Addis Ababa University

College of Natural and Computational Sciences

Ethnobotanical Study of Wild and Semi-Wild Edible Plants in and AroundTselim-dur Forest of Raya Alamata Woreda, TigrayNational Regional State of Ethiopia.

Asmamaw Adhena Arefe

A Thesis Presented to the Department of Zoological Sciences Addis AbebaUniversity in partial Fulfillment of the Requirements for the degree of Masters of Science in Biology

August, 2019

Addis Ababa, Ethiopia

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Approval sheet

This is to Certify That the Thesis Prepared by AsmamawAdhan aArefe under the Title: **Ethnobotanical Study of Wild and Semi- Wild Edible Plants in and Around Tselim-dur Forest of Raya AlamataWoreda, Tigray National Regional State of Ethiopia**.And submitted in partial Fulfillments of the Requirements for the Dgree of Masters of science (M.Sc) in Biology Compiles with regulation of the University and Meets the Accepted Standards with Respect to Originality and Quality.

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Abstract

Ethnobotanical Study of Wild and Semi- Wild Edible Plants in and Around Tselim-dur Forest of Raya AlamataWoreda, Tigray National Regional State of Ethiopia

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Addis abebaUniverstiy, 2019

Ethnobotanical studies were conducted to identify and document Wild and Semi Wild Edible Plants in and around Tselimdur forest Raya Alamata woreda southern Tigray Ethiopia. The study were made using a combination of methods namely household semi structure interview, focus group discussion, guided field walk, market survey and field walk observation. Atotal of 72 households' /informants/ were selected through purposive sampling methods from the district area for interview. Each informant was asked to list the Wild and Semi Wild Edible Plants traditionally consumed in the area, the edible part of the plants, and mode of consumption. In addition they were asked to the seasonal availability of the plant and the commonly marketed plants. About 37 Wild and Semi Wild Edible Plants belonging to 31 genera and 23 families were reported as commonly eaten in the study area. Beside this, they were asked the threats and traditional conservation measures of the plants. Different WSWEPs have various economic values like medicine, fodder, forage. The dependence on such plants has gradually decline due to deforestation of the natural habitats and modernization. Some of the edible plants in the district area were *Carissa spinarum, Ximenia americana, Zizphus spina-christi, Balanites aegyptiaca,* and *Opuntia ficus-indica*. The most preferred wild and semi wild edible plants were *Opuntia ficus-indica, Zizphus spina-christi* and *Balanites aegyptiaca*. Expansion of agriculture, over grazing and urbanization were the most distractive factors. Increasing the awareness of communities on valuable of wild and semi wild edible plants and securing alternative income sources, is necessary in any rural development programmed aiming at securing food and sustaining its resources in the area.

Keywords: Wild and semi wild edible plants, Tselim-dur, Raya Alamata, Ethnobotanic, Forest

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ABBREVIATION

WSWEPs: Wild and Semi Wild Edible Plants

FAO: Food and Agricultural Organization

WHO: World Health Organization

CIDA:Canadian International Development Agency

IBC: Institute of Biodiversity Conservation

MOARD: Ministry of Agriculture and Rural Development

SNNPR: Southern Nations and Nationalities and People Regional State

PIC: Prior Informed Consent

USAID**:** United State and Agency for International Development

CRS: Catholic Relief Services

NTFPs:Non Timber Forest Products

WFP: World Food Program

NFPA: National Forest Priority Areas

CSA: Central Statistical Agency

CHAPTER -ONE

1. INTRODUCTION

1.1 Back ground

Many studies showed that these edible plants species are useful in Globe and Africa and during food shortage (Agea *et al*., 2011; Leonti, 2006; Menedez-Baceta *et al*., 2012). Because of this reason these plants are more consumed in food insecure areas as compared to food sufficient area.

Ethiopia is a country with a land of different nations, nationalities and groups that have their own food materials, food habits, cultures and values; hence people in rural area of Ethiopia have indigenous knowledge on preparation, consumption and side effect of WSWEPs (Kebu Balemie and Fassil Kebebew, 2006; Amare Getahun, 1974).However the level of knowledge differ by cultural identity, economic status, educational level, age and sex (Berhane Kidane *et al*., 2014; pardo-de-Santayan*et al*., 2007; Leonti, 2006; Rathore, 2006; Bharucha and Pretty, 2010; Agea *et al*., 2011), Tilahun Teklehaymanot and Miruts Giday, 2010). However, due to socio economic changes like modern lifesty, less local knowledge of WSWEPs use had been decreased (Termote*et al*., 2011. Nowadays, anthropogenic and natural factors are threatening the natural ecosystem, which cause the diversity of these plants species to be decrease (IBC, 2012; Kebu Balemie and Fassil kebebew *et al*., 2006).

Wild and semi wild edible plants are plants that grow with no human control and provide edible parts for human and other life (Termote *et al*, 2011). Usage of such as plants in human diet has been presents since the early age of human existence (Tinsae Bahru*et al*., 2013). Consumptionof wild and semi wild edible plants for food occurs both in food shortage and food aveilable (Zemede Asfaw and mesfin Tadesse, 2001; FAO, 2004).

Other also worked on marketability and socio-economic value of these plants species for instance Agea*et al*., (2011) in Uganda, Saha (2014) in India, Badimo, et at.,(2015) in Botswana, and Maroyi, (2013) in Zimbabwe all showed that wild and semi wild edible plants increase income and ensure income inequality. However, the usage and role has still very little and are considered food of children, women and low income communities in many parts of Ethiopia.

Full ethnobotanical studies required for full conservation of these natural resources and the indigenous knowledge of rural communities (Abraha Demekiristos, 2016; Luczaj *et al*., 2012; Menedez-Baceta *et al*., 2012).Unfortunately no ethnobotanical studies had previously been

carried out in Raya Alamatadistrict.It is one of the unexplored regions of the country and that is why this research is so crucial in the area which would help to conserve these resources and the knowledge of the local community.The general objective of the ethonobtanical study was identify and document the WSWEPs of the district area and is important as biodiversity Conservation through increasing the awareness of the local community.

1.2 Statement of the problem

Tselim-dur forest is a protected area in Raya Alamata, Tigray Region (Luel Kidane *et al*., 2010). Forest makes a significant addition of food, oxygen, shelter, recreation and medicines for the local people and other life Getachew Addiss *et al*., 2013; Tamene Yohannes, 2015; Getnet chekole, 2011).

The forest has been affected from continued human pressure like deformation, over grazing in the last decades mainly to acquire land for agriculture, grazing, settlement and wood charcoal production(Luel Kidane *et al*., 2010). Causing use of WSWEPs below that of the past, they were considered not the food of educated people, and the eating habits of the local people changes from time to time and until the present time no ethnobotanical data documenting these resources of the district area, If the knowledge is properly documented it can be passed to next generation and benefit the community (Getent Chekole, 2011). Therefore, the objective of the present ethnobotanical study in the area is to document and promote the use of WSWEPs found in the area. Hence identifying, documenting and conserving of the species and indigenous knowledge's in and around the forest are immediate task and can improve nutrition, increase dietary diversity and may also have the potential to be valuable food sources if cultivated and to make great contribution in food security.

1.3 Hypothesisof the problem

1. Most of the edible plant species found in the area are fruit edible
2. The knowledge of female on WSWEPs is equal to male.
3. Age does not affect the knowledge of WSWEPs
4. Education does not affect the knowledge of WSWEPs
5. WSWEPs have other uses apart to food and most are gathered and traded by children and Women

1.4 Research questions

- What are the wide and semi wide edible plants and used in the district area?
- What part of the plants are edible and which group of people used them and more knowledgeable?
- What are the most common edible plants both in the normal time and during food shortage?
- Which plants are used as in come generation most? Or more marketable
- What other uses do these plants have and when they are available?
- What are the main threats and traditional conservation measures of these plants?
- Are the recorded and identified wild and semi wild edible plants species reported elsewhere in Ethiopia and Africa?

1.5 Objective

1.5.1 General objective

The general objective of this study was to identify and document the use and management of wild and semi wild edible plants and related indigenous knowledge in and around Tselim-durforest Raya Alamata district.

1.5.2. Specific objectives

The specific objectives of the study were:

- ✓ To identify and document the wild and semi wild edible plants, their edible parts in the area, and altitudinal distribution.
- ✓ To identify the marketable, other uses and most preferred wild and semi edible plants of the area.
- ✓ To identify the knowledge difference of the community on the wild and semi wild edible plants.
- ✓ To identify the major threats and indigenous conservation method of the wild and semi wild edible plants in the area.

CHAPTR TWO

2 REVIEW OF RELEVANT LITERATURES

2.1. WSWEPs, status, benefit for cultural identity and distribution

Wild and semi wild edible plants are plants that grow in natural or semi-natural ecosystem and can exist with no direct human action and semi- wild refers to plant that are partially wild and are gifted with one or more parts for food (Menendez-Baceta *et al* ., 2012; Termote *et al* .,2011; Kalle and soukand, 2012).

Concerning benefit for cultural identity traditional consumption of WSWEPs represents the culture and land of origin (Bharucha and pretty, 2010; UNESCO, 2003; Maxia *et al*., 2008; Termote*et al.*, 2011.). Howard (2010) fined that cultural identity and agro biodiversity are strongly linked. Wild edible plants are an important part of Bulgarian pattern of culture (Nedelcheva, 2013). Consumption of WSWEPs was linked to the socio-cultural, spiritual life and health of Indan (Mir, 2014). Dogan *et al*. (2013) also reported the consumption of plants in an area is closely associated with the socio-cultural features of the Turkey.

MOARD (2007) reported all over the world, the decline in the habit of gathering of wild edible plants caused the loss of the knowledge and the natural habitats of wild edible plants.

2.2. The role of WSWEPs in food security and during the time of famine

Food insecurity in many rural region of the world was caused by deforestation, drought and climate change. Thus communities are dependent on WSWEPs to meet their nutritional needs and income (FAO, 2004; Getnet chekole, 2011). Mekuanent Tebkew, 2015; Amare Getahun, 1974; Tardio *et al* , and Leonti*et al*., 2006;Kalle, 2012; Boedecker, 2014; aged *et al*., 2013, 2011;Somnassage *et al* .,2000 and Demele Teketay, 2010; Pitso and Lebessa. 2014).

Famine–food plants; are only eaten at times of food stress (Guinand and Dechassa Lemessa, 2000; Soukand and Kalle, 2015). For instance WSWEPs in Mexico were harvested and consumed when household cultivated food crops were decreased (LaRochelle and Berkes, 2003). Getnet Chekole (2011) reported over 70% of the WSWEPs are consumed at times of starvation in Libo Kemekem. In India most of the rural people depend on WSWEPs to fulfill their needs in period of food crisis (Rana *et al*., 2012; ocho *et al*., 2012. Similarly in Botswana Uganda, Wolayt

of north omo zone indigenous vegetable secures the food gaps for rural communities (IBC, 2012; Guinand and Dechassa Lemessa, 2001).

Based on this the report of CIDA (2010) showed in Niger, 83% of informants reported increased dependence on wild foods during drought and in the Tanzania, wild food were consumed more in food insecure season. In line with this Alkinnifesis (2004) showed 60_80% of the rural people in South Africa encountered food shortage for 3-4 months in a year and consume WSWEPs to cope the problem accordingly in Botswana around 150 WSWEPs are consumed all the time or particularly during famine. The use of wild food increased from 10% in normal time to up to 40% in famine period (Dandena Gelmmesa, 2010). In addition Zemede Asfaw and Mesfin Tadesse (2001) reported 15% of the wild and semi wild edible plants are famine food in Ethiopia.

In the district area *Urtica simensis, Rhus natalensis, Oxygonum sinuatum, Cyperus bulbosus* were consumed during food shortage or famine. In addition Guinand and Dechassa Lemessa (2000) reported the most common and well known typical famine food plants in southern Ethiopia as *Amaranthus graecizans, Amorphophallus gallaensis, Balanites aegyptiaca, Corchorus olitorius, Cyprus bulbosus, Guizotia scabra, Maerua angolensis, Piliostigma thonninghii and Urtica simensis*.The role of WSWEPs like *Ziziphus spina-christis and Balanites aegyptiaca* fruits in poverty reduction to reach 42% and 26% respectively in south kordofan (Adam, 2011). WSWEPs are also consumed at time of normal, war and other hardship (USAID and CRS, 2000; Mazhar *et al*., 2007; Okia *et al*., 2011). FAO (2009) in its state of food security in the world report estimated that around one billion people use wild plants in their diet.

2.3. Economical value and marketability of wild and semi and wild edible plants

Local people of the world do not collect WSWEPs only to food source but, they were gathered to increase income of the communities through sales (Ruffo, 2002; Debela Hunde *et a.,l* 2011 ; Mekuanent Tebkew, 2015; Bharuch and pretty, 2010; Agea *et al*., 2013; Reyes-Garcia, 2005; Mbabaz *et al* ., 2013; Saha, 2014). The market use of WSWEPs was influenced by type of species, in come status of the community, geographical location of the area and price (Berhane Kidane *et al*., 2014; Jeeva, 2009; Agea*et al*., 2011).

WSWEPs were equally collected from their natural habitat and the income gained is for individual use but if they were from home garden of the individual, they were only be used by the owners (Rana*et al*., 2012; Debela Hunde *et al*., 2011; Tamene Yohannes, 2015).

Marketability of WSWEPs was seasonal, very limited and selling increase during food shortage. The sale of the wild and semi edible fruits was found to contribute to 50%, 60% and 75% of the local annual family income in wad-Abid, Abu-karshola and Rashed (salihand Ali, 2014)

The fruit or seed of some WSWEPs were used for more complex use in other countries, for example the seed of *Balanites aegytiaca* are crushed and the Kernels are boiled with water to extract oil for cooking purpose in Sudan (Salihand Ali, 2014). In Ethiopia as a whole and particularly in the district area a number of wild and semi wild edible plants are of economic value and are traded in markets in certain areas for example *Opuntia ficus –indica, Ximenia americana, , Ziziphus spina –chris* in Tigray region. In addition fruit of *Cordial africana* and *Ziziphus spina-christi* are also on market in Jana Mora district. The widely sold wild species at local level are *Dovyalis abyssinica Mimusops kummel, Ximenia americana, Adansonia digitata, Annona senegalensis, Balanties aegyptiaca, and Syzyguim guineens*e.Where as *Mimusops kummel and Ziziphus spina-christ*i are marketed at national level while *Balanites aegyptaca and Tamarindus indica* are marketed internationally (Guinand and Dechassa Lemessa, 2000).

Mekuanent Tebkew (2015) reported that these plants are also used as shading, shelter, and rope conservation as well as provide adaptation to climate change (IBC, 2012).

The document of the Satheeth (2015) show that out of 370 indigenous food plants reported in Ethiopia edible fruit/seed 25 of them were marketable fruit/seed. 21 are marketable in local markets, 2 making, timber, honey production and washing clothes as detergents in chilga district. In line with this Getachew Addis *et al*. (2013) reported the economic or multipurpose of Cordial africana for food, medicine, building, house hold use, agricultural tool, fuel wood, fodder, and income generation.

Debela Hunde *et al* (2011) reported that the oil from seed of *Ximenia americana* is also used as cosmetic, the edible fruit was used for beer, the bark, root, and leaves are used to treated Leprosy, Headaches, and ulcers in east shewa communities. Beside to this WSWEPs have several indirect benefits such as sources of genetic diversity; encourages agro forestry practice in dry land areas; habitat for different organism; rehabilitation of degraded lands; soil and water are reported national (*Mimusops kummel.Ziziphus spina-christi*) 2 species are the international marketable (*Opuntia ficus indica, Balanites aegyptiaca*). Others like coffee: in the western part of Ethiopia, in Illubabor and Jimma zones, part of the coffee production is still harvested from non domesticated coffee trees growing naturally in the forests the ripe fruit of *Opuntia ficus-*

indica, a Cactus plant are traded for each on market in Tigray (Assegid Assefa and Tesfay Abebe, 2011). Seven plants (18.92%) of the recorded WSWEPs were marketed in Alamata and Korem. Of the marketable *Opuntia Ficus-indice, Balanites aegyptiaca and Ziziphus spina christi* were the most frequently traded species and found in high quantity in the market and fruits represent the highest proportion of edible parts

2.4 .Edible part and habitats of wild and semi wild edible plants

Wild edible plants are plants with one or more parts that can be used for food (Kulle and soukand, 2012; Nedelcheva, 2013; Boedecker *et al*., 2014). Hinnawi, (2010); Dogan *elal*.,(2013;Menend ez-Baceta *et al*., (2012) reported that edible part of the WSWEPs are leaf, root flowers, barks, inflorescence, and fruit. Most local people consume fruit and fresh leaves followed by shoots (Tena Regassa *et al*., 2014). Incontrast Anywar *et al*., and Sansanelli and Tassoni (2014) in Uganda and Italy reported that leaves were the most used parts of the plants as food followed by fruit. Mondal (2012) and Mir (2014) also reported that edible parts of WSWEPs as leaves, whole parts, Rhizome, fruit, leaf petiole in turkey. The dominant edible part in Bulgaria is leaves (Nedelcheva, 2013). This is also true in the present study that fruits were 76.9%, leaves 7.7%, gum 8.10% followed by flower/nectar, stem, seed whole parts, and bulbs (2.56%). This part was also reported by other researcher's like Zemede Asfaw and Mesfin Taddese (2001) as the major edible parts. But in other countries like Poland studied by Lentini and Venza (2007) reported that fruit are the second most important plant part used. Demele Teketay (2010) also reported fruits as the dominant parts in Ethiopia. Concerning, the habitat types; today land is in short supply due to the high population increase in most highland areas of Ethiopia. High population increase has led to environmental degradation many highland areas have lost their diversity so they are found in home garden, farmland, roadside, church and in forest in Ethiopia and India(Nashriyash *et al* ., 2011; Getnet chekole, 2011;Agea *et al* ., 2011). Zemede Asfaw and Mesfin Tadese (2001)reported that forest habitat gave 102 species, woodland 99 species, grassland 83 species, bushland 52 species rocky and dry area 47 species, cultivated place 41 species, riverbanks road side 31 species, disturbed 25 species). Similarly in current study the habitat of the recorded WSWEPs were forest 8 (21.62%), home garden 3(8.10%), but 70.27% were distributed in the roadside, forest, farm land, home garden, showed that the wild and semi wild edible plants are distributed in different area.

2.5. Mode of consumption and habitats of wild and semi wild edible plants

Wild and semi wild edible plants are consumed non-cooked eating in a hurry and in small amount (Ojele and Kakudid, 2015; Hinnawi, 2010; Berhane Kidane *et al*., 2014 Getachew addis *et al* 2013; Tinsae Bahru *et al* 2013,). Uncooked eating as small food arises during hours spent away from home or carried and eaten at home. Most of such items are eaten immediately from collection areas such as grazing land, farmland, road sides and forest. Nedelcheva, (2013) reported WSWEPs were consumed raw, salad, and boiled, dried.

Menendez-Baceta *et al*. (2012) also reported that WSWEPs was consumed raw, smashed and mixed with water, boild, and liqueur in India. Salih and Ali (2014) reported that children eat the kernet of *Zizphus spina-chisti* after crushing the hard coat of the seed in Sudan.The consumption of raw, fresh WSWEPs in a number of countries for example in Zimbabwe (Maroyi, 2011), India (Menendez-Baceta *et al*., 2012), In European Mediterrian (Leonti *et al*., 2006). In Uganda kakudidi (2015), in Bulgaria Nedelcheva (2013) and in Ethiopia Ermias Lulek *et al*., (2011) showed similarities in food tradition between countries.

Berhane kidane *et al*.,(2014) also reported that most fruit were consumed raw and fresh but some were cooked with maize and sorghum flour and few species were processed in to maale and Ari Ethnic communities. In line with Tilahun Teklehaymanot and Miruts Gidey (2010) reported around 13 species of vegetables that were gathered from the wild forest and they were chopped and boiled to be used contrast the majority of the reported WSWEPs by Tena Regassa *et al*. (2014) were consumed as spice to porridge with other cultivated crops in Kwego and Kara district. In as fruit, either or dried and leafy vegetables were consumed mainly cooked or boiled in Chelia district.

The consumption of many WSWEPs was strongly linked to tending livestock, charcoal burning herding, and walking to school, when following cattle or sheep, children and adult herders had a lot of time to observe nature, as they moved through the land (Mekuanent Tebkew,2015; Berhane Kidane *et al* ., 2014 ; Getnet Chekole; Ermias Lulek *et al* ., 2011). Tinsas Bahru *et al*., (2013) reported that most of the edible plants parts recorded were eaten raw without any further processing in, awash national park.

Most of the recorded edible plants species 34 (91.89%) from the current study were eaten raw, and uncooked and 2 species (5.40%) like *Utrica simensis and Ferula communis*-which are eaten after cooked but 1 species (2.63%) that is *Thymus serrulatus* were consumed both cooked, dried

and raw as spice. Based on habits wild semi wild edible plants are found in herbs shrubs, trees, vine, and climber (Getachew Addis *et al*., 2013; Assegid Assefa Tesfay Abebe, 2011; Debela Hunde *et al*., 2011).

2.6. Nutritional potential of wild and semi wild edible plants

A number of wild and semi wild edible plants are nutrition (Hinnawi, 2010; Debela Hunde *et al*., 2011; Mekuuanet Tebkew, 2015; Saha *et al*., 2014; Jeeva, 2009; Boedecker, 2014). Nutritional analysis of some WSWEPs showed that in many case the national quality is comparaple and in some even greater to the cultivated varieties (Demele Teketay, 2010and Ermias Lulekal *et al*., 2011). Horo and Topno, 2015; Satheesh 2015) reported that WSWEPs are are important source of essential vitamins and minerals, carbohydrates, proteins, lipid and fiber in India and Ethiopia. Debela Hunde *et al*. (2011) reported that WSWEPs of some species from different sites contain different nutrients. For example, *Balanites aegyptiaca and Ziziphus spina-christi* is highest in protein. In addition Fentahun Mengistu and Hnger (2009) studied the nutrient of *Ziziphus spina-christiand Dispyyros mespiliformis* showed that these wild species contained higher quantities of important nutrients than cultivated ones. Ermias Lulekal *et al*.(2011) reported that WSWEPs play an important role asa source of energy and micronutrient for instance *Moringa oleifera* were source of protein, fat, *Ximenia americana* were source of Ca, P,Mg, in Niger, *Cadaba farinose* were source of protein, fat, Fe, K, Na, Mg, Mn, and Zn in Cameron. In the Sahel, several edible desert plants are source of essential fatty acids, iron, zinc and calcium (Glew *et al*., 1997; Aberoumand, 2011). From the present recorded wild and semi wild edible plan *Ziziphus spina-christis, Balanites aegyptiaca and Ximenia americana* were analysed as nutrious.

2.7. Harvesting seasons and main gatherers

Time and frequency of harvesting of WSWEPs depends on the plant parts and varies from place to place (Kebu Balemine Fassil Kebebew, 2006; Boedecker, 2014). Our knowledge of plants today is the result of the historical property of our ancestors, who learned based on experience by trial and error (Agea *et al*., 2011). There are several species occurring wildly and collected and being consumed from various sources according to their availability (Singh, 2011). Berhane Kidane*et al*., (2014) reported that WSWEPs were important as food in the dry season and at the beginning of the rainy season. Similarly Mekuanent Tebkew (2015) reported that the edible plant parts were gathered from the wild at different time of the year and the majority were gathered

and consumed from March to May and August to the November in Chliga. Jeeva, (2009) reported that flowering of WSWEPs starts between January and March; the fruiting however varies from species to species. The time of harvesting and frequently depends in the district area on the type of plants parts. Plant type and season (Appendix 4), for instance *Opuntia ficus-indica and Carissa spinarm* were harvested during the rainly season/ July, Agust and September/ but *Balanites aegyptiaca* is harvested in February, April according the informants and *Ferula communis* were harvested during famine (when there is no other altenative) or any other hard ship like war other wise it is not common to be used as food. Tardio et al. (2006 Utrica simensis) also reported in Spain wild fruit were mainly harvested at the end of the summer and in autumn, most species used as vegetables were collected in spring.

2.8. Influencing factors to use wild and semi wild edible plants

Plant use patterns are not static; the change in patterns of wild plant use differ by region and are plant associated with life style changes, urbanization, large-scale farming and lesser contact with nature and many other reasons (Luczaj, 2012). The factor that increase the utility of WSWEPs are; food insecurity caused by drought, land degradation, climate change (Tilahun Teklehaymanot and Miruts Giday, Giday, 2010; Assegid Assefa and Tesfay Abebe, 2011). Mekuanent Tebkew *et al*. (2014) reported as changed food habits, cultural ignorance, difficult for collection, under-valuation, according to Guinand and Dechassa Lmessa, (2000) dependence on only some limited cultivated crop, modernization, culture, and religion factors in utility of WSWEPs.

Similarity people of the district area were influence by dependence on limited domesticated crops 31(43.05%), undervaluation 9 (12.5%), inaccessibility 5(6.94%), norm 27(37.5) (using these plants were considered as poor or there are cultural ignorance) price of the plants were very low compared to the domesticated food crops and less knowledge on the nutritional contents. Barucha and Pretty (2010) reported the main constrains to use WSWEPs world wide as declining availability, local people perception as being food for poor, loss of traditional knowledge, high work load to collect, process, prepare. Menendez-Baceta (2011) also reported considering as old fashion or food of old people, too time-consuming, famine food, in Gorbeialdea.

Boedecker (2014) in Benin also reported selling difficulty, highly perishable, long cooking time is constrains to use WSWEPs. In normal times, only children, youngsters, women and the

poorest families gather and consume WSWEPs (Zemede Asfaw and Mesfin Tadesse, 2001; Berhane Kidane *et al*., 2014.

2.9. Threat factors of wild and semi wild edible plants

Ethiopia contains number of ecological zones and plant flora (Assegid Assefa and Tesfay abebe, 2011; Kebu Balemie, and fassil Kebebe, 2006: Tilahun Teklehymanot and Miruts Gidey, 2010). Currently, however, the biodiversity of Ethiopia faces various threats. According to Berhane Kidane *et al*. (2014) wild and semi wild fruit resources are not only important as food but also have several functions and services in maale and Ari Ethnic communities. Due to their various functions, these resources may be exposed to over exploitations, especially in periods of food scarcity but these threatening factors may vary from region to region, depending up on the local socio-economic and ecological circumstances. Based on this Demele Teketay (2010) reported the main threats were government institutional capacity, population growth, land degradation, deforestation and weak management in Ethiopia.

Salihand Ali (2014) reported that agricultural expansion and selective harvesting were the main threatening factors, overgrazing was mentioned as principal threat in enhanced intrelated fram work aid Tandik villages, uncontrolled fire setting, was another important threat in enhanced intrelated fram work aid District, Fuel wood collection was mentioned as a common threatening factor in all the sites of Sudan. Elephants are the major threats to decrease WSWEPs in Uganda Bandimo *et al*.,(2015). Ecological and environmental problems such as soil degradation, soil erosion and alteration of natural ecosystem as well as the loss of natural resources are generally threats in Libo Kemekem district Getnet Chekole,(2011).

Hinnawi (2010); Tinsae Bahuru *et al*. (2013) and Shumsky (2014) reported that threats resulted mainly as of human activities. However the level of destructiveness of these activities varied from location to location. Among these activities were: agricultural land expansion, fuel wood collection, over grazing, over harvesting, uncontrolled fire setting and unsustainable use of plants in; Awash National park. (Tena Regassa *et al* ., 2014; Debela Hunde *et al*.2012, ; Getachew Addis *et al* .,2013) also reported the main threats of WSWEPs as agricultural expansion,over grathing,fuel wood collection in Chelia, East Shewa and Konso district respectively. Most of the above results are also reported in different areas by Kebu Balemie and Fassil Kebebew (2006), Demele Teketay (2010), Assegid Assefa and Tesfay and Abebe, (2011); Debela Hunde *et al* ., (2012) and Neudseck *et al*., (2012).

In the present research the main threats reported by the informants is unsustainable use of plants due to undervaluation, less understanding in their future consequence and benefit, agricultural expansion, overgrazing, over harvesting for charcoal/due to selfishness of some peoples/urbanization. Especially agricultural land expansion and illegal fuel wood collection as the major destructive factors in the district area.

2.10. Conservation measures of wild and semi wild edible plants

Taking in to account the importance of WSWEPs to household food security, income generation and others, it is essential that the national habitat that making gathering be appropriately protected, managed, to avoid the destructive factors,Tinsae Bahru *et al*. (2013) reported the conservation measure under taken in Awash national park as agro forestry; home garden, living fence, farm, individual protected area, decrease deforestation.

Understanding of WSWEPs role is necessary for natural resource management, sustainable use and even increases their positive impact Fentahun Mnguistu and Huger,(2009). Conservation measure Libo Kemekem district were-Natural forest protection by the people in collaboration with the government, planting the threatened plants in their home garden and enclosure in their natural habitat Getnet Chekole.Similarly Ojelel and Kakudi(2015) reported the conservation measures recorded in Obalanga as trees around homesteads, school, churches, protection from fire and regulation of cutting.

Arenas and Scarpa (2006) elaborated conservation measure of wild and semi wild edible plants includes agro-forestry; trees around homestead, schools and churches, protection from fire and regulation of cutting in chorote India and Argentina. The knowledge and benefit of these edible plant species increase community interest in conservation. But this neglects species with little known values and yet they could become very useful with increase in our knowledge and technology (Fentahun Mengistu and Hager, 2008; Getachew Addis *et al*.,2013; Debela Hunda *et al*., Berhane Kidane *et al*., 2014).

CHAPTER THREE

3 MATERIALS AND METHOD

3.1.1 Study Area Description

3.1.2. Geographical Location

The study area is located in southern zone of Tigray at about 600 km north of addis abeba or 180km far away south of mekelle, the capital city of Tigray regional state.It is located between 12^0 25 to 12^0 56' N latitude, 39^0_{23} and $39^0_{75'}$ E longitude.At an altitudinal distribution from 1460 m.a.s.l to 2688 m.a.s.l.The study area lies within the southern Tigray lowlands. The study was conduct in and around Tselimdur forest; Raya Alamata district. Raya Alamata district covers an area of 750050 hectare. It is bounded by endamohoni district in the east, Ofla district in North, Raya kobo woreda in southern direction and Waghumra zone of Amhara national state in West

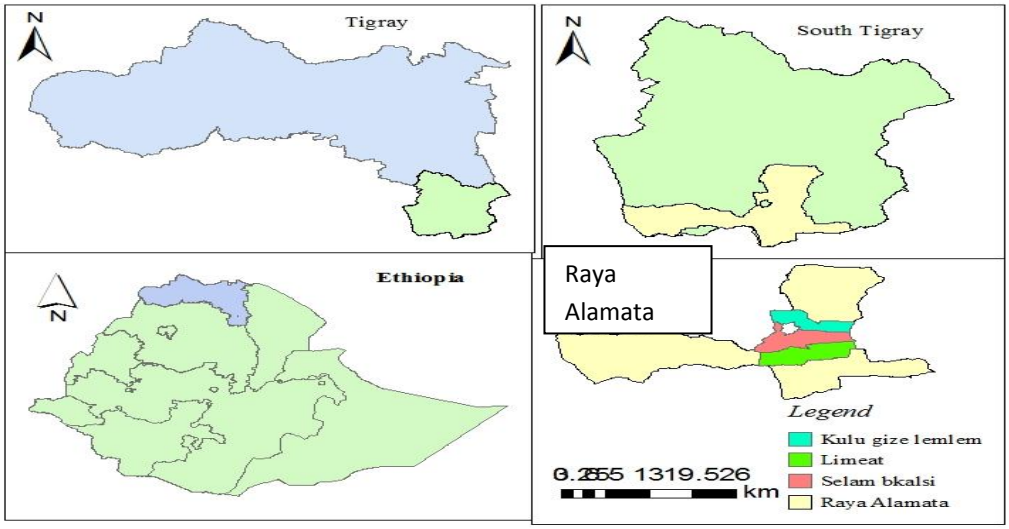

Figure 1**:** Map of the study area

3.1.3. Soil and climate

The soil type found is Eutric Cambisols and Eutric Fluvisols (STZ, 2000). Climate differs between the lowland and highland of the area. The eastern lowland of Alamata is characterized by hot to warm sub-moist type of climate where the mean monthly rainfall is between 41 to 82

mm and the mean annual temperature is $18c^0$ to 27^0c. A semi –bimodal rainfall pattern with a small peak in April and maximum peak in August dominates this area .However, metrological data of the area indicate that rainfall is highly variable and evapo-transpiration is high. The western highland is categorized under sub moist highlands. The western highland is characterized by a mean annual temperature of 12^0c to 18^0 c and a mean monthly rainfall of 40 to 62 mm. though the amount rainfall relatively low .The coefficient of variation for the area indicates that rainfall is moderately variable

3.1.4. Population

Based on the 2007 national census conducted by the central statistical agency of Ethiopia (CSA) raya Alamata district has a total of population of 126778, of which 62467 are men and 64311 are women, no urban inhabitants were reported with an area of 1,028.85 square kilometers. In addition to this 95.4% of the population is orthodox Christian and 4.6% are Muslim. Raya Alamata district has been divided in to 15 peasant association or locally tabias for administrative purposes. In community, the majority of the people practice similar economic activates mixed farming (crop and livestock production), they share the same ecological niches, culture and language.

3.1.5. Topography

Raya Alamata is divided in to western highland and eastern lowland. The western part (Tsetsera, akogira, soria, awdikulu and merewa) is categorized under the northern highland of Ethiopia, having an altitude range of 2000 to 2688 m.a.s.l. It is characterized by steep slopes, gorges and undulating terrain having scattered flat lands used for grazing livestock and farming. It covers 25% of the woreda. The topography of the area dominate by steep slopes has induced erosion. The eastern low land with its ten tabias is generally plain in topography with an altitude ranging from 1450 to 1750 m.a.s.l. The plain landscape of this area makes the area suitable for agriculture and it covers 75% of the wored, (SourceRara Alamata agricultural bureau).

3.1.6. Vegetation

The area was covered forest composed of different indigenous species. According to Zenebe Gebre-Egziabher *et al.* (1998) and information obtained from local informants.The forest contains disturbed natural high forest, bushes, shrubs, agricultural plots and settlement area.

3.1.7. Farming system of the community

Crop-livestock production (mixedfarming) is the major activity of the farming system in the communities. Crop production is primarily rain-fed. Teff, Sorghum, Maize are the major crop production.In the area Livestock production (Cattle, Sheep. Goat and Donkey) is just as important a component of the farming system as that of crop production (from agricultural bureau of Raya Alamata District). In addition to crop and livestock production, there are some farmers who engage in petty trading in grain, animals and consumable items (on a small scale). Some farmers have homes in Alamata town, which they rent out for additional income. During the off-seasons a few farmers travel to the neighbor Amhara and Raya Azabo regions to buy animals such as oxen, goat and donkey to sell at Alamata, korem and machew markets.

3.2 Study method

3.2.1. Reconnaissance survey

Reconnaissance survey ofthe area had been used from October 1 to 15, 2019 following Martin (1995), basic information was collected from the administrative district offices, forest scout (forest guards) and local people before conducting field study. This gives a general clue to identify the study sites. Followin this, a total of three study sites/*kushet/* were selectfor data collectionin and around Tselim-dur forests based on relative distance, vegetation cover and interaction of the community with the forest as well as, relative altitudinal differences by purposive sampling. These sites are; *selam bekalsi tabiya*, *leamat tabiya* and *kulu gize lemlem* tabia from each tabiya one *kushet* was selected again namely *dima*, *kagima* and *facha* respectively accordingly to their closeness to the forest.

The Materials which I were use plant press, plastic bag, note book, GPS and digital video photo camera were make available for the study

3.2.2. Key Informant selection

After the selection of three *tabias(Kebeles*) from the study area a total of 72 informants 24 for each selected sites which includes 36 male and 36 female from aged of 25 to 80 were selected by purposive sample technique used to call individual of 5 to 6 other knowledgeable native from all age, sex, and educational status as was used by Menendez –Baceta (2011). This technique help to found only those that can give more information about WSWEPs of the particular area.

According 72 respondents were choosen. All informants are native and have familiarity with local plants of the area and the informants are sampled almost in equal proportion 24 from each *kushet/ kebele* and of these 36 male and female each were requested at different age.There are also young respondent (from 20-25 in this study) to find out the gap on the knowledge of wild and semi wild edible plants among young and old generate. The key informants were select from each study village by purposive sampling technique. Minimum of three to four key informants involved in guided field walk, Interview, observation, group discussion and identification of plant specimens from each sites. In this case, key informants' means-informants having better indigenous knowledge regarding wild and semi wild edible plants than the other general informants. Accordingly, 12 key informants (8 male and 4 females) with age of 25 to 80 are select. The forest scouts and *kushet* agricultural officials facilitated and guided the process and served as key informants during field study.

3.2.3. Method of the Ethnobotanical data collection

Ethnobotanical data (qualitatively and quantitative) were collected from December to February, 2019, by cross-section walk in the forest and *kushet* where the edible plant species grow, Accordingly, semi –structure interview, guided field walk, group discussions, and market survey were applied to obtain indigenous knowledge of the local people on wild and semi wild edible plants. Collection of data was also done through guide field walk, which involves a combination of observation and interview methods. This implies that some of the interviews were made while walking through the forest. Informants were also asked to rank and give score to some wild edible plants according to their personal taste, market and preference and according to their multiple uses. All of the interviews were held based on check- lists of questions prepared before hand in English language and translated in to Amharic and Tigrigna, the language of informants. Following this, interviews and discussions were carried with informants and key informants. In addition, the discussions were also covering the relevant issues about wild and semi wild edible plants during the time.

3.2.3.1.Semi structure interview with informants

Before carrying out the interview and group discussion an oral prior informed consent (PIC) found from every informants that is the objectives of the study were introduced to the general informants and particularly to the scout and local leaders (informants consensus). After obtaining

informants consensus, and introduce the objective, field observation and interview were carried out through cross section walk in the forest following Tilahan Teklehymanot and Miruts Gidey (2010). The general informants were asked using checklist of open question in English language and were translate in to Amharic or Tigrigna because some informants can listen and speech both language.

3.2.3.2.Group discussion

To cross- check the recorded plants and their use following Martin (1995). There were three groups in each kushet which consist of four individual that include community elders and knowledgeable persons. The numbers of discussion werethree times on the district site (onetimes in each site). The place and time for discussion was decided on the interest of informants.

Figure 2 :Group discussion with key informant on the list of WSWEP

3.2.3.3.Field observation with guided field walk

Field observation with guided field walk was conducted to crosscheck presence of the plants, growth form, habitat characteristics and edible parts. Most field observation took place using cross check walk in the forest

Figure 3 : photo field observation

3.2.3.4.Identification of botanical specimens

Wild and semi wild plant species were collected from the wild and home garden based on ethnobotanical information provided by the informants collected during guided field walk specimens were pressed numbered and give vernacular name on each sheets and dried. Most of the family identification was performed in the field. Most of the species identification process was conducted by using taxonomic key in published volumes of the Flora of Ethiopia and Eritrae written by Tewlde Gebregziabher (Volume 2-7)

3.2.3.5.Market survey

Market assessments of the WSWEPs were conducted in Alamata and korem local market-nearest market place to the study site to judge the relative use in income generation (marketability) of the WSWEPs.

3.2.4. Quantitative Ethnobotanicl data analyses

The collected data were grouped in to qualitatively and quantitatively type during guided field walk and from unstructured or informal open-ended interview. Finally the result of the work was presented in percent, graphs, table and figures. Furthermore,one computer Programmes namely Microsoft Excel was used in performing the analysis.

3.2.4.1. Preference ranking

As described by martin (1995), Alexiades (1996) and Cotton (1996) Selected wild and semi wild edibles plants was conducted using on the degree of importance particularly tastes and

marketability of the short listed plants in the respective sits to assess the perception of community. The most preferred wild and semi wild edible plants were selected by the key informants consensus and ranked that is 5-most preferred, 4-commonly preferred,3-prefered but notcommon,2- preferred1- least preferred. Finally such ranking of the species was summed up and average ranking was employed.

3.2.4.2.Paired comparison

It was applied to determine the most destructive threatening factors for WSWEPs based on the information perceived from the informants.The number of paired factor was calculated by the formulan(n-1)/2 as described by (Martin, 1995) wher n is the number of factors.After identifying 7 factors which are more cited by the key informants, pair comparsion was carried out after randomized both sequence of the pairs.The sequence was randomized by numbering from 1-21 in alphabetical orderand made available for choice. The informant were asked to choose one from each pairs, then summed up and ranked.

3.2.4.3.Informant consensus

This method was used to confirm the validity and reliability of information given by the informants on the WSWEPs recorded during the interview.This was carried out by contacting the informants more than one for the same issue and the reliability and validity was checked and recorded.This insures whether or not the idea of the informant was the sam.When the idea of the key informants differed from the original information, data were rejected; only the accepted ones were taken in to concideration and were analayss according to (Alexiades, M .N., 1996).

CHAPTER FOUR RESULT

4. RESULTS

4.1. Indigenous Knowledge and Emic Categorization

4.1.1. Classification of plants based on height

People living in different part of the world have an indigenous knowledge to classify plants such as based on habit. In similar way, people living in the study area classify plants in to four categories based on height

Table: 1. Classification of plants based on height by the indigenous people

In Tigrigna language	Height	In English
Om	More than 4-6 feet	Tree
Kutkato	4-6 feet	Shrub
Tsihiyay(Saeri)	Less than 4-6 feet	Herb
Hareg	_	Climber

4.1.2. Soil classification

Soil is classified by the people of Rara Alamata district in to seven based on color and size of the soil. According, Tselim hamed stands to black soil and keih hamed to red soil.

Table 2: Emic categorization of soil

Emic categories	Soil type
Walka	Black soil/Clay soil
Keih hamed	Red soil
Hashewa	Sandy soil
Korethamed	Stony soil
Delel	Loamy soil
Lihum hamed	Limesoil
Tsaeda hamed	Whitesoil

4.1.3. Land form classification

The indigenous people of the study area classify land forms in to five based on altitude, steepness, and depth of the area. The indigenous people describe the name tsedifi to mountain and shintro to valley

Table 3: Emic categorization of land form by indigenous people

Emic category	In English
Tsedify	Mountain
Korobta	Hill
Shintro	Valley
Meda	Plain
Gereb	River

4.2. Taxonomic diversity

The people in the study area use diverse plant species that are used as a source of food which are obtained from the wild as well as semi-wild. A total of 37 plants species that belongs to 31 genera and 23 families were identified to be used as a source of food in the study area which are found naturally in the wild and semi wild (Appendix 3

4.2.1. Number of species belonging to each family

Which are used as a source of food varies from family to family (Appendix 4). Accordingly, family *Moraceae* posses the highest number of edible plants species amounting 5 (13.15%) followed by *Tilliacea and Rosaceae* 3 (8.10%) each

Table 4: Number of species belonging to each family

No	Family	No. species	%	Rank
1	*Moraceae*	5	13.15	1
2	*Rosaceae*	3	8.10	2
3	*Tiliaceae*	3	8.10	2
4	*Apocynaceae*	2	5.40	3
5	*Rhamnaceae*	2	5.40	3
6	*Flacourtiaceae*	2	5.40	3
7	*Lamiaceae*	2	5.40	3
8	*Polygonaceae*	2	5.40	3
9	*Asclepiadaceae*	2	5.40	3
10	*Anacardiacae*	2	5.40	3
11	Other	12	32.43	-

4.2.2. Number of Genera belonging to each family

The study showed that the number of genera that contribute edible plant species vary from family to family (Appendix4). In the study area, family *Rosaceae* contributes the highest number of genera amounting 3 (9.68%) but the other were with less number of genera.

Table 5 : Number of genera belonging to each family

No	Family	No of Genera	%	Rank
1	*Rosaceae*	3	9.68	1
2	*Moraceae*	2	6.45	2
3	*Polygonaceae*	2	6.45	2
4	*Asclepiadaceae*	2	6.45	2
5	*Rhamnaceae*	2	6.45	2
6	*Lamiaceae*	2	6.45	2
7	Other	18	58.68	

4.2.3.Number of plant species belonging to each Genus

The study showed that the number of plant species belonging to each genera vary from genera to genera (Appendix4). In the study area, genera Ficus contribute the highest number of edible plant species amounting 4 (10.81%) but the other Genus contains less numbers species.

Table 6: Number of plants species belonging to each genus

No	Genera	No of species	%	Rank
1	*Ficus*	4	10.81	1
2	*Grewi*	3	8.19	2
3	*Rhus*	2	5.40	3
4	*Dovyalis*	2	5.40	3
5	Other	26	70.27	-

4.3. Harvesting period

The study showed that the gathering period of the edible plants differs according to the plant type and from area to area. Most of the recording edible plant species were gathered during summer (July-September).

Table7: harvesting period

No. of edible plants	%	Harvesting period
27	72.97	July-September
9	24.32	February-April
1	2.70	Any time

4.4. Main Gatherer

The study revealed that the main gatherers were the recorded WSWEPs children (male and female) 41(56.94%), youngster 16(22.2%), poor or landless people 9(12.5%) and by all household 6(8.33%). Most of the recorded edible plant species were consumed by children and women accounted 33(89.19%), but 4(10.8%) were consumed by all communities.

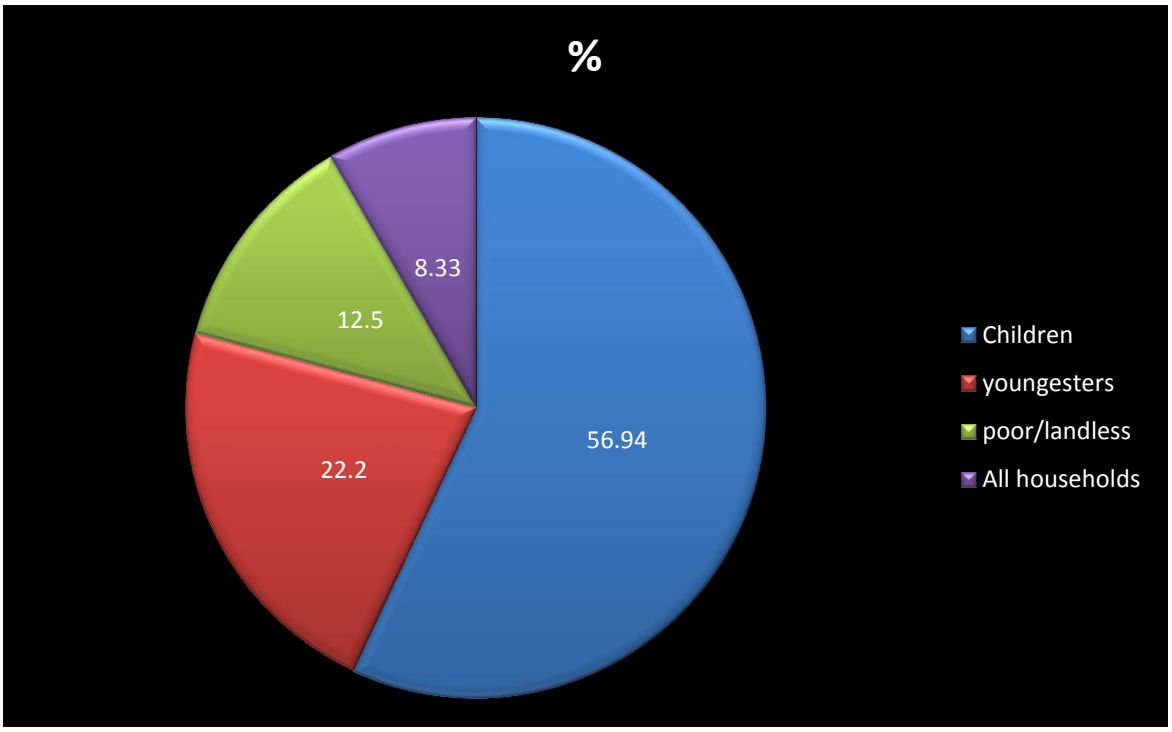

Figure 4: Main gatherer of edible plants parts

4.5. Source, status, part and nature of the plant parts used

4.5.1. Source wild and semi wild edible plants

Wild andsemiwild edible plants are obtained from different sources. Most of the edible parts were obtained from all habitats accounted for 26 (70.27%) followed by forest (wild) 8 (21.62) and home garden 3(8.10%).

Table8: Source of WSWEPs in the area

Habitat	No of species	%
Forest(wild)	8	21.62
Home garden	3	8.1
In all habitat	26	76.27

4.5.2.Status of wild and semi wild edible plants

The study indicated that the status of wild and semi-wild edible plants is high in the study area and accounted for 19(40.54%) followed by medium 11(35.14%) and low 7 (24.32%)

Table 9: Status of WSWEPs in the study area

Status	No. of species	%	Rank
High	19	51.35	1
Medium	11	29.72	2
Low	7	18.91	3

4.5.3. Part used

The study revealed that the local people consume different part of the plant. Fruits bearing wild and semi-wild edible plants were the highest accounted for 28 (75.68%) followed by leaves 3(8.11%). The rest plant parts: bulb, flower, gum, seed, stem and whole parts each account one plant (2.7%). (Figure5).

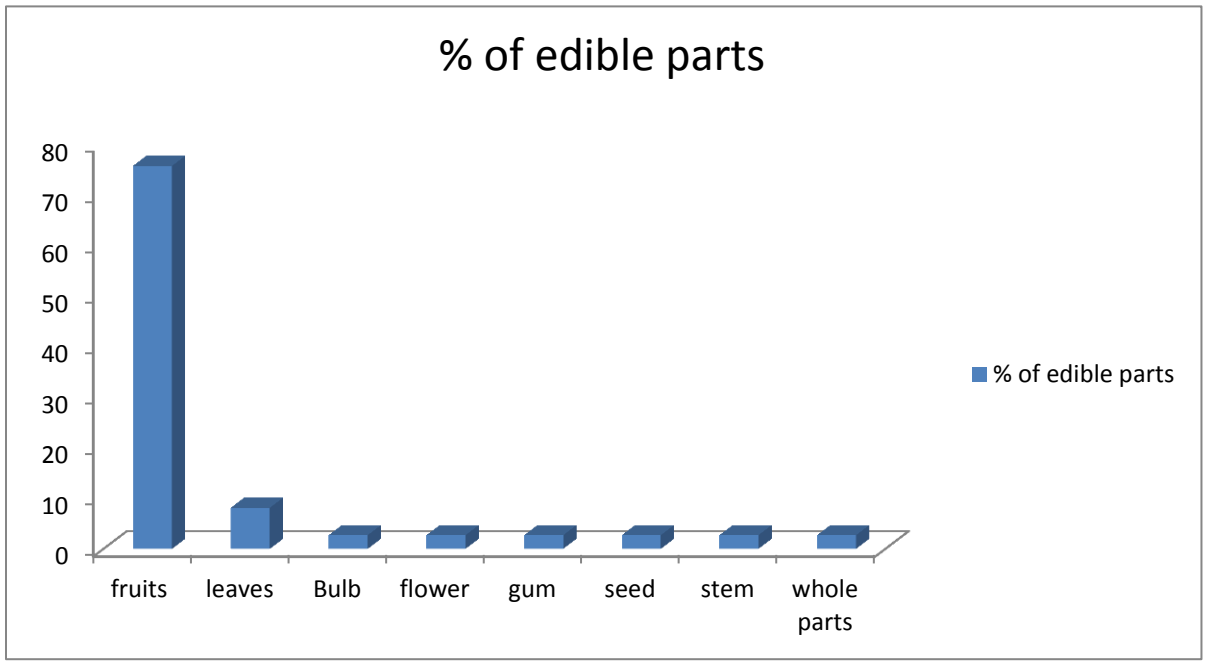

Figure 5: Edible plants part

4.5.4. Nature of the plant parts used

The study revealed that the local people consume rawdry, fresh and prepared parts of the plants. The plant parts consumed as raw and fresh scored the highest accounted for 32(86.46%) followed by

Fresh and dry 2(5.40%), cooked 2 (5.40%), Fresh, dry and cooked 1 (2.70%). (Figure6).

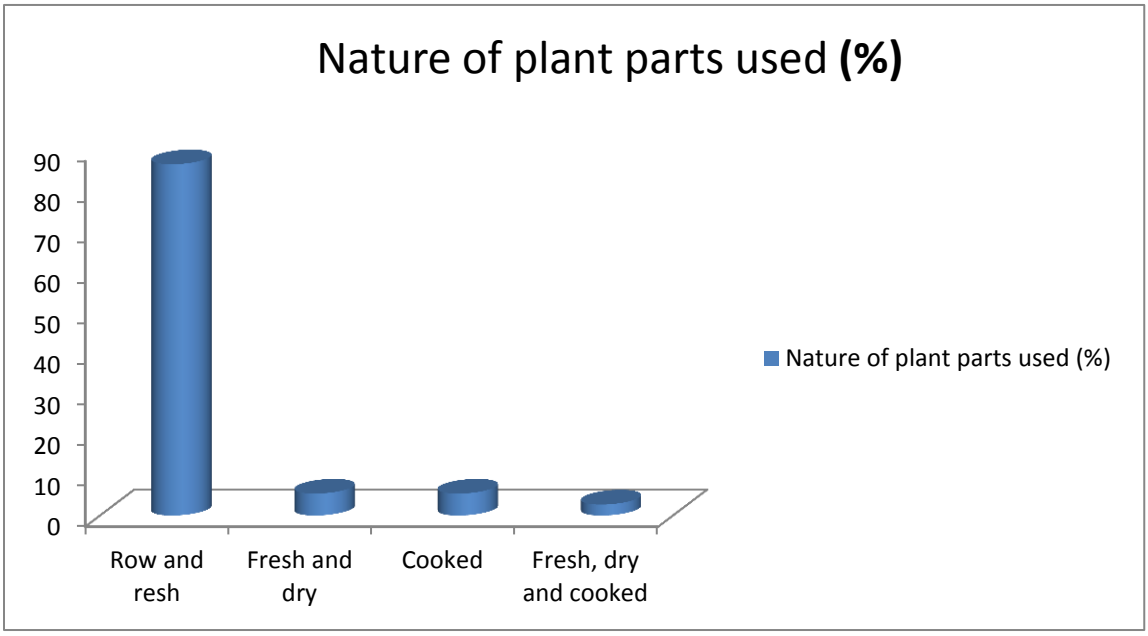

Figure 6: Nature plant part used

4.6.Growth form (habit) of wild and semi wild edible plants

The habit of the recorded wild and semi wild edible plants species includes tree, shrub, and herbs. The dominant habit of the plant in the district area was tree that accounts 17(45.95%), followed by shrub 13(35.13%) and herbs 7(18.92%)

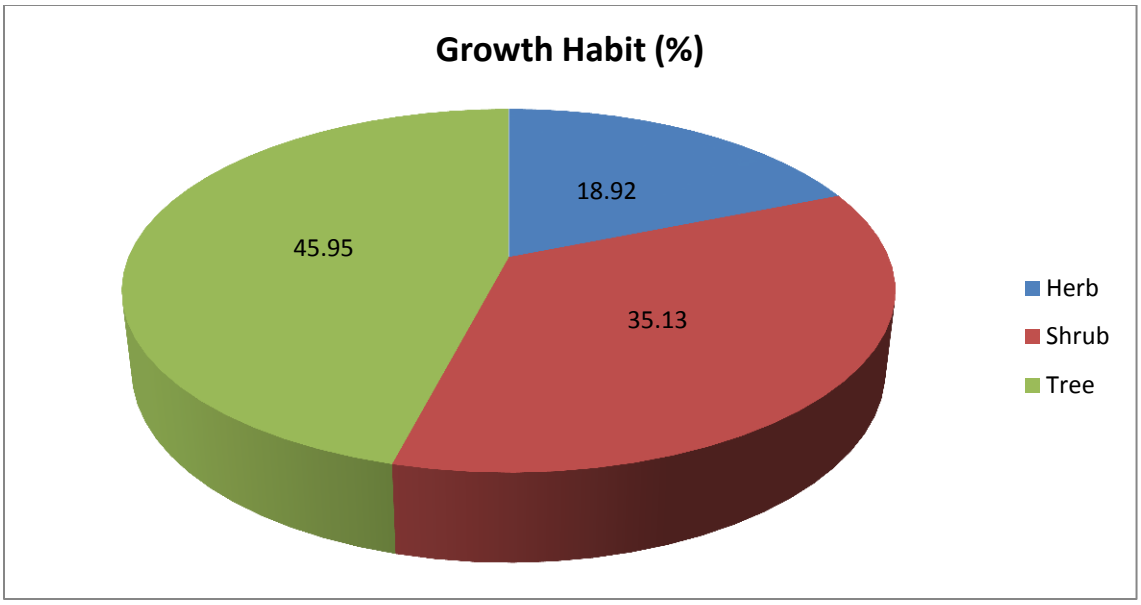

Figure 7: Habit of wild and semi wild edible plants

4.7.Altitudinal distribution of WSWEPs in the study area

The result of study revealed that these wild edible plant species are distributed in different altitudes. Most of the Edible plant species were harvested from altitude above 2400 m.a.s.l accounting 24 (64.86%) followed 13(35.13%) from 1500-2400 but no plant species were harvested from altitude below 1500 m.a.s.l.)

Table10: Altitudinal distribution of WSWEPs in the study area

Altitudinal distribution	Number of edible plant species	Percentage
1500-2400 masl	13	35.14%
Above 2400 masl	24	64.86%
Below 1500	0	0%

4.8.Preference ranking, informant consensus pair wise ranking

4.8.1.Preference ranking of wild and semi wild edible plants

The local people of the district area were found to appreciate some edible plants over the other in their taste quality. The most preferred species in the district area were the following in increasing order *Opuntia ficus-indica, Prunus persica Ziziph spina-christi, Balanites aegyptiaca, and Carissa spinarum.*

Table11: preference ranking of 6 most common WSWEPs according to their taste (6-most preferred, 1-least preferred)

WSWEPs	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Sum	Ran
Balanties aegyptiaca	3	1	3	3	3	1	2	3	2	2	4	2	29	4
Carissa spinarum	2	3	2	2	2	3	1	2	3	3	2	3	28	5
Prunus persica	5	4	4	4	4	5	4	5	5	5	5	5	55	2
Opuntia ficus – indica	6	6	6	6	6	6	6	6	6	6	6	6	72	1
Ziziphus spina – chirsti	4	5	5	5	5	4	5	4	4	4	3	4	52	3
Rosa abyssinica	1	2	1	1	1	2	3	1	1	1	1	1	16	6

4.8.2. Informant consensus of wild and semi wild edible plants

The result of the present study indicated that some wild edible plants are common or more popular than the other. The WSWEPs that are more popular to the informants were cited by more informants.

Table 12 top ten popular WSWEPs of the study area

WSWEPs	No informant	%
Opuntica ficus indica	66	91.66
Ziziphus spina-christis	61	84.72
Ficu sur	57	79.2
Prunus persica	53	73.6
Balanites aegyptiaca	46	63.88
Rosa abyssinica	45	62.5
Carissa spinarum	42	58.33
Solanum americanum	41	56.94
Ximenia Americana	37	51.38
Sageretia theat	33	45.83

A number of WSWEPs listed by the individual informants as edible was also rejected during group discussion as they are not common edible plant species in the site by the key informants and only 37 of them were the accepted as edible in three district sites. The popularity of the 37 wild and semi wild edible plants according the key informant is due to their multipurpose use and their abundance in the area. The informants ignored species with little known values and yet they could become very useful with increase in our knowledge and technology.

4.8.3.Pair wise ranking of threats of wild and semi wild edible plants

Factors that cause to decline or to extinct these plants differ from region to region, from area to .area and from plant type and community to community. To check the local perception on the factors pair wise ranking of seven threatened factors were conducted with the four key informants from each site, 21 possible pair were made from n(n-1)/2 were n is the number of factors followed Martin (1995).

All possible pairs and order with each pair were randomized and made available for choice. The informant were asked to choose one from each pairs, then summed up and ranked. The threat factors were ranked in the district area as agricultural expansion, fuel wood collection, over grazing, urbanization and selective harvesting as the main threats to wild and semi wild edible plants.

Table 13 Pair wise ranking of factors that threats wild and semi wild edible plants in the district area

Threats	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4	T	R
Drought	2	0	2	0	0	3	2	2	2	1	1	2	17	7th
Fuel wood collection	2	1	3	2	3	2	1	3	2	1	3	2	25	2nd
Over grazing	1	2	2	3	3	2	1	1	2	2	1	3	23	3rd
Selective harvesting	1	1	1	2	2	0	2	1	2	2	1	0	15	5th
Urbanization	3	2	1	2	3	2	2	0	1	1	2	2	21	4th
Expansion of agriculture	3	3	3	3	2	3	3	2	3	3	3	3	34	1st
Over exploitation	1	3	2	2	2	3	1	1	0	2	1	0	18	6th

Key: R-response of the informants

4.9.Conservation measures

According to the key informant none of the plant species documented in the area had any formal protection status. Through traditional knowledge of the WSWEPs was conserved in the area in different habitats. The tree and shrubs which constitute the greatest life forms in the area required more conservation measures according the informants.

Table 14 Conservation habitats of WSWEPs in the district

Conservation habitat	Participants	**%**	Rank
Church/School	19	26.38	2
Farm land	13	18.05	3
Home garden	31	43.05	1
Natural forest	9	12.5	**4**

4.10 Marketability of wild and semi wild edible plants

The local people of the district area were found to appreciate some wild edible plants over the other in their use income generation or marketabilities.

Table 15 Marketable wild and semi wild edible plants in the study area

WSWEPs	Local name	Parts	Units	Who sold	
Opuntia ficus-indica	Kulkala	Fruit	Number	Both sexes	
Balanites aegyptiaca	Bedano	Fruit	Cup	Female	
Carissa spinarum	Agam	Fruit	Cup	Female	
Ximenia americana	Mulo	Fruit	Cup	Female	
Morus alba	Injori	Fruit	Cup	Female	
Prunus persica	Kuk	Fruit	Number	Both sexes	
Ziziphus spina –christi	Kunkura	Fruit	Cup	Female	

Income gained from the sale of the plants species is one of the particular benefits of the people who have low income (poorest communities) to increase and fulfill their basic needs. According to the informants and during group discussion, these plants are often sold at much smaller level

and price. They sold at local market only and very few flows out of the region like *Opuntia ficus-indica and Ziziphus spina christi.*

Figure 8 : Market surveys of WSWEPs in Alamata and Korem

5 .Discussions

5.1 Growth form/ habits and soil types

People living in different part of the world have an indigenous knowledge to classify plants based on their habits, density and heights. In similar way, peoples living in the study area classify plants in to four categories based on their heights. However, the local communities' of Tara Gedam and Amba forests categorized their plants based on the height in to five as reported by (Getnet Chekole, 2011). All cultures recognize natural classes of animals and plants, and traditional cultures as concerned with classifying their world as western scientist (Johnson, 1992). The local people of Ejiaji (Chelya) classify their plants of surrounding in to four based on dominating tree and density of the plants that cover the land as reported by (Endalew Amenu, 2007). Thus people classify their plants based on their culture or indigenous knowledge.

Soil is classified by the people of Raya Alamata district in to seven based on color and size. However the locale people of Tara Gedam and Amba forests categorized the soil on their perception in to five based on color and size (Getnet chekole, 2011). Similarly indigenous people of Ejaji (chelya district) classify soil based on color, texture and suitability for cropping in to five types (Endalew Amenu 2007). The local communities categorized or classify plants based on their height in to four; soil based on color and size in to six and land form based on altitude, and steepness as reported by (Tizazu Gebre, 2005). Emic categorization depends on native categories (Zent, 1996) and is drawn from the way people perceive things through their own eyes and classify objects in their own language (Martin, 1995), Studies depth of the area in to five in Tigrigna language. Similarly with the study the local communities of Tara Gedam and Amba forests categorized their land escape, based on their perception in to seven (Getnet chekole, 2011).

5.2. Taxonomic diversity and their families and genera

The study revealed that people in different area use wild and semi-wild edible plants as a source of food. However, the number of plants species varies from area to area, and from district to district. A total of 37 wild edible plants were identified for food and other multipurpose uses in semiarid, east shewha, Ethiopia (Debela Hunde eta. 2011) 66 wild edible plants were recorded in Derashe and Kucha Districts, So the numbers of WSWEPs recorded in the district area were not much less than the other areas and need sustainable use not to be wiped out. The same as the

study ethnobotanical study conducted by Tena Regassa *et al*. (2014) showed *Moraceae* was the dominant family contributing the highest number of edible plants species. However, different studies showed that the dominant families which contribute edible plant part vary from area to area. Thus number of genera in different family varied from area to area. And study conducted by Nedelcheva (2013) indicated that genera *Rumex* accounted the highest edible plant species in Bulgaria which amounting 4(4.45%). In addition Ojelel and Kakudidi (2015) indicated that the genus *Ficus* dominated with the highest edible plant species in Uganda followed by *Corchorus*. In line to this the genus *Grewia* contain the highest number of species which accounting 5(13.51%) in East Shewa (Debela Hunde *et al*., 2011). So the number of species varied from Genera to Genera and from area to area.

5.3. Ripening and harvesting seasons as well as main gatherers

The key informants of the study area pointed out those edible plant species were ripened and consumed in the study area in different season of the year. For example *Opuntiaficus-indica*: in the season /June, July, August, and September /*Ziziphus spina-christi, and Balanites aegyptiaca* (February-April). However Mekuanent Tebkew (2015) study showed that more edible plant species were harvest during autumn and summer in Boost in fantail. Furthermore *Ximenia americana* was harvested from September to November in East Shewa (Debela Hunde *et al*., 2011). Ethnobotanical study of Tinsae Bahru *et al*. (2013) showed that collection of WSWEPs was done by children, younger, livestock herder and poor family in, Awash National park this is similar to the result of the study area. However, Tena Regassa *et al*. (2014) also reported women and children were the major gatherer and followed by men as well as all household in cheliga district.

5.4. Habitats of WSWEPs in the study area

WSWEPs can grow in different area throughout the world an ethno-botanical study conducted by mekaunent Tebkew *et al*. (2014) reported that natural forest; farm land and riverine were the most habitats of wild and semi wild edible plants in Chilga District, Northwestern Ethiopia. Furthermore Agea *et al*. (2011) reported that most wild and semi wild plants are found in pure wild while some are in semi wild states. Similarly the present result showed that the recorded edible plants species *Opuntia ficus-indica, Becium grandiflorum, and Rumex nervosus, Carissa spinarum* were widely distributed but like *Ficus ovate*, sparsely distributed in the area, they were

found in home garden or church or other enclosed areas. However others like *Grewi atrichocarpa and Ximenia ameriana* were only found in the forest. Ethnobotanical study of abundance status by Getachew Addis *et al*. (2013) in Konso people indicated that, only 16% were reported to be very abundant 45% were abundant, 37% were occasionally found and 2% were rare.

5.5. Edible plant parts and consumption of WSWEPs in the study area

Fruit is the dominant edible part in the study area and leave is followed Sujarwo *et al*. (2015) in Bali found fruit as the dominant consumed parts. However leaves are by followed far, the most commonly used plant parts reported by Agea *et al*. (2011) in Uganda. Getachew addis *et al*. (2013) also reported that 46% eaten their Fruits. Leaves were the most frequently used as food (45.1%), followed by fruit in Uganda (Anywar *et al*,). In the study area more than 90% edible plants are eaten as raw or unprepared; Mekuanent Tebkew *et al*. (2014) also reported 79% of the reported edible plants were consumed raw or fresh in Chilga district. Salih and Ali (2014) showed fruit of nearly all of recorded were consumed fresh in Sudan. Getnet Chekole (2011) also reported that most such edible plant species were consumed fresh but very few cooked

In the study area tree are the most habit (45.95%) followed by shrub (35.1) and the rest are herb in Kara and Kwego (Tilahun Teklehymanot and Miruts Gidey, 2010) tree is the dominant habit of the edible plant species. However study of Ojelel and Kakudidi (2015) showed herbs as the dominant habit in Uganda. So WSWEPs had different growth form according the plant type

5.6. Pereferance ranking and threats of WSWEP in the study area

Opuntia ficus-indica, Prunus persica Ziziphus spina-christi, Balanites aegyptiaca, and Carissa spinarum were ranked by the informant based on their taste quality. The same is true that ethnobtanical study conducted by Getachew Addis *et al*. (2013) ranked *Opuntia ficus-indica* highest in Konso and Bayfers Tamene *et al*. (2000) in Cheffa. However species preference varies from region to region or from area to area, for example the fruits of *Balanites aegyptaca* are the most preferred edible fruit by the local communities of the Afar and Oromo communities and in the buffer area of Awash Tinsea Bahru *et al* (2013) but ranked 21 by Getachew Addis *et al*. (2013) in Konso. However to this Salih and Ali (2014) reported that *Balanites aegyptiaca, Ziziphus spina-christi*, fruits was indicated as most preferable over the others and of high marketability in Sudan

The threat factors ranked in the district area as agricultural expansion, fuel wood collection, over grazing, urbanization and selective harvesting as the main threats to wild and semi wild edible Ethnobotanical study conducted by Salih and Ali (2014) reported in Rashad, Wad-Abid and Tagyek, agricultural expansion was ranked as the principal threats factor. In contrast to this study overgrazing was mentioned as principal threat in EIF aid and Tandik villages. Uncontrolled fire setting was another important threat in EIF aid district; elephants are the major theart to reducing of WSWEPs in the Botswana (Badimo *et al*., 2015). An ethnobotanical study carried by Tena Regassa *et al*. (2014) indicated that Agricultural expansion was identified as a major threats followed by overgrazing and fuel wood collection in Chelia district. In addition Mekunanent Tebkew *et al*.(2014) reported that Fuel wood collection, illegal charcoal production and construction were the major threats in mid land area of Cheliga but in low land area of Cheliga agricultural expansion, fuel wood collection and illegal charcoal production are the major threats, these threats of WSWEPs were varied from area to area.

5.7. Conservation measures of WSWEPs in the study area

Without management intervention of the government it may lead to the extinction of a species and loss of associated indigenous knowledge on wild and semi wild edible plants. Similar with the study area conservation of forests in Cheffa has been carried by the communities' socio-cultural factors like belief (Bayfers Tamene *et al*., 2000). Assegid Assefa and Tesfay Abebe (2011) reported that preventing from cutting for fire wood in Benna and Tsemay district. Natural forest protection, planting the threatened plant in the home garden was the conservation method by Getnet Chekole (2011).

5.8. Marketability of WSWEPs in the study area

Income gained from the sale of the plants species is one of the particular benefits of the people who have low income (poorest communities) to increase and fulfill their basic needs. According to the informants and during group discussion, these edibleplants are often sold at much smaller level and price. They sold at local market only and very few flows out of the region like *Opuntia ficus-imdica.* During the group discussion women and youngsters (female and male) commonly sold these edible plant species in the local market. These edible plants species were also used as income sources in other areas and countries for instance, ethnobotanical study carried and Ali (2014) showed that *Balanites aegytiaca and Ziziphs spina-christi*, as high marketable in Sudan

and Tinsae Bahru *et al*. (2013),in Awash national park. Wild and semi wild edible plant were marketing at the main market, road side, in shop with other food crops like lemon, mango, sugar cane, onion and vegetable. Berhane Kidane *et al*. (2014) also reported collecting wild and semi wild edible plants to sell in the market was said to be a common practice by the rural communities during different seasons and marketing only took place at the main market

6. CONCLUSTION AND RECOMMENDATION

6.1.Conclustion

Forests are crucial to provide food, oxygen, shelter, recreation and medicine.Total of 37 WSWEPs were recorded.Most plant parts used as food in the study area were fruit (76.92%) and 47.22% were trees.All the recorded plant species in the study area were important seasonally.The result of the study also showed among the wildand semi wildedible plants recorded *Opuntia ficus-indica ,Ziziphus spina-christi and Balanites aegyptiaca* make addition of income from sale of fruit during the different season of the year. Habitat of the WSWEPs constitudes 8(16.21%) forest, 3(8.1%) homegarden, 26(70%) from all habitats and used for different purpose. In addition the result indicated that most of the wild edible species (91.66%) were mainly used by children, herder, and poor communities. Fresh fruit was mainly consumed plant parts.The matrix ranking of the WSWEPs of the area showed that most of the recorded WSWEPs were used for food source and non-food source.The people of the study area depend less in such food plants species but on the cultivated food crops.On the other hand this result suggested many of these plants were under threats from various anthropogenic factors,like agricultural expansion, fuel wood collection, over grazing, urbanization, and selective harvesting.The removal of habitats such as forests do have a direct impact on ecosystem diversity and wild edible plant species as well. Similarly this study indicated most of the wild and smi wild food plants in the study areas need to be protected, especially the forest through increasing community awarrnes and public based managment in all level. Wild and semi wild edible plant use was found not to be a well-recognized usage during normal times when cultivated food is abundant in the study area.Therefore; special management is needed to sustain the benefits of these plants.

Communities' competition for the highly popular food plants in their ecological habitat put more pressure and increases the vulnerability of the plants. It is not simply enough to encourage the use of these plants without conserving them and the environment that will ensure their survival. With increasing deforestation, exploitation and changes in land use, the diversity of natural vegetation in the district area is declining and many of these wild foods and fruits are no longer readily available. Some of the important wild foods plants have already are becoming very rare.This study also pointed out that some of the community collect the WSWEPs for their own consumption only while others collect for sale as well.The other point that the present study showed was *Opuntia ficus indica* and *Ziziphus spina –chrisiti* were the most preferrable over the

other WSWEPs.The IC-value of the study recorded WSWEPs also showed most of the WSWEPs were used as source of food and non-food value and the marketability or income source for the local communities.

6.2.Recommendation

Based on the results of the study, the following recommendations are forwarded.

- Communities awarrnes aim to increase consumption, domestication and community based protection of these edible plants need to encourage at all levels.
- There is a need for identification of nutritional value, and possible side effects of using these wild edible plants.
- Need to improve market structure in order for the local communities to realize their full market potential of these plant species
- Polices on conservation, food-security and agriculture need to be integrated to recognize and preserve the importance of wild edible plant species.
- Forest management systems that sustain the household's income opportunities are needed.
- Wild edible plants that provide food during periods of food scarcity or famine should be particularly Promoted for planting in farmlands in order to improve household food security;
- More research should be carried out on the nutritional and medicinal properties of wild edible plants
- People should be encouraged to protect and conserve wild food plants in their farmlands

7. REFERANCES

Abraham Demekiristos (2016). Collection and identification of wild Fruits Tree/Sub Species in Amhara Region, Ethiopia.Journal *of Natural Sciences Research,*6(11):

Agea,J.G.,Okia,C.A.,Abohassan,R.A.A.,Kimondo,J.M.,Obua,J.,Hall,J.andZewegTeklehaymanot(2011).Wildand Semi-WildFoodPlantsofBunyoro-Kitara Kingdom of Uganda:GrowthForms, Collection Niches, Parts ConsumedConsumptionPatterns, Maingatherers and Consumers *Journal of Environmental Resources*,5(2):74–86.

Agea, G.J., Isublukalu, P., Kimondo,J. M., Okia,C. A., Obaa, B.B., Woiso, D.A., Obua, J., ZewgeTeklehaymanot (2013).Market Structure of Wild and Semi Wild Edible Plants Traded inBunyoro-KitaraKingdom, Uganda. *InternationalJournal Medicine Aromatic plants*, 3(2):300-316

Aberoumand, A. (2011).Nutritional Potential Evaluating of Medicine and Edible Plant Foodin Iran.*WorldJournal of Medical Pharmaceutical and Biological Sciences*, 1(1**):**20-26.

Akinnifesi, F.K, Kwesiga, F.R., Mhanga, J., Mkonda, A. Chilanga, T. Swai, R. (2004). Domesticating, Priority Miombo Indigenous Fruit, Trees as aPromising Livelihood Option for Small Farmers in Southern Africa, *ActaHorticulture*, 632: 15-30.

Amare Getahun,(1974).The role of wild plants in the native Diet in Ethiopia: ecosystems, 1: 456 .

AssegidAssefa andTesfay Abebe (2011**)** Wild edible Trees and Shrubs in the semi-aridLowlands of Southern Ethiopia.*Journal ofScienceand Development,* 1:5–19.

Adam,Y.O (2011) Contribution of Local level Tradein Non Timber Forest Products to RuralDevelopmentinRashadLocalityofNubaMountainsSudanPh.DThesisTechnicalUniversity of Dresden, Faculty ofForest, Geology and Hydro Sciences, Germany.

Anywar, O., Oryem-Origa, H., Mugisha, M.K. (2014).Wild plants used as nutraceuticals from NebbiDistrict, Uganda.*EuropeanJournal of Medicinal Plants*,4(6): 641-660

Alexiades, M. N. (1996). Collecting Ethnobotanical data: anintroduction to basic concepts and techniques.In A.M.N. (Ed.), selected guidelines for ethnobotanical research: a field manual.The New York Botanical Garden, Bronx, New York.

Bharucha Z: and Pretty, J. (2010), the roles and values of wild foods in agricultural Systems. , *Journal of Philiphis Transaction Royal Society,* 365:2913–2926.

Badimo D: Lepetu, J. and Teketay, D. **(**2015). Utilization of Edible Wild Plants and theirContribution toHousehold Income in Gweta Village CentralBotswana.*AfricanJournal ofFoodScience*and *Technology*, 6(7): 220-228.

Boedecker, J., Termote, C., Assogbadjo, A.E., Damme V.P., Lachat, C. (2014). Dietary Contribution of wild edible plants to Womens diets in the buffer zone around the Lama Forest, Benin.*Food science*.

Berhane Kidane, Maesen, L.J.G., V., Andel, T.V, Zemed Asfaw, Sosef, M.S.M. (2014).Ethnobotany of Wild and semi-wild edible fruit species used by Maale and Ari Ethnic Communitiein Southern Ethiopia.*Ethnobotany Research & Applications*, 12:455-471.

Cotton, C.M. (1996). *Ethnobotany Principles and Applications* John Wiley and Sons Ltd.West Sussex, England, U.K.

CIDA (2010).Food security from the forest: regulating wild edible plants for household Food : Security in sub-Saharan Africa.

Cruz, M.P., Peroni, N.and Albuquerque, U.P. (2013). Knowledge, use and management of native Wild edible plants from aseasonal dry forest (NE, Brazil).*Journal ofEthnobiology*and*Ethnomedicine*, 9:79.

Dogan, Y., Ugulu, I., Durkan, N. (2013). Wild edible plants sold in the local markets of Izmir, Turkey. *PakistanJournal ofBotany*, 45: 177-184.

Demele Teketay: Feyera Senbeta, Maclachlan, Million Bekele, M. & Barklund, P. (2010). , Edible, Wild Plants inEthiopiaAddis AbabaUniversity Press, Addis Ababa.

Debela Hunde, Njoka, J.T., Nyangito, M.M.and Zemed Asfaw (2011). Neutraceutical wild plants ofSemiaridEast Shewa, Ethiopia: Contributions to food and healthcare Security of the Semiarid People. *Resources Journal*, 5:1–16.

Debela Hunde: Njoka; J.T Zemed Asfaw, and Nyangito, M.M. (2011). Seasonal availability and Consumption of wild edible plants in semiarid Ethiopia: Implications to food security and climate change adaptation. *Journal of Horticulture*and *Forestry*,3(5):138–149.

Debela Hunde, Njoka, J.T., Zemed Asfaw, and Nyangito, M.M. (2011).wild edible fruits of Importancefor Human nutrition in semiarid parts of East Shewa Zone, Ethiopia: associated indigenous knowledge and implications to food security.*Pakistan Journal of Nutrition*,10(1):40-50.

Debela Hunde: Njoka, J.T., Zemed Asfaw, and Nyangito, M.M. (2012). Comparative analysis of Indigenous knowledge on use and management of wild edible plants: The case of central East Shewa of Ethiopia. *Ethnobotany Research &Applications*, 10:287-304.

Dandena Gelmesa (2010**).** Shifting to alternative food source: potential to overcome Ethiopians; malnutrition and poverty problems:Innovation and sustainable development in Agriculture and food (ISDA).Montpellier, June 28–30, Haramaya University, Local SeedBusiness Project, Dire Dawa,Ethiopia, 10. Ermias Lulekal, Zemed Asfawand Ensermu Kelbessa, Damme, P.V. (2011). Wild edible plants in Ethiopia: Review on their potential to combat food insecurity. Afrika Focus, 24(2):71–121.

Demele Teketay: Feyera Senbeta, Maclachlan, Million Bekele, M. & Barklund, P. (2010).Edible Wild Plants in Ethiopia, Addis AbabaUniversity Press, Addis Ababa.

Debela Hunde, Njoka, J.T., Nyangito, M.M.and Zemed Asfaw (2011). Neutraceutical wild plants ofSemiaridEast Shewa, Ethiopia: Contributions to food and healthcare Security of the Semiarid People. *Resources Journal,* 5:1–16.

Debela Hunde: Njoka, J.T., Zemed Asfaw, and Nyangito, M.M. (2011). Seasonal availabilityand Consumption of wild edible plants in semiarid Ethiopia: Implications to food security andclimate change adaptation. *Journal of Horticulture*and *Forestry,*3(5):138–149.

Debela Hunde, Njoka, J.T., Zemed Asfaw, and Nyangito, M.M. (2011).wild edible fruits of Importancefor Human nutrition in semiarid parts of East Shewa Zone, Ethiopia: associated indigenous knowledge and implications to food security.*Pakistan Journal of Nutrition,*10 (1**)**:40-50.

Debela Hunde: Njoka, J.T., Zemed Asfaw, and Nyangito, M.M. (2012). Comparative analysis of Indigenous knowledge on use and management of wild edible plants: The case of central East Shewa of Ethiopia. *Ethnobotany Research &Applications*, 10:287-304.

Dandena Gelmesa (2010**).** Shifting to alternative food source: potential to overcome Ethiopians; malnutrition and poverty problems:Innovation and sustainable development in Agriculture and food (ISDA).Montpellier, June 28–30, Haramaya University, Local SeedBusiness Project, Dire Dawa,Ethiopia, 10.

Ermias Lulekal, Zemed Asfawand Ensermu Kelbessa, Damme, P.V. (2011). Wild edible plants in Ethiopia: Review on their potential to combat food insecurity. Afrika Focus, 24(2):71–121

FAO (2004), the state of food insecurity in the World: Monitoring the progress towards the WorldMonitoring the progress towards the world food summit and millennium developent goals: Rome.

Fantahun Mengistu: and Hager, H. (2009). Exploiting locally available aesources for food and Nutritional Security Enhancement: Wild Fruits Diversity, Potential and State of Exploitationinthe Amhara Region of Ethiopia. *Food Security,*1(2): 207–219.

Fantahun Mengistu: and Hager, H. (2008)' Wild edible fruit species cultural domain, informant speciesCompetenceand preference in three Districts of Amhara Region, Ethiopia.*EthnobotanyResearch and Applications,* 6:487-502.

FAO: (2009). The State of Food Insecurity in the World Rome (Italy):

FAO ,Friedman, J. Z., Yaniv, A., Dafni and Palewitch, D. (1986).A preliminary classification on theHealing potential of medicinalplants, based on rational analysis and ethnopharmacological fieldsurvey among Bedouins in the NegevDesert, Israel.*Journal of Ethno-pharmacology*, 16:275- 287.

Getnet Chekole, (2011).An Ethnobotanical Study of Plants Used inTraditional Medicine and as Wild Foods in and around Tara Gedam and Amba Remnant Forests.

Getachew Addis, Zemed Asfaw, and Zerihun Woldu, (2013).Therole of wild and semi-wild ediblePlant in houshold food sovereignty inHamer and Konso communities, South Ethiopia.*EthnobotanyResearch&Applications*, 11:251-271.

Getachew Addis: Zemed Asfaw, and Zerihun Woldu (2013). Ethnobotany of wild and Semi wild Edible Plants of Konso Ethnic Community, South Ethiopia.*Ethnobotany* Research & Applications, 11:121-141

Guinand and Dechassa Lemessa (2001) .A practical field guideto wild-food plants in Ethiopia: General description Edible parts preparation methods and palatability. UNDP Emergency Unitfor Ethiopia, Addis Ababa.

Guinand: and Dechassa Lemessa (2000). Wild food plants in Ethiopia reflections on the role of wild-foodsand 'famine-Foods' at a time of drought UNDP-EUE field mission report Addis Abeba, Ethiopia.

Glew, R. H., VanderJagt, D. J., Lockett, C., Grivetti, L. E., Smith, G. C., Pastuszyn, A& Millson M: (1997). Amino-acid, fatty acid and mineral composition of 24 indigenous plants of Burki nafaso.*Journal of Food Compositionnal*10: 205–217.

Howard, P. (2010). Cultureand agrobiodiversity.In nature and culture (Eds S. E. Pilgrim & J.Pretty), London, UK: Earthscan, 163–184.

Hinnawi, N. S., A. (2010).An Ethnobotanical Study of wild edible plants in the Northern West Bank: Palestine M.Sc.Thesis An-Najah National University, Nablus, Palestine.

Horo: S., Topno, S. (2015). Study and analysis of nutritional value of some wild and semi wild Edible plants consumed by "HO" Tribes of W.Singhbhum District, Jharkhand, India. *International Journal of Herbal Medicine*,3(5): 25-32.

IBC **(**2012).The state of food insecurity in the World: Economic Growth is Necessarybut not Sufficien toAccelerate Reduction of Hunger and Malnutrition: FAO (Food and Agriculture Organization theUnited Nations), Rome, Italy.

Kalle, R., Sõukand, R. (2012). Historical ethnobotanical review of wild edible plants of Estonia (1770s–1960s). Acta Socio Botany Poland,81(4):271–281.

Kebu BalemieandFassil Kebebew,(2006).Ethnobotanical Study of Wild EdiblePlantsinDerasheand Kucha Districts, South Ethiopia.*Journal of Ethnobiology* and*Ethnomedicine,* 2(53):

Leonti: M, Nebel, S, Rivera, D, Heinrich, M. (2006). Wild gathered food plants in theEuropean Mediterranean: A Comparative analysis. *Economical Botany*,**),** 60 (2130–142.

Luczaj, L. (2012).Ethnobotanical review of wild edible plants of Slovakia.Acta societatis BotanicorumPoloniae, 81(4**)**: 381-396.

Leul Kidane Wolde Michael, Tamrat Bekele and Sileshi Nemomissa**, (**2010).Vegetation Composition Hugumbirda-GratK hassu National Forest Priority Area, SouthTigray,2 (2), 27-48.

MoARD: (2007). Horn of Africa consultations of food security, country report.Addis Ababa, Ethiopia: ministry of agriculture and rural development, government of Ethiopia.

Martin, G.J. (1995). Ethnobotany*:* A people and plants conservation manual.Chapman and Hall London.

Mondal T. (2012). Ethno-botanical investigation on important wild Edible herbs of Siliguri

Subdivisionof Darjeeling District, West Bengal.India.*Journal of Today's Biological Sciences: Research and Review*,1 (1**)**:19-22.

Menendez-Baceta, G., Aceituno-Mata, L. Tardío, J. Victoria Reyes-García, and Pardo-De-Santayana M. (2012).Wild edible plants traditionally gathered inGorbeialdea (Biscay Basque country).Genetic Resources and CropEvolution (in press).

Mir: M.Y. (2014). Documentation and Ethno botanical survey of wild edible plants usedby the Tribalsof Kupwara, J & K, and India*International Journal of Herbal Medicine*,2 (4): 11-18.

Maxia: A. Lancioni, M.C., Balia, A.N., Alborghetti, R., Pieroni, A. & Loi, M.C**. (**2008). Medical Ethno-botanyoftheTabarkins, aNorthernItalian (Ligurian) Minority Insouth -Western Sardinia .*Genetic Resources and Crop Evolution*, 55:911–924.

Mekuanent Tebkew (2015). Wild and Semi-Wild Edible Plants in Chilga District, Northwestern Ethiopia: Implication for Food Security and Climate Change Adaptation.*GlobalJournal of wood Science, Forestry* andWildlife, and 3(3):072-082.

Mekuanent Tebkew: Zemed Asfaw, and Solomon Zewudie, (2014). Underutilized Wild Edible Plants inthe ChilgaDistrictNorthwestern Ethiopia; Focus on Wild Woody Plants.*Agriculture and food security*, 3:12.

Nedelcheva, A. (2013).An Ethnobotanical study of wild edible plants in Bulgaria.*Eurasia Journal of Biologicalscience*, 7:77-74.

Neudeck LA Velino L, Bareetseng P, Ngwenya, B.N, Teketay, D.Motsholapheko, M.R. (2012).The contribution of edible wild plants to pood security, Dietary, Diversityand income of householdsinShorobeVillage, Northern Botswana.*Ethnobototany Resources and Application*, 10:449–462.

Okia, C.A., Agea, J.C., Kimondo, J.M., Abohassan, R.A.A., Obua, J.and Zeweg Teklehaimanot (2011).Harvestingand processing of *Balanites aegyptiaca l*eaves and fruits for local consumptionby rural communities in Uganda.*Journal of Food Technology*,9(2):83-90.

Ojelel, S.andKakudidi, E.K. (2015). Wild edible plant species utilized by subsistence farming Community in Obalanga subcountryAmuria DistrictUganda.Journalof Ethnobiology amdicine, 11*: 7.*

Ocho: D.L. P.C., Struik, L.L. Price &.Enserum Kelbessa (2012).Assessing the levels of food shortage Using the Traffic Light Metaphor by Analyzing the Gathering and Consumption of Wild Food.

Powell: B, Maundu, P, Kuhnlein, H.V, and Johns, T. (2013). Wild foods from farm and forest in The: East Usambara Mountains, Tanzania. *Ecological Food and Nutrition*, 52:451–478.

Pardo-de-Santayana, M, Tardío, JM., Blanco, E, Carvalho, AM, J.J., Lastra, E., Miguel and Morales, R.(2007).Traditional Knowledge of Wild Edible Plants Used in the Northwest of the IberianPeninsula (Spain and Portugal): a Comparative Study.Journal of Ethnobiology andEthnomedicine, 3: 27.

Pitso: F.S. and Lebese, M. R. (2014**).** Traditional Uses of Wild Edible Plants.Journal of Human Ecology, 48(1): 23-31.

Reyes-Garcia: V., Vadez, V., Huanca, T., Leonard, W. and Wilkie, D. (2005**).** Knowledge and Consumption ofwild plants: A comparative study in two Tsimane villages in theBolivian Amazon.*Ethnobotany Researchand Applications*, 3: 201-207.

Rana,J.C. Pradheep,K.,Chaurasia,O. P., Sood,S. Sharma,R. M.,Singh,A. and Negi, R. (2012). Genetic Resources of Wild Edible Plants and their Uses among TribaCommunitiesof Cold Arid Region of India.*GeneticResoursecrop evolution*, 59:135-149.

Rathore, M: (2009).Nutrien tContent of Important Fruit Trees from Arid Zone of Rajasthan. *Journal Hortculture Forestry*,1: 103-108.

Ruffo, C.K., Birnie, A., Tengnäs, B. (2002).Edible wild plants of Tanzania.Regional Land ManagementUnit (RELMA), Nairobi, Kenya: Swedish International Development Cooperation Agency (Sida).

Shumsky, S., Gordon, M., Hickey, Bernard Pelletier and Johns, T. (2014).Understanding the Contribution: of Wild Edible Plant to rural social ecological resilience in semi-arid Kenya. *Ecology*and *Society*, 19(4):34.

Singh, (2011) Wild Edible Plants: a Potential Source of Nutraceuticals. *InternationalJournal of PharmaSciences* and *Research*, 2 (12**)**, 216-225.

Satheesh, N. (2015). Review on Distribution, Nutritional and Medicinal Values of *Casimiroa edulus*Llave-An Underutilized Fruit in Ethiopia.*American-Eurasian Journal Agriculture*and*Enviro- nmental Science*, 15 (8): 1574-1583.

Sõukand, R. and Kalle, R. **(**2015).Emic conceptualization of a 'Wild Edible Plant' in Estonia in the Second Half of the 20th Century TRAMES, 1: 15–34.

Salih, N.K.M., Ali, A.H. (2014). Wild food trees in Eastern Nuba Mountains, Sudan: Use DiversityAnd Threatening Factors.*Journal of Agriculture and Rural Development in the Tropics and Subtropics*,115 (1): 1-7.

Saha, D., Sundriyal, M. and syndriyal, R.C. (2014).Diversity of Food Compostion and Nutritive Analysisof WSWEPs in Multi-Ethnic Triala Land Northeast India; an ImportantFacet for FoodSupply.*Indian journal of Traditional Knowledge*,13 (4):698-705.

Sujarwo, W.I.B.K., arinasa, G., Caneva and Guarrera, P.M. (2015).Tradional Knowdelge of Wild And Semi-Wild Edible Plants Used in Bali (Indonesia) to Maintain Biological and Cultural Diversity, 07:12.

Somnasang, P. Moreno-Black, G. (2000). Knowing, gathering and eathing: Konwledge and Attitudes about Wild Food in an Isan Village in Northeastern Thailand.Journal of Ethno-biology, 20(2): 197-216.

Tilahun Teklehaymanot and Miruts Giday, (2010).Ethnobotanical Study of Wild Edible Plants of Kara andKewegoSemipastoralist People in Lower Omo River valley, DebubOmo Zone, SNNPR, Ethiopia.JournalofEthno-biologyand Ethnomedicine, 6:23.

Tamene Yohannes (2015). Diversity of Crop Wild Relatives and Edible Wild Plants in Ethiopia.*Journal Biodivers Manage Forestry*, 4:3.

Tena Regassa, Ensermu Kelbessa, and Zemed Asfaw (2014), Ethno-botany of Wild and Semi-WildEdiblePlantsof Chelia District, West-Central Ethiopia.*Science, Technology and Arts Research Journal*, 3(4): 122-134

Tardio, J. Pardo-de Santayana, M, and Morales R. (2006), Ethno-botanical review of wild edible Plantsin Spain.*BotanyJournal Linnean Society*,152 (1):27–71.

Termote, C., P. Van Damme, and Djailo, B. D. (2011), eating from the wild: Turumbu, Mbole and Bali traditional knowledge Non-cultivated edible plants, DistrictTshopo, DR.Congo.*GeneticResourcesand Crop Evolution*,58(4**):**585-618.

Tinsae Bahru (2013). Wild Edible Plants: Sustainable Use and Management byIndigenous Communities in and the Buffer Area of Awash National Park Ethiopia.*Ethiopia Journal of Science*, 36(2), 93-108.

Dheeraa' Town, Arsi, Ethiopia: *Ethiopian Journal of Science,* 29(1):71-80.

USAID and CRS, (2000), exploring the potential of indigenous wild food plants for livelihood Security, in southern Sudan Proceedings and an Overview of Workshops Held in Southern Sudan Draft Distribution Paper for the Regional Workshop 'Exploring the Potential of Indigenous Food Plants Held inMombassa, Kenya, 22 - 26.

UNESCO: **(**2003). Convention for the Safeguarding of the Intangible Cultural Heritage.Paris: UNESCO

Zemed Asfaw: and Mesfin Tadesse (2001).Prospects for Sustainable Use and Development of Wild Food Plants in Ethiopia. *Economic Botany*, 55(1):

8. APPENDIXES

Appendixes 1 Semi-structured interview conducted in the study area

PART ONE: PERSONAL INFORMATION

1. Date _____ Month _____Year _____

2. Name of respondent _____

3. Respondent's sex: Male _____ Female _____

4. Age _____ _____ Language_____ Occupation _____

5. Respondent's address: Kebele/Tabiya/_____

6. Respondent's religion: 1.Orthodox, 2.Muslim, 3.other specify

7. Educational status: 1. Uneducated, 2.Educated) if other

8. Respondent's marital status: 1. Single, 2. Married,

9. The role of respondent in the household: 1. Husband, 2.Wife, 3. Son/Daughter, 4. other Specify

10. The role of respondent in the local communities? 1. Religious leader, 2.Kebele Official or Representative 3.Knowledgeable elder, 4.Student

PART TWO: ETHNOBOTANICAL INFORMATION

1. List the most common wild and semi wild edible plants found in the forest and around it?2. Of These wild and semi wild edible plants which are the most popularly used by theLocal communities?

3. What parts of the wild and semi wild edible plants are used as food? Root, Leaf, Bark, Stem, Flower, fruit, seed, whole part

4. Where does the plant grow Forest, homegarden, roadside and farmlandand in what Altitude?

5. What is the mode of consumption (preparation) Fresh, cooked, fresh, dried, cooked.

6. Are there any division of the wild and semi wild edible plants like faminefood, none famine food in your area?

7. If your answer is yes which group are famine foods and which are none famine?

8. Which group of the wild and semi wild edible plants is marketable and is source of income And which are more common in the market?

9. Where often these wild and semi wild edible plants are sold? At village, road side, nearlocal Market, national market

10. Do you have a chance to see people to collect WSWEPs in your area?

11. If your answer is yes which member of the community uses the WSWEPs frequently?

Children, women, men, or all house holde

12. Which age, sex groups, sells and exchanges them mostly?

13. Are the WSWEPs easily accessible? If not why

14 Is there any interference between modernization and traditionally using of wild and semiPlant in the area?

15. Are there community members who frequently depend more on traditional WSWEPs as Compared tocultivated crops?

16. Are there threats to wild and semi wild edible plants? If so what are the major

17. Which wild and semi wild edible plants have otherpurpose other than foodin the area?

18. What traditional management strategies commonly practiced by the local communitiesto Conserve wild and semi wild edible plants in the study area?

19. When is it gathered? Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

20. What are the constrains or influencing factors to use or cultivate like the domesticated

Crops Belif or cultue, less knowledge, less price, undervalue?

Appendixes 2 List of informant participated in the study area

Kushet	Name	sex	Age	marriage	Edu.	Religion	Mentioned plant
Dima	Molla Abirha	M	24	Single	12th	Orthodox	5
	Alnaz Molla	F	46	Married	Illiterate	Orthodox	6
	Desalew Abadi	M	35	Married	12th	Orthodox	6
	Mushira Degu	F	40	Married	Illiterate	Orthodox	6
	Shimuye Derbew	M	48	Married	Illiterate	Orthodox	5
	Abeba Kebede	F	40	Married	Illiterate	Orthodox	4
	Zinabu Molla	M	38	Married	12th	Orthodox	6
	Shiwaga Adihena	F	55	Married	Illiterate	Orthodox	6
	Zenebe Darige	M	44	Married	Illiterate	Orthodox	6
	Tumity Moges	F	25	Single	12th	Orthodox	8
	Kassa Abadi	M	75	Married	Illiterate	Orthodox	4
	Hana Tadele	F	35	Married	12th	Orthodox	3
	Dibolo Berehe	M	73	Married	Illiterate	Orthodox	7
	Bine Sharew	F	28	Single	10th	Orthodox	8
	Akeza Moges	F	23	Single	11th	Orthodox	6
	Abirha Tegegn	M	55	Married	Church	Orthodox	4
	Tadelu Baye(k)	F	46	Married	Illiterate	Orthodox	10
	Adhena Baye	M	36	Married	Church	Orthodox	5
	Adanu Berhe(ke)	F	40	Married	Illiterate	Orthodox	9
	Kahisay Takele	M	67	Married	10th	Orthodox	7
	Molla Derbew(k)	M	50	Married	Illiterate	Orthodox	8
	Beletu Ngus	F	42	Married	Illiterate	Orthodox	9
	Akeza Tebege	F	33	Single	Illiterate	Orthodox	5
	Sium Baraki(ke)	M	73	Married	Religion	Orthodox	8

Kajima	Meles Alem	M	67	Married	Religion	Orthodox	9
	Hilifti Nega	F	57	Married	Illiterate	Orthodox	7
	Gimiga Abebe	F	24	Married	12Th	Orthodox	4
	Tadele Bruku	M	71	Married	Illiterate	Orthodox	6
	Dawet siyum	M	24	Single	12th	Orthodox	6
	Woyinay Hagoes(k)	M	39	Married	Illiterate	Orthodox	8
	Alemu tiku	M	28	Single	12th	Orthodox	7
	Lema Taye	M	61	Married	Church	Orthodox	6
	Alefu misgun	F	57	Married	Illiterate	Orthodox	8
	Konigo Bayu(k)	F	40	Married	Illiterate	Orthodox	9
	Selam Zinabu	F	24	Single	11th	Orthodox	5
Facha	Asadi nigus	F	25	Married	12th	Orthodox	7
	Lema Hages	M	68	Married	Illiterate	Orthodox	4
	G/mikal Abebaw	M	72	Married	Church	Orthodox	6
	Wudeta Hailu (k)	M	35	Married	Illiterate	Orthodox	8
	Amare sium	M	40	Single	10th	Orthodox	7
	Hafitu Akeza(ke)	M	24	Single	10th	Orthodox	9
	Etenesh mesele	F	45	Married	Illiterate	Orthodox	4
	Tiku Abadi	M	28	Single	12th	Orthodox	3
	Zizash Taye	F	67	Married	Illiterate	Orthodox	5
	Alefech yezina	F	34	Married	Illiterate	Orthodox	6
	Beletu Degefew	F	25	Married	Illiterate	Orthodox	7
	Abadit Lilay	F	36	Married	Illiterate	Orthodox	9
	Yezinash Tassew	F	31	Married	Illiterate	Orthodox	5
	Mokuriaw Hafitu	M	30	Single	Church	Orthodox	6
	Yesof Molla	M	33	Married	Illiterate	Orthodox	5
	Girma Hagos	M	47	Married	Illiterate	Orthodox	7

	Setu Molla(k)	M	24	Marriedd	Diploma	Orthodox	8
	Moges Abay	M	71	Married	Illiterate	Orthodox	6
	Hailu Abadi(k)	M	43	Married	12th	Orthodox	9
	Kassu legese	F	52	Married	Illiterate	Orthodox	5
	Debesay Nega	M	35	Married	12th	Orthodox	6
	Desta Beyne	M	68	Married	Illiterate	Orthodox	6
	Zenebech Tsegay	F	23	Single	12th	Orthodox	5
	Reasom Belay	M	25	Single	12th	Orthodox	7
	Liwam Nega	F	40	Married	Illiterate	Orthodox	8
	Halefom Nigatu	M	36	Married	10th	Orthodox	4
	Kidane Abiriha	M	67	Married	Illiterate	Orthodox	9
	Zufu Tebege	F	32	Married	Illiterate	Orthodox	6
	Biri Hagoes	F	23	Single	Illiterate	Orthodox	6
	Hiray Legese	F	76	Married	Illiterate	Orthodox	5
	Reda endalew(k)	M	28	Married	Illiterate	Orthodox	8
	Yezinash Dawit	F	28	Married	10th	Orthodox	6
	Belayinesh Wayu	F	68	Married	Illiterate	Orthodox	5
	Tesfanesh Abeje	F	45	Married	12th	Orthodox	3
	Netsanet Kebede	F	37	Married	Illiterate	Orthodox	5
	Selaminesh Tassew	F	52	Married	Illiterate	Orthodox	7
	Hiwot Aribise(k)	F	25	Married	Illiterate	Orthodox	8

Appendixes 3 List of wild and semi wild edible plants

NO	Species name	Family	Local name	Habit	Habitat
1	*Acaciaabyssinica hochst.*	*Fabaceae*	Chea	Tree	homegarden/Forest
2	*Acokantheraschimperi A*	*Apocynaceae*	Meroz	Shrub	Forest,farmland
3	*Prunus persica L.*	*Rosaceae*	Kuk	Tree	Homegarden
4	*Carissa spinarumL.*	*Apocynaceae*	Agam	Shrub	Forest,roadside,fl
5	*Allophylusmacrobotrys*	*Sapindaceae*	Meara	Tree	Forest,farmland
6	*Cordia africana Lam.*	*Boraginaceae*	Awhi	Tree	Farmland,homegarden
7	*Cyperus bulbosus vahl*	*Cyperaceae*	Kuenti	Herb	Farmland
8	*Euclea racemosa murr*	*Ebenaceae*	Kiloa	Tree	Forest
9	*Ferula communis L.*	*Apiaceae*	Dog	Herb	Forest
10	*Ficus ovaa vah.*	*Moraceae*	Daero	Tree	Home garden
11	*Grewi atrichocarpa*	*Tiliacea*	Roboy	Tree	Forest
12	*Morus alba* L.	*Moraceae*	Injury	Shrub	omegarden,roadside
13	*Oxygonum sinuatum* (Meisn.) dammer	*Polygonaceae*	Chew-amrakut	Shrub	Farmland
14	*Rhus retinorrhoea* oliv	*Anacardiaceae*	Nefasito	Shrub	Forest
15	*Rosa abyssinica*lindley	*Rosaceae*	Kaga	Shrub	Farmland/forest
16	*Argemone mexicana* L.	*Papaveraceae*	Hangoro	Herb	Forest
17	*Urtica simensis* steudel	*Urticaceae*	Amea	Herb	roadside,home garden
18	*Ximenia Americana*	*Olacaceae*	Mulo	Tree	Forest
19	*Thymus serrulatus*	*Lamiaceae*	Tosin	Herb	Forest
20	*Ficus palmata* forssk	*Moraceae*	Beles	Tree	Farmland,roadside
21	*Rhus natalensis* krauss	*Anacardiacea*	Atam	Tree	Forest,farmland
22	*Gomphocarpus fruticosus*	*Asclepiadaceae*	Enchie	Shrub	Forest

23	*Balanites aegyptiaca*	*Balanitaceae*	Bedano	Tree	homegarden,farmland
24	*Opuntia ficus-indica*	*Cactaceae*	Kulikal	Shrub	homegarden,farmland
25	*Dovyalisabyssinica (*A.Rich.)	*Flacourtiaceae*	Mengolhats	Tree	homrgarden Farmland
26	*D.verrucosa (*Hochst.)Warb.	*Flacourtiaceae*	Tuemtenay	Shrub	homegarden,forest
27	*Becium grandiflorum*	*Lamiaceae*	Tebeb	Shrub	Forest,homegarden, road
28	*Ficus sur forssk.*	*Moraceae*	Shanfa	Tree	homgar,Farmland,roadside
29	*Rumex nervosus* Vahl	*Polygonaceae*	Enbacho	Shrub	farmland,homegarden,fores
30	*Ziziphusspina-christi* (L.) Desf.	*Rhamnaceae*	Kunkura	Shrub	home garden,roadside
31	*Cassipourea malosana* (Baker)	*Rhizophoracea*	Keyh-om	Tree	Forest,farmland,
32	*Rubussteudneri*	Rosaceae	Mengolel	Shrub	hog,roadside,forest
33	*Grewiferruginea Hochst.*	*Tiliaceae*	Meleglega	Tree	farmland,homegarden
34	*Griwi mollis Juss.*	*Tiliaceae*	Reway	Tree	Forest,farmland,
35	*Sageretiathea (Osbeck) M.C.*	*Rhamnaceae*	Kichil agam	Shrub	Forest
36	*Ficus sycomorus* L.	*Moraceae*	Oda	Tree	forest,homegarden
37	*Solanum americanum*	*Solanaceae*	Amalo	Herb	farmland,home garden

Appendixes 4 Number of plant species and genera to each family

No	Family	No of spp.	%	Rank	No of Gen.	%	Gathering time
1	*Rosaceae*	3	7.89	2	3	9.68	July-No.
2	*Moraceae*	5	13.15	1	2	6.45	July-April
3	*Tiliaceae*	3	7.89	2	1	3.22	July-August
4	*Apocynaceae*	2	5.26	3	2	6.45	July-Sep
5	*Rhamnaceae*	2	5.26	3	2	6.45	Feb-April
6	*Flacourtiaceae*	2	5.26	3	1	3.22	July-April
7	*Lamiaceae*	2	5.26	3	2	6.45	July-Sep
8	*Solanaceae*	1	2.63	4	1	3.22	July-August
9	*Sapindaceae*	1	2.63	4	1	3.22	Feb-April
10	*Boraginaceae*	1	2.63	4	1	3.22	Feb-April
11	*Cyperaceae*	1	2.63	4	1	3.22	July-August
12	*Olacaceae*	1	2.63	4	1	3.22	July-Sep
13	*Ebenaceae*	1	2.63	4	1	3.22	July-August
14	*Apiaceae*	1	2.63	4	1	3.22	July-August
15	*Polygonaceae*	2	5.26	3	2	6.45	July-Sep
16	*Anacardiaceae*	2	5.26	3	2	6.45	July-Sep
17	*Papaveraceae*	1	2.63	4	1	3.22	July-August
18	*Urticaceae*	1	2.63	4	1	3.22	October-Jan.
19	*Balanitaceae*	1	2.63	4	1	3.22	Feb-April
20	*Rhizophoracea*	1	2.63	4	1	3.22	Feb-April
21	*Fabaceae*	1	5.26	3	1	3.22	Any time
22	*Cactaceae*	1	2.63	4	1	3.22	July-Sep
23	*Asclepiadaceae*	1	2.63	4	1	3.22	July-Sep
Total		37	100%		31	100%	

Appendixes 5 plant speciesand parts used

No	Scientific name	Parts used	Preparatio	Other uses
1	*Balanites aegyptiaca (L.) Del.*	Fruit	Raw	At,swc,fw,forage
2	*Carissa spinarum* L.	Fruit	Raw	Swc,fw,fence
3	*Zizphus spina-christi* (L.) Desf.	Fruit	Raw	Swc,fw ,At, forage,
4	*F. sur* Forssk	Fruit	Raw	Swc ,fw ,At, forage
5	*Opuntia ficus-indica* (L.) Miller	Fruit	Raw	Swc,forag,shade,fence
6	*Ficus ovata* Vahl.	Fruit	Raw	Swc ,fw ,At, forage
7	*Morus alba* L.	Fruit	Raw	Fence, forage
8	*Cordia africana* Lam	Fruit	Raw	Fence, Swc, fw
9	*G. mollis* Juss	Fruit	Raw	At, Swc, fw
10	*Rubus steudneri* Schweinf	Fruit	Raw	Swc, forage
11	*Euclea racemosa* Murr.	Fruit	Raw	Swc, At,fw
12	*Ximenia americana* L	Fruit	Raw	Fd,swc,forage
13	*Sageretia thea* (Osbeck) M.C.	Fruit	Raw	Fd,swc,fence,forage
14	*Ficus sycomorus* L.	Fruit	Raw	Swc,forage,Fd,shade
15	*Urtica simensis* Steudel	Leaf	cooked	Fd,Swc,fence,shade
16	*Acokanthera schimperi*	Fruit	Raw	Fd,swc,fence,shade
17	*Grewiaferruginea*Hochst.exA.Rich	Fruit	Raw	Fd,swc,fence,shade
18	*Cassipoureamalosana* Baker)	Fruit	Raw	Fd,swc,fence,shade
19	*Rumex nervosus* Vahl	Stem	Raw	Fd,swc,fence,shade
20	*Beciumgrandiflorum(Lam.)*	Flower	Raw	Fd,swc, shade, fence
21	*D. verrucosa (Hochst.) Warb*	Fruit	Raw	Fd,swc, shade
22	*Dovyalis abyssinica (*A.Rich.)	Fruit	Raw	Fd,swc, shade, fence
23	*Gomphocarpus fruticosus* (L.)	Fruit	raw	Fd,swc, shade
24	*R. natalensis* Krauss	Fruit	raw	Fd,swc,shade,forage
25	*Thymus serrulatus* Hochst. ex Benth	Whole part	Fresh,driedand cooked	Fd ,fod,shade, forage

26	*Rosa abyssinica* Lindley	Fruit	raw	Fd,fod,shad, forage
27	*Rhus retinorrhoea* Oliv.	Fruit	raw	Fd,swc,fence,shade
28	*Oxygonum sinuatum* (Meisn.)	Leaves	raw	Fd,swc,,shade,fodder
29	*Grewiatrichocarpa Hochst.exA.Rich*	Fruit	raw	Fd,swc
30	*Ferula communis* L.	Leaves	cooked	Fd,swc,,shade,fodder
31	*Cyperus bulbosus* Vahl	Bulb	raw	Fd,swc,shade,fodder
32	*Allophylus macrobotrys* Gilg	Fruit	raw	Fd,swc, shade
33	*Argemone mexicana* L.	Seed	raw	Fd,swc,,shade,fodder
34	*Acacia abyssinica Hochst*.	Gum	raw	Fd,swc,,shade,fodder
35	*Prunus persica* (L.) Batsch	Fruit	raw	Fd,swc,,shade,fodder
36	*Ficus palmata* Forssk	Fruit	Raw	Shade, swc, fodder
37	*Solanum americanum Miller*	Fruit	Herb	Fd,swc,,shade,fodder

Key: FD –food, Swc-soil and water conservation, Fw-fuelwood, At-agricultural tool.

Appendixes 6 Common WSWEPs of the study area





A **B** **C** **D** **E**




F **G** **H** **I**

J

A. Ziziphus spina-christi.

B. Opuntia ficus-indica

C.Balanites aegyptiaca

D. Ficus sycomorus L

E. R. natalensis krauss.

F. Sageretia thea

*G. D.verrucosa (*Hochst.) Warb.

H. *Rumex nervosus* Vahl

I. *Carissa spinarum* L.

J. *Morus albaL.*

Approval sheet II

I certify that all the correction and recommendation suggested by the Examining committee are incorporated into the final thesis entitled:**Ethnobotanical Study of Wild and Semi- Wild Edible Plants in and Around Tselim-dur Forest of Raya Alamata Woreda, Tigray National Regional State of Ethiopia**and recommend that the thesis be accepted as partial fulfillment of requirement for the degrre of master of Science in Biology by: **Asmamaw Adhena Arefe**

Name of principal Advisor	Signature	Date
Name of Co-Advisor	Signature	Date