ADDIS ABABA UNIVERSITY
SCHOOL OF POST GRADUATE STUDIES
COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE
DEPARTMENT OF ZOOLOGICAL SCIENCES

"WILD EDIBLE PLANT SPECIES DIVERSITY AND UTILIZATION IN SOKORU DISTRICT, JIMMA ZONE, OROMIA REGIONAL STATE, ETHIOPIA."

A THESIS SUBMITTED TO THE SCHOOL OF POST GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS OF SCIENCE IN BIOLOGY.

BY
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As thesis research advisors, we hereby confirm that we have read and reviewed the thesis titled "Wild edible plant species diversity and utilization in Sokoru district, Jimma Zone, Oromia regional state, Ethiopia" submitted under our supervision by BONSA FIKADU. We recommend that it be submitted to complete the thesis requirement.

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As member of the Board of Examiners of the M.Sc. Thesis open Defense examination, we certify that we have read and evaluated the Thesis prepared BONSA FIKADU the candidate. We recommend that the thesis be accepted as fulfilling the thesis requirements for the degree of Master of Science in field of Biological Sciences.

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The final copy of the Thesis must be submitted to the Council of Graduate Studies (CGS) through the candidate's department or school graduate committee (DGC or SGC) after it is approved and accepted.

DEDICATION

This thesis work is dedicated to my family for encouraging and supporting me in every aspect.

STATEMENT OF THE AUTHOR

I certify that the attached M.Sc. thesis is entirely my own. Throughout my study, data collection, analysis, and thesis compilation, I followed all ethical and technical scholarly standards. All scholarly materials used in the thesis have been appropriately cited.

This thesis was submitted in partial fulfillment of the requirements for Addis Abeba University's Master of Science in Biological Science degree. The thesis is stored in the Addis Abeba University Library and is available to borrowers in accordance with the Library's policies. I now declare that this thesis has not been submitted to any other institution for the award of any academic degree, diploma, or certificate.

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ACRONYMS AND ABBREVIATION

SWOA ..... Sokoru Woreda Office of Agriculture

F.....Fruit

FAO..... Food and Agricultural Organization

Fd.....Firewood

FL ..... Farm land

GPS.....Global Positioning System

H..... Herbs

HG ..... Home garden

NF.....Natural Forests

Sd.....Seed

Sh.....Shrubs

T ..... Tree

WEPS ..... Wild edible plant

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ABSTRACT

The protection of wild edible plant species in the Jimma zone of the Oromia Regional State, Ethiopia, has received little attention, despite the fact that wild edible plants are crucial during times of food crisis. Before it is lost forever, gathering and recording ethnobotanical knowledge is an essential and pressing undertaking. Sokoru District communities use wild food plants and this project aims to explore and document their uses. Before choosing a particular study area, the Office of Agriculture, elders, and kebele administrative personnel were consulted during a preliminary survey that was conducted to gain an overview of the socioeconomic and cultural elements of the communities in the Sokoru districts that were under study. To calculate the sample size, systematic and purposeful random samplings were employed.

The diversity of wild edible plant species found in the Sokoru district was discovered and recorded for the study through semi-structured interviews, group discussions, observation, and key informant-guided field observation. A total of 14 WEPs were reported in the study region; of these, 10 families were gathered and documented. Moraceae, Myrtaceae, Flacourtiacea, and Rosaceae (two species) are the plant families that include the greatest number of wild edible plants; the remaining plant families only contribute one species each. Of the 14 wild edible plant species that have been identified for the study, 10 (71.43%) have been shown to have multipurpose roles, while 4 (28.57%) have a role limited to food in the area.

Out of the ten (71.43%) multipurpose wild edible plant species, two (14.29%) were utilized for food and firewood, two (14.29%) for food and construction, three (21.42%) for food and charcoal, two (14.29%) for food and medicinal, and one (7.14%) for revenue value generator. In Sokoru district, ten key informants were randomly selected from 14 informants to rank the six most threatening factors of wild edible plant species. The results showed that overgrazing, wild fires, and construction and building ranked fourth, fifth, and sixth on the list of threatening factors of WEPs in the study area, while agricultural expansion, charcoal making, and firewood collection ranked first, second, and third, respectively.

Keywords: Agricultural expansion, Food shortage, Key informants, multipurpose roles, Socio-economic, threatening factors.

CHAPTER ONE

1. INTRODUCTION

1.1. Background

Human communities historically relied on a far greater variety of species to meet their demands for food, fiber, health security, and other necessities (Shand, 1997). Accordingly, wild food plants have been a part of human diets since the beginning of time (Agca *et al*., 2011). But as a result of domesticating particular species, human society underwent changes in lifestyle that led to their ignorance and forced them to cultivate the chosen species. Because of this, the current demands of humankind for staple meals are met by a very small number of crops (Schunko and Vogl, 2010). While over 7000 species have been found to be utilized for food and are either fully or partially domesticated, only about 30 crop species produce about 95% of the world's food energy (FAO, 1995).

In order to provide many basic human requirements, biodiversity is extremely important. The gathering of wild plants served as humans' initial non-hunting food source; yet, this natural supply persisted even after agriculture and animal husbandry were introduced. Traditional knowledge of wild food plants has been passed down orally through generations by ethnic peoples, who have preserved it in their memories. People have collected plant resources for a variety of everyday needs since the beginning of time. Products made from wild plants provide a significant portion of the income and means of subsistence for hundreds of millions of people, primarily in developing nations. Wild edible plants (WEP) offer non-indigenous people supplemental food, act as a substitute for traditional foods for indigenous people, and provide a different way to make money. Indigenous people depend on WEP as vital vitamin and nutrition supplements. WEP are crucial vitamin and nutrient supplements for indigenous people as a result. Because of this, wild food supplies act as a buffer against food shortages and lessen the likelihood of food insecurity for nearby

people. WEP offer a genetic resource pool for hybridization and selection, and they also hold great promise for the domestication and subsequent production of novel crops. Certain populations or regions are familiar with a great deal of valuable wild food plants, whereas others are not. The assessment and recording of traditional knowledge regarding the variety, application, and condition of wild edible plants (WEP) are essential, especially in light of the rapidly diminishing traditional knowledge of WEP and the growing dependency on manufactured foods. Tradition-based knowledge about WEP documented in Ethiopia is very limited compared to medicinal plants (CBD, 2009).

Worldwide, a variety of wild edible plant species' parts—including their fruits, leaves, stems, roots, tubers, flowers, and others—are consumed. Wild edible plants (WEP) give impoverished communities an additional source of revenue in addition to serving as a supplement to non-indigenous people's diets and providing staple food for indigenous people (Ju *et al*., 2013). Wild food plants not only ensure the security of food and health, but they also improve the ecosystem by producing leaf litter, preventing erosion, preserving surface moisture, and enhancing the physical characteristics of the soil (Akinnifesi *et al*., 2007).

About 10% of the 6000 species of higher plants that make up Ethiopia's flora are endemic (Gebre Egzabeher T., 1991). For a large number of food plants and their wild cousins, the nation is recognized as a hotspot for biodiversity and as a place of origin and diversification (Awas T., 1997). The majority of the nation's rural residents rely on the nation's woodlands, bush areas, and thickets for their livelihoods as supplies of agricultural land, fuel wood, and non-timber forest products including wild food plants (Getahun A., 1994). Compared to comparatively food- sufficient areas, the use of wild plants appears to be more widespread in the nation's food-insecure areas (Abbink, 1993).Therefore, a large number of Ethiopian rural residents typically eat wild food plants for survival during food shortage (Mengistu F. and Hager, 2008).

Ethiopia has little research on the sustainable use of wild food plants since cultivated plants are given more attention than wild food plants (Debela *et al.*, 2011). Like most of the nation, there are few studies on wild food plants and limited focus on research and development projects in the region. Ethnobotanical data are essential for conservation and community development initiatives, claims Martin (1995). Our understanding of plant use can be expanded through ethnobotanical data (Tadesse M. and Demissew S., 1992; Kelbessa E. *et al.*, 1992).

The protection of wild edible plant species has received little attention, despite the fact that they are crucial during times of food scarcity. The majority of land use planning and implementation, economic development, and biodiversity conservation initiatives still overlook wild edible plant (WEP) species (Ayele D., 2017).This suggests that the indigenous population in the area does not have a thorough understanding of the value of protecting biodiversity and the advantages of ecosystem services (FAO, 2005).

According to Ruffo *et al.* (2002), there appears to be a greater prevalence of wild plant intake in places experiencing food insecurity, with a diverse array of species being consumed. The idea that certain plants are "famine-foods," meaning they are only eaten during periods of food crisis and may thus be used to predict the occurrence of famine. Native Americans are aware of the value and role that wild plants have in their daily diets. They are also aware of potential health risks, such as stomach irritation that can occasionally result from consuming particular wild plants (FAO, 1989). However, research is still lacking, especially when it comes to the variety, regeneration status, and conservation methods of wild-food plants. This is in contrast to the extensive traditional knowledge of using wild plants for medicinal purposes, which has been well documented (Misgana *et al*.,1994).

Similar to this, non-cultivated plants in various locations within the Jimma zone of the Oromia regional State, Ethiopia, contribute significantly to income generation and supply a sizable amount

of supplemental food. However, there is a lack of documented data regarding wild edible plants (WEPs) and no biodiversity conservation or management practices are implemented in the region. There is a serious risk to the area's wild vegetation resources, especially its food plants. Currently, as a result of various human activities, the majority of the area's natural vegetation's and significant wild food plants are declining and losing their physical and species composition. Gathering and preserving ethnobotanical information before it disappears completely is an essential and pressing responsibility. Consequently, the goal of this research was to identify and catalog wild food plants that were studied.

1.2. Objectives of the Study

1.2.1. General objective

The general objective of this study was to explore and document Utilization and Diversity of wild edible plants used by local people in Jimma zone.

1.2.2. Specific objectives

♠ To identify and document utilization and diversity of wild edible plants consumed by the people in the study area;

♠ To identify and record parts of wild edible plants which are edible to humans;

♠ To assess threats (factors) that affects wild edible plant species in the study area;

♠ To determine the constraints associated with conservation of wild food plants in the study area.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. What are Wild Plants?

According to Getahun A. (1974), the term "wild" refers to plants or plant species that grow spontaneously in self-sustaining populations in natural or semi-natural habitats and can live without direct human intervention. The phrase is distinguished from "cultivated" or "domesticated" plants or plant species that have evolved by human intervention, such as selection or breeding, and rely on management for survival. Wild plants can be moved from forests or other ecosystems to trails or near human habitations, as well as into fields, where they are widely available and easily collected (Ruffo *et al*., 2002). According to FAO (1990), the minimal form of domestication appears to be quite frequent and is practiced by many people around the world. The utilization of wild foods as part of a local response to rising food insecurity is well documented, and this resulted in famine foods such as wild vegetables, berries, nuts, fruits, and insects. Mzava (1993) suggests that during times of limited food stress, children and those in lower socioeconomic status may consume these items more frequently. However, in times of high food insecurity, such foods may be widely consumed.

2.2. Nutritional Value of Wild Food Plants

Wild foods constitute a regular element of rural people's diets, not just during times of food scarcity (Campbell, 1996). The majority of dietary studies emphasize the importance of consuming calories from staple foods. However, the quantity of wild foods consumed, frequency of intake, and nutrient

Content have all been investigated (Fleuret, 1979). According to the FAO (1990), a variety of studies give evidence for the everyday use of wild food products as side dishes or snack foods, as well as alternatives for staples. The chemical composition of several wild food sources has also been studied to demonstrate their nutritional value. Nutritional research of wild plant foