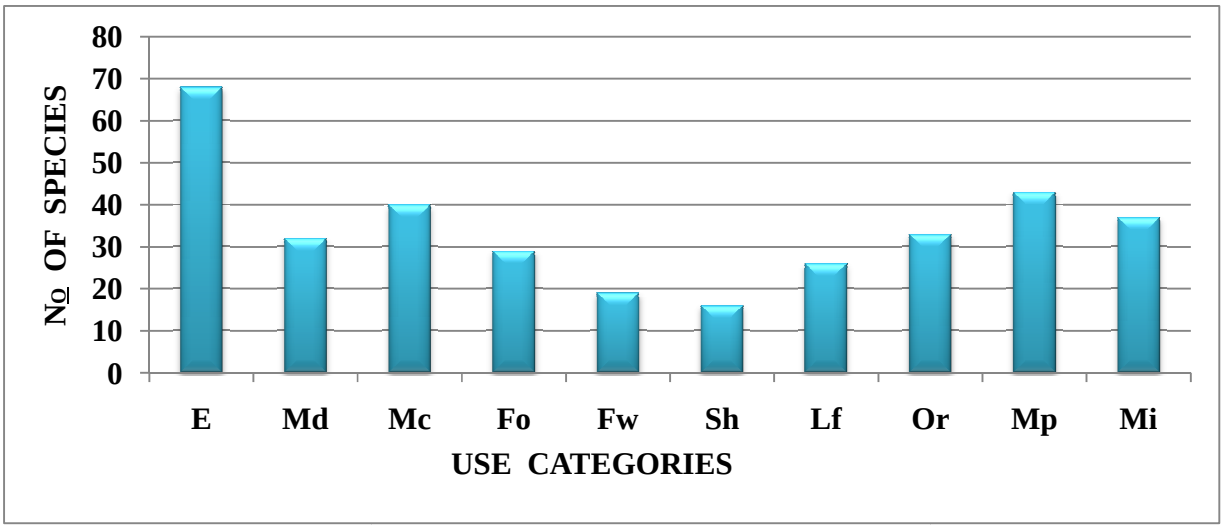


Figure 6 Plant species share of use categories identified during the study

Note-1: E=Edible, Md=Medicinal, Mc=Material culture, Or=Ornamental, Fo=Fodder, Lf=Live fence, Fw=Firewood, Sh=Shade, Mp=Multipurpose use, Mi=Miscellaneous use

Note-2: Plant species with more than one use aspect have been recounted under each category

The current study showed taxonomically diverse plant groups managed in and around homegardens and used by people of the study area. This implies the richness of traditional knowledge in the area on plant use. The result of getting more number of garden species for food agreed with that of Zemede Asfaw and Ayele Nigatu (1995), Belachew Wassihun *et al*. (2003), Tadesse Duressa (2003) and Talemos Seta (2007). This shows that the purpose of managing garden plants in the study area was primarily for food production, manifested by the proportion of food plants recorded. Moreover, the result on use of garden plants for diverse benefits agreed with the reports of Zemede Asfaw and Ayele Nigatu (1995), Hoft *et al.* (1999) and Ashenafi Ayenew (2009) in that indigenous people often have a wealth of knowledge and experience about local plant resource and rely on them for food, medicine, construction, firewood and so on.

5.2.1 Direct uses of homegarden components in the area

5.2.1.1 Edible plants obtained from homegardens

Plants used as food by the people of Kochere Wereda make up 68 species (41%) of the useful plants recorded from homegardens in the area, grouped in 56 genera and 32 families. (Appendix

VI). This result is in line with the findings about the Ghanaian, Javanese and Nepalese homegardens in that the purpose of managing tropical and temperate homegardens was for household subsistence in food and additional income generation (Bennett-Lartey *et al.,* 2002; Soemarowoto *et al.,* 2002; Shrestha *et al.,* 2002). Zemede Asfaw (1997a) reported about 126 (75% of the total record) plant species used as food from Ethiopian homegardens. Moreover, Belachew Wassihun *et al*. (2003) and Habtamu Hailu (2008) reported 48 and 37 edible plant species from homegardens of Arbaminch and Sebeta areas respectively. The current study has identified about 68 plant species used as food from homegarden areas in Kochere Wereda. The current study from this area showing such a high gene pool of food plants in homegardens weighting about 55% of the country's total implies the area to be an important center of diversity for food crops and it needs further attention and research.

Out of these 68 edible plants, 54 species (79% of the edibles or 33% of the total) are cultivated while the rest 14 are wild or semi-wild. Considering the parts of total edible plants collected, 25 (37% of total of edibles) species were fruits, while 16 (24%) were used for seeds, 12 (18%) for underground parts i.e. root tubers, corms or bulbs and 8 (12%) species for leaves where as the rest were used for their stems and leaves in association with other parts. Equally importantly, species with more than one parts used were recounted for their used parts under each categories.

Regarding plant families that contributed food in the area, Fabaceae & Solanaceae have provided seven species each in the first rank while Poaceae contributed six. Next, Rutaceae made five, followed by Brassicaceae and Alliaceae that shared three species each. However, the families Musaceae, Poaceae and Brassicaceae are the most important families providing food plants to Gedeo people of the area, based on ranking results (Table 2) and discussion with the local people. The greater share in species number of edible plants by family Fabaceae and Poaceae is attributed to the general scenario that they are taxonomically diverse and most ethnobotanically important in the top ten ranks that contributed more to the ethnobotanical database of our country, Ethiopia.

5.2.1.1.1 Cultivated food plants from homegardens

The cultivated food plants make up 54 species under 45 genera and 26 families (Appendix VII). Family Fabaceae with seven and Poaceae with six species are followed by Rutaceae and Solanaceae with five species each and family Brassicaceae and Alliaceae with three species each

as contributors of more number of food plants of cultivation in the area respectively. The results of Zemede Asfaw and Ayele Nigatu (1995) and that of Talemos Seta (2007) are in line with the current findings; i.e. five plant families contributing more number of species of food plants were included in the first five important plant families used as sources of food plant for Kochere area, whatever their rank order may be.

With regard to the horticultural categories of cultivated plants, also inclusion of some species under more than one horticultural class being considered and recounted, 14 species are fruits while 15 are vegetables, 12 are root and tuber crops of which root tubers, corms and/or bulbs are edible. Moreover, ten as spices and condiments, eight as fragrant and fumigants, seven medicinal plants, six pulses and five cereals were identified (Appendix VIII). This is similar to the results of Zemede Asfaw and Ayele Nigatu (1995), Zemede Asfaw (2002), Belachew Wassihun *et al.* (2003) and Habtamu Hailu (2008) in the fact that fruits and vegetables are the major horticultural categories managed in homedardens being the top two in terms of number of species recorded. Similar results were reported for the Guatemalan and Nepalese homegardens in the fact that fruits and vegetables are the most important components of garden edible plants (Leiva *et al.*, 2002; Shirestha *et al.*, 2002). The possible reason for this might be the higher market values for fruits and the household nutritional requirements for vegetables in addition.

Preference ranking and ranking using index of cultural significance (ICS) were done for important food plants frequently mentioned, the result (Table 2) of which showed *Ensete ventricosum, Zea mays* and *Brassica carinata* were the most culturally important food plant species for Gedeo people in the area. These results are also supported by findings of homegardens of southern Ethiopia by Tesfaye Abebe (2005) in that coffee, ENSET, maize and *Brassica* species were found at the top of frequency of on farm occurrence of crop species for Sidama homegardens in south Ethiopia.

Table 2 Preference and ICS ranking on important food plants

Scientific name	*Preference ranking*		*ICS ranking*	
	Total	***Rank***	***Total***	***Rank***
Annona squamosa	44	**10**	70	**10**
Brassica carinata	85	**3**	107	**3**
Dioscorea praehensilis	80	**4**	95	**4**
Ensete ventricosum	119	**1**	145	**1**
Eragrostis tef	31	**12**	35	**12**
Hordeum vulgare	55	**6**	81	**6**
Ipomoea batatas	72	**5**	90	**5**
Musa x paradisiaca	48	**9**	73	**9**
Persea americana	50	**8**	73	**8**
Phaseolus lunatus	51	**7**	76	**7**
Triticum aestivum	35	**11**	66	**11**
Zea mays	109	**2**	125	**2**

5.2.1.1.2 Non-cultivated food plants from homegardens

Among the recorded edible plants, 14 species are non-cultivated, i.e. wild or semi-wild either tolerated, encouraged or managed to grow in and around homegardens as shade tree, live fence or else. These belong to ten families and 12 genera. Solanaceae leads the group with three species while Amaranthaceae and Myrtaceae each contribute two species and the rest families are represented by a species each. With regard to growth forms, seven are herbaceous, five are trees and two are shrubs. Fruit is the most used part represented with ten species followed with three used for their leaves and two for seeds, *Solanum nigrum* being used for its leaves and fruits (Appendix IX). The presence of wild or semi-wild edibles in homegardens were also reported for the Ghanaian and Nepalese homegarens in that gardens are considered as spaces for introduction, domestication and experimentation of wild or exotic plant species of importance to the local people (Bennett-Lartey *et al.*, 2002; Leiva *et al.*, 2002; Sheresta *et al.*, 2002).

These results showed that cultivated food plants are the major components of foods of the Gedeo people; manifested by the lesser number of wild or semi-wild edibles, of which more number of cultivated fruits and vegetable species are maintained. This agrees with the use of fruits and vegetables to complement the vitamin and mineral shortage and associated disorders on use of

ENSET products and other crops like cereals and root tubers in the area as staple foods, also reported by Belachew Wassihun *et al.* (2003). In addition, fruits like *Musa x paradisiaca*, *Persea americana*, *Annona squamosa* and *Citrus aurantifolia* were found to supplement the household economy providing additional income being sold at local markets.

Moreover, the result that exhibited lesser number of non-cultivated (wild or semi-wild) food plants might also be attributed to the decline or loss of wild edible plant use culture at recent times. In addition, it might also dipict lesser demand to use wild or semi-wild foods in the area by the young generation, with a mentioned cause that a number of wild edible plants their ancestors had used are nowadays no more used as food in the culture. The other possible reason for this is that a family that depends on wild foods is considered as poor and morally weak to cultivate and feed the family members in the culture. Zemede Asfaw and Mesfin Tadesse (2001) reported similar cases towards attitudes of using wild or semi-wild foods in Ethiopia. Based on priority ranking done on important wild or semi-wild edible fruits (Table 3), *Syzygium guineense* and *Ficus sycomorus* took the highest priority in the area.

Table 3 Paired comparison on wild or semi-wild edible fruit plants

(***I_1 - I_{10}*** = Informants)

Scientific name	***Preferences***											
	I_1	***I_2***	***I_3***	***I_4***	***I_5***	***I_6***	***I_7***	***I_8***	***I_9***	***I_{10}***	***Total***	***Rank***
Cordia africana	5	3	2	4	3	2	1	1	1	1	**23**	**6**
Ficus sycomorus	6	5	5	3	5	5	5	4	4	5	**47**	**2**
Morus alba	4	1	3	5	1	4	2	5	5	4	**32**	**3**
Peponium vogelii	2	2	1	2	4	1	4	3	3	3	**25**	**5**
Physalis peruvianna	3	4	4	1	2	3	3	2	2	2	**26**	**4**
Syzygium guineense	1	6	6	6	6	6	6	6	6	6	**55**	**1**

5.2.1.2 Medicinal plants from homegardens

Among the plant species encountered in this study, 32 (19%) are medicinal from homegardens and the immediate surroundings under 32 genera and 23 families (Appendix X). Lamiaceae and Fabaceae contributed four and three species while Myrsinaceae, Rosaceae, Rutaceae and Asteraceae contributed two species each as providers of more number of species of garden medicines. Considering their growth forms ten trees, 12 herbs, nine shrubs and one climber

species were recorded. With regard to parts used, 19 (59%) out of the 32 species for leaves and other parts together with leaves, seven (22%) for fruits, five for roots, corms or bulbs, four for stem phloem and three for their seeds, vines and inflorescences. During data analysis, some species were recounted for more than one category of parts used because of overlaps. The result of finding 19% of homegarden plants as medicinal species is contrasted with the findings for the Vietnamese homegarden in that, the later is dominated with medicinal plants followed by vegetables and fruit species in rank order (Trinh *et al.*, 2002). Not far from this, the Cuban homegardens were found to contain the highest proportion of medicinal plants next to ornamental species.

The ten commonly used and repeatedly mentioned medicinal plants were presented to key informants so that they rank them based on their personal preference. The results (Table 4) showed that *Artemisia abyssinica, Albizia gummifera* and *Allium sativum* were found the most important medicinal plants ranking from first to third in the culture of the local people. The major diseases in the area are presented on appendices section listing the top ten morbidity cases recorded at Chelelektu health center, for the year 2009 (Appendix XI; CHC, 2009). Accordingly pneumonia, acquit fever illness and urinary tract infections were found the first three and the most prevalent cases. Traditional herbal medicine practitioners were found to treat these infections locally using plant preparations from homegardens and the immediate surroundings (Appendix XII).

Among the 32 medicinal plant species recorded from homegardens, 29 (91%) were used to treat human ailment and only two (*Calpurnia aurea* and *Croton macrostachyus*) were used for treating livestock ailments (Appendix XII). This exhibited that knowledge of medicinal plants used to treat human ailments is wider than that of traditional veterinary medicines in the area. This could be because of the cultural dependence of the local people on plant materials for their subsistence as food or sources of income and inputs for material culture, than on animals. Tesfaye Awas *et al.* (1997) reported a similar result about dependence of local people on plants than on animals for their livelihoods. This have indicated that the animal rearing part of agriculture is not much more developed in the area and none or only a few cattle, sheep and/ or goats with or without one donkey, horse or mule and a few chickens was found per household at the homegardens encountered.

On the contrary, from personal observation and asking local people, the area was found to be important site for beef consumption; however, the oxen for beef were obtained from other areas and a little cattle development was observed. SLUF (2006) reported similar results for Wonago Wereda of Gedeo Zone in that the significance of Gedeo's agroforestry systems for livestock production is not comparable to the other basic benefits gained. The other possible reason for the lesser traditional ethnoveterinary knowledge observed is that, the area exhibits no lowland agroclimatic conditions, and cool weather condition prevails for not less than eight months of a year that is not favorable for development of important disease causing organisms of veterinary importance. Apart from these, plants of ethnoveternary values might be collected from the wild areas in the vicinity and the local people might not get obliged to manage them in their homegardens that could also be associated to possibly lesser frequency of veterinary diseases.

About 21 (66%) of the medicinal plant species recorded were found to be wild origin while the rest were cultivated plants in homegardens for other purposes. Common medicinal plant species (*Rosmarinus officinalis, Ruta chalepensis, Artemisia abyssinica, Cymbopogon citratus, Eucalyptus globulus, Allium sativum* and *Citrus aurantifolia*) were cultivated for their medicinal use around homes and are used as primary or secondary medicinal plants.

The closeness of percentage proportion of growth forms of medicinal plants to one another except for climbers (a single species), is contrary to the investigations on medicinal plants found to be dominated by herbs (Belachew Wassihun *et al.,* 2003 and Habtamu Hailu, 2008). This could be associated to the characteristic vegetation type of the area i.e. dominated by trees and shrubs of the agroforegtry system, while study areas of these authors were found to be woodlands and wooded savannas respectively. The most commonly used plant parts for herbal perpetrations in the area came from leaves of garden plants. Belachew Wassihun *et al*. (2003), Mirutse Giday *et al*. (2003) as well as Mirutse Giday and Gobena Ameni (2003) reported large proportion of herbal preparations from leaves.

Table 4 Preference ranking on important medicinal plants from homegardens

(I_1 - I_{10} = Informants)

Scientific name	Preferences										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Albizia gummifera	1	4	3	10	4	4	6	2	5	3	**79**	**2**
Allium sativum	10	10	10	5	10	3	10	9	1	10	**78**	**3**
Artemisia abyssinica	6	7	9	7	9	8	9	8	10	9	**82**	**1**
Cymbopogon citratus	7	6	6	1	6	7	8	7	3	7	**58**	**6**
Eucalyptus globulus	5	3	4	6	5	4	4	3	8	4	**46**	**8**
Fagaropsis angolensis	3	5	2	9	7	10	2	4	4	5	**51**	**7**
Ocimum lamiifolium	4	1	5	4	3	2	3	5	2	2	**31**	**9**
Rosmarinus officinalis	8	2	8	8	2	9	5	6	7	8	**63**	**5**
Ruta chalepensis	9	9	7	2	8	5	3	10	9	6	**68**	**4**
Vernonia amygdalina	2	8	1	3	1	1	1	1	6	1	**25**	**10**

5.2.1.3 Plants used in material culture from homegardens

The current study had identified about 40 (24%) plant species used in material culture of Gedeo people under 36 genera and 20 families from homegardens (Appendix XIII). Out of these, 36 species are used in construction of houses, fences, beehives and furniture. Some of these plants have more than one uses as material culture to the local people. The habit of these plants is 28 trees, seven herbs, three shrubs, and two climbers. The majority of them are of wild or semi-wild in origin (28 species or *ca* 70%). These are managed in homegardens in various forms, i.e. left there during clearing of the former forest, grown spontaneously and encouraged to grow or transplanted from the local wild areas as described in Zemede Asfaw (2001a); while the cultivated species found were 12. Stems are the major plant parts used in material culture (31 species), while leaf sheath, leaves and straws took the next consecutive ranks.

The key informants were made to rank important plant species for construction of houses or fences and for beehive making purposes, separately. The result (Table 5) indicated that *Eucalyptus camaldulensis, Syzygium guineense* and *Cordia africana* were the top three for construction of houses fences and the likes. This shows that Gedeo people in the area make materials for their day-to-day uses or make houses and others from plants found in their surroundings. Furniture are carved from selected plant species like *Cordia africana, Hagenia*

abyssinica, *Cupressus lusitanica* and *Syzygium guineense* since it is proved with time that these species provide good quality timber. *Phoenix reclinata*, *Arundo donax* and *Arundinaria alpina* are used to make various types of materials such as basketry, dining table and shelves for use in local shops. Wild plants overweigh the composition of plants used for material culture while trees are the major growth forms and stems are the most used parts. This is in agreement with the result that construction as the second ranking purpose of managing trees and shrubs in homegardens and crop fields in the area.

In addition, bee keeping was found as an important practice among farmers exhibited by beehives managed and put on trees in the homegardens and crop fields; that is also supported by Tadesse Kippie (1994). The diverse flowering plants in the agroforestry and homegarden systems were found an important forage for honeybees in the area (Appendix III, SLUF, 2006). Therefore, farmers were found to select plants for beehive construction and hence get more honey. *Cordia africana*, *Croton macrostachyus* and *Euphorbia ampliphylla* took the highest rank from first to third for preparation of beehives, up on the results of preference rankings (Table 6).

Table 5 Preference ranking on important plants used in construction

(***I*** $_1$ **-** ***I*** $_{10}$ = Informants)

Scientific name	***preferences***										***Total***	***Rank***
	I $_1$	***I*** $_2$	***I*** $_3$	***I*** $_4$	***I*** $_5$	***I*** $_6$	***I*** $_7$	***I*** $_8$	***I*** $_9$	***I*** $_{10}$		
Albizia gummifera	11	10	11	10	12	4	5	6	10	9	**78**	**4**
Calpurnia aurea	5	9	5	9	4	1	3	3	5	5	**49**	**9**
Cordia africana	9	12	8	6	10	9	10	5	9	10	**88**	**3**
Croton macrostachyus	4	7	7	4	2	2	2	1	1	2	**33**	**11**
Cupressus lusitanica	8	4	4	5	8	5	9	7	2	7	**59**	**6**
Eucalyptus camaldulensis	12	11	9	11	11	11	8	9	12	11	**105**	**1**
Eucalyptus globulus	3	3	2	2	6	10	7	10	11	2	**56**	**7**
Fagaropsis angolensis	10	8	6	8	7	6	4	11	6	8	**74**	**5**
Millettia ferruginea	7	5	10	7	5	8	1	2	3	6	**54**	**8**
Syzygium guineense	6	6	12	12	9	12	12	12	7	12	**100**	**2**

Table 6 Preference ranking on plants used in preparation of beehives

(I_1 - I_{10} = Informants)

Scientific name	Preferences										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Acacia abyssinica	8	8	4	1	4	1	1	1	2	3	**33**	**8**
Arundinaria alpina	2	2	1	2	1	4	4	6	1	1	**23**	**10**
Cordia africana	10	10	5	10	10	5	10	7	10	10	**82**	**1**
Croton macrostachus	9	9	3	9	6	10	7	4	4	6	**67**	**2**
Ensete ventricosum	5	4	2	3	2	3	2	3	3	2	**29**	**9**
kErythrina brucei	3	3	6	7	6	6	6	10	9	9	**64**	**4**
Euphorbia ampliphylla	6	7	9	4	3	8	5	8	8	8	**66**	**3**
Ficus sur	7	5	10	8	7	2	2	2	7	4	**54**	**5**
Ficus sycomorus	4	6	7	5	8	7	9	5	6	5	**62**	**6**
Trichilia emetica	1	1	8	6	9	9	8	9	5	7	**63**	**5**

5.2.1.4 Fodder plants from homegardens and the immediate surrounding

The contribution of currently collected useful plants as fodder is about 29 species under 27 genera and 13 families of homegarden species among which 19 are wild or semi-wild origin (Appendix XIV). Considering their growth forms, 14 species are herbs while ten are trees and five are shrubs. The key informants were asked to rank important forage plants and the result (Table 7) indicated that *Vernonia amygdalina*, *Dombeya torrida* and *Millettia ferruginea* are of the highest rank rating first to third in the culture. The reports of Sustainable Land Use Forum also mentioned *Millettia ferruginea* and *Vernonia amygdalina* as important fodder plants from the agroforests and homegardens of Wonago Wereda of Gedeo Zone, collected for stall-feeding (SLUF, 2006).

Table 7 Preference ranking on forage plants from garden areas

(I_1 - I_{10} = Informants)

Scientific name	preferences										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Acacia abyssinica	3	4	3	5	2	1	2	2	3	2	**27**	**12**
Arundinaria alpina	1	1	1	1	1	11	12	8	1	6	**42**	**11**
Catha edulis	4	8	9	4	5	5	8	9	5	8	**65**	**6**
Celtis africana	2	2	2	12	10	10	2	6	8	1	**55**	**8**
Dombeya torrida	12	11	6	11	11	9	9	7	7	10	**93**	**2**
Ficus thonningii	6	12	7	8	7	2	6	3	12	5	**68**	**5**
Millettia ferruginea	7	10	11	7	12	12	11	12	6	12	**80**	**3**
Morus alba	9	3	4	3	3	7	3	4	4	4	**44**	**10**
Pennisetum violaceum	5	7	12	10	6	4	5	10	10	9	**78**	**4**
Persea americana	11	6	8	2	9	6	7	1	2	7	**59**	**7**
Sesbania sesban	10	5	5	6	4	3	1	5	9	3	**51**	**9**
Vernonia amygdalina	8	9	10	9	8	8	10	11	11	11	**95**	**1**

In addition, a significant amount of crop residues of *Zea mays*, *Hordeum vulgare*, *Eragrostis tef*, *Sorghum bicolor* and *Triticum aestivum* were used as fodder in the locality. Communal grazing land is observed on some PAs e.g. at Bunno, even though overgrazed and plots of land closed for grazing was not found. This might be one of the indications of shortage of land and the intensive utilization of available land resource for farming. Livestock is not released free to graze in the crop fields as the case of cereal farming systems in northern Ethiopia (Ashenafi Ayenew, 2009). This is because farms of Gedeos' are occupied with ENSET & coffee because of which they are well managed and intercropped with annual and perennial crops (Tadesse Kippie, 1994). Therefore, cattle feeding were found to be through controlled grazing and by use of cut and carry systems. SLUF (2006) and Alemtsehay Teka (2008) reported similar results for Wonago and Eza Weredas of Gedeo and Gurage Zones respectively about the mode of cattle feeding among the homegardens of their respective indigenous people.

5.2.1.5 Plants used as firewood

The important plants used as firewood to the local people in the area came from 19 species under 15 genera and 11 families of homegardens and the immediate surroundings (Appendix XV). Most of these plant species are obtained at wild or semi-wild state (14 species) while five are purposely planted in gardens. With regard to their habit, almost all (17 species) are trees while shrubs and herbs are represented with a single species each. The key informants ranked culturally the most important firewood species and the result (Table 7) showed that *Millettia ferruginea*, *Albizia gummifera* and *Acacia abyssinica* took the highest priority of first to third respectively.

Table 8 Preference ranking on plants used as fuel wood

(***I*** $_{1}$ **- *I*** $_{10}$ = Informants)

Scientific name	***Preferences***										***Total***	***Rank***
	I $_{1}$	***I*** $_{2}$	***I*** $_{3}$	***I*** $_{4}$	***I*** $_{5}$	***I*** $_{6}$	***I*** $_{7}$	***I*** $_{8}$	***I*** $_{9}$	***I*** $_{10}$		
Acacia abyssinica	10	10	8	8	7	1	1	1	8	9	**63**	**3**
Albizia gummifera	8	6	10	4	9	5	7	7	6	8	**70**	**2**
Calpurnia aurea	3	1	2	2	2	3	4	2	1	5	**25**	**10**
Cordia africana	4	2	6	6	3	8	3	4	3	1	**40**	**9**
Croton macrostachyus	2	8	4	7	1	2	5	5	4	6	**44**	**8**
Eucalyptus camaldulensis	7	7	3	3	9	6	6	8	2	4	**51**	**6**
Millettia ferruginea	9	9	9	10	10	9	10	9	10	10	**95**	**1**
Prunus africana	1	4	5	5	6	7	9	10	9	2	**58**	**4**
Syzygium guineense	6	3	7	1	4	10	8	6	7	3	**55**	**5**
Vernonia amygdalina	5	5	1	9	8	4	2	3	5	7	**49**	**7**

The local people were found to be dependent on firewood (Tadesse Kippie, 2002; SLUF, 2006) or other traditional fuel sources of energy like crop residues. Almost all of the plant species used as firewood was trees (16 species) preferred for the durable wood they provide than shrubs. Even though charcoal use is less in the area, artisans preferred trees like *Combretum molle* & *Acacia abyssinica* to make metallic parts of farm implements for their high & durable energy and low wood ash formation. Since the area is rich in agroforestry, the local people prefer a tree with better potential from homegardens for firewood. As the results of preference ranking showed (Table 9), *Millettia ferruginea, Albizia gummifera* and *Acacia abyssinica* were found the top

three ranking due to their fast growth, high flammability, more energy production and low wood ash formation. Tadesse Kippie (2002) similarly proposed these tree species as important firewood sources. Moreover, Fernandes *et al.* (1985) reported a considerable amount of homegarden plants used as immediate fuel sources in people living at Mount Kilimanjaro.

5.2.2 Indirect uses of homegarden plants

Homegarden plants are managed not only for their direct uses but also grown to get indirect benefits; e.g. used as shade trees, soil fertilizers, live fences, ornamentals, forage for honeybees and as means of gaining high social status by traditional families.

5.2.2.1 Shade plants and soil fertilizing species

Plants used in shading for coffee, ENSET and other garden components as well as for recreational and social gathering services as also reported by Tadesse Kippie (1994), came from 16 species under 13 genera and ten families of garden plants (Appendix XVI). All of these are wild or semi-wild in origin and they are trees considering their growth forms. The key informants were asked to rank them (Table 9) based on their suitability for the soil and the lower plants grown below their story. Accordingly, *Millettia ferruginea, Cordia africana* and *Albizia gummifera* were found to score first to third ranks in the culture. This result agrees with the report of SLUF in the fact that *Millettia ferruginea* was found an important shade and soil fertilizer species for Gedeo people (SLUF, 2006).

This showed that trees are being managed not only for their wood sources, but also for use when they are on site as shades for garden plants or for societal gatherings in addition to use as edible fruits and resting sites for farmers in the farm and at the gate of homes. According to Tadesse Kippie (2002), Zemede Asfaw (2002) and SLUF (2006), this is the non-destructive use of plants where no part of the plant is removed from the mother tree and hence it needs further encouragement and intensification.

In addition, leguminous trees and shrubs as well as some other species that are locally proven to improve soil moisture and fertility by farmers, were found managed in coffee and ENSET gardens. These groups include species of *Acacia, Millettia, Albizia, Ficus, Vernonia* and many others. SLUF (2006) reported similar cases for management of the homegarden agroforestry

systems of Gedeo people at Wonago Wereda in application of agroforestry trees for soil fertility management.

Table 9 Preference ranking on plants used for their shade

(I_1 - I_{10} = Informants)

Scientific name	Preferences										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Acacia abyssinica	7	7	5	7	7	2	2	2	3	6	**65**	**4**
Acacia senegal	6	6	4	6	6	1	1	2	5	3	**40**	**7**
Albizia gummifera	9	8	9	10	9	8	8	8	8	8	**85**	**3**
Cordia africana	10	9	8	8	10	7	9	9	10	9	**82**	**2**
Croton macrostachyus	2	2	6	2	3	5	5	6	4	4	**39**	**8**
Ekbergia capensis	3	1	2	3	1	4	6	5	2	2	**29**	**9**
Fagaropsis angolensis	1	4	1	1	2	3	3	1	1	1	**18**	**10**
Ficus sycomorus	5	5	10	4	5	9	7	7	7	6	**65**	**4**
Ficus thonningii	4	3	3	5	4	6	4	4	3	5	**41**	**6**
Millettia ferruginea	8	10	7	9	8	10	10	10	9	10	**91**	**1**

5.2.2.2 Live fences and ornamental plants of homegardens

Plants used in delimiting ones ownership of land to protect homegardens from intrusion by domestic and/ or wild animals and to restrict flow of genetic materials by theft are 26 species. These make 16% of the total under 23 genera and 14 families (Appendix XVII). About one third (ten) of these are managed for one or more use aspects other than as live fences and are cultivated while others are wild or semi-wild plants managed to grow at the periphery of homegardens. The growth forms of these plants include 12 shrubs, six trees, four herbs and four climber species. The key informants were asked and have made preference rankings on ten most important species used as live fence in the area and the results (Table 10) showed that *Vernonia amygdalina*, *Cupressus lusitanica* and *Morus alba* as the highest priority ranking first to third for the local people. Species of *Cupressus lusitanica* was used as live fence in the urban areas and still preferable in the rural areas as well.

The results showed that garden fencing is an important management practice observed in the area to protect homegarden components. As Zemede Asfaw (1997) reported, one or the other part of gardens might be free of fencing. Accordingly, the rare part of back yards that continues freely to crop fields in the study area was found free of fences sometimes. The plant materials on live fences are of multipurpose importance as forage species, medicinal plants, fruits, pulses as well as ornamental species and shade trees. The selected live fence plants most of the time are either shrubs with profuse stem growth and climber plants that stratify the fence prohibiting free sight and access to the garden. Zemede Asfaw (1997) and SLUF (2006) respectively reported similar cases about homehardens of Ethiopia in general and the indigenous agroforestry systems of Wonago area in particular.

Moreover, the local people are habited to manage ornamental plants in and around their gardens and appreciate their beauty at indoors and farms. About 34 plant species were found managed for their primary or secondary ornamental values (Appendix XVIII). These plants belong to 28 genera and 22 families of plants collected. Ornamental plants also provide uses such as live fences, shade trees and others and most of them are found managed at the front yards of homegardens, while others such as ENSET varieties with reddish foliages and parts are used as ornamentals in the backyards or ENSET fields. In rank order of the number of species they contain, the growth forms of ornamental plants are herbs, shrubs, trees and climbers. Considering their parts that the local people preferred them as ornamentals are by most their flowers or inflorescences and their general attractive appearance of aboveground parts. Some of these were deliberately planted while others are managed around fences; front yards or in the farms as wild or semi-wild species left on site during forest clearing and garden establishment.

Table 10 Preference ranking on plants used as live fence

(I_1 - I_{10} = Informants)

Scientific name	preferences										Total	Rank
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}		
Cupressus lusitanica	10	5	10	5	5	8	9	6	9	9	**76**	**2**
Erythrina brucei	2	1	2	2	3	6	3	2	1	1	**23**	**10**
Euphorbia ampliphylla	5	3	4	6	7	1	8	9	10	7	**60**	**5**
Ficus thonningii	1	2	1	8	10	2	1	1	3	2	**31**	**9**
Justicia schimperiana	7	6	3	7	4	7	10	10	5	6	**65**	**4**
Morus alba	8	4	5	10	8	9	7	8	7	8	**74**	**3**
Passiflora edulis	9	7	8	1	2	4	6	3	2	4	**46**	**8**
Phaseolus lunatus	4	10	7	3	1	5	5	4	6	5	**50**	**6**
Sesbania sesban	3	8	7	4	6	3	2	7	4	3	**47**	**7**
Vernoina amygdalina	6	9	9	9	9	10	4	5	8	10	**79**	**1**

5.2.2.3 Plants used in apiculture (honeybee development) practices

Honeybee development is an important practice among farmers of the area manifested by beehives managed and put on trees in the homegardens and crop fields. Honey is sold at local markets and is used in preparation of traditional drinks by the local people. These observations are also in line with that of Tadesse Kippie (1994). The diverse flowering plants in the agroforestry and homegarden systems were found to be important forages for honeybees. Flowers of *Coffea arabica*, *Acacia abyssinica*, *Cordia africana*, *Mangifera indica*, *Pesea americana* and *Syzygium guineense* were reported as some of the important bee forage plant in the area.

Since apiculture (honeybee development) is environment friendly development practice observed, it demands further intensification and encouragement because it keeps trees and other flowering plants protected in the farm and crop fields for sustainable use. Tadesse Kippie (2002) and SLUF (2006) reported similar results on management and use of honeybees and their products by Gedeo people discussing about their land use systems. Fernandes *et al.* (1985) also reported similar results on the agroforestry management of the Chagga homegardens about management and harvesting of honeybees and honeybee products.

5.2.3 Multipurpose plant species

About 77 plant species were recorded to have multiple uses in the area among which 43 are recorded as multipurpose, having three or more number of use categories mentioned (Appendix XIX). Around 28 out of these 43 are wild or semi-wild in origin while 15 species are cultivated in and around homegardens. Considering their growth forms, 28 species are trees while eight are herbs, six are shrubs and one is a climber. Community ranking (data matrix ranking) and ICS ranking was done by the key informants on ten of the most frequently mentioned multipurpose woody species and the results (Table 11) showed that *Syzygium guineense, Cordia africana* and *Albizia gummifera* are the most culturally important multipurpose woody species from homegardens in the area. Fabaceae and Poaceae contributed more number of plant species for multipurpose use (seven species each) while Moraceae and Myrtaceae took the next ranks, contributing three species each.

This result showed that Gedeo farmers have the habit of growing plants in their homegardens and crop fields with more than one beneficial aspect, i.e. multipurpose species (also reported in Tadesse Kippie, 2002). They never tolerate or encourage wild plants in and around their gardens if the cost of maintaining these plants does not overtake their provisions. This was manifested by the higher number of plants species with multipurpose use in gardens; i.e. 43 species (26%) from the total number of plants recorded and this compensates the cost of management for the farmer. Research done at Gedeo zone on land use systems of Gedeo people also revealed the traditions of managing plants with multipurpose benefits by farmers (Tadesse Kippie, 2002; SLUF, 2006). Similarly homegardens of Northern Tanzania (Fernandes *et al.,* 1985), Nepal (Shrestha *et al.*, 2002), Guatemala (Leiva *et al.*, 2002) and Ghana (Bennett-Lartey *et al.*, 2002) were found multipurpose providing divers benefits to households managing them.

Table 11 Preference and ICS ranking on use of multipurpose woody species

Scientific name	*Preference*		*ICS*	
	Value	***Rank***	***Value***	***Rank***
Acacia abyssinica	220	**10**	100	**9**
Albizia gummifera	480	**3**	201	**4**
Cordia africana	510	**2**	382	**2**
Croton macrostachyus	260	**9**	75	**10**
Eucalyptus camaldulensis	370	**6**	372	**3**
Eucalyptus globulus	320	**7**	148	**7**
Ficus sycomorus	310	**8**	97	**8**
Millettia ferruginea	460	**4**	182	**5**
Syzygium guineense	660	**1**	392	**1**
Vernonia amygdalina	400	**5**	167	**6**

5.2.4 Plants of other miscellaneous uses

About 37 plant species under 33 genera and 25 families were recorded as useful in various ways, the criteria used is the number of species per use type recorded, i.e. less than ten (Appendix XX). The miscellaneously used plants are 22 wild or semi-wild species and 15 cultivated ones. Considering their growth forms 20 trees, nine shrubs, seven herbs and one climber species were included. Use aspects like bee hive preparation, charcoal making, soil fertilization, use as fragrant, fumigant, stimulant and narcotic, craft makers, utility plants, farm implements and others were grouped as miscellaneous use categories of garden plants in the area.

5.3 Traditional Management of components of the environment

The traditional management and conservation practices on homegarden useful plants of the area have been retrieved using garden observation, semi-structured interviews, and personal or group discussions with informants. Subsequent analysis is presented hereunder for the major management and conservation practices recorded.

5.3.1 Traditional Homegardens (GATE UDUMA)

5.3.2.1 Plant composition in homegardens

In the study area, homegardens are called GATE UDUMA and 165 useful plant species have been encountered from gardens and the immediate surroundings among which 102 grown in homegardens, 61 in both homegardens and crop fields while only two species (*Eragrogstis tef* and *Tirticum aestivum*) were found strictly on crop fields. The most probable reason for this might be the special agronomic needs of TEFF and wheat in that both require intensive land preparation, soil management and weeding to get pronounced amount of yield as reported by the informants. In contrast, homegardens are managed with a minimum amount of labor and not every weedy biomass is removed, since some wild useful species are tolerated there. In addition, preparation of clear land for TEFF and wheat is impossible due to incorporation of diverse annual and perennial crops in gardens. Plant species encountered in the homegardens found useful for several purposes such as sources of food and medicines, materials for construction, fuel woods, spices, condiments and fragrant plants, farm implements, fencing materials, shade trees, soil fertilizers and many species were found multipurpose. The Cuban and Guatemalan traditional people were also found to manage their homegardens to get multiple benefits for household sustenance in food security, medicinal and ornamental values (Castineiras *et al.*, 2002; Leiva *et al.*, 2002). Fruit crops (such as C*itrus* species, *Musa x paradisiaca, Persea americana* and *Annona squamosa*); vegetables (like *Brassica* species, *Capsicum annuum, Capsicum frutescens, Lycopersicon esculentum, Beta vulgaris, Daucus carota* and *Solanum nigrum*); and cereals (such as *Zea mays, Triticum aestivum, Hordeum vulgare, Sorghum bicolor* and *Eragrostis tef*) are the major edibles groups. Moreover, medicinal plants (like *Ruta chalepensis, Artemisia abyssinica, Cymbopogon citratus, Ocimum lamiifolium* and *Rosmarinus officinalis*); spices (like *Aframomum corrorima, Ocimum basilicum* and *Rosmarinus officinalis*) and multipurpose trees (like *Millettia ferruginea, Cordia africana, Syzygium guineense, Acacia abyssinica* & *Eucalyptus camaldulensis*) were representative species of homegardens in the area. Figure 7 shows features of homegardens of Gedeo people in the study area.

Figure 7 Gedeo homegardens & various plant species managed in gardens of Kurmi, Bunno and Hanchebi PAs from top to bottom-Photo by Solomon Tamrat (2010)

This is also supported by the results of Zemede Asfaw and Ayele Nigatu (1995) and Zemede Asfaw (1997), in the fact that Ethiopian homegardens were found species and use diverse, being economically and ecologically sustainable and continuous. On the basis of production they are year round suppliers of sustainance to the local people. Furthermore these results agree with the findinds for the Chagga homegardens at mount Kilimanjaro that are reported to be multistory, multipurpose and multiuse agroforstry systems (Fernandes *et al.*, 1985).

5.3.2.2 Farmer management of crops in homegardens

A number of management practices are performed in the homegardens of Gedeo people in the area. One of which is the endeavor to maintaining diverse plant species in the garden as much as possible. High diversity is achieved through planting and protecting annual and perennial herbs and woody perennials in mixtures. This was also reported by SLUF (2006) and Zemede Asfaw (2001a). Soil fertility in the homegarden is maintained mainly through incorporation of household wastes, animal manure and others as well as mulching that agreed with the findings of Tadesse Kippi (2002). Plants like *Erythrina brucei, Millettia ferruginea, Cordia africana* and *Vernonia amygdalina* were grown in the homegarden because of common belief and time-tested experience among farmers that these species are important in increasing soil fertility and conserving soil moisture. Tadessie Kippie (2002) reported similar results on case study of Gedeo land use about the high species diverse and self-fertilizing soil systems of Gedeos agroforetery homegardens. Moreover, Tesfaye Abebe (2005) repeated similar result on his report about the ENSET and coffee based agroforestry homegardens of the south, were the farming system manages itself for various ecological and environmental equilibrium.

Management practices like intercropping and crop rotation were observed among farmers of the area. Cereals were rotated with leguminous crops such as *Vivia faba* and *Pisum sativum* and *Phaseolus vulgaris* with perception and experience that legumes provide more soil fertility in gardens. Maize was intercropped with *Canavalia ensiformis, Ipomoea batatas, Capsicum annuum, Capsicum frutescens, Cucurbita pepo, Vicia faba* and *Brassica* species. In coffee fields and young ENSET plantations maize was also found intercropped with *Ipomoea batatas* and *Saccharum officinarum.* The reason why intercropping is done was found to collect more amount of product per unit area to optimize with shortage of land and to fulfill the diverse household needs. This is a common case of homegarden management practice observed in south Ethiopia (Belachew Wassihun *et al.*, 2003; Tadesse Duressa, 2003; Tesfaye Abebe, 2005 and Talemos

Seta, 2007). However, crops such as *Hordeum vulgare, Triticum aestivum, Eragrostis tef* and *Allium* species were found cropped solely because of their locally proven agronomic need giving more yield when cropped solely. Another important crop management culture observed is the practice of cultivating various types of local varieties of crops like in the case of *Hordeum vulgare* and *Ensete ventricosum* in gardens and farms of the neighboring households in a village. The reason for this was found to protect their local landraces from rapid loss by sudden or abrupt climatic changes, onset of disease or serious insect pests. Locust and/ or caterpillar worm that causes loss of a crop variety from all farms in the locality might be a problem if they have planted the same landrace in every farm of a village, as reported by the informants. Therefore, farmers were found to make discussions and took decisions on what local variety of crop to be planted by heads of households in the village and they diversify landraces in their farms on every cropping season.

The other basic management practice observed for homegardens of Gedeo people was the spatial (horizontal or vertical) and temporal arrangements of useful plants of gardens. Horizontally the front yards of homegardens locally called BA'AXE is mostly composed of various ornamental plant species that are introduced or native to Ethiopia such as *Salvia leucantha, Salvia splendens, Euphorbia pulcherrima, Rosa abyssinica, Rosa x richardii, Tradescantia zebrina, Amaranthus hybridus, Passiflora edulis* and *Passiflora caerulea.* BA'AXE of some households is less planted and may or may not be covered with grass, and frequently contains live fence species at the front associated with edible pulses or fruits such as *Phaseolus lunatus, Passiflora edulis* and occasionally shade trees for the household to use as refreshment or resting site. Still other households naturally or associated with shortage of land, are obliged to use BA'AXE to plant crops like *Annona squamosa, Arachis hypogea, Citrus aurantifolia, Zea mays, Canavalia ensiformis, Brassica carinata, Prunus persica, Vernonia amygdalina, Sesbania sesban* and *Morus alba.*

The side yards called SORRO in Gedeo language are covered with species such as *Dioscorea praehensilis, Dioscorea sagittifolia, Colocasia esculenta, Nicotiana tabacum, Ruta chalepensis, Persea americana, Capsicum annuum, Ipomoea batatas* and *Musa x paradisiaca*. The back yard called GATE is the wider part of Gedeo homegardens that is rich in organic matter from household wastes or dung and manure applied and covered with *Ensete ventricosum, Coffea arabica, Citrus sinensis, Zea mays, Catha edulis, Hordeum vulgare, Ipomoea batatas, Saccharum officinarum* and trees like *Cordia africana, Millettia ferruginea, Albizia gummifera*

and *Croton macrostachyus*. Here the land at the back is partitioned to plant crops like *Zea mays, Ipomoea batatas, Hordeum vulgare,* and *Catha edulis* while others intercropped to these systems include *Canavalia ensiformis, Cucurbita pepo, Brassica carinata* on which ENSET and coffee are usually common and are basic. Figure 8 shows the spatial arrangement and farmer's management of homegarden environment and its useful components with emphasis on the crop arrangements.

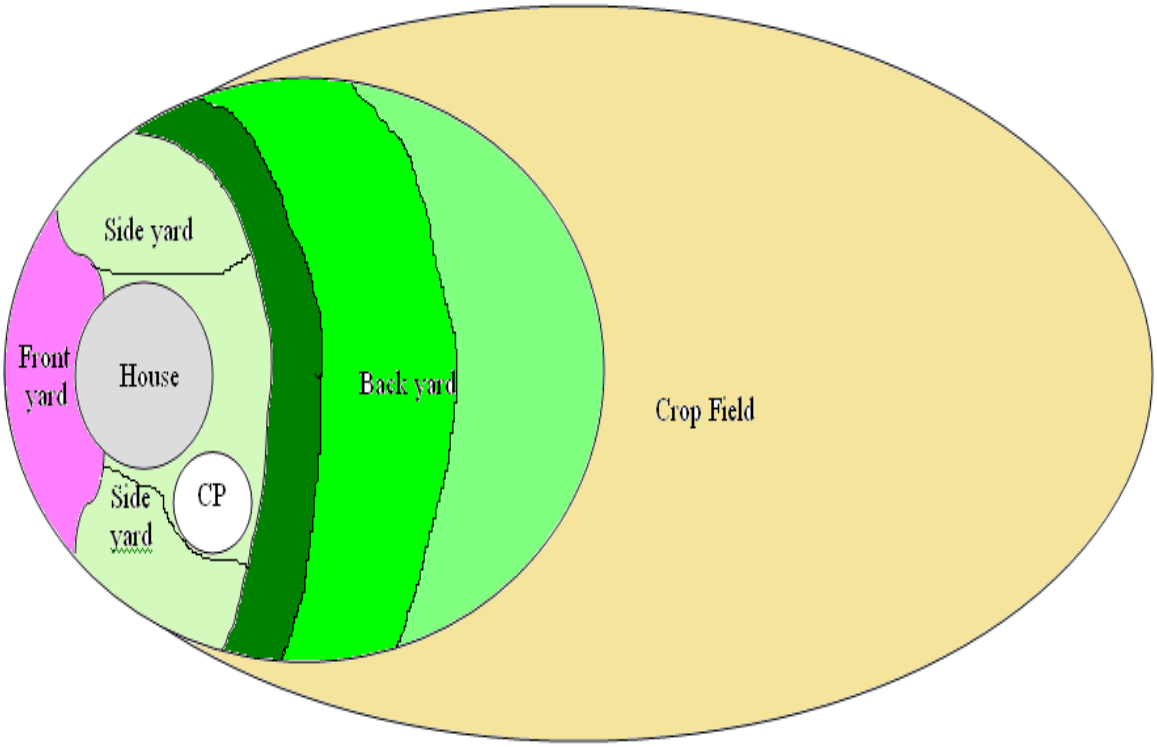


Figure 8 The spatial management of homegarden area and its components

Note: CP = Animal pen & store for garden products; the different green color intensities show backyards at close middle and far distance from the living home; see also the spatial crop composition listed below (the species under each categories are found on appendix 3)

Front yard/BA'AXE
- Live fences on boundary
- Ornamentals
- Shade trees
- Fruit trees
- Maize, barley, pulses, leaf cabbage

Side yard/SORRO
- Medicinal plants
- Spices and condiments
- Roots crops
- Fruit trees
- Shade trees
- Live fences on boundary

Back yard/GATE
- Spices & condiments
- Medicinal plants
- Leaf cabbage, cucurbits
- ENSET
- Root crops
- Fruit trees
- Shade trees
- Maize, barley, sorghum
- Coffee, KHAT
- Live fences

Crop field/FICHA
- Coffee
- ENSET
- KHAT
- Maize, barley, wheat, TEFF, sorghum
- Root crops
- Shade trees

In some households, homegardens are separated from crop fields by dry or live fences especially when there are cattle penned in the living square to prohibit the entry to the crop fields and homegardens. In case there is fear of theft or destruction of garden components by wild or domestic animals, it is fenced with dry or live fences, which is similarly reported by several authors about homegardens of Ethiopia (Zemede Asfaw, 2002; Belachew Wassihun *et al.*, 2003; Tesfaye Abebe, 2005; Alemtsehay Teka, 2008). In addition, Bennett-Lartey *et al.* (2002) reported that about 48% of northern Ghanaian homegardens are fenced to prohibit damage of garden components by goats, sheep and cattle.

Whatever the type of crops managed, Ethiopian homegardens in general and gardens of south Ethiopia in particular, are managed to harbor various components with respect to the living house. This is based on various reasons like the need for quick and immediate access of spices, condiments and medicinal plants such as *Rosmarinus officinalis, Capsicum* species, *Ocimum basilicum, Ruta chalepensis* and others during dinning times or immediate onset of common diseases (Zemede Asfaw, 1997a; Tadesse Duressa, 2003; Talemos Seta, 2007 and Alemtsehay Teka, 2008). Leiva *et al.* (2002) also reported for Guatemalan homegaredns that useful plants are managed in close proximity to the dwellings for easy access and collection of foods, medicines, firewood for their day-to-day life and fodder for their domestic animals.

The vertical stratification of components of Gedeo homegardens is not obvious for the first time observer and it demands a closer look in to the basic components that constitute the stories. The upper story contains tree species such as *Cordia africana, Millettia ferruginea, Albizia gummifera, Croton macrostachyus* and fruit trees such as *Persea americana, Prunus persica,* matured ENSET plants of higher age that emerged to the upper canopy. The middle one contains ENSET plants, coffee of higher age rank, fruit trees like *Casmiroa edulis, Mangifera indica, Psidium gujava, Annona squamosa, Musa x paradisiaca, Citrus sinensis, Gardenia ternifolia, Ricinus communis* and *Catha edulis.*

The lower story in turn contains *Zea mays, Capsicum annuum, Capsicum frutescens, Colocasia esculenta, Xanthosoma sagittifolium, Ocimum lamiifolium, Aframomum corrorima* and *Ruta chalepensis* while the ground cover contains *Ipomoea batatas, Brassica* species, *Hordeum vulgare, Lycopersicon esculentum, Artemisia abyssinica, Ocimum basilicum, Solanum tuberosum, Solanum nigrum* and the likes. Here climbing species such as *Canavalia ensiformis, Phaseolus lunatus, Phaseolus vulgaris, Dioscorea praehensilis, Dioscorea sagittifolia,*

Passiflora edulis, *Lageneria ciceraria* and *Cucurbita pepo* could traverse from ground to the middle story stratifying the homegardens and hence making it dense. Moreover, species such as *Erythrina brucei* and *Dracaena afromontana* are emergent species that come out of the vertical strata. Tadesse Kippie (1994) and SLUF (2006) for Gedeo agroforestry homegardens and Zemede Asfaw (2002) in general for Ethiopian homegardens reported that farmers manage crops on vertical basis, i.e. development of multistoried crop association systems to allow optimal share of solar radiation and maximize the benefits obtained. The northern Tanzanian (Fernandes *et al.*, 2002) and the Ghanaian (Bennett-Lartey *et al.*, 2002) homegardens are also found to be multistory agroforestry systems depicting four vertical layers of garden species that are inhabited with diverse useful plants in growth cycle, growth forms and agronomic needs.

5.3.2.3 Crop protection practices

Traditional crop protection practices are the other homegarden management practices observed in the area. Farmers protect their crops and homegarden components from vertebrate and invertebrate pests and important diseases. Important crop pests in the area are primates such as baboons (locally called GALADDO) and velvet monkeys called QAMALLE in Gedeo language, TUKA for mole rat and WERRO for another type of rodent pest. In addition, birds, wild pigs, and dogs are important crop pests of the area. The invertebrate pests observed include XUXE for termites and ant families that bore tubers, caterpillar worms and the likes. Farmers use a traditional rope called WENCHIF in Amharic to abandon the primates from around the farm throwing solid matter like soil-aggregate or large gravels and making alarming sounds to scare them not to come close to the crop farms. These pests consume root and tuber crops like ENSET, sweet potatoes, yams, ENSET product called QOCHO, beans, maize, sugar cane, sweet stalk sorghum, wheat, barley, fruits, vegetables and pulses.

Some of the invertebrate pests such as termites and ants are protected by serious weeding and mixing the top and sub soils while others like birds are protected cutting twigs of larger trees to minimize the numbers that nest on them. In addition, cropping at proper times was followed to protect heavier attacks by pests since crops planted earlier and later ripe eventually and later respectively and becomes more prone to heavier attack by invertebrate pests and birds. Temesgen Addis *et al.* (2008) and Mesfin Tessera *et al.* (2008) reported respectively about important pests and diseases of ENSET plants in Ethiopia; which include the ones mentioned on the current study. The associated diseases of garden crops in the area include that of ENSET, coffee, leaf cabbage

and fruit plants such as avocado and banana. ENSET and banana wilt disease, ENSET corm and root rot diseases locally called WE'ALO and XETTE, Coffee Berry Disease (CBD) locally called KOLEERA; plant bugs that affect leafy vegetables like *Brassica* species, called CHUBUKO and fruit rot in avocado were the major problems observed. These crops are locally important for livelihoods of the people being staple foods, important cash crop, basic additives and significant fruits respectively receiving higher ranks and acceptability among people of the area. Report from Sustainable Land Use Forum (SLUF) also revealed important pests and diseases of agroforestry systems of Gedeo people, bacterial wilt and CBD being the major ones affecting a considerable proportion of annual production for Wonago Wereda (SLUF, 2006).

The farmer removes from the soil and buries in pits, burns in excavations or on stands those ENSET and coffee plants attacked by disease to protect further distribution of the causative agents in the farm or garden. Tadesse Kippie (2002) reported similar results about diseases management of crops giving emphasis on diseases of ENSET and coffee plants and the management techniques on protection and prevention of these by the local people. Adding, Alemtsehay Teka (2008) reported important diseases of ENSET for homegardens of Eza Wereda, in Gurage zone, such as ENSET bacterial wilt and ENSET corm-rot infections causing serious problems in the area.

5.3.2.4 Sourcing of planting materials

Considering the sources of planting materials for gardening, the local people use various ones. From the harvest of the previous year, the best performing crop plants are selected to provide seeds for the next season. In selecting these, farmers rely on such parameters as growth habit, e.g., in maize, short height to avoid lodging but high yielding potential i.e. one or two large ears each with a greater number of seeds. In leafy vegetables plants that sucker profusely and tolerate continuous harvests, in bulbous crops, those produce larger bulbs are selected. In roots and tuberous crops, those produce large and numerous tubers are selected. Selected seeds are kept on smoke or mixed with kerosene to prohibit attack by insect pests. Moreover, root and tuber crops such as *Solanum tuberosum, Colocasia esculenta* and *Dioscorea praehensilis* are left in the soil and are retrieved on the next season for planting. Tadesse Kippie (2002) reported equivalent results about selection and storage of planting materials for farmers of Gedeo people as an important management component of the well-developed agroforestry systems.

Okigbo (1994) reported the case of crop selection and storage as a common practice observed for African farmers. In the study area, a household that failed to keep seeds at home could borrow or buy seeds selected and kept in the neighboring households or in the immediate PAs. The other source of seed used is the market place. In such cases, the buyer peasant asks the seller about the characteristic features of varieties of crop seeds he or she is selling, and has access to select according to ones interest from the market. Moreover, peasants also have access to collect improved seeds from agriculture and rural development office of the Wereda. Apart from that, saplings of some medicinal plants and useful tree species are collected from the wild areas in the surroundings and are planted and managed in the homegardens. Bennett-Lartey *et al.* (2002), Castineiras *et al*. (2002), Fernandes *et al.* (2002), and Shirestha *et al*. (2002) reported various sources of germplasm for the Tanzanian, Ghanaian, Nepalese and Cuban homegardens respectively. They mentioned the household itself as the prime source of germplasm, the neighbors or relatives, the immediate local markets, agriculture development offices and farmer cooperatives as well as the natural wild areas as important ones.

5.3.2.5 Marketing of homegarden products and the roles of social groups

Markets are set on Mondays and Thursdays, the later being larger in size and exchangeable commodities at Chelelektu and Fisehagenet towns. Here people come from each corner of the Wereda and get together to share genetic materials, agricultural innovations and technologies, as well as to exchange basic needs and to share culture.

Considering marketability of products of homegardens, women and children are in charge of selling fruits (*Annona squamosa, Persea americana, Musa x paradisiaca, Citrus aurantifolia*)*;* vegetables (*Brassica* species, *Solanum tuberosum, Solanum nigrum, Capsicum annuum, Capsicum frutescens* and *Allium* species). Moreover, spices (*Aframomum corrorima, Ocimum basilicum* and *Coriandrum sativum*)*;* pulses (*Canavalia ensiformis, Phaseolus lunatus* and *Phaseolus vulgaris*); Medicinal plants (*Ruta chalepensis, Cymbopogon citratus, Rosmarinus officinalis, Citrus aurantifola*) and sugar plants (*Saccharum officinarum* & *Sorghum bicolor*) were observed on market survey (Figure 9). The marketable products from gardens are either sold in fresh (fruits, vegetables, planting materials of ENSET and coffee) or dried (seeds of some crops for planting, medicinal plants in whole or powder) forms.

The Sustainable Land Use Forum reported about marketability and market values of important garden products of Gedeo people including coffee, ENSET, KHAT (*Catha edulis*), fruits, tree products (lumber and firewood) and honey together with their market values (SLUF, 2006). Coffee is sold at the national market once the agriculture office of the Wereda maintains local prices to collect it from the farmer. At national level, *Kochere specialty coffee* is known for its organic nature and high national income it earns. Moreover, forest products such as lumber firewood and honey are also important garden components supplementing additional income, and provide sustenance to the local people. Adding, local food prepared from ENSET plant called QOCHO is marketed during cropping seasons by families with young ENSET gardens. Germplasm of ENSET plant is also found sold at local markets during the rainy seasons for planting.

Various authors that have done research on different parts of Ethiopia in general and the ones who did in south Ethiopia in particular showed similar results about marketability of garden products in that women and children took the highest role. A similar case was observed in the current study. Garden products are sold when there is surplus production, the objective being to buy other basic needs or to balance diets and get more income for sustenance of livelihood of the family (Zemede Asfaw, 1997a; Paulos Abebe, 2007; Talemos Steta, 2007; Alemtsehay Teka, 2008 and Mathewos Agize, 2008).

Figure 9 Components originating from homegardens sold at local markets of Chelelektu and Fiseha Genet urban centers-Photo by Solomon Tamrat (2010)

5.3.2 Traditional field cropping (FICHA) practices

The main crop field, locally called FICHA, is relatively large and located outside the living quarter. Therefore, there is limited human interference with the components and supply of manure and household wastes is limited too. This shows us that soil fertility gradually falls as one walks away from homegardens to crop fields and the number of plant species managed gets fewer and fewer in the same direction as mentioned by Okigbo (1994), Zemede Asfaw (2002) and Gebemedihin Teklehaymanot & Mulubrhan Haile (2007). Quiroz *et al.* (2002) also compared and contrasted homegardens with crop fields and found a similar result in that gardens are species diverse both in inter and intra-specific variability than the main crop fields in Venezuela. Cash crops (coffee and KHAT) as well as cereals and ENSET are the major components of crop fields of Gedeo people in the area. *Eragrostis tef, Sorghum bicolor, Hordeum vulgare, Triticum aestivum* and *Zea mays* (Figure 10) are the cereals, while *Coffea arabica* and *Catha edulis* were the major cash crops and ENSET is the main staple food almost in all households on both the agroecologies found.

Figure 10 Field crops (top: *Triticum aestivum* at Kurumi, bottom left: *Ipomoea batatas* intercropped with *Zea mays* at Jeldu and bottom right: *Zea mays* at Kurumi PAs)- Photo by Solomon Tamrat (2010)

According to Atnafu Bekele *et al.* (2008), Ethiopia being the place where ENSET is domesticated for diverse use, a significant level of intra-specific variability is observed among the Sidama, Gedeo, Gurage, Wolaita, Gamogofa, and Kembata areas in south. The local people of Kochere area identified more than ten varieties of ENSET. Table 12 shows only some of them on which characteristic features could easily be identified and documented from interviews and garden observations. Providing ecological, economic and cultural benefits, this plant is almost everything of Gedeo people. SLUF (2006) identified and mentioned about 15 different uses of ENSET plant for Gedeo people. Figure 11 shows a young girl preparing local food called QOCHO pulverizing ENSET corm at a homegarden in Daka Dima PA. Moreover, about four varieties of *Hordeum vulgare* (Table 13; Figure 12) and at least two varieties of other crops were identified based on morphological variations as well as length of maturity dates, disease, pest and drought resistance, taste and others as the results of semi-structured interviews and discussions revealed. Zemede Asfaw (1989) also identified and described wide range of infraspecific genetic variability for Ethiopian barley. The SLUF (2006) report is also supported with these findings in the fact that Gedeo agroforests were found to harbor a wide range of farmer's varieties for a number of crop species. Talemos Seta (2007) and Alemtsehay Teka (2008) also found a number of ENSET landraces for Wolaita and Gurage homegardens respectively.

Farmers of Kochere Wereda prefer to grow maize because of its high quantity yield and fodder formation, use in firewood and its ability to grow in all sorts of agroecologies of the Wereda. According to Kossila (1988) as cited in Adugna Tolera (2001), maize is an important crop for feed because of more straw formation as compared to other crops. Furthermore, ENSET was found the most culturally important food crop cultivated in both gardens and crop fields, and only being preceded by ENSET; maize was found the second culturally important food crop of Gedeo people in the area.

Figure 11 A young girl pulverizing ENSET corm in QOCHO preparation at Daka Dima PA-Photo by Solomon Tamrat (2010)

ENSET variety whose corm found to be edible (e.g. ASTARA, DIMOYE and QARASE local varieties) was reported to produce good quality of QOCHO and BULLA. In addition, varieties that are stronger in removal of the pseudostem from the ground during harvesting were reported to produce good quality fiber (e.g. GANTICHO, TORACHO and QORQORRO local varieties). Based on results of preference ranking, ranking using ICS and discussion with the local people it was found that *Ensete ventricosum* is the most culturally important food crop that provides multipurpose significance to the local people (Table 2; SLUF, 2006). The spongy nature of ENSET plant and its wider leaves provide more moisture to the soil and keeps the ecological balance of an area lowering the solar radiation that strikes soil and maintains it wetter; a result supported by findings of Tadesse Kippie (2002).

Table 12 Some local varieties or clones of ENSET in the area with their characteristic features

Local name	Characteristic features mentioned
ASTAARA	Red colored on all over the parts, about 2m tall, Corm is edible & tasty, disease resistant, more fiber producer, and shade intolerant.
DIMOYE	Red parts, about 3 m tall, corm edible, disease tolerant, shade loving.
FELELE	Green (silvery white), about 2 m tall, shade loving and disease tolerant variety.
GANTICHO	Black pseudostem, above 3 m tall, produces much QOCHO, and more fiber shade loving.
KAKE	Red parts, about 2.5 m tall, fast growing, medicinal use, fast fermentation and shade loving.
MUNDETIXA	Extremely bloody red parts, about 2 m tall, high quality QOCHO, shade tolerant and disease resistant.
NI'FO	Green (spotted with black), about 3 m tall, fast growing, shade loving, disease intolerant, corm edible.
QARASSE	Red colored parts, 2 m tall, fast growing, shade intolerant, corm is edible, ferments rapidly.
QORQORRO	Silvery white, about 2 m tall, shade tolerant, disease intolerant and produces high quality QOCHO.
SHAAGNA	Green parts, about 1.5 m tall and trunk wider at the base, more QOCHO quality producer than that of the GANTICHO variety; but less to it in QOCHO quantity, shade tolerant, disease resistant.
TOORACHO	White silvery (spotted with black), about 2 m tall, fast growing.

Table 13 Local varieties/ landraces of *Hordeum vulgare* collected from the area

(Am. =Amharic language; Gdo.=Gedeo language)

Local name	Characteristic features mentioned	Remarks
BAXIRA	2- rowed The median florets are fertile & the others are degenerate and sterile, forming 2 rows of caryopsis 8-10 cm awn length Grain attachment starts just at the rachis	Roasted, pounded to flour & used in various forms (Porridge, soup/ gruel, local food and drink called BASSO, SHAMEETA (Gdo.) and the likes
HORSISSO	2-rowed No sterile florets like that of BAXIRA 6-7 cm awn length Grain attachment starts 1-1.5 cm up the rachis, are light weighted	Roasted & consumed as snack food called SENEF-KOLO (Am.) during breakfast/ coffee times
BORSHE	6-rowed 10-12 cm awn length Grains medium sized and appresed to the main axis	The flour is used in the same way to BAXIRA variety
NUURU	6-rowed 12-15 cm awn length Grains large & robust, more loose from the main axis	The flour is used in the same way to BAXIRA variety

Figure 12 Local landraces of *Hordeum vulgare* from the study area (BAXIRA, HORSISSO, BORSHE and NUURU; from left to right)-Photo by Solomon Tamrat (2010)

Furthermore, ENSET plant conserves moisture and keeps the air around humid, making the area moist and comfortable for dwelling. To mention more, it also keeps the soil intact and safe from further erosion. Moreover, the plant is used in construction of traditional houses as touching (the dry sheath) or tying material for roofs and walls (the dry mid rib or rope made from the fiber). In addition, this species is used as rapping material for butter (the dry sheath), KHAT and Ethiopian local bread called DIFFO-DABO (the fresh leaf). In addition, its products (QOCHO, BULLA, fiber and the leaf) are sold to generate additional income and purchase other household commodities. To list more, the rope from its fiber or mid rib is used to tie cattle at home or to restrict area of foraging by cattle. Tadesse Kippie (2002) and SLUF (2006) reported similar results about the diverse benefits obtained from garden plants by Gedeo people, with emphasis on ENSET as multipurpose crop.

Coffea arabica is the other most significant crop encountered in the area that is consumed in the households as stimulant and as an income source. The Wereda is well known for the high quality coffee called *Kochere specialty coffee* it supplies to the national market. The Gedeo people according to SLUF (2006); consider dry coffee as *dry bank*, benefiting households to save money in kind. The crop possesses the highest cultural significance being equally important as that of ENSET. The wider coffee plantations managed, the crucial economic roles the crop plays in the livelihoods of the people and its inclusion on the first three garden crops formerly mentioned by the local people in almost all PAs and households interviewed, exhibits its high cultural value. The hoe-culture (root crop based) farming system of southern Ethiopia were found to contain coffee and/ or KHAT as a major cash crop and ENSET as a basic staple food maintained as the keystone species of homegarden components in various nations and nationalities of southern peoples. This was suggested by findings of Tadesse Kippie (2002); Belachew Wassihun *et al*. (2003); Tesfaye Abebe (2005); Talemos Seta (2007) and Alemtsehay Teka (2008).

5.3.3 Traditional agroforestry practices

The Gedeo people are well known for their ENSET and coffee based agroforsts locally called GATE KARA, from past to present times (Tadesse Kippie, 1994; 2002; SLUF, 2006). Trees are deliberately left or planted in the gardens and crop fields of the area. About 50% (81 species) of the total number of plant recorded was trees and shrubs managed in the homegardens and crop fields.

According to the reports of Tadessie Kippie (2002), Zemede Asfaw (2002) and SLUF (2006), these trees were managed and left there during forest clearing and/ or deliberately planted for their benefits and some of them are huge in size and older in age while others are smaller and younger. The provisions of these trees are construction materials, farm implements, fuel sources, shade, soil fertility, honey and wax, edible fruits, traditional medicines, live fences and additional income sources as mentioned by the informants. The same result was reported by Tadessie Kippie (2002) for Gedeo people in addition to what reported for Sidama homegardens by Tesfaye Abebe (2005) that various types of woody species managed in gardens were used for diverse types of uses. *Acacia abyssinica*, *Millettia ferruginea*, *Cordia africana*, *Albizia gummifera*, *Vernonia amygdalina*, *Albizia grandibracteata*, *Croton macrostachyus*, *Acacia senegal*, *Ficus sur* and *Ficus sycomorus* were found as common trees scattered in the homegardens and crop fields of the Gedeo people in the Wereda.

Priority rankling on the purpose of managing trees in and around homegardens showed (Table 14), use as fuel sources took the highest priority followed by use for construction purposes. Shade trees to ENSET and coffee plants and use as soil fertilizers took the next respective priorities. This result is in agreement with that of priority ranking done to identify the most important threats on components of homegardens in the area (Table 15). Moreover, Tadesse Kippie (2002) reported that trees managed in Gedeo agroforests provide diverse uses to the people of the local people being equally important as their ENSET and coffee plants for subsistence.

Table 14 Priority ranking on purposes of managing trees in homegardens and crop fields

(**I_1 - I_{10}** = Informants)

Use categories	***Preferences***										***total***	***rank***
	I_1	***I_2***	***I_3***	***I_4***	***I_5***	***I_6***	***I_7***	***I_8***	***I_9***	***I_{10}***		
Construction	5	5	4	5	5	4	5	5	4	5	**47**	**2**
Farm tools	1	1	2	2	1	1	1	2	2	1	**14**	**6**
Forage plants	2	2	2	4	1	1	2	3	2	3	**22**	**5**
Fuel sources	6	6	6	6	5	5	6	5	6	6	**57**	**1**
Shade trees	4	4	4	4	4	3	2	4	4	4	**37**	**3**
Soil fertilizers	3	3	3	2	3	2	4	3	4	3	**30**	**4**

5.3.4 Traditional soil fertility management practices

Gedeo people of the area use various traditional management practices to keep their soils fertile. Various types of legumes and other plants were used to keep the soil fertile and wet, making it optimum for plant growth. *Albizia gummifera, Acacia abyssinica, Vernonia amygdalina, Ficus sycomorus, Millettia ferruginea* and *Sesbania sesban* are species used to keep the soils fertile. Moreover, the local people add plant residues, straws of crops like in the case of maize and some older parts of ENSET leaves as well as the byproduct of coffee from coffee processing plants, locally called ASHARA, to the soil so as to increase its organic matter content and keep its fertility. Tadesse Kippie (2002) and SLUF (2006) reported that Gedeos' soil management practices involve the application of plant residues, growing of herbaceous undergrowths, planting of leguminous trees and shrubs in homegardens and crop fields as the major ones.

In addition it was also found that dung or manure were applied to the homegardens together with other household wastes and the soils of homegardens were found black, moist, fertile and suitable for cropping diverse plant species. However, application of dung is not as such prominent on the vast midland areas of the Wereda, which is also reported by Westphal (1975) and Tadesse Kippie (2002). Manure application was also reported as soil management practice in homegardens of the Gamo (Belachew Wassihun *et al.*, 2003), Silti (Tadesse Duressa, 2003) and Wolaita (Talemos Seta, 2007) people. The other traditional method used to maintain soil fertility observed is the use of terraces and check dams to keep the soil from erosion by run-offs and/ or to rehabilitate gullies using plant materials as impedance to run offs. Generally, the local people believe to keep their soils from erosion and leaching by developing agroforestry trees and covering the soil with perennial crops and annual herbaceous undergrowths that hold it intact against water erosion. The use of green manure from leguminous and herbaceous plants of the homegardens for enrichment and conditioning of garden soils were also reported for the Javanese and Nepalese gardens as an important traditional soil management practice (Somarowoto *et al*., 2002 and Shrestha *et al*., 2002).

5.3.5 Socio-cultural practices associated with plant use and conservation in the area

In the study area, culture and religion exerts very strong influence on peoples' life and some of them were found important to conservation of nature, especially flora of the area. A household or

head of it who managed wide varieties of crops especially ENSET and possesses well managed and species rich homegardens gets more respect and pride in the culture of Gedeo people. Feleke Woldeyes (2000) reported a similar result for Kaficho homegardens at Bonga area in the fact that ENSET was taken as structural component and important treasure for the local people. Furthermore, Sherestha *et al.* (2002) reported that homegardens were considered as symbols for social status in Nepal and a household with wide, species diverse and clean gardens were received the highest social values. This had encouraged the local people to manage and keep diverse plant species in their homegardens. Furthermore, cutting trees from sacred places is a taboo in the locality (also reported by Belachew Wassihun *et al*., 2003) and hence smaller plant communities were observed on graveyards indicating that formerly there was dense forest in the areas. In addition, cutting trees from ones farm was considered as if cutting the life of the owner and hence it is forbidden in the culture of the local people. Moreover, large trees are managed in front of homes or on open fields to use as shade for social gatherings on which local court is set to assess and judge on local disagreements. In addition, traditional ceremonies such as the GEDA ceremony, traditional worships and sports are performed under and around large trees. Tadesse Kippie (2002) also reported a similar observation on the agroforestry homegardens of Gedeo people.

Traditional proverbs associated with plant use and management were retrieved from discussion sessions with the local people which either encouraged the farmer or household who managed species rich homegardens, huge ENSET or coffee farms and field crops. On the other hand, proverbs are used to initiate a peasant that had less performance so that he could perform better for the next season. Some of these proverbs are ‘yooshsha hujjalokenni wissalokenni’, which means a household head is a hard worker who cultivates and produces copiously and feeds his family well. The other is ‘esi gobachii herebannii manjokennii hujakebanni’ which means the man on refer never woks on farms of others for money because he has well managed ENSET and coffee garden or farm to get benefits on times of hardships. This is also supported by reports of Tadesse Kippie (1994) in the fact that Gedeo people were culturally known for their proverbs and sayings in encouraging hard working and independence while they criticize and discourage dependence and beggary in the society revealing the high social status gained through management of well-handled, species diverse and sustainable gardens and crop fields.

5.4 Threats to useful plants in homegardens

The most destructive harvesting methods observed and recorded on plant use were stem cutting while harvesting of fruits and seeds were found to be the least. Stems were cut for construction, furniture, firewood and crafts. The most locally scarce plants with stem cutting were *Syzygium guineense, Cordia africana, Acacia abyssinica, Combretum molle* and *Olea europaea* L. subsp. *cuspidata*; the former two for construction, crafts and furniture while the rest for firewood, charcoal.

Analysis of the results of semi-structured interviews and that of ICS ranking, and discussions with the local people revealed *Acacia abyssinica, Syzyguum guineense, Cordia africana, Prunus afrciana* and *Millettia ferruginea* were over exploited due to severe consumption. *Cordia africana* and *Syzygium guineense* were found important almost for all use categories mentioned and especially for construction and furniture; while *Millettia ferruginea, Acacia abyssinica, Acacia senegal* and *Combretum molle* were preferred for firewood and charcoal making. The use pressure on these plant species were also indicated by results of the ICS ranks (Table 10) such that a plant species with the highest ICS rank faces the most threat in the locality because of repeated use for multiple needs.

The results of pair wise ranking (Table 15) on factors mentioned as threats to garden useful plants showed use as firewood, wood for construction and disease as the highest rank rating first to third. Tadesse Duressa (2003) reported drought as the major problem as threat to homegardens in Silti Zone while Alemtsehay Teka (2008) mentioned performance below the required effort of gardens as the major threat factor that determines diversity and composition of gardens in Eza Wereda of Gurage Zone in south Ethiopia.

The possible reason might be the climatic condition of Silti zone, i.e. reported as dry region and the associated shortage of rainfall (recurrent drought); that causes problem for development of most of the herbaceous annual crops in homegardens (Tadesse Duressa, 2008). In the case of Eza Wereda, the problem of exerting below the required effort of gardens prevailed because of lack of sufficient labor to manage the ENSET-based homegardens as the crop demands more labor. This in turn could be traced to the observed problem of the family heads (father and mother) being the only labor power involved in garden management activities, while children go to school and they preferred to go to towns during summer time for off-farm activities (Alemtsehay

Teka, 2008). Various causes of threats had also been reported for the Tanzanian and Javanese gardens; ignorance by the higher officials as development opportunities, encroachment of towns to rural areas, migration of the rural youngsters to urban areas and changes in dietary habits of the local people being the major ones (Fernades *et al.*, 1985; Soemarwoto *et al.*, 1985).

Five plant species recorded in the current study were found listed under the threat categories of the IUCN red list of shrubs and trees of Ethiopia and Eritrea (Appendix XXI). These plants are under the least concern, vulnerable or near threatened states based on the criteria of IUCN. However, they were found managed in and around homegardens in the study area and are used for various purposes. It might demand conservation measures to be taken for these species in the future, but the current trend is not a problem.

Table 15 Paired comparison on causes of threats to useful plants of gardens

(R_1-R_{10} = Ranks assigned by the key informants)

Causes of threats	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	*Total*	*Rank*
Charcoal making	3	1	2	2	1	0	0	0	0	0	**9**	**6**
Diseases	1	3	5	2	3	4	3	4	5	3	**33**	**3**
Firewood collection	5	4	4	4	4	2	5	2	2	5	**37**	**1**
Floods	0	0	0	3	0	5	1	1	3	1	**14**	**5**
Pests	2	3	1	0	2	3	2	5	4	2	**22**	**4**
Wood for construction	4	4	3	4	5	1	4	5	1	4	**35**	**2**

5.5 Altitudinal variation of basic garden components in the area

The Wereda was sampled for its traditional knowledge and plant use diversity partitioned in to three broad sites as Kurumi site (Kurumi and Daka Dima PAs), Bunno site (Bunno, Kore and Sigiga PAs) and Hanchebi site (Hanchebi, Sisota and Jeldu PAs). The three sites on investigation were found to exhibit sociocultural and agroclimatic variations as well as variations in plant diversity and use.

The highlands (*ca* 2008-2606 m above sea level) are cool and humid most of the time in a year. Moreover, the local people are known to plant ENSET as staple food in wide than the midlands in their homegardens. Coffee is rare on the highest altitudes of the highland PAs. For instance,

based on observation during fieldworks and the results of discussion with the local people; in Kurumi PA, coffee is planted on lower parts of altitudes following KONGA local river valley that is not less than 100 m below the asphalt highway because of low temperature stress on higher altitudes. Cereals such as *Hordreum vulgare* and *Zea mays* in addition to the common additive *Brassica* species were found important food crops in highlands. However, fruit crops are not prominent parts of gardens in the highlands. For instance, the informants reported that only these days they are trying to adapt *Musa x paradisiaca, Mangifera indica* and *Malus sylvestris* in to their gardens. They have also reported that, *Persea americana* was only recently introduced in to their gardens from midlands & most of the farmers were found against *Casimiroa edulis* tree for the reason they reported that it removes soil moisture. SLUF (2006) also reported that many of the lower or middle altitude crops especially fruits were incorporated only eight decades ago to the Gedeo highlands.

The Bunno site, from midland (*ca* 1685-2078 m above sea level) areas, is known for coffee, ENSET, fruits and vegetable mixtures in their homegardens. This site shares plant germplasm from both the bordering lowlands and the highlands of the Wereda. Based on data gathered through discussions with the local people, ENSET being the major staple food, root and tuber crops were more important than cereals in this area. *Brassica* species were also found important additive to the food products of ENSET.

In the case of Hanchebi site (*ca* 1716-2146 m above sea level), coffee still being a significant cash crop, the site was found important for *Musa x paradisiaca* plants in gardens. ENSET planting was found less as farm component in Hanchebi site as compared to gardens of Kurumi and Bunno sites and the local people use cereals and root tuber crops for food other than ENSET and *Brassica* species as complements.

Sites around Kurumi that was sampled to represent highlands of the Wereda, harbors 133 useful plant species from gardens and crop fields, while those around Bunno and Hanchebi contain 145 and 139 respectively; representing the midlands. The number of species common to the three sites is 112; while 118, 115 and 131 plant species were recorded common to Kurumi and Bunno, Kurumi and Hanchebi as well as Bunno and Hanchebi PAs respectively. Considering species collected exclusively in one of the three sites; 12 for Kurumi, eight for Bunno and five for Hanchebi were recorded (Table 16).

Based on these results, the midlands are found to possess more number of homegarden useful plant species than the highlands and the traditional ethnobotanical knowledge were found proportionally diverse on plant use. The higher number of common species between Bunno and Hanchebi sites results from the similarity in agroecological conditions, both being midlands. In addition, since the midlands are close and adjacent to the lowlands of Oromia region at southern parts, there is higher rate of plant use culture and germplasm exchange. Moreover, the possible reason why the study sites around Kurumi get more number of species exclusive to the site might be the high geographical distance to the other sites as well as agroecological and slight cultural deviations that favors more number of species to be restricted in the area.

Table 16 Comparison of the three study sites for composition of useful plant species of gardens (K=Kurumi PA, B=Bunno PA, H=Hanchebi PA)

Total no of species			Common species				Restricted species		
K	**B**	**H**	**K & B**	**K & H**	**B & H**	**K & B & H**	**K**	**B**	**H**
133	**145**	**139**	**118**	**115**	**131**	**112**	**12**	**8**	**5**
			Total plant species recorded in the current study area = 165						

5.6 Comparison of garden useful plants of the area with other study areas

The comparison was made with findings for Bonga (Feleke Woldeyes, 2000), Arbaminch (Belachew Wassihun *et al.*, 2003), Wolaita (Talemos Seta, 2007), Eza (Alemtsehay Teka, 2008) and Sebeta (Habtamu Hailu, 2008) areas. The results of Jaccard's coefficient of similarity showed (Table 17) the highest similarity coefficient (i.e. 36%) with Eza Wereda, while it was found the least with Wolaita area (being only 30%). The possible reason for this could be the sociocultural similarities, especially feeding practices of ENSET as a major staple food by the Gedeo and Gurage people that guides cultivation and management of other associated garden plants with respect to it. This might had contributed to more similarity in species composition of gardens of the two areas. Moreover, Wolaita area is known for use of root and tuber crops as staple foods other than ENSET plant. In addition, the soils were reported to be more depleted because of intensive soil preparation for root crops and the associated erosion and leaching that could be attributed to rugged terrain of the area either (Talemos Seta, 2007). Therefore, this case

might determine the cultivation of specific sorts of crops in gardens. However, soils of Gedeo people were found organic and supported by the traditional agroforestry management practices and it allows growing various crops in gardens (Tadesse Kippie, 2002).

The study areas under comparison do not show more deviations from the mean value of Jaccard's coefficient of similarities, i.e. 32.6 %. Accordingly, Eza Wereda showed +3.4 % deviations from the mean while Wolaita area exhibited –2.6 % of it. A possible reason for this could be the general sociocultural and/ or agroclimatic similarities among these study areas. Sociocultural in a sense, the study areas in comparison are from the SNNPR of Ethiopia except for Sebeta area, in the fact that the areas are known for farming and use of root and tuber crops as major subsistent garden crops following ENSET and coffee, the major crops in the livelihoods of these people. Considering climatic condition of these areas, they receive bimodal rainfall and hence two major and two minor cropping seasons are observed which helped in cropping garden components continuously through a year allowing crop (annuals and perennials of all sorts of growth forms) diversification in time and space.

Table 17 Comparison of species found in the study area with that of other study areas

Study areas	Species No (a or b)	Common species, c	Jaccard's coefficient, Sj	% similarity	Sources (Authors)
Kochere area	166	_	_	_	
Bonga area	170	82	0.32	32	Feleke Woldeyes (2000)
Arbaminch area	133	76	0.34	34	Belachew Wassihun *et al.* (2003)
Wolaita area	160	75	0.30	30	Talemos Seta (2007)
Eza area	119	75	0.36	36	Alemtsehay Teka (2008)
Sebeta area	135	72	0.31	31	Habtamu Hailu (2008)

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

GATE UDUMA (Gedeos' traditional homegarden) is an important place for cultivation of edibles, medicinal plants, cash crops, and other important plant species. This agroecosystem serves functions of fulfilling subsistence to the local people in the area. From homegarden products pulses, vegetables and fruits supplement staple food plants like ENSET, maize, wheat and barley for vitamins, minerals and proteins to make a would be balanced diet to households. Homegarden plants were also found important in providing household medicinal services and additional household income, indicators of social status and implications of cultural and language diversity of the local people.

The frequency and intensity of homegardening in the Wereda varies with agroclimatic characteristics and the dominant plant species to gardens. The mid lands have exhibited high frequency of gardening practices as compared to the high land areas based on garden observations. Moreover, ENSET dominated areas exhibited high frequency and intensity of gardenining while that dominated with coffee were found less frequent and less intense, based on the results of garden tours.

Totally, 166 useful plant species were recorded from homegarden areas in the Wereda. The contribution of edible plants and plants maintained in homegardens is high. Farmers in the area collected a high diversity of cultivated taxa that includes many farmers' varieties. Among these *Ensete ventricosum, Coffea arabica, Zea mays* and *Brassica carinata* were found almost on every homegarden observed. ENSET, maize, barley, sweet potatoes and yams (*Dioscorea praehensilis* and/ or *Dioscorea sagittifolia*) were found the basic staple foods while coffee is important cash crop followed by *Catha edulis*. *Brassica* species are the most important additives used with the staples. *Ensete ventricosum, Coffea arabica* and *Catha edulis* are perennials while other annual crops are incorporated in various ways and trees and shrubs are encouraged in these systems to create an ecological balance and sustainability, in addition to provision of sustenance and cultural services.

Most of the local people in the area can call names, classify and relate in addition to telling the merits and demerits of plants in their surroundings. They could also reason out causes to scarcity

of useful plants and identify solutions to these threats in their localities. The traditional management and conservation practices in the area were generally found to be demand driven. The Gedeo people of Kochere Wereda emphasized management of garden resources through use; but not simply for the sake of protection, which is manifested through maintenance of multipurpose species with annual and perennial crops in their homegardens.

Diversification of species goes hand in hand with the tradition to promote diversity of diet and income sources, minimize crop failure and intensify production within small plot of land and ensuring continuity of production throughout the year. Agroforetry practices that favor native tree and shrubby species management in homegardens and crop fields are the most effective conservation strategies commonly observed in the area. Sacred places of graves are also found to be important conservation areas that housed smaller plant associations.

However, the traditional ethnobotanical knowledge and homegarden useful plants of the area are under threat from the high human impact; and hence there is an on-going local scarcity of some useful plants. This is further magnified by the slight sociocultural changes in the local people. The problem is manifested through loss of traditional knowledge on wild foods and traditional medicines and rarity of some of important tree species that had been used in the former century. For instance, *Hagenia abyssinica* and *Embelia scimperii* had been important traditional medicinal plants used against tapeworm infections are no more as such medicinally required as the report of the informants indicated. Instead, people rush into clinics or pharmacies to buy modern medicines. Moreover, trees like *Cordia africana*, *Olea europaea* subsp. *cuspidata* and *Syzygium guineense* that are used in material culture of the Gedeo people are these days getting lost in the area. Furthermore, traditional ethnobotanical knowledge is passed from generation to generation through oral traditions and it is more and more diluted as it reaches to the next generation and otherwise it might be entirely lost when the owner of the knowledge dies before retrieval of the information.

Recognizing the immense wealth of indigenous knowledge on management and use of local plant resources, we should learn from the principles behind the success or failure of these local systems of knowledge on which the people have survived over generations. Therefore, this research calls for measures to respect, preserve and maintain knowledge, innovations and practices of the local people for sustainable use of plants through the recommendations forwarded hereafter.

6.2 Recommendations

1. Maintenance of GATE UDUMA (Gedeos' traditional homegarden) is a strategy for complementarities between *in-situ* and *ex-situ* conservation of agrobiodiversty, and thus it should be considered as priority area of conservation.

2. Research and development efforts should pay attention to the sustainability of homegardens as part of farming systems that play crucial roles to food security and nutritional requirements of the local people, since a considerable amount of plant species were found cultivated primarily for food in homegardens in the area.

3. Research should be conducted to alleviate loss of products of ENSET for ENSET bacterial wilt and ENSET corm rot as well as loss of coffee for CBD. These problems are frequently raised and mentioned by informants in the area as major problems reducing yields.

4. Conservation priority should be given to species vulnerable for local exhaustion and that are subject to destructive harvesting methods such as *Syzygium guineense, Cordia africana, Olea europaea* subsp. *cuspidata* and *Prunus africana.*

5. The continued conservation of multipurpose species in cultivated lands and species diverse homegardens should be encouraged.

6. The government and NGOs together with private actors should collaborate in introducing environment friendly technologies that replace firewood consumption since it was recorded as the major cause of threat to woody components of homegardens and crop fields. With this regard, the agriculture sector should encourage use of biogas as fuel source.

7. The local people have the principles of sustainability rooted in their tradition culturally or as a coping mechanism towards shortage of land; and hence it is essential to respect, preserve and maintain indigenous knowledge and practices to manage and sustainably use biodiversity. Therefore, research on indigenous traditional knowledge should be promoted further.

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8 APPENDICES

APPENDIX I List of informants interviewed via semi-structured way

(**Sex**: M=male, F=female; those with /*/ are the key informants)

No	Full name	age	sex	Marital Status	Educational status	Locality
1.	Adaantu Kifle*	30	F	Married	Illiterate	Bunno
2.	Adduke Awade	60	M	Married	Illiterate	Kurumi
3.	Alemayehu Bekele	45	M	Married	8th	Sisota
4.	Alemayehu Debela	48	M	Married	7th	Hanchebi
5.	Almaz Tesemma	30	F	Married	Illiterate	Bunno
6.	Asefa Gelgle	35	M	Married	4th	Kore
7.	Berry Edema*	54	M	Married	3rd	Kore
8.	Beyene Bedecha	60	M	Married	Illiterate	Bunno
9.	Beyene Guta	44	M	Married	5th	Kurumi
10.	Birihanu Seid*	33	M	Married	4th	Hanchebi
11.	Bishawu Mekonnen	45	M	Married	5th	Kurumi
12.	Bizuneshe Tuma	33	F	Married	Illiterate	Hanchebi
13.	Daniel Oda	32	M	Married	10th	Jeldu
14.	Demieeie Gelcaha	50	M	Married	7th	Bunno
15.	Gemege Kuta	80	M	Married	4th	Jeldu
16.	Haymanot Roba	26	M	Married	4th	Bunno
17.	Hordoffa Geddo*	80	M	Married	4th	Kurumi
18.	Kassie Bedassa	50	M	Married	5th	Bunno
19.	Kifle Demissie	36	M	Married	8th	Kurumi
20.	Kifle Gobena	36	M	Married	8th	Hanchebi
21.	Kifle Tamrat*	22	M	Married	10th	Kore
22.	Mamo Oyo	80	M	Married	Illiterate	Sigiga
23.	Mariyam Dogoma	42	M	Married	8th	Sisota
24.	Mikalu Tamirat	23	M	Married	7th	Kore
25.	Mulugeta Shallo	40	M	Married	7th	Dakka dima
26.	Mulunesh Gaado*	60	F	Married	Illiterate	Hanchebi
27.	Negash Mamo	35	M	Married	8th	Jeldu
28.	Oosse Shanko*	67	M	Married	Illiterate	Kurumi
29.	Selli Bagejo	72	M	Married	5th	Bunno
30.	Shibru Dori	50	M	Married	4th	Sigiga
31.	Tadesse Jebo	48	M	Married	Illiterate	Hanchebi

32.	Tefera darasso	50	M	Married	Illiterate	Kore
33.	Tefera Gobena	45	M	Married	5th	Sisota
34.	Tefera Loni	45	M	Married	4th	Kurumi
35.	Tessema Lole*	52	M	Married	Illiterate	Dakka dima
36.	Tigist Tadesse	28	F	Married	6th	Hanchebi
37.	Turre Moroma	65	M	Married	Illiterate	Bunno
38.	Waaqo wote	77	M	Married	Illiterate	Bunno
39.	Waqqo Duube	80	M	Married	Illiterate	Kurumi
40.	Workalem Saale*	25	F	Married	4th	Bunno
41.	Xeeko Birre	70	M	Married	Illiterate	Dakka dima
42.	Yohannes Beyene	25	M	Married	3th	Jeldu
43.	Zemache Admassu	25	M	Married	4th	Bunno
44.	Zemenu Gizew	25	M	Married	4th	Bunno
45.	Zenebeche Shallo*	40	F	Married	2nd	Hanchebi

APPENDIX II Checklist of questions used to collect ethnobotanical data via semi-structured interviews

1. Information on the respondents:
   - ❖ Name: ----------
   - ❖ Age: ----------, Sex Male/ Female (record!)
   - ❖ Marital Status: single/ married/ widowed/ divorced (Underline)
   - ❖ Educational status: illiterate/ elementary school or grade1-8/ secondary school or grade 9-12/ College graduate or diploma holder, University graduate or 1st degree holder
   - ❖ Locality: Region: ***SNNPR***; Zone: ***Gedeo***; Wereda: ***Kochere***; Kebele: ---------- PA.
2. What are the local names of useful plants that you know in you village or PA. Start from your garden and tell the origin from where the plants are obtained (wild or domesticated) and if domestic, are these cultivated in gardens or crop fields ?).
3. What crops are grown in your village? Mention the local names and their uses.
4. Are there crops with local varieties you selected and maintained? Mention the most important ones with their local names and locally known characteristic features.
5. What planting practices do you use in gardening or planting field crops? Mention the planting materials used for the crops grown in gardens and crop fields.
6. Mention the local names of wild edible plants grown in and around homegardens in your village.

7.1. Which edible wild plant is most commonly used locally?

7.2. What part of the wild edible plant (the seed/ fruit/leaf/ stem/ root…) is edible?

7.3. Which age group or social classes of people consume these wild plants (children/ women/ shepherds/ farmers), mention!

7.4. At what conditions and periods are the wild plants used (as ordinary food, as snacks, seasonal foods, emergency and famine foods. Mention!

8. Mention the local names of traditional medicinal plants you know in your locality from gardens and crop fields.

9.1. Which of these medicinal plants are widely used locally?

9.1 For human ailments, mention the mode of preparation and application/ administration.

10. Which wood is the most preferable in your community for construction? for firewood? for shade? for bee hive construction? (Mention!)
11. Mention plants used as fodder/ animal feed.

11.1. Which part of the plant is used as fodder?

11.2. At what season of the year is the plant used as fodder?

12. Mention taboos, myths, or rituals and other concepts linked to plant use and conservation.

13. Mention plants that appear in myths, rituals, sorcery or other stories.

14. Are there wild plants people deliberately leave in their crop fields? If yes, for what purpose?

15. What are the local names of multipurpose plants you know in your locality? Mention where these are grown (in gardens/ crop fields.)

16. Do you know any plant of special importance; mention their local names with their importance.

17. What are names of locally scarce useful plants in your village, mention the causes of scarcity for each species.

18. What are the local plant harvesting methods that are the most destructive for the plant?

19. What are the local levels of conservation practices to conserve these scarce useful plants?

20. What are the names of different vegetation types in your village? Based on local categorization, which is the dominant one?

21. What are the names of different type of landforms in your village? Based on local categorization.

22. What are the names of local categories of arable lands in your village? Based on local categorization, which one is the dominant?

23. What are the names of different soil types in your village? Based on local categorization.

24. What are seasons known in your village? Based on local categorization, characterize each one!

APPENDIX III List of plant species collected from the study area

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated;
Part used L=Leaf, Ph=Phloem, Sh=Stem Sheath, R=Root, Pt=Petiole, F=Fruit, Sd=Seed, Bu=Bulbs, St=Stem, Agp=Above ground parts, Rt=Root tuber, Cor=Corm, Vi=Vine, Str=Straw, Rh=Rhizome, Br=Brunch, Fl=Flower, Inf=Inflorescence; Bt=Bracts, Wp=Whole plant;
Use class: E=Edible, Md=Medicinal, Co=Construction of houses, Fw=Firewood, Or=Ornamental, Lf=Live fence, Fo=Fodder, Fu=Furniture, Sh=Shade, Bh=Bee hive making, Fb=Forage for honey bees, Sf= Soli fertilizer plants, Ch=Charcoal, Ut=Utility plants, Fum=Fumigants, Fr=Fragrant, Wm=Wetlands management plants, Cl=Traditional cleaning agents, Ws=Walking sticks, Cr=Craft making, Fn Dry fencing, Is=Income source/ cash crops, St=Stimulants, Nr=Narcotic, Tb=Tooth brush, Fi=Farm implement, Mp=Multipurpose species, Mi=Miscellaneous use species

Scientific name	Family name	Vernacular name		Habit	Status	Part used	Uses mentioned
		Gedeo name	Amharic name				
Acacia abyssinica Hochst. ex Benth.	Fabaceae	Wacho	Bazra girar	T	W	St, Lf, Fl	Fw, Ch, Sf, Sh, Fo, Fb
Acacia senegal (L.) Wild.	Fabaceae	Wacho	Sibansa girar	T	W	St, Lf, Fl	Fw, Ch, Sf, Sh, Fo, Fb
Aframomum corrorima (Braun) Jansen	Zingiberaceae	Cororima	Korerima	H	C	Sd	E
Agave sisalana Perrine ex Engel.	Agavaceae	Kacha	Kacha	H	SW	L	Lf
Ajuga integrifolia Buch.-Ham. Ex D. Don	Lamiaceae	Anamuro	Armagussa	H	W	L	Md
Albizia grandibracteata Taub.	Fabaceae	Dambalkuche		T	W	St	Fw
Albizia gummifera (J. F. Gmel.) C. A. Sm.	Fabaceae	Gorbe	Sesa	T	W	St, Ph	Md, Co,Fw, Fn
Alcea rosea L.	Malvaceae	Abeba		H	C	Fl	Or
Allium sp.	Alliaceae	Shunkurta	Shinkurt	H	C	L	E
Allium cepa L.	Alliaceae	Kulubi dima	Key shinkurt	H	C	Bu	E
Allium sativum L.	Alliaceae	Kulubi adi	Nech shinkurt	H	C	Bu	E, Md
Aloe sp.	Aloaceae		Ret	H	SW	L	Md
Amaranthus caudatus L.	Amaranthaceae	Abeba	Aluma	H	SW	Sd, Inf	E, Or
Amaranthus hybridus L.	Amaranthaceae	Rafu		H	W	L	E
Ananas comosus (L.) Merr.	Bromeliaceae	Ananisa	Ananas	H	C	F	E

Appendix III continued							
Annona squamosa L.	Annonaceae	Gishta	Gishita	T	C	F	E
Arachis hypogea L.	Fabaceae	Lawuze	Lewuz	H	C	F	E
Artemisia abyssinica Sch. Bip. ex A. Rich.	Asteraceae	Chugune	Chigugne	H	C	L, Inf	Fr, Md
Artraxon micans (Nees) Hochst.	Poaceae	Bena/ Bedha		H	W	Wp	Fo
Arundinaria alpina K. Schum.	Poaceae	Lema	Kerkeha	H	SW	St,L, She	Co, Fu, Lf, Fo, Bh, Ws, Fn
Arundo donax L.	Poaceae	Shomboko	Shemboko	H	SW	St, L	Fo, Lf, Co, Fu
Asparagus africanus Lam.	Asparagaceae	Sariti	Kestancha	S	W	L	Md
Azadirachta indica A. Juss.	Meliaceae	Nime	Nim	T	SW	L, F	Md, Or
Bersama abyssinica Fresen.	Meliaceae	Tibiro	Azamr	T	W	St	Co, Fu
Beta vulgaris L.	Chenopodiaceae	Kaysire	Keysir	H	C	Rt	E
Brassica carinata A. Br.	Brassicaceae	Shana	Gomen yehabesha	H	C	L	E
Brassica oleracea L.	Brassicaceae	Tiqilgomana	Tikilgomen	H	C	L	E
Brassica rapa L.	Brassicaceae	Kosta	Kosta	H	C	L	E
Brucea antidysenterica J. F. Mill.	Simaroubaceae	Lafa	Abalo	T	W	F	Md
Cajanus cajan (L.) Millsp.	Fabaceae	Atara simbirro	Yewof ater	S	C	St, Sd	E, Lf
Calpurnia aurea (Ait.) Benth.	Fabaceae	Chekata	Digita	S	W	L, St	Md, Co, Fu, Lf, Fi, Fb
Canavalia ensiformis (L.) DC.	Fabaceae	Boloke (Sidist gorash or Zetegne gorashe)	Adenguware	Cli	C	Vi, Sd	E, Lf
Canna indica L.	Cannaceae	Abeba	Enset abeba	H	C	Fl	Or
Canna x generalis L. H. Bailey	Cannaceae	Abeba	Enset abeba	H	C	Fl	Or
Capsicum annuum L.	Solanaceae	Kara	Karia	H	C	F	E
Capsicum frutescens L.	Solanaceae	Mitmito	Mitmita	H	C	F	E
Carica papaya L.	Caricaceae	Papaya	Papaya	H	C	F	E
Casimiroa edulis La Liave	Rutaceae	Abikere	Kasmir	T	C	F	E
Casuarina equisetifolia L.	Casuarinaceae	Shewshewe	Shewshewe	T	SW	St, L	Co, Or, Fn
Catha edulis (Vahl.) Forssk. ex Endl.	Celastraceae	CHAATE	KHAT	S	C	L	St, Is
Celtis africana Burm. F.	Ulmaceae	Motokamo	Tuye	T	W	St, Lf	Co, Fo, Fw, Fi, Ch, Fn

Appendix III continued							
Chrysanthemum coronarium L.	Asteraceae	Abeba	Abeba	H	C	Fl	Or
Cirtrus sp.	Rutaceae	Marara	Merara	T	C	F	E
Citrus aurantifolia (Christm.) Swingle	Rutaceae	Lome	Lomi	T	C	F	E
Citrus sinensis (L.) Osb.	Rutaceae	Burtukane	Birtukan	T	C	F	E
Clematis hirsuta Perr. & Guill.	Ranunculaceae	Fite	Yeazo hareg	Cli	W	L	Md
Clerodendrum myricoides (Hochst.) Vatke.	Lamiaceae	Abeba	Abeba	H	SW	Fl	Or
Coffea arabica L.	Rubiaceae	Buno	Buna	T	C	Sd, Fl	St, Is, Fb
Colocasia esculenta (L.) Schott.	Araceae	Godare adi	Godere	H	C	Rt	E
Combretum collinum Fresen.	Combretaceae	Rukensa	Yekola abalo	T	W	St	Co, Fw, Ch, Fn
Combretum molle R. Br. ex G. Don	Combretaceae	Rukensa	Abalo	T	W	St	Co, Fw, Ch, Fn
Commeliana africana L.	Commelinaceae	Lalunte	Wuha ankur	H	W	Vi	Md, Fo
Cordia africana Lam.	Boraginaceae	Wodesa	Wanza	T	W	St, F	E, Co, Fu, Sh, Bh, Fb
Coriandrum sativum L.	Apiaceae	Jebe	Dinbilal	H	C	F	E
Cosmos bipinnatus Cav.	Asteraceae	Abeba	Abeba	H	C	Fl	Or
Crassula schimperi Fisch. & Mey.	Crasulaceae	Abeba	Abeba	H	C	L	Or
Croton macrostachyus Del.	Euphorbiaceae	Mokenisa	Bisana	T	W	L, St, Ph	Md, Co,Fw, Fb
Cucurbita pepo L.	Cucurbitaceae	Bakula	Duba	H	C	L, F, Sd	E, Md
Cupresus lusitanica Mill.	Cupressaceae	Hinesa	Yeferengi tid	T	C	ST, L	Co, Fu, Fw, Lf, Or, Fn
Cymbopogon citratus (DC.) Stapf	Poaceae	Hiticho	Tegisar	H	C	L	Md, Fr
Cyperus bulbosus Vahl	Cyperaceae	Abeba	Engicha/ Kunti	H	SW	L	Or
Dahlia pinnata Cav.	Asteraceae	Abeba	Abeba	H	C	Fl	Or
Daucus carota L.	Apiaceae	Carote	Carot	H	C	Rt	E
Dianthus caryophyllus L.	Caryophyllaceae	Abeba	Abeba	H	C	Fl	Or
Dioscorea praehensilis Benth.	Dioscoreaceae	Bohina dima	Bohina nechu	Cli	C	Rt	E
Dioscorea sagittifolia Pax.	Dioscoreaceae	Bohina adi	Bohina keyu	Cli	C	Rt	E
Dodonea angustifolia L. f.	Sapindaceae	Itacha	Kitkita	S	W	St, R	Md, Fw, Tb
Dombeya torrida (J. F. Gmel.) P. Bamps	Sterculiaceae	Danisa	Wulkifa	T	W	St, L	Co, Fo, Sh, Fn

Appendix III continued							
Dovyalis caffra (Hook. f. & Harv.) Hook. f.	Flacourtiaceae	Koshima	Koshim	S	SW	St, F	E, Lf
Dracaena afromontana Mildbr.	Dracaenaceae	Choea	Mota	T	W	St, L	Fo, Sh
Dracaena fragrans (L.) Ker Gawl	Dracaenaceae	Lante		S	SW	St, Lf	Fo, Lf
Ekebergia capensis Sparrm.	Meliaceae	Sombo	Lol	T	W	St	Co, Fu
Embelia schimperi Vatke	Myrsinaceae	Hanku	Enkoko	T	W	F	Md
Ensete ventricosum (Welw.) Cheesman	Musaceae	Wesho	Enset	H	C	Cor, She, L, Pt	E, Md, Co, Sf, Fo, Bh, Or
Eragrostis tef (Zucc.) Trotter	Poaceae	Tafe	Tef	H	C	Sd, Str	E, Co, Fo
Erythrina brucei Schweinf. **	Fabaceae	Wolena	Korch	T	W	St, L	Sf, Sh, Bh, Lf, Fo, Fb
Eucalyptus camaldulensis Dehnh.	Myrtaceae	Barzafe dima	Bahirzaf keyu	T	C	St	Co, Fw, Wm, Fn
Eucalyptus globulus Labill.	Myrtaceae	Barzafe golalo	Bahirzaf nechu	T	C	St, Ph, L, F	Md, Co, Fw, Wm, Fn
Euphorbia ampliphylla Pax	Euphorbiaceae	Adama	Kinchib/ Kulkuwal	T	SW	St	Lf, Bh
Euphorbia cotinifolia L.	Euphorbiaceae	Abeba		S	SW	St, Lf	Lf, Or
Euphorbia pulcherrima Klotzsch.	Euphorbiaceae	Abeba	Abeba	S	C	St, Lf	Lf, Or
Fagaropsis angolensis (Engl.) Dale	Rutaceae	Sisa	Yama	T	W	L, St, F	Md, Co, Fu, Fw, Sh, Fn
Ficus sur Forssk.	Moraceae	Odaco	Shola	T	W	St, L	Co, Sf, Sh, Bh
Ficus sycomorus L.	Moraceae	Odaco	Shola	T	W	St, L	Co, Sf, Sh, Bh
Ficus thonningii Blume	Moraceae	Dembi	Chibah	T	SW	St, L	Sh, Fo, Lf
Foeniculum vulgare Mill.	Apiaceae	Ensilale	Ensilal	H	C	L	Fr
Gardenia ternifolia Schumach. & Thonn.	Rubiaceae	Gambela	Gombib	T	W	L	Md
Grevillea robusta R. Br.	Proteaceae	Gravelia	Gravilia	T	C	St, L	Co, Or, Fn
Grewia ferruginea Hochst. ex A. Rich.	Tiliaceae		Alenkoza	S	W	L	Fo
Hagenia abyssinica (Bruce) J. F. Gmel.	Rosaceae	Heto	Koso	T	W	St, F	Md, Co, Fu, Sh, Bh, Fn
Helianthus annuus L.	Asteraceae	Suufe	Suf yeferengi	H	C	Sd	E
Hibiscus acetosella Welw. ex Hiern	Malvaceae	Abeba	Abeba	S	SW	Fl	Or, Lf
Hibiscus rosa-sinensis L.	Malvaceae	Abeba	Abeba	S	C	Fl	Or
Hordeum vulgare L.	Poaceae	Soa	Gebs	H	C	Sd, She	E, Co, Mt
Ipomoea batatas (L.) Lam.	Convolvulaceae	Matatesa	Sikuwar diniche	H	C	Rt, Vi	E, Fo

Appendix III coninued							
Iresine herbstii Lindl.	Amaranthaceae	Abeba	Abeba	H	C	L	Or
Jasminium grandiflorum L.	Oliaceae	Dicicha	Tembelel	Cli	W	Vi	Co, Bh, Fn
Juniperus procera Hochst. ex Endl.	Cupressaceae	Hinesa	Yehabesha tid	T	C	St	Co, Fw,Fr, Fum, Fn
Justicia schimperiana (Hochst. ex Nees) T. Anders.	Acanthaceae	Kisha	Sensel	S	W	St, L, Fl	Md, Lf, Fb
Lactuca sativa L.	Asteraceae	Salata	Selata	H	C	L	E
Lagenaria siceraria (Molina) Standl.	Cucurbitaceae	Buke	Kil	Cli	W	Vi, Fr	Lf, Ut
Lantana camara L.	Verbenaceae	Abeba	Yewof kolo	S	SW	L, St, Fl	Lf, Or
Lippia adoensis Hochst. ex Walp. *Var. koseret* Sebsebe**	Verbenaceae	Ujubana	Koserot	S	C	L, Inf	Fr
Lycopersicon esculentum Mill.	Solanaceae	Timatime	Timatim	H	C	F	E
Maesa lanceolata Forssk.	Myrsinaceae	Abaea	Kelewa	S	W	L, F	E, Md
Malus sylvestris Mill.	Rosaceae	Aple	Aple	T	C	F	E
Mangifera indica L.	Anacardiaceae	Mango	Mango	T	C	F	E
Manihot esculenta Crantz.	Euphorbiaceae	Mogo	Cssava	S	C	Rt, L	E, Fo
Melilotus suaveolens Ledeb.	Fabaceae	Titiko		H	C	L	Md
Millettia ferruginea (Hochst.) Bak. **	Fabaceae	Dararto	Birbira	T	W	St, L	Co, Fw, Sf, Sh, Fo, Fb, Fn
Mirabilis jalapa L.	Nyctaginaceae	Abeba	Harmele kobera	H	C	Fl	Or
Morus alba L.	Moraceae	Gora	Enjori	T	SW	St, L, F	E, Fo, Lf
Musa x paradisiaca L.	Musaceae	Muze	Muz	H	C	She, L, F	E, Co, Fo, Bh
Nicotiana tabacum L.	Solanaceae	Tambo	Timbaho	H	C	L	Nr
Ocimum basilicum L.	Lamiaceae	Besobilo	Besobila	H	C	L, F	E
Ocimum lamiifolium Hochst. ex Benth.	Lamiaceae	Damakase	Damakese	S	W	L	Md
Oenothera biennis L.	Onagraceae	Abeba	Abeba	H	C	Fl	Or
Olea europaea L. subsp. c*uspidate* (Wall. Ex G. Don) Cif.	Oliaceae	Ejersa	Woyira	T	W	St, L	Co, Fu, Fw, Sh, Ch, Fn, Fum
Passiflora caerulea L.	Passifloraceae	Abeba	Hareg abeba	Cli	C	Vi	Or
Passiflora edulis Sims.	Passifloraceae	Kophe	Kophi	Cli	C	F, Vi	E, Lf
Pelargonium zonale (L.) ‘Her.	Geraniaceae	Abeba	Abeba	H	C	Fl	Or

Appendix III continued							
Pennisetum violaceum (Lam.) L. Rich.	Poaceae	Oba	Zihone sar	H	C	St, L	Fo, Lf
Peponium vogelii (Hock. f.) Engl.	Cucurbitaceae	Surupa		H	W	F	E
Persea americana Mill.	Lauraceae	Abukato	Avocado	T	C	F	E
Phaseolus lunatus L.	Fabaceae	Kokeye	Adenguware	Cli	C	Vi, Sd	E, Lf
Phaseolus vulgaris L.	Fabaceae	Rakinta kokeye	Adenguware	Cli	C	Sd	E
Phoenix reclinata Jacq.	Arecaceae	Meti	Zenbaba	T	C	L	Cr
Physalis peruviana L.	Solanaceae	Lukuluku/ Shisha	Awut	H	W	F	E
Phytolacca dodecandra L Hèrit.	Phytolaccaceae	Haranja	Endod	S	W	F	Md, Cl
Pisum sativum L.	Fabaceae	Atara	Ater	H	C	Sd	E
Podocarpus falcatus (Thunb.) R. B. ex Mirb.	Podocarpaceae	Birbirsa	Zigba	T	SW	St, L	Fu, Co, Sh, Or, Fn
Polysphaeria parvifolia Hiern	Rubiaceae	Kurume		T	W	F	E
Prunus africana (Hook. f.) Kalkm.	Rosaceae	Garbi	Tikur enchet	T	W	ST, Ph, L, F	Md, Co, Fw, Ch, Fi, Sh, Fn
Prunus persica (L.) Batsch.	Rosaceae	Koke	Yehabesha kok	T	C	F	E
Psidium guajava L.	Myrtaceae	Zaytone	Zezitone	T	SW	F	E
Pycnostachys abyssinica Fresen. **	Lamiaceae	Tontona		H	W	L	Md
Rhamnus prinoides L 'Herit.	Rhamnaceae	Geshe	Gesho	S	C	St, L, F	E
Ricinus communis L.	Euphorbiaceae	Kobo	Gulo	H	SW	L, Sd	E, Fo
Rosa abyssinica Lindley	Rosaceae	Abeba	Tsigereda nech	S	C	Fl	Or
Rosa x richardii Rehd.	Rosaceae	Abeba	Tsigereda key	S	C	Fl	Or
Rosmarinus officinalis L.	Lamiaceae	Matibasha	Siga metibesha	S	C	L, St	E
Rumex abyssinicus Jacq.	Polygonaceae	Kobo	Mekmeko	H	W	St, L	Fo
Rumex nepalensis Spreng.	Polygonaceae	Balikane	Embacho	H	W	L, R	Md
Ruta chalepensis L.	Rutaceae	Sugete	Tenadam	S	C	L, F	E, Md, Fr
Saccharum officinarum L.	Poaceae	Shomnkora	Shenkora aGeda	H	C	St, L	E, Fo
Salvia leucantha Cav.	Lamiaceae	Abeba	Abeba	S	C	Fl	Or
Salvia nilotica Jacq.	Lamiaceae	Ukete	Hulegeb	H	W	L	Md
Salvia splendens Sellow ex Roem. & Schult.	Lamiaceae	Abeba	Abeba	S	C	Fl	Or

Appendix III continued							
Sesbania sesban (L.) Merr.	Fabaceae	Shashato	Sesbania	T	C	St, Lf	Lf, Fo, Co, Fb
Solanecio gigas (Vatke) C. Jeffrey **	Asteraceae	Dumbela	Yeshikoko gomen	S	W	St, L	Lf, Fo
Solanum nigrum L.	Solanaceae	Tunaye	Awut	H	SW	L, F	E
Solanum tarderemotum Bitter	Solanaceae	Shana		H	SW	L	E
Solanum tuberosum L.	Solanaceae	Dinicha	Dinich	H	C	Rt	E
Sorghum bicolor (L.) Moench	Poaceae	Mishinka/ Tinkisha	Mashila/ tinkish	H	C	St, Sd, L	E, Fo
Syzygium guineense (Willd.) DC.	Myrtaceae	Badesa	Dokima	T	W	St, F	E, Co, Fu, Fw, Sh, Ch, Fn
Tagetes erecta L.	Asteraceae	Abeba	Abeba	H	C	Fl	Or
Tradescantia zebrina Hort. ex Bosse.	Commelinaceae	Abeba	Abeba	H	C	L	Or
Trichilia emetica Vahl	Meliaceae	Tala	Yezinjero wonber	T	W	St, L	Co, Sf
Triticum aestivum L.	Poaceae	Dine/ Sinde	Sinde	H	C	Sd, Str	E, Co, Mt
Tropaeolum majus L.	Tropaeolaceae	Abeba	Abeba	S	C	Fl	Or
Vernonia amygdalina Del.	Asteraceae	Ebicha	Girawa	S	W	St, L, R	Md, Fo, Lf, Co, Fb
Vernonia myriantha Hook. f.	Asteraceae	Reji		S	W	St	Lf, Co
Vicia faba L.	Fabaceae	Bakela	Bakela	H	C	Sd	E
Xanthosoma sagittifolium (L.) Schott.	Araceae	Godare xillo	Godere tikuru	H	C	Rt	E
Zea mays L.	Poaceae	Badala	Bekolo	H	C	Sd, St, L, Str	E, Fo, Fw

***Note*:** **: Eendemic plant species listed on the IUCN red list of shrubs and trees of Ethiopia

Sidist gorash or Zetegne gorash: Refers to pod of *Canavalia/ Phaseolus* species with 6-9 seeds per pod, locally

APPENDIX IV Collection areas, collection sites & collection numbers of useful plants under each plant family

Collection site: K=Kurumi PA, B=Bunno PA, H=Hanchebi PA; '**+**' = Presence, '**0**'= absence,

Collected from: HG=Homegarden, CF=Crop fields or margins of crop fields.

Family name	Scientific name	Collection area			Collection site (HG/CF)	Coll. number
		K	B	H		
Acanthaceae	*Justicia schimperiana* (Hochst. ex Nees) T. Anders.	+	+	+	HG	ST024
Agavaceae	*Agave sisalana* Perrine ex Engel.	**0**	+	**0**	HG, CF	ST002
Alliaceae	*Allium* sp.	+	**0**	**0**	HG	ST004
Alliaceae	*Allium cepa* L.	+	**0**	**0**	HG	ST005
Alliaceae	*Allium sativum* L.	+	**0**	**0**	HG	ST003
Aloaceae	*Aloe* sp.	**0**	+	+	HG	ST006
Amaranthaceae	*Amaranthus caudatus* L.	+	+	+	HG, CF	ST008
Amaranthaceae	*Amaranthus hybridus* L.	+	+	+	HG	ST009
Amaranthaceae	*Iresine herbstii* Lindl.	+	+	+	HG, CF	ST112
Anacardiaceae	*Mangifera indica* L.	**0**	+	**0**	HG	ST060
Annonaceae	*Annona squamosa* L.	+	+	+	HG	ST011
Apiaceae	*Coriandrum sativum* L.	+	+	**0**	HG	ST021
Apiaceae	*Daucus carota* L.	+	+	+	HG	ST038
Apiaceae	*Foeniculum vulgare* Mill.	+	+	+	HG	ST142
Araceae	*Colocasia esculenta* (L.) Schott.	**0**	+	+	HG	ST042
Araceae	*Xanthosoma sagittifolium* (L.) Schott.	+	+	+	HG	ST015
Arecaceae	*Phoenix reclinata* Jacq.	+	+	+	HG	ST017
Asparagaceae	*Asparagus africanus* Lam.	+	**0**	**0**	HG	ST018
Asteraceae	*Artemisia abyssinica* Sch. Bip. ex A. Rich.	+	+	+	HG	ST019
Asteraceae	*Chrysanthemum coronarium* L.	+	+	+	HG	ST145
Asteraceae	*Cosmos bipinnatus* Cav.	**0**	**0**	+	HG	ST047
Asteraceae	*Dahlia pinnata* Cav.	+	+	+	HG	ST013

Asteraceae	*Helianthus annuus* L.	+	+	+	HG	ST093
Asteraceae	*Lactuca sativa* L.	+	+	+	HG	ST049
Asteraceae	*Solanecio gigas* (Vatke) C. Jeffrey	+	+	**0**	HG	ST025
Asteraceae	*Tagetes erecta* L.	+	+	+	HG	ST026
Asteraceae	*Vernonia amygdalina* Del.	+	+	+	HG	ST027
Asteraceae	*Vernonia myriantha* Hook. f.	+	+	+	HG	ST028
Boraginaceae	*Cordia africana* Lam.	+	+	**0**	HG, CF	ST012
Brassicaceae	*Brassica carinata* A. Br.	+	+	+	HG	ST032
Brassicaceae	*Brassica oleracea* L.	+	+	+	HG	ST031
Brassicaceae	*Brassica rapa* L.	+	+	+	HG	ST150
Bromeliaceae	*Ananas comosus* (L.) Merr.	+	+	+	HG, CF	ST033
Cannaceae	*Canna indica* L.	+	+	+	HG	ST035
Cannaceae	*Canna x generalis* L. H. Bailey	+	+	+	HG	ST151
Caricaceae	*Carica papaya* L.	+	+	+	HG	ST143
Caryophyllaceae	*Dianthus caryophyllus* L.	+	+	+	HG, CF	ST053
Casuarinaceae	*Casuarina equisetifolia* L.	+	+	+	HG	ST039
Celastraceae	*Catha edulis* (Vahl.) Forssk. ex Endl.	+	+	+	HG, CF	ST162
Chenopodiaceae	*Beta vulgaris* L.	+	+	+	HG	ST030
Combretaceae	*Combretum collinum* Fresen.	**0**	+	+	HG, CF	ST042
Combretaceae	*Combretum molle* R. Br. ex G. Don	**0**	+	+	HG, CF	ST044
Commelinaceae	*Commeliana africana* L.	+	+	+	HG	ST029
Commelinaceae	*Tradescantia zebrina* Hort. ex Bosse.	+	**0**	+	HG	ST043
Convolvulaceae	*Ipomoea batatas* (L.) Lam.	+	+	+	HG, CF	ST007
Crasulaceae	*Crassula schimperi* Fisch. & Mey.	+	+	+	HG, CF	ST057
Cucurbitaceae	*Cucurbita pepo* L.	+	+	+	HG, CF	ST051
Cucurbitaceae	*Lagenaria siceraria* (Molina) Standl.	+	+	+	HG	ST164
Cucurbitaceae	*Peponium vogelii* (Hock. f.) Engl.	**0**	+	+	HG, CF	ST049
Cupressaceae	*Cupressus lusitanica* Mill.	+	+	+	HG	ST120
Cupressaceae	*Juniperus procera* Hochst. ex Endl.	+	+	+	HG, CF	ST001

Cyperaceae	*Cyperus bulbosus* Vahl	+	+	+	HG	ST022
Dioscoreaceae	*Dioscorea praehensilis* Benth.	+	+	+	HG	ST054
Dioscoreaceae	*Dioscorea sagittifolia* Pax.	+	+	+	HG	ST149
Dracaenaceae	*Dracaena afromontana Mildbr.*	**0**	+	+	HG	ST055
Dracaenaceae	*Dracaena fragrans* (L.) Ker Gawl	+	+	+	HG, CF	ST095
Euphorbiaceae	*Croton macrostachyus* Del.	+	+	+	HG	ST047
Euphorbiaceae	*Euphorbia ampliphylla* Pax	+	+	+	HG	ST062
Euphorbiaceae	*Euphorbia cotinifolia* L.	**0**	**0**	+	HG	ST061
Euphorbiaceae	*Euphorbia pulcherrima* Klotzsch.	+	+	+	HG, CF	ST147
Euphorbiaceae	*Manihot esculenta* Crantz.	**0**	+	**0**	HG, CF	ST096
Euphorbiaceae	*Ricinus communis* L.	+	+	+	HG	ST060
Fabaceae	*Acacia abyssinica* Hochst. ex Benth.	**0**	+	+	HG, CF	ST071
Fabaceae	*Acacia senegal* (L.) Wild.	**0**	+	+	HG, CF	ST072
Fabaceae	*Albizia grandibracteata* Taub.	+	+	+	HG, CF	ST063
Fabaceae	*Albizia gummifera* (J. F. Gmel.) C. A. Sm.	+	+	+	HG, CF	ST064
Fabaceae	*Arachis hypogea* L.	**0**	**0**	+	HG, CF	ST065
Fabaceae	*Cajanus cajan* (L.) Millsp.	+	+	+	HG, CF	ST077
Fabaceae	*Calpurnia aurea* (Ait.) Benth.	+	+	+	HG	ST066
Fabaceae	*Canavalia ensiformis* (L.) DC.	+	+	+	HG	ST034
Fabaceae	*Erythrina brucei* Schweinf.	+	+	+	HG, CF	ST106
Fabaceae	*Melilotus suaveolens* Ledeb.	**0**	+	**0**	HG	ST068
Fabaceae	*Millettia ferruginea* (Hochst.) Bak.	+	+	+	HG, CF	ST075
Fabaceae	*Phaseolus lunatus* L.	+	+	+	HG	ST069
Fabaceae	*Phaseolus vulgaris* L.	+	+	+	HG	ST067
Fabaceae	*Pisum sativum* L.	+	**0**	**0**	HG	ST070
Fabaceae	*Sesbania sesban* (L.) Merr.	+	+	+	HG	ST078
Fabaceae	*Vicia faba* L.	+	**0**	**0**	HG, CF	ST076
Flacourtiaceae	*Dovyalis caffra* (Hook. f. & Harv.) Hook. f.	**0**	+	**0**	HG	ST056
Geraniaceae	*Pelargonium zonale* (L.) ‘Her.	+	**0**	+	HG	ST080

Lamiaceae	*Ajuga integrifolia* Buch.-Ham. ex D. Don	**0**	**0**	+	HG	ST081
Lamiaceae	*Clerodendrum myricoides* (Hochst.) Vatke.	+	+	+	HG, CF	ST140
Lamiaceae	*Ocimum basilicum* L.	+	+	+	HG	ST083
Lamiaceae	*Ocimum lamiifolium* Hochst. ex Benth.	+	+	+	HG	ST084
Lamiaceae	*Pycnostachys abyssinica* Fresen.	**0**	+	**0**	HG	ST085
Lamiaceae	*Rosmarinus officinalis* L.	+	+	+	HG	ST086
Lamiaceae	*Salvia leucantha* Cav.	+	+	+	HG	ST088
Lamiaceae	*Salvia nilotica* Jacq.	+	**0**	**0**	HG	ST087
Lamiaceae	*Salvia splendens* Sellow ex Roem. & Schult.	**0**	+	+	HG	ST089
Lauraceae	*Persea americana* Mill.	+	+	+	HG	ST090
Malvaceae	*Alcea rosea* L.	+	+	+	HG	ST091
Malvaceae	*Hibiscus acetosella* Welw. ex Hiern	+	+	+	HG	ST093
Malvaceae	*Hibiscus rosa-sinensis* L.	+	+	+	HG, CF	ST122
Meliaceae	*Azadirachta indica* A. Juss.	+	+	+	HG, CF	ST094
Meliaceae	*Bersama abyssinica* Fresen.	+	+	+	HG	ST040
Meliaceae	*Ekebergia capensis* Sparrm.	+	+	+	HG, CF	ST104
Meliaceae	*Trichilia emetica* Vahl	+	+	**0**	HG, CF	ST097
Moraceae	*Ficus sur* Forssk.	+	+	+	HG, CF	ST099
Moraceae	*Ficus sycomorus* L.	+	+	+	HG, CF	ST100
Moraceae	*Ficus thonningii* Blume	+	+	+	HG	ST014
Moraceae	*Morus alba* L.	+	+	+	HG	ST101
Musaceae	*Ensete ventricosum* (Welw.) Cheesman	+	+	+	HG, CF	ST121
Musaceae	*Musa x paradisiaca* L.	+	+	+	HG, CF	ST103
Myrsinaceae	*Embelia schimperi* Vatke	+	+	+	HG, CF	ST102
Myrsinaceae	*Maesa lanceolata* Forssk.	+	+	+	HG, CF	ST135
Myrtaceae	*Eucalyptus camaldulensis* Dehnh.	+	+	+	HG, CF	ST107
Myrtaceae	*Eucalyptus globulus* Labill.	+	+	+	HG, CF	ST058
Myrtaceae	*Psidium guajava* L.	**0**	+	+	HG	ST108
Myrtaceae	*Syzygium guineense* (Willd.) DC.	+	+	+	HG, CF	ST109

Nyctaginaceae	*Mirabilis jalapa* L.	+	+	+	HG	ST110
Oliaceae	*Jasminium grandiflorum* L.	**0**	+	+	HG, CF	ST050
Oliaceae	*Olea europaea* L. subsp. c*uspidata* (Wall. Ex G. Don) Cif.	**0**	+	+	HG, CF	ST112
Onagraceae	*Oenothera biennis* L.	+	+	**0**	HG	ST113
Passifloraceae	*Passiflora caerulea* L.	**0**	+	+	HG	ST114
Passifloraceae	*Passiflora edulis* Sims.	+	+	+	HG	ST115
Phytolaccaceae	*Phytolacca dodecandra* L Hèrit.	+	+	+	HG, CF	ST116
Poaceae	*Artraxon micans* (Nees) Hochst.	+	+	+	HG, CF	ST117
Poaceae	*Arundinaria alpina* K. Schum.	+	**0**	**0**	HG, CF	ST118
Poaceae	*Arundo donax* L.	+	+	+	HG, CF	ST119
Poaceae	*Cymbopogon citratus* (DC.) Stapf	+	+	+	HG	ST052
Poaceae	*Eragrostis tef* (Zucc.) Trotter	+	+	+	CF	ST073
Poaceae	*Hordeum vulgare* L.	+	**0**	+	HG, CF	ST045
Poaceae	*Pennisetum violaceum* (Lam.) L. Rich.	**0**	+	+	HG	ST123
Poaceae	*Saccharum officinarum* L.	+	+	+	HG, CF	ST124
Poaceae	*Sorghum bicolor* (L.) Moench	+	+	+	HG, CF	ST125
Poaceae	*Triticum aestivum* L.	+	**0**	**0**	CF	ST126
Poaceae	*Zea mays* L.	+	+	+	HG, CF	ST127
Podocarpaceae	*Podocarpus falcatus* (Thunb.) R. B. ex Mirb.	+	+	+	HG, CF	ST128
Polygonaceae	*Rumex abyssinicus* Jacq.	+	+	+	HG, CF	ST129
Polygonaceae	*Rumex nepalensis* Spreng.	+	+	+	HG, CF	ST130
Proteaceae	*Grevillea robusta* R. Br.	**0**	+	**0**	HG, CF	ST160
Ranunculaceae	*Clematis hirsuta* Perr. & Guill.	+	+	+	HG	ST082
Rhamnaceae	*Rhamnus prinoides* L 'Herit.	+	+	+	HG	ST133
Rosaceae	*Hagenia abyssinica* (Bruce) J. F. Gmel.	+	**0**	**0**	HG	ST023
Rosaceae	*Malus sylvestris* Mill.	+	**0**	**0**	HG	ST010
Rosaceae	*Prunus africana* (Hook. f.) Kalkm.	+	+	+	HG, CF	ST136
Rosaceae	*Prunus persica* (L.) Batsch.	**0**	+	+	HG	ST137
Rosaceae	*Rosa abyssinica* Lindley	+	+	+	HG	ST138

Rosaceae	*Rosa x richardii* Rehd.	+	+	+	HG	ST139
Rubiaceae	*Coffea arabica* L.	+	+	+	HG	ST016
Rubiaceae	*Gardenia ternifolia* Schumach. & Thonn.	**0**	+	+	HG	ST131
Rubiaceae	*Polysphaeria parvifolia* Hiern	+	**0**	**0**	HG, CF	ST142
Rutaceae	*Casimiroa edulis* La Liave	+	+	+	HG	ST038
Rutaceae	*Cirtrus* sp.	**0**	+	+	HG	ST146
Rutaceae	*Citrus aurantifolia* (Christm.) Swingle	**0**	+	+	HG	ST145
Rutaceae	*Citrus sinensis* (L.) Osb.	**0**	+	**0**	HG	ST132
Rutaceae	*Fagaropsis angolensis* (Engl.) Dale	+	+	+	HG, CF	ST098
Rutaceae	*Ruta chalepensis* L.	+	+	+	HG	ST148
Sapindaceae	*Dodonea angustifolia* L. f.	+	+	+	HG, CF	ST159
Simaroubaceae	*Brucea antidysenterica* J. F. Mill.	+	+	+	HG, CF	ST074
Solanaceae	*Capsicum annuum* L.	+	+	+	HG	ST152
Solanaceae	*Capsicum frutescens* L.	+	+	+	HG	ST036
Solanaceae	*Lycopersicon esculentum* Mill.	+	+	+	HG	ST105
Solanaceae	*Nicotiana tabacum* L.	+	+	+	HG	ST154
Solanaceae	*Physalis peruviana* L.	+	+	+	HG, CF	ST155
Solanaceae	*Solanum nigrum* L.	+	+	+	HG	ST156
Solanaceae	*Solanum tarderemotum* Bitter	**0**	+	+	HG	ST158
Solanaceae	*Solanum tuberosum* L.	+	+	+	HG	ST157
Sterculiaceae	*Dombeya torrida* (J. F. Gmel.) P. Bamps	+	+	+	HG	ST079
Tiliaceae	*Grewia ferruginea* Hochst. ex A. Rich.	+	+	+	HG, CF	ST134
Tropaeolaceae	*Tropaeolum majus* L.	**0**	**0**	+	HG	ST161
Ulmaceae	*Celtis africana* Burm. F.	+	+	+	HG	ST020
Verbenaceae	*Lantana camara* L.	+	+	+	HG	ST163
Verbenaceae	*Lippia adoensis* Hochst. ex Walp.	+	+	+	HG	ST153
Zingiberaceae	*Aframomum corrorima* (Braun) Jansen	+	+	**0**	HG	ST165

APPENDIX V List of cultivated plants from homegardens and crop fields

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Use classes: E=Edible, Md=Medicinal, Co=Construction of houses, Fw=Firewood, Or=Ornamental, Lf=Live fence, Fo=Fodder, Fu=Furniture, Bh=Bee hive making, Fb=Forage for honey bees, Sf= Soli fertilizer plants, Fum=Fumigants, Fr=Fragrant, Wm=Wetlands management plants, Cr=Craft making, Fn= Dry fencing, Is=Income source/ cash crops, St=Stimulants, Nr=Narcotic, Mt=Mattress making

No	Scientific name	Family name	Habit	Use categories
1.	*Aframomum corrorima*	Zingiberaceae	H	E
2.	*Alcea rosea*	Malvaceae	H	Or
3.	*Allium cepa*	Alliaceae	H	E
4.	*Allium sativum*	Alliaceae	H	E, Md
5.	*Allium* sp.	Alliaceae	H	E
6.	*Ananas comosus*	Bromeliaceae	H	E
7.	*Annona squamosa*	Annonaceae	T	E
8.	*Arachis hypogea*	Fabaceae	H	E
9.	*Artemisia abyssinica*	Asteraceae	H	Md, Fr
10.	*Beta vulgaris*	Chenopodiaceae	H	E
11.	*Brassica carinata*	Brassicaceae	H	E
12.	*Brassica oleracea*	Brassicaceae	H	E
13.	*Brassica rapa*	Brassicaceae	H	E
14.	*Cajanus cajan*	Fabaceae	S	E, Lf
15.	*Canavalia ensiformis*	Fabaceae	Cli	E, Lf
16.	*Canna indica*	Cannaceae	H	Or
17.	*Canna x generalis*	Cannaceae	H	Or
18.	*Capsicum annuum*	Solanaceae	H	E
19.	*Capsicum frutescens*	Solanaceae	H	E
20.	*Carica papaya*	Caricaceae	H	E
21.	*Casimiroa edulis*	Rutaceae	T	E
22.	*Catha edulis*	Celastraceae	S	St, Is
23.	*Chrysanthemum coronarium*	Asteraceae	H	Or
24.	*Cirtrus* sp.	Rutaceae	T	E
25.	*Citrus aurantifolia*	Rutaceae	T	E
26.	*Citrus sinensis*	Rutaceae	T	E
27.	*Coffea arabica*	Rubiaceae	T	St, Is, Fb
28.	*Colocasia esculenta*	Araceae	H	E
29.	*Coriandrum sativum*	Apiaceae	H	E
30.	*Cosmos bipinnatus*	Asteraceae	H	Or
31.	*Crassula schimperi*	Crasulaceae	H	Or
32.	*Cucurbita pepo*	Cucurbitaceae	H	E, Md

33.	*Cupressus lusitanica*	Cupressaceae	T	Co, Fu, Fw, Lf, Or, Fn
34.	*Cymbopogon citratus*	Poaceae	H	Md, Fr
35.	*Dahlia pinnata*	Asteraceae	H	Or
36.	*Daucus carota*	Apiaceae	H	E
37.	*Dianthus caryophyllus*	Caryophyllaceae	H	Or
38.	*Dioscorea praehensilis*	Dioscoreaceae	Cli	E
39.	*Dioscorea sagittifolia*	Dioscoreaceae	Cli	E
40.	*Ensete ventricosum*	Musaceae	H	E, Md, Co, Sf, Fo, Bh, Or
41.	*Eragrostis tef*	Poaceae	H	E, Co, Fo
42.	*Eucalyptus camaldulensis*	Myrtaceae	T	Co, Fw, Wm, Fn
43.	*Eucalyptus globulus*	Myrtaceae	T	Md, Co, Fw, Wm, Fn
44.	*Euphorbia ampliphylla*	Euphorbiaceae	T	Lf, Bh
45.	*Foeniculum vulgare*	Apiaceae	H	Fr
46.	*Grevillea robusta*	Proteaceae	T	Co, Or, Fn
47.	*Helianthus annuus*	Asteraceae	H	E
48.	*Hibiscus rosa-sinensis*	Malvaceae	S	Or
49.	*Hordeum vulgare*	Poaceae	H	E, Co, Mt
50.	*Ipomoea batatas*	Convolvulaceae	H	E, Fo
51.	*Iresine herbstii*	Amaranthaceae	H	Or
52.	*Juniperus procera*	Cupressaceae	T	Co, Fw, Fum, Fr, Fn
53.	*Lactuca sativa*	Asteraceae	H	E
54.	*Lippia adoensis*	Verbenaceae	S	Fr
55.	*Lycopersicon esculentum*	Solanaceae	H	E
56.	*Malus sylvestris*	Rosaceae	T	E
57.	*Mangifera indica*	Anacardiaceae	T	E
58.	*Manihot esculenta*	Euphorbiaceae	S	E, Fo
59.	*Melilotus suaveolens*	Fabaceae	H	Md
60.	*Mirabilis jalapa*	Nyctaginaceae	H	Or
61.	*Musa x paradisiaca*	Musaceae	H	E, Co, Fo, Bh
62.	*Nicotiana tabacum*	Solanaceae	H	Nr
63.	*Ocimum basilicum*	Lamiaceae	H	E
64.	*Oenothera biennis*	Onagraceae	H	Or
65.	*Passiflora caerulea*	Passifloraceae	Cli	Or
66.	*Passiflora edulis*	Passifloraceae	Cli	E, Lf, Or
67.	*Pelargonium zonale*	Geraniaceae	H	Or
68.	*Pennisetum violaceum*	Poaceae	H	Fo, Lf
69.	*Persea americana*	Lauraceae	T	E
70.	*Phaseolus lunatus*	Fabaceae	Cli	E, Lf
71.	*Phaseolus vulgaris*	Fabaceae	Cli	E
72.	*Phoenix reclinata*	Arecaceae	T	Cr

73.	*Pisum sativum*	Fabaceae	H	E
74.	*Prunus persica*	Rosaceae	T	E
75.	*Rhamnus prinoides*	Rhaminaceae	S	E
76.	*Rosa abyssinica*	Rosaceae	S	Or
77.	*Rosa x richardii*	Rosaceae	S	Or
78.	*Rosmarinus officinalis*	Lamiaceae	S	E
79.	*Ruta chalepensis*	Rutaceae	S	E, Md, Fr
80.	*Saccharum officinarum*	Poaceae	H	E, Fo
81.	*Salvia leucantha*	Lamiaceae	S	Or
82.	*Salvia splendenes*	Lamiaceae	S	Or
83.	*Sesbania sesban*	Fabaceae	T	Lf, Fo, Co, Fb
84.	*Solanum tuberosum*	Solanaceae	H	E
85.	*Sorghum bicolor*	Poaceae	H	E, Fo
86.	*Tagetes erecta*	Asteraceae	H	Or
87.	*Tradescantia zebrina*	Commelinaceae	H	Or
88.	*Triticum aestivum*	Poaceae	H	E, Co, Mt
89.	*Tropaeolum majus*	Tropaeolaceae	H	Or
90.	*Vicia faba*	Fabaceae	H	E
91.	*Xanthosoma sagittifolium*	Araceae	H	E
92.	*Zea mays*	Poaceae	H	E, Fo, Fw

APPENDIX VI Edible plants collected from homegardens and crop fields

Part used L=Leaf, Sh=Stem Sheath, F=Fruit, Sd=Seed, Bu=Bulbs, St=Stem, Rt=Root tuber, Cor=Corm, Fl=Flower,

Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated;

No	Scientific name	Family name	Part used	Status of domestication
1.	*Aframomum corrorima*	Zingiberaceae	Sd	C
2.	*Allium cepa*	Alliaceae	Bu	C
3.	*Allium sativum*	Alliaceae	Bu	C
4.	*Allium* sp.	Alliaceae	L	C
5.	*Amaranthus caudatus*	Amaranthaceae	L	W
6.	*Amaranthus hybridus*	Amaranthaceae	Sd	SW
7.	*Ananas comosus*	Bromeliaceae	F	C
8.	*Annona squamosa*	Annonaceae	F	C
9.	*Arachis hypogea*	Fabaceae	Sd	C
10.	*Beta vulgaris*	Chenopodiaceae	Rt	C
11.	*Brassica carinata*	Brassicaceae	L	C

12.	*Brassica oleracea*	Brassicaceae	L	C
13.	*Brassica rapa*	Brassicaceae	L	C
14.	*Cajanus cajan*	Fabaceae	Sd	C
15.	*Canavalia ensiformis*	Fabaceae	Sd	C
16.	*Capsicum annuum*	Solanaceae	F	C
17.	*Capsicum frutescens*	Solanaceae	F	C
18.	*Carica papaya*	Caricaceae	F	C
19.	*Casimiroa edulis*	Rutaceae	F	C
20.	*Cirtrus* sp.	Rutaceae	F	C
21.	*Citrus aurantifolia*	Rutaceae	F	C
22.	*Citrus sinensis*	Rutaceae	F	C
23.	*Colocasia esculenta*	Araceae	Rt	C
24.	*Cordia africana*	Boraginaceae	F	W
25.	*Coriandrum sativum*	Apiaceae	Sd	C
26.	*Cucurbita pepo*	Cucurbitaceae	L, F, Sd	C
27.	*Daucus carota*	Apiaceae	Rt	C
28.	*Dioscorea praehensilis*	Dioscoreaceae	Rt	C
29.	*Dioscorea sagittifolia*	Dioscoreaceae	Rt	C
30.	*Dovyalis caffra*	Flacourtiaceae	F	SW
31.	*Ensete ventricosum*	Musaceae	She, Cor	C
32.	*Eragrostis tef*	Poaceae	Sd	C
33.	*Helianthus annuus*	Asteraceae	Sd	C
34.	*Hordeum vulgare*	Poaceae	Sd	C
35.	*Ipomoea batatas*	Convolvulaceae	Rt	C
36.	*Lactuca sativa*	Asteraceae	L	C
37.	*Lycopersicon esculentum*	Solanaceae	F	C
38.	*Maesa lanceolata*	Myrsinaceae	F	W
39.	*Malus sylvestris*	Rosaceae	F	C
40.	*Mangifera indica*	Anacardiaceae	F	C
41.	*Manihot esculenta*	Euphorbiaceae	Rt	C
42.	*Morus alba*	Moraceae	F	SW
43.	*Musa x paradisiaca*	Musaceae	F	C
44.	*Ocimum basilicum*	Lamiaceae	L, Fl	C
45.	*Passiflora edulis*	Passifloraceae	F	C
46.	*Peponium vogelii*	Cucurbitaceae	F	W
47.	*Persea americana*	Lauraceae	F	C
48.	*Phaseolus lunatus*	Fabaceae	Sd	C
49.	*Phaseolus vulgaris*	Fabaceae	Sd	C
50.	*Physalis peruviana*	Solanaceae	F	W
51.	*Pisum sativum*	Fabaceae	Sd	C
52.	*Polysphaeria parvifolia*	Rubiaceae	F	W

53.	*Prunus persica*	Rosaceae	F	C
54.	*Psidium guajava*	Myrtaceae	F	SW
55.	*Rhamnus prinoides*	Rhaminaceae	St, L	C
56.	*Ricinus communis*	Euphorbiaceae	Sd	SW
57.	*Rosmarinus officinalis*	Lamiaceae	L	C
58.	*Ruta chalepensis*	Rutaceae	L, F	C
59.	*Saccharum officinarum*	Poaceae	St	C
60.	*Solanum nigrum*	Solanaceae	L, F	SW
61.	*Solanum tarderemotum*	Solanaceae	L	SW
62.	*Solanum tuberosum*	Solanaceae	Rt	C
63.	*Sorghum bicolor*	Poaceae	St, Sd	C
64.	*Syzygium guineense*	Myrtaceae	F	W
65.	*Triticum aestivum*	Poaceae	Sd	C
66.	*Vicia faba*	Fabaceae	Sd	C
67.	*Xanthosoma sagittifolium*	Araceae	Rt	C
68.	*Zea mays*	Poaceae	Sd	C

APPENDIX VII Cultivated food plants from homegardens and crop fields

Collected from: HG=Homegarden, CF=Crop fields or margins of crop fields.

No	Scientific name	Family name	Cultivated at HG or CF
1.	*Aframomum corrorima*	Zingiberaceae	HG
2.	*Allium cepa*	Alliaceae	HG
3.	*Allium sativum*	Alliaceae	HG
4.	*Allium* sp.	Alliaceae	HG
5.	*Ananas comosus*	Bromeliaceae	HG, CF
6.	*Annona squamosa*	Annonaceae	HG
7.	*Arachis hypogea*	Fabaceae	HG, CF
8.	*Beta vulgaris*	Chenopodiaceae	HG
9.	*Brassica carinata*	Brassicaceae	HG
10.	*Brassica oleracea*	Brassicaceae	HG
11.	*Brassica rapa*	Brassicaceae	HG
12.	*Cajanus cajan*	Fabaceae	HG, CF
13.	*Canavalia ensiformis*	Fabaceae	HG
14.	*Capsicum annuum*	Solanaceae	HG
15.	*Capsicum frutescens*	Solanaceae	HG
16.	*Carica papaya*	Caricaceae	HG
17.	*Casimiroa edulis*	Rutaceae	HG

18.	*Cirtrus* sp.	Rutaceae	HG
19.	*Citrus aurantifolia*	Rutaceae	HG
20.	*Citrus sinensis*	Rutaceae	HG
21.	*Colocasia esculenta*	Araceae	HG
22.	*Coriandrum sativum*	Apiaceae	HG
23.	*Cucurbita pepo*	Cucurbitaceae	HG, CF
24.	*Daucus carota*	Apiaceae	HG
25.	*Dioscorea praehensilis*	Dioscoreaceae	HG
26.	*Dioscorea sagittifolia*	Dioscoreaceae	HG
27.	*Ensete ventricosum*	Musaceae	HG, CF
28.	*Eragrostis tef*	Poaceae	CF
29.	*Helianthus annuus*	Asteraceae	HG
30.	*Hordeum vulgare*	Poaceae	HG, CF
31.	*Ipomoea batatas*	Convolvulaceae	HG, CF
32.	*Lactuca sativa*	Asteraceae	HG
33.	*Lycopersicon esculentum*	Solanaceae	HG
34.	*Malus sylvestris*	Rosaceae	HG
35.	*Mangifera indica*	Anacardiaceae	HG
36.	*Manihot esculenta*	Euphorbiaceae	HG, CF
37.	*Musa x paradisiaca*	Musaceae	HG, CF
38.	*Ocimum basilicum*	Lamiaceae	HG
39.	*Passiflora edulis*	Passifloraceae	HG
40.	*Persea americana*	Lauraceae	HG
41.	*Phaseolus lunatus*	Fabaceae	HG
42.	*Phaseolus vulgaris*	Fabaceae	HG
43.	*Pisum sativum*	Fabaceae	HG, CF
44.	*Prunus persica*	Rosaceae	HG
45.	*Rhamnus prinoides*	Rhaminaceae	HG
46.	*Rosmarinus officinalis*	Lamiaceae	HG
47.	*Ruta chalepensis*	Rutaceae	HG
48.	*Saccharum officinarum*	Poaceae	HG, CF
49.	*Solanum tuberosum*	Solanaceae	HG
50.	*Sorghum bicolor*	Poaceae	HG, CF
51.	*Triticum aestivum*	Poaceae	CF
52.	*Vicia faba*	Fabaceae	HG, CF
53.	*Xanthosoma sagittifolium*	Araceae	HG
54.	*Zea mays*	Poaceae	HG, CF

APPENDIX VIII Categories of cultivated plants according to their agricultural classes

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber, **sp.**=Species

No	Horticultural category	Habit	Planting method	Planted in a form of
1	**Fruits plants (14 Species)**			
	Ananas comosus	H	Digging	Cut rosette part
	Annona squamosa	T	Transplanting	Seedling
	Carica papaya	T	Sowing & transplanting	Seedling
	Casimiro edulis	T	Transplanting	Seedling
	Citrus aurantifolium	T	Transplanting	Seedling
	Citrus sinensis	T	Transplanting	Seedling
	Citrus sp.	T	Transplanting	Seedling
	Malus sylvestris	T	Transplanting & layering	Seedling
	Mangifera indica	T	Transplanting	Seedling
	Morus alba	T	Digging & layering	Seedling/stem layer
	Musa x paradisiaca	H	Transplanting	Seedling/cut corm part
	Passiflora edulis	Cli	Transplanting	Cultivated
	Persea americana	T	Transplanting	Seedling
	Prunus persica	T	Transplanting	Seedling
2	**Vegetables (16 Species)**			
	Allium cepa	H	Digging	Bulbs
	Allium sativum	H	Digging	Bulbs
	Allium sp.	H	Digging	Whole plant
	Beta vulgaris	H	Sowing	Seed
	Brassica carinata	H	Sowing	Seed
	Brassica oleracea	H	Sowing	Seed
	Brassica rapa	H	Sowing	Seed
	Capsicum annuum	S	Sow & transplanting	Seedling
	Capsicum frutescens	S	Sow & transplanting	Seedling
	Cucurbita pepo	H	Digging	Seed
	Daucus carota	H	Sowing	Seed
	Lactuca sativa	H	Transplanting	Seed
	Lycopersicon esculentum	H	Sow & transplanting	Seedling
	Solanum nigrum	H	Digging	Seedling/stem cut
	Solanum tuberosum	H	Digging	Cut/small whole tuber
3	**Roots and tubers (12 Species)**			
	Allium cepa	H	Planting the bulb	Bulbs

	Allium sativum	H	Planting the bulb	Bulbs
	Beta vulgaris	H	Sow & transplant	Seed
	Colocasia esculenta	H	Digging	Cut/whole corm
	Daucus carota	H	Sow & transplant	Seed
	Dioscorea praehensilis	Cli	Digging	Small whole tuber
	Dioscorea sagitifolia	Cli	Digging	Small whole tuber
	Ensete ventricosum	H	Sow&/or transplanting	Seedling,
	Ipomoea batatas	H	Digging	Vine
	Manihot esculenta	S	Digging	Stem cuttings
	Solanum tuberosum	H	Digging	Cut/small whole tuber
	Xanthosoma sagittifolium	H	Digging	Cut/whole corm
4	**Medicinal plants (7 Species)**			
	Allium sativum	H	Digging	Bulbs
	Artemisia abyssinica	H	Digging	Seedling
	Cymbopogon citratus	H	Digging	Whole plant
	Eucalyptus globulus	T	Sow & transplant	Seedling
	Ocimum lamiifolium	H	Transplanting	Seedling
	Rosmarinus officinalis	S	Digging	Stem cut
	Ruta chalepensis	S	Digging	Stem cut
5	**Pulses (6 Species)**			
	Cajanus cajan	S	Sowing	Seed
	Canavalia ensiformis	Cli	Sowing	Seed
	Phaseolus lunatus	Cli	Sowing	Seed
	Phaseolus vulgaris	Cli	Sowing	Seed
	Pisum sativum	H	Sowing	Seed
	Vicia faba	H	Sowing	Seed
6	**Cereals (5 Species)**			
	Eragrostis tef	H	Sowing	Seed
	Hordeum vulgare	H	Sowing	Seed
	Sorghum bicolor	H	Sowing	Seed
	Triticum aestivum	H	Sowing	Seed
	Zea mays	H	Sowing	Seed
7	**Stimulants & narcotics (4 Species)**			
	Catha edulis	S	Transplanting	Stem cut
	Coffea Arabica	T	Sow & transplant	Seedling
	Nicotiana tabaccum	H	Sowing	Seed
	Rhamnus prinoides	S	Layering	Stem lay

8	**Oil crops (3 Species)**			
	Arachis hypogeal	H	Sowing	Seed
	Brassica carinata	H	Sowing	Seed
	Helianthus annuus	H	Sowing	Seed
9	**Spices & condiments (10 Species)**			
	Aframomum corrorima	H	Sowing	Seed
	Allium sativum	H	Digging	Bulbs
	Capsicum annuum	S	Sow & transplant	Seedling
	Capsicum frutescence	S	Sow & transplant	Seedling
	Coriandrum sativum	H	Sowing	Seed
	Foeniculum vulgare	H	Sowing	Seedling
	Lippia adoensis	S	Transplanting	Seedling
	Ocimum basilicum	H	Transplanting	Seedling
	Rosmarinus officinalis	S	Digging	Stem cut
	Ruta chalepensis	S	Digging	Stem cut
10	**Fragrant & fumigants (8 Species)**			
	Cymbopogon citrates	H	Dig & transplant	Whole plant
	Eucalyptus globulus	T	Sow & transplant	Seedling
	Foeniculum vulgare	H	Sowing	Seedling
	Juniperus procera	T	Transplanting	Seedling
	Lippia adoensis	S	Transplanting	Seedling
	Ocimum basilicum	H	Transplanting	Seedling
	Olea europaea L. subsp. *cuspidata*	T	Transplanting	Seedling
	Ruta chalepensis	S	Digging	Stem cut

APPENDIX IX Wild or semi-wild edible plants from homegardens

Growth form: S=Shrub, T=Tree, H=Herb
Part used L=Leaf, F=Fruit, Sd=Seed

No	Scientific name	Family name	Habit	Parts used
1.	*Amaranthus caudatus*	Amaranthaceae	H	Sd
2.	*Amaranthus hybridus*	Amaranthaceae	H	L
3.	*Cordia africana*	Boraginaceae	T	F
4.	*Dovyalis caffra*	Flacourtiaceae	S	F
5.	*Maesa lanceolata*	Myrsinaceae	S	F
6.	*Morus alba*	Moraceae	T	F

7.	*Peponium vogelii*	Cucurbitaceae	H	F
8.	*Physalis peruviana*	Solanaceae	H	F
9.	*Polysphaeria parvifolia*	Rubiaceae	T	F
10.	*Psidium guajava*	Myrtaceae	T	F
11.	*Ricinus communis*	Euphorbiaceae	H	Sd
12.	*Solanum nigrum*	Solanaceae	H	L, F
13.	*Solanum tarderemotum*	Solanaceae	H	L
14.	*Syzygium guineense*	Myrtaceae	T	F

APPENDIX X Medicinal plants from homegardens and the surroundings

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Part used L=Leaf, Ph=Phloem, R=Root, Pt=Petiole, F=Fruit, Sd=Seed, Bu=Bulbs, Cor=Corm, Vi=Vine, Inf=Inflorescence

No	Scientific name	Family name	Habit	Part used
1.	*Ajuga integrifolia*	Lamiaceae	H	L
2.	*Albizia gummifera*	Fabaceae	T	Ph
3.	*Allium sativum*	Alliaceae	H	Bu
4.	*Aloe* sp.	Aloaceae	H	L
5.	*Artemisia abyssinica*	Asteraceae	H	L, Inf
6.	*Asparagus africanus*	Asparagaceae	S	L
7.	*Azadirachta indica*	Meliaceae	T	F
8.	*Brucea antidysenterica*	Simarroubaceae	T	F
9.	*Calpurnia aurea*	Fabaceae	S	L
10.	*Clematis hirsuta*	Ranunculaceae	Cli	L
11.	*Commeliana africana*	Commelinaceae	H	Vi
12.	*Croton macrostachyus*	Euphorbiaceae	T	L, Ph
13.	*Cucurbita pepo*	Cucurbitaceae	H	Sd
14.	*Cymbopogon citratus*	Poaceae	H	L
15.	*Dodonea angustifolia*	Sapindaceae	S	R
16.	*Embelia schimperi*	Myrsinaceae	T	F
17.	*Ensete ventricosum*	Musaceae	H	Cor, Pt
18.	*Eucalyptus globulus*	Myrtaceae	T	L, Ph, F
19.	*Fagaropsis angolensis*	Rutaceae	T	F, L
20.	*Gardenia ternifolia*	Rubiaceae	T	L
21.	*Hagenia abyssinica*	Rosaceae	T	F
22.	*Justicia schimperiana*	Acanthaceae	S	L
23.	*Maesa lanceolata*	Myrsinaceae	S	F

24.	*Melilotus suaveolens*	Fabaceae	H	L
25.	*Ocimum lamiifolium*	Lamiaceae	S	L
26.	*Phytolacca dodecandra*	Phytolacaceae	S	F
27.	*Prunus africana*	Rosaceae	T	Ph
28.	*Pycnostachyus abyssinica*	Lamiaceae	H	L
29.	*Rumex nepalensis*	Polygonaceae	H	L, R
30.	*Ruta chalepensis*	Rutaceae	S	L
31.	*Salvia nilotica*	Lamiaceae	H	L
32.	*Vernonia amygdalina*	Asteraceae	S	L, R

APPENDIX XI The top ten morbidity cases in the Wereda as the data of CHC (2009)

No	Dx (Diagnosis)	No of patients	%
1	Pneumonia	443	26.3
2	AFI (Acute Fever Illness)	418	25.0
3	UTI (Urinary Tract Infection)	188	11.3
4	Intestinal parasites	122	7.3
5	Anemia	88	5.2
6	Dysentery	77	4.6
7	Otitis media (Bacterial infection)	47	3.0
8	Bacterial conjunctivitis	38	2.3
9	Rheumatoid arthritis	37	2.2
10	Dental case	34	2.0
11	Other disorders	179	11.0
	Total	**1671**	**100.0**

APPENDIX XII List of medicinal plants mentioned in the study area with diseases treated and method of use

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Part used L=Leaf, Ph=Phloem, Sh=Leaf sheath, R=Root, Pt=Petiole, Inf=Inflorescence, Cor=Corm
F=Fruit, Sd.=Seed; Those with (*****) are not mentioned in the total list (Appendix II) as medicinal due to their 2^0 medicinal value;
Those with (******) =Used to treat livestock ailments; (Am.) =Amharic language; (Gdo.)=Gedeo language

Scientific Name	Habit	Part used	Method of preparation and application	Disease treated
Albizia gummifera	T	Ph	The smooth phloem is chewed and the extract is swallowed	Stomach-ache/ YE-HOD-QURTET (Am.)
Artemisia abyssinica	H	L, Inf	The leaf is boiled and the affected body is showered with it	Evil eye/ YE-BUDDA BESHITA (Am.)
*Arundinaria alpina**	H	L	The leaf is squashed and supplied through month of the young cattle	Evil-eye disorders in cattle
Azadirachta indica	T	F	The dry fruit is powdered and added on the affected body	Wounds
*Calpurnia aurea***	S	L L	The leafy brunch together with that of *Prunus africana* is warmed on fire and the diseased body part is hit gently Leaf squashed and the product is rubbed on skin of affected cattle	Joint pains or artirities/ YE-QURTIMAT BESHITA (Am.) Remove flees from the skin in cattle
*Capsicum frutescens**	S	F	The fruit in mixture with other spices is consumed with food stuffs like meat or root/ tuber crops	Common cold
*Carica papaya**	H	F L	The ripe fruit with that of *Persea americana* is consumed Leaf is squashed, mixed with water & sugar to drink	Constipation, convolution of intestine Malaria
*Citrus aurantifolia**	S	F	The ripe fruit is squeezed, or is drunk in the form of juice	Stomach ache, Common cold
Clematis hirsuta	Cli	L	The leaf part is kept between jaws/tooth for about 30 minutes. The leaf extract is drunk with milk or the leaf is prepared with soup of meat and drunk	Tooth-ache Strong wound/ YE-QOLLA-QUSIL (Am.) GAMITOKE (Gdo.) that lasted longer
*Coffea arabica**	T	Sd	Roasted and the powdered seeds are mixed with 2 spoons of honey and consumed	Amoebic dysentery and Giardiasis
*Colocasia esculenta**	H	Pt	The leaf petiole is warmed on fire and the extract from the cut end is applied in the affected ear	Ear ache that produces fluid of bad sniff
*Croton macrostachyus***	T	L, Ph Ph L L L	The leaf or phloem is mixed with the root of *Phytolacca dodecandra* and squashed, after which mixed with water and drunk. The phloem is squashed, mixed with the powdered seed of *Hagenia abyssinica* and drunk The leaf is squashed and extract mixed with water and supplied to the cattle The leaf is chewed and the extracted tissue is applied through mouth as liquid vapor The leaf or stem is smoked in living home	Gonorrhea Teniasis in the case it is not easily treated with *Hagenia abyssinica.* Nagagna/ YE-GENDI BESHITA (Am.) in cattle Wounds To abandon air-borne diseases
Cucurbita pepo	Cli	Sd	The seed is roasted and consumed as snack food	Teniasis

Cymbopogon citratus	H	L	The leaf together with that of *Vernonia amygdalina* is rubbed between palms and the exudates is applied on affected body part	Snake bite
*Dioscorea praehensilis**	Cli	L	The leaf is rubbed and squeezed between palms and the exudates is applied on affected skin	Fungal skin infection called QUAQUCHA (Am.)
Dodonea angustifolia	S	R	The root is chewed or squashed and the extract is swallowed or drunk with water	Rabies or YE-EBID-WUSHA BESHITA (Am.)
*Dracaena afromontana**	T	L	The leaf sheath or petiole is cut and warmed on fire, 2 drops of the exudates is added in the affected ear after cooling	Ear-ache that produces fluid of bad sniff
Embelia schimperi	T	F	The dried fruit is powdered and the product is mixed with water and drunk	Teniasis and other intestinal helments
Ensete ventricosum (DIMOYE & ASTARA land races)	H	Cor, L	The high quality ENSET product called BULLA (Gdo.) is consumed	Broken body parts and used in postnatal body strengthening in women
Eucalyptus globulus	T	L Ph	The leaf is smoked in homes or the smoke is inhaled The root phloem is chewed with salt and the juice is swallowed	Typhoid Stomach-ache
Fagaropsis angolensis	T	F, L	The fruit is powdered and drunk with coffee The extract of leaf is drunk on empty stomach The seed together with leaf of *Solanum* species called EMBUWAY (Am.) is squashed and drunk with coffee	Stomach-ache Gonorrhea that is called CHIBIXXO (Gdo.) Epilepsy
Gardenia ternifolia	T	F, L	The fleshy inner portion of fruit is used to lotion the affected foot and between the fingers	Allergy on foot due to cold temperature/ frost, contructed on walking bare foot
Hagenia abyssinica	T	Inf, F	The inflorescence with the fruit is powdered, mixed with water and drink empty stomach.	Teniasis
*Juniperus procera**	T	F	The leaf is warmed on fire and the fog is smelled and inhaled	Head-ache
Justicia schimperiana	S	L	Leaf is squashed and Mixed with water, filtered and drink on empty stomach	Yellow-fever, Malaria
*Lycopersicon esculentum**	H	L	The ripe fruit is squashed with fruit of *Hordeum vulgare* and the paste is used as grease on the head	Fungal infection on human head that affects hair hygien and quality called FOREFOR (Am.)
*Musa x paradisiaca**	H	L	The juicy fluid from the petiole cut is used to treat the affected part	Freshly cut body part to stop bleeding
*Nicotiana tabacum**	H	L	The leaf is squashed and the juice is applied on the wound	Intense wounds on body parts
Ocimum lamiifolium	S	L	The leaf extract is either used as lotion on face and affected parts or drank with Coffee	Allergy to solar radiation on skin called YE-MITCH BESHITA (Am.)
Olea europaea L. subsp. *cuspidata*	T	Sd	The seed is powdered and applied on the affected boy part	Strong wounds
Prunus africana	T	Ph	The phloem of the tree, together with that of *Eryhtrina brucei* is chewed with salt	Intensive stomach ache/ DEREK-QURTET (Am.)
Pycnostachys abyssinica	H	L	The squashed leaf extract is used as lotion on body The leaf is squashed on palms and lotioned on face or inhaled via nose	Evil-eye called LI'KIFT (Am.) Skin allergy caused by solar radiation called

				MITCH (Am.), Eye-disorder/ TRACOMA (Am.)
Rhamnus prinoides *****	S	L	The leaf with that of *Coffea arabica* is squashed and the paste is applied on affected body parts	Fungal disease on children head
Rosmarinus officinalis	S	L	The leaf is roasted with meat and consumed	Stomach disorders
Rumex abyssinicus *****	H	R	The root is boiled and the extract is drunk Root is squashed mixed with water and drunk	Hypertension Constipation, bloody diarrhea and epilepsy
Rumex nepalensis	H	R	The root is squashed with the phloem of *Croton macrostachyus*, mixed with water, and drunk after filtration	Gonorrhea
Ruta chalepensis	S	L	The leaf is squashed and mixed with honey and the product is drunk using tee spoon for water glass	Relive swellings on hands, legs etc
*Solannm nigrum******	H	L	The leaf is cooked and consumed as vegetable	Prolonged diarrhea, constipation
*Syzygium guineense******	H	Ph	The phloem is squashed with leaf of *Dodonea angustifolia* and *Cymbopogon citratus* and the filter is drunk or simply the phloem is chewed and the juice is swallowed.	Diarrhoea
Vernonia amygdalina	S	R, L	The root is chewed and the juice is swallowed Leaf is chewed and the extract is swallowed	Stomach ache Common-cold

APPENDIX XIII Plant species used in material culture from homegardens & the surroundings

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated;
Part used L=Leaf, Sh=Stem Sheath, F=Fruit, St=Stem, Vi=Vine, Str=Straw;
Use classes: Co=Construction of houses, Fu=Furniture, Bh=Bee hive making, Ut=Utility plants, Ws=Walking sticks, Cr=Craft making, Fn=Dry fencing, Fi=Farm implement.

No	Scientific name	Family name	Habit	Status	Part used	Uses
1.	*Albizia gummifera*	Fabaceae	T	W	St	Co, Fn
2.	*Arundinaria alpina*	Poaceae	H	SW	St, She	Co, Fu, Bh, Fn, Ws
3.	*Arundo donax*	Poaceae	H	SW	St, L	Co, Fu
4.	*Bersama abyssinica*	Meliaceae	T	W	St	Co, Fu
5.	*Calpurnia aurea*	Fabaceae	S	W	St	Co, Fu, Fi,
6.	*Casuarina equisetifolia*	Casuarinaceae	T	SW	St	Co, Fn
7.	*Celtis africana*	Ulmaceae	T	W	St	Co, Fi, Fn
8.	*Combretum collinum*	Combretaceae	T	W	St	Co, Fn
9.	*Combretum molle*	Combretaceae	T	W	St	Co, Fn
10.	*Cordia africana*	Boraginaceae	T	W	St	Co, Fu, Bh
11.	*Croton macrostachyus*	Euphorbiaceae	T	W	St	Co
12.	*Cupressus lusitanica*	Cupressaceae	T	C	St	Co, Fu, Fn
13.	*Dombeya torrida*	Sterculiaceae	T	W	St	Co, Fn
14.	*Ekebergia capensis*	Meliaceae	T	W	St	Co, Fu
15.	*Ensete ventricosum*	Musaceae	H	C	She, L	Co, Bh
16.	*Eragrostis tef*	Poaceae	H	C	Str	Co
17.	*Erythrina brucei*	Fabaceae	T	W	St	Bh
18.	*Eucalyptus camaldulensis*	Myrtaceae	T	C	St	Co, Fn
19.	*Eucalyptus globulus*	Myrtaceae	T	C	St	Co, Fn
20.	*Euphorbia ampliphylla*	Euphorbiaceae	T	C	St	Bh
21.	*Fagaropsis angolensis*	Rutaceae	T	W	St	Co, Fu, Fn
22.	*Ficus sur*	Moraceae	T	W	St	Co, Bh
23.	*Ficus sycomorus*	Moraceae	T	W	St	Co, Bh
24.	*Grevillea robusta*	Proteaceae	T	C	St	Co, Fn
25.	*Hagenia abyssinica*	Rosaceae	T	W	St	Co, Fu, Bh, Fn
26.	*Hordeum vulgare*	Poaceae	H	C	She	Co
27.	*Jasminium floribundum*	Oliaceae	Cli	W	Vi	Co, Bh, Fn
28.	*Juniperus procera*	Cupressaceae	T	C	St	Co, Fn
29.	*Lageneria siceraria*	Cucurbitaceae	Cli	W	F	Ut
30.	*Millettia ferruginea*	Fabaceae	T	W	St	Co, Fn
31.	*Musa x paradisiaca*	Musaceae	H	C	She, L	Co, Bh
32.	*Olea europaea* L. subsp. *cuspidata*	Oliaceae	T	W	St	Co, Fn
33.	*Podocarpus falcatus*	Podocarpaceae	T	SW	St	Fu, Co, Fn

34.	*Prunus africana*	Rosaceae	T	W	St	Co, Fi, Fn
35.	*Sesbania sesban*	Fabaceae	T	C	St	Co
36.	*Syzygium guineense*	Myrtaceae	T	W	St	Co, Fu, Fn
37.	*Trichilia emetica*	Meliaceae	T	W	St	Co
38.	*Triticum aestivum*	Poaceae	H	C	Str	Co
39.	*Vernonia amygdalina*	Asteraceae	S	W	St	Co
40.	*Vernonia myriantha*	Asteraceae	S	W	St	Co

APPENDIX XIV Forage plants from the study area for development of domestic animals

Growth form: S=Shrub, T=Tree, H=Herb;
Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated

No	Scientific name	Family name	Habit	Domestication status
1.	*Acacia abyssinica*	Fabaceae	T	W
2.	*Acacia senegal*	Fabaceae	T	W
3.	*Artraxon micans*	Poaceae	H	W
4.	*Arundinaria alpina*	Poaceae	H	SW
5.	*Arundo donax*	Poaceae	H	SW
6.	*Celtis africana*	Ulmaceae	T	W
7.	*Commeliana africana*	Commelinaceae	H	W
8.	*Dombeya torrida*	Sterculiaceae	T	W
9.	*Dracaena afromontana*	Dracaenaceae	T	W
10.	*Dracaena fragrans*	Dracaenaceae	S	SW
11.	*Ensete ventricosum*	Musaceae	H	C
12.	*Eragrostis tef*	Poaceae	H	C
13.	*Erythrina brucei*	Fabaceae	T	W
14.	*Ficus thonningii*	Moraceae	T	SW
15.	*Grewia ferruginea*	Tiliaceae	S	W
16.	*Ipomoea batatas*	Convolvulaceae	H	C
17.	*Manihot esculenta*	Euphorbiaceae	S	C
18.	*Millettia ferruginea*	Fabaceae	T	W
19.	*Morus alba*	Moraceae	T	SW
20.	*Musa x paradisiaca*	Musaceae	H	C
21.	*Pennisetum violaceum*	Poaceae	H	C
22.	*Ricinus communis*	Euphorbiaceae	H	SW
23.	*Rumex abyssinicus*	Polygonaceae	H	W
24.	*Saccharum officinarum*	Poaceae	H	C
25.	*Sesbania sesban*	Fabaceae	T	C

26.	*Solanecio gigas*	Asteraceae	S	W
27.	*Sorghum bicolor*	Poaceae	H	C
28.	*Vernonia amygdalina*	Asteraceae	S	W
29.	*Zea mays*	Poaceae	H	C

APPENDIX XV Plants used as fuel sources in a form of firewood

Growth form: S=Shrub, T=Tree, H=Herb;
Status of domestication: W=Wild, C=Cultivated;

No	Scientific name	Family name	Habit	Status
1.	*Acacia abyssinica*	Fabaceae	T	W
2.	*Acacia senegal*	Fabaceae	T	W
3.	*Albizia grandibracteata*	Fabaceae	T	W
4.	*Albizia gummifera*	Fabaceae	T	W
5.	*Celtis africana*	Ulmaceae	T	W
6.	*Combretum collinum*	Combretaceae	T	W
7.	*Combretum molle*	Combretaceae	T	W
8.	*Croton macrostachyus*	Euphorbiaceae	T	W
9.	*Cupressus lusitanica*	Cupressaceae	T	C
10.	*Dodonea angustifolia*	Sapindaceae	S	W
11.	*Eucalyptus camaldulensis*	Myrtaceae	T	C
12.	*Eucalyptus globulus*	Myrtaceae	T	C
13.	*Fagaropsis angolensis*	Rutaceae	T	W
14.	*Juniperus procera*	Cupressaceae	T	C
15.	*Millettia ferruginea*	Fabaceae	T	W
16.	*Olea europaea* L. subsp. *cuspidata*	Oliaceae	T	W
17.	*Prunus africana*	Rosaceae	T	W
18.	*Syzygium guineense*	Myrtaceae	T	W
19.	*Zea mays*	Poaceae	H	C

APPENDIX XVI Shade plants managed in and around homegardens

Status of domestication: W=Wild, SW=Semi-wild

No	Scientific name	Family name	Habit	Status
1.	*Acacia abyssinica*	Fabaceae	T	W

2.	*Acacia senegal*	Fabaceae	T	W
3.	*Cordia africana*	Boraginaceae	T	W
4.	*Dombeya torrida*	Sterculiaceae	T	W
5.	*Dracaena afromontana*	Dracaenaceae	T	W
6.	*Erythrina brucei*	Fabaceae	T	W
7.	*Fagaropsis angolensis*	Rutaceae	T	W
8.	*Ficus sur*	Moraceae	T	W
9.	*Ficus sycomorus*	Moraceae	T	W
10.	*Ficus thonningii*	Moraceae	T	SW
11.	*Hagenia abyssinica*	Rosaceae	T	W
12.	*Millettia ferruginea*	Fabaceae	T	W
13.	*Olea europaea* L. subsp. *cuspidata*	Oliaceae	T	W
14.	*Podocarpus falcatus*	Podocarpaceae	T	SW
15.	*Prunus africana*	Rosaceae	T	W
16.	*Syzygium guineense*	Myrtaceae	T	W

APPENDIX XVII Live fence plant species of homegardens

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated;

No	Scientific name	Family name	Habit	Status
1.	*Agave sisalana*	Agavaceae	H	SW
2.	*Arundinaria alpina*	Poaceae	H	SW
3.	*Arundo donax*	Poaceae	H	SW
4.	*Cajanus cajan*	Fabaceae	S	C
5.	*Calpurnia aurea*	Fabaceae	S	W
6.	*Canavalia ensiformis*	Fabaceae	Cli	C
7.	*Cupressus lusitanica*	Cupressaceae	T	C
8.	*Dovyalis caffra*	Flacourtiaceae	S	SW
9.	*Dracaena fragrans*	Dracaenaceae	S	SW
10.	*Erythrina brucei*	Fabaceae	T	W
11.	*Euphorbia ampliphylla*	Euphorbiaceae	T	C
12.	*Euphorbia cotinifolia*	Euphorbiaceae	S	C
13.	*Euphorbia pulcherrima*	Euphorbiaceae	S	C
14.	*Ficus thonningii*	Moraceae	T	SW
15.	*Hibiscus acetosella*	Malvaceae	S	SW
16.	*Justicia schimperiana*	Acanthaceae	S	W
17.	*Lageneria siceraria*	Cucurbitaceae	Cli	W

18.	*Lantana camara*	Verbenaceae	S	SW
19.	*Morus alba*	Moraceae	T	SW
20.	*Passiflora edulis*	Passifloraceae	Cli	C
21.	*Pennisetum violaceum*	Poaceae	H	C
22.	*Phaseolus lunatus*	Fabaceae	Cli	C
23.	*Sesbania sesban*	Fabaceae	T	C
24.	*Solanecio gigas*	Asteraceae	S	W
25.	*Vernonia amygdalina*	Asteraceae	S	W
26.	*Vernonia myriantha*	Asteraceae	S	W

APPENDIX XVIII Ornamental plants encountered from homegardens

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Part used L=Leaf, Vi=Vine, Fl=Flower, Bt=Bracts, Wp=Whole plant;

No	Scientific name	Family name	Habit	attractive Part
1.	*Alcea rosea*	Malvaceae	H	Fl
2.	*Amaranthus hybridus*	Amaranthaceae	H	Fl
3.	*Azadirachta indica*	Meliaceae	T	Wp
4.	*Canna indica*	Cannaceae	H	L, Fl
5.	*Canna x generalis*	Cannaceae	H	L, Fl
6.	*Casuarina equisetifolia*	Casuarinaceae	T	Br, L
7.	*Chrysanthemum coronarium*	Asteraceae	H	Fl
8.	*Clerodendrum myricoides*	Lamiaceae	H	Fl
9.	*Cosmos bipinnatus*	Asteraceae	H	Br, Fl
10.	*Crasula schimperi*	Crasulaceae	H	Wp
11.	*Cupressus lusitanica*	Cupressaceae	T	Br, L
12.	*Dahlia pinnata*	Asteraceae	H	Fl
13.	*Dianthus caryophyllus*	Caryophyllaceae	H	Fl
14.	*Ensete ventricosum*	Musaceae	H	L
15.	*Euphorbia cotinifolia*	Euphorbiaceae	S	L
16.	*Euphorbia pulcherrima*	Euphorbiaceae	S	Bt
17.	*Grevillea robusta*	Proteaceae	T	L
18.	*Hibiscus acetosella*	Malvaceae	S	Wp
19.	*Hibiscus rosa-sinensis*	Malvaceae	S	Fl
20.	*Iresine herbistii*	Amaranthaceae	H	L
21.	*Lantana camara*	Verbenaceae	S	Fl
22.	*Mirabilis jalapa*	Nyctaginaceae	H	Fl
23.	*Oenothera biennis*	Onagraceae	H	Fl

24.	*Passiflora caerulea*	Passifloraceae	Cli	Wp
25.	*Passiflora edulis*	Passifloraceae	Cli	Wp
26.	*Pelargonium zonale*	Geraniaceae	H	Fl
27.	*Podocarpus falcatus*	Podocarpaceae	T	Br, L
28.	*Rosa abyssinica*	Rosaceae	S	Fl
29.	*Rosa x richardii*	Rosaceae	S	Fl
30.	*Salvia leucantha*	Lamiaceae	S	Fl
31.	*Salvia splendenes*	Lamiaceae	S	Fl
32.	*Tagetes erecta*	Asteraceae	H	Fl
33.	*Tradescantia zebrina*	Commelinaceae	H	Vi, L
34.	*Tropaeolum majus*	Tropaeolaceae	S	Fl

APPENDIX XIX Plants of multiple uses with multipurpose species marked (*)

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated;
Use classes: E=Edible, Md=Medicinal, Co=Construction of houses, Fw=Firewood, Or=Ornamental, Lf=Live fence, Fo=Fodder, Fu=Furniture, Sh=Shade, Bh=Bee hive making, Fb=Forage for honey bees, Sf=Soli fertilizer plants, Ch=Charcoal, Ut=Utility plants, Fum=Fumigants, Fr=Fragrant, Wm=Wetlands management plants, Cl=Traditional cleaning agents, Ws=Walking sticks, Fn=Dry fencing, Is=Income source/ cash crops, St=Stimulants, Tb=Tooth brush, Fi=Farm implement

No	Scientific name	Family name	Habit	Status	Use categories
1.	*Acacia abyssinica**	Fabaceae	T	W	Fw, Ch, Sf, Sh, Fo, Fb
2.	*Acacia senegal* *	Fabaceae	T	W	Fw, Ch, Sf, Sh, Fo, Fb
3.	*Albizia gummifera**	Fabaceae	T	W	Md, Co,Fw, Fn
4.	*Allium sativum*	Alliaceae	H	C	E, Md
5.	*Amaranthus hybridus*	Amaranthaceae	H	C	E, Or
6.	*Artemisia abyssinica*	Asteraceae	H	SW	Fr, Md
7.	*Arundinaria alpina**	Poaceae	H	SW	Co, Fu, Lf, Fo, Bh, Ws, Fn
8.	*Arundo donax**	Poaceae	H	SW	Fo, Lf, Co, Fu
9.	*Azadirachta indica*	Meliaceae	T	SW	Md, Or
10.	*Bersama abyssinica*	Meliaceae	T	W	Co, Fu
11.	*Cajanus cajan*	Fabaceae	S	C	E, Lf
12.	*Calpurnia aurea**	Fabaceae	S	W	Md, Co, Fu, Lf, Fi, Fb
13.	*Canavalia ensiformis*	Fabaceae	Cli	C	E, Lf
14.	*Casuarina equisetifolia**	Casuarinaceae	T	SW	Co, Or, Fn
15.	*Catha edulis*	Celastraceae	S	C	St, Is
16.	*Celtis africana**	Ulmaceae	T	W	Co, Fo, Fw, Fi, Ch, Fn
17.	*Coffea arabica**	Rubiaceae	T	C	St, Is, Fb

18.	*Combretum collinum**	Combretaceae	T	W	Co, Fw, Ch, Fn
19.	*Combretum molle**	Combretaceae	T	W	Co, Fw, Ch, Fn
20.	*Commeliana africana*	Commelinaceae	H	W	Md, Fo
21.	*Cordia africana**	Boraginaceae	T	W	E, Co, Fu, Sh, Bh, Fb
22.	*Croton macrostachyus**	Euphorbiaceae	T	W	Md, Co,Fw, Fb
23.	*Cucurbita pepo*	Cucurbitaceae	H	C	E, Md
24.	*Cupressus lusitanica**	Cupressaceae	T	C	Co, Fu, Fw, Lf, Or, Fn
25.	*Cymbopogon citratus*	Poaceae	H	C	Md, Fr
26.	*Dodonea angustifolia**	Sapindaceae	S	W	Md, Fw, Tb
27.	*Dombeya torrida**	Sterculiaceae	T	W	Co, Fo, Sh, Fn
28.	*Dovyalis caffra*	Flacourtiaceae	S	SW	E, Lf
29.	*Dracaena afromontana*	Dracaenaceae	T	W	Fo, Sh
30.	*Dracaena fragrans*	Dracaenaceae	S	SW	Fo, Lf
31.	*Ekebergia capensis*	Meliaceae	T	W	Co, Fu
32.	*Ensete ventricosum**	Musaceae	H	C	E, Md, Co, Sf, Fo, Bh
33.	*Eragrostis tef**	Poaceae	H	C	E, Co, Fo
34.	*Erythrina brucei**	Fabaceae	T	W	Sf, Sh, Bh, Lf, Fo, Fb
35.	*Eucalyptus camaldulensis**	Myrtaceae	T	C	Co, Fw, Wm, Fn
36.	*Eucalyptus globulus**	Myrtaceae	T	C	Md, Co, Fw, Wm, Fn
37.	*Euphorbia ampliphylla*	Euphorbiaceae	T	SW	Lf, Bh
38.	*Euphorbia cotinifolia*	Euphorbiaceae	S	SW	Lf, Or
39.	*Euphorbia pulcherrima*	Euphorbiaceae	S	C	Lf, Or
40.	*Fagaropsis angolensis**	Rutaceae	T	W	Md, Co, Fu, Fw, Sh, Fn
41.	*Ficus sur**	Moraceae	T	W	Co, Sf, Sh, Bh
42.	*Ficus sycomorus**	Moraceae	T	W	Co, Sf, Sh, Bh
43.	*Ficus thonningii**	Moraceae	T	SW	Sh, Fo, Lf
44.	*Grevillea robusta**	Proteaceae	T	C	Co, Or, Fn
45.	*Hagenia abyssinica**	Rosaceae	T	W	Md, Co, Fu, Sh, Bh, Fn
46.	*Hibiscus acetosella*	Malvaceae	S	SW	Or, Lf
47.	*Hordeum vulgare**	Poaceae	H	C	E, Co, Mt
48.	*Ipomoea batatas*	Convolvulaceae	H	C	E, Fo
49.	*Jasminium grandiflorum**	Oliaceae	Cli	W	Co, Bh, Fn
50.	*Juniperus procera**	Cupressaceae	T	C	Co, Fw, Fr, Fum, Fn
51.	*Justicia schimperiana**	Acanthaceae	S	W	Md, Lf, Fb
52.	*Lageneria siceraria*	Cucurbitaceae	Cli	W	Lf, Ut
53.	*Lantana camara*	Verbenaceae	S	SW	Lf, Or
54.	*Maesa lanceolata*	Myrsinaceae	S	W	E, Md
55.	*Manihot esculenta*	Euphorbiaceae	S	C	E, Fo
56.	*Millettia ferruginea**	Fabaceae	T	W	Co, Fw, Sf, Sh, Fo, Fb, Fn
57.	*Morus alba**	Moraceae	T	SW	E, Fo, Lf

58.	*Musa x paradisiaca**	Musaceae	H	C	E, Co, Fo, Bh
59.	*Olea europaea* L. subsp. *cuspidata**	Oliaceae	T	W	Co, Fu, Fw, Sh, Ch, Fn
60.	*Passiflora edulis*	Passifloraceae	Cli	C	E, Lf
61.	*Pennisetum violaceum*	Poaceae	H	C	Fo, Lf
62.	*Phaseolus lunatus*	Fabaceae	Cli	C	E, Lf
63.	*Phytolacca dodecandra*	Phytolacaceae	S	W	Md, Cl
64.	*Podocarpus falcatus**	Podocarpaceae	T	SW	Fu, Co, Sh, Or, Fn
65.	*Prunus africana**	Rosaceae	T	W	Md, Co, Fw, Ch, Fi, Sh, Fn
66.	*Ricinus communis*	Euphorbiaceae	H	SW	E, Fo
67.	*Ruta chalepensis**	Rutaceae	S	C	E, Md, Fr
68.	*Saccharum officinarum*	Poaceae	H	C	E, Fo
69.	*Sesbania sesban**	Fabaceae	T	C	Lf, Fo, Co, Fb
70.	*Solanecio gigas*	Asteraceae	S	W	Lf, Fo
71.	*Sorghum bicolor*	Poaceae	H	C	E, Fo
72.	*Syzygium guineense**	Myrtaceae	T	W	E, Co, Fu, Fw, Sh, Ch, Fn
73.	*Trichilia emetica*	Meliaceae	T	W	Co, Sf
74.	*Triticum aestivum**	Poaceae	H	C	E, Co, Mt
75.	*Vernonia amygdalina**	Asteraceae	S	W	Md, Fo, Lf, Co, Fb
76.	*Vernonia myriantha*	Asteraceae	S	W	Lf, Co
77.	*Zea mays**	Poaceae	H	C	E, Fo, Fw

APPENDIX XX Miscellaneous use plant species from homegardens & the surroundings

Growth form: S=Shrub, T=Tree, H=Herb, Cli=Climber;
Status of domestication: W=Wild, SW=Semi-wild, C=Cultivated;
Use classes: Bh=Bee hive making, Fb=Forage for honey bees, Fi=Farm implements, Sf=Soli fertilizer plants, Ch=Charcoal, Ut=Utility plants, Fum=Fumigants, Fr=Fragrant, Wm=Wetlands management plants, Cl=Traditional cleaning agents, Ws=Walking sticks, Is=Income source/ cash crops, St=Stimulants, Nr=Narcotic, Tb=Tooth brush, Cr=Craft making, Mt=Matteress making

No	Scientific name	Family name	Habit	Status	Uses
1.	*Acacia abyssinica*	Fabaceae	T	W	Ch, Sf, Fb
2.	*Acacia senegal*	Fabaceae	T	W	Ch, Sf, Fb
3.	*Arundinaria alpina*	Poaceae	H	SW	Ws
4.	*Calpurnia aurea*	Fabaceae	S	W	Fi, Fb
5.	*Catha edulis*	Celastraceae	S	C	St, Is
6.	*Celtis africana*	Ulmaceae	S	W	Fi, Ch
7.	*Coffea arabica*	Rubiaceae	T	C	St, Is, Fb
8.	*Combretum collinum*	Combretaceae	T	W	Ch

9.	*Combretum molle*	Combretaceae	T	W	Ch
10.	*Cordia africana*	Boraginaceae	T	W	Fb
11.	*Croton macrostachyus*	Euphorbiaceae	T	W	Fb
12.	*Cymbopogon citratus*	Poaceae	H	C	Fr
13.	*Dodonea angustifolia*	Sapindaceae	S	W	Tb
14.	*Ensete ventricosum*	Musaceae	H	C	Sf, Bh
15.	*Erythrina brucei*	Fabaceae	T	W	Sf, Fb
16.	*Eucalyptus camaldulensis*	Myrtaceae	T	C	Wm
17.	*Eucalyptus globulus*	Myrtaceae	T	C	Wm
18.	*Ficus sur*	Moraceae	T	W	Sf
19.	*Ficus sycomorus*	Moraceae	T	W	Sf
20.	*Foeniculum vulgare*	Apiaceae	H	C	Fr
21.	*Hordeum vulgare*	Poaceae	H	C	Mt
22.	*Juniperus procera*	Cupressaceae	T	C	Fr, Fum
23.	*Justicia schimperiana*	Acanthaceae	S	W	Fb
24.	*Lageneria siceraria*	Cucurbitaceae	Cli	W	Ut
25.	*Lippia adoensis*	Verbenaceae	S	C	Fr
26.	*Millettia ferruginea*	Fabaceae	T	W	Sf, Fb
27.	*Nicotiana tabacum*	Solanaceae	H	C	Nr
28.	*Olea europaea* L. subsp. *cuspidata*	Oliaceae	T	W	Fum, Ch
29.	*Phoenix reclinata*	Arecaceae	T	C	Cr
30.	*Phytolacca dodecandra*	Phytolacaceae	S	W	Cl
31.	*Prunus africana*	Rosaceae	T	W	Ch, Fi
32.	*Ruta chalepensis*	Rutaceae	S	C	Fr
33.	*Sesbania sesban*	Fabaceae	T	C	Fb
34.	*Syzygium guineense*	Myrtaceae	T	W	Ch
35.	*Trichilia emetica*	Meliaceae	T	W	Sf
36.	*Triticum aestivum*	Poaceae	H	C	Mt
37.	*Vernonia amygdalina*	Asteraceae	S	W	Fb

APPENDIX XXI Garden plant species of the area under the IUCN red list of endemic trees & shrubs of Ethiopia/ & Eritrea

Habit: S=Shrub, T=Tree, H=Herb; **IUCN category**: LC=Least concern, VU=Vulnerable, NT=Near threatened;
Flora region: GD=Gonder, GJ=Gojam, HA=Harerge, WU=Wello, AR=Arisi, SU=Shewa, m ab sl=Meters above sea level

	Scientific name	Family name	Habit	IUCN catego	Altitude (m ab sl)	Habitat	Remark
1	*Erythrina brucei*	Fabaceae	T	LC	1200-2900	Edges, open places of upland forests	
2	*Lippia adoensis*	Verbenaceae	S	LC	1900-2400	Common in disturbed areas and forest margins	
3	*Milletia ferruginea*	Fabaceae	T	LC	1000-2500	Upland forests, riparian fotests, Coffee plantations	
4	*Pycnostachys abyssinica*	Lamiaceae	H	NT	1100-2700	Humid margins of forests, Coffee plantations, planted in hedges	Cultivated in WU, AR, SU, HA
5	*Solanecio gigas*	Asteraceae	S	LC	1750-3350	Clearings in montane forests, river banks	Grown as a hedge plant

Source: The current study, Vivero *et al.* (2005) and Flora of Ethiopia /and Eritrea books

Declaration

I the undersigned, declare that this thesis is my original work that has not been presented for any degree award or academic qualification anywhere and all materials used for this thesis have been duly acknowledged.

Solomon Tamrat Debessa

Signature ----------

Date----------

This thesis has been submitted for examination with our approval as research advisors;

Dr. Zemede Asfaw Signature----------

Date----------

Prof. Sebsebe Demissew Signature----------

Date----------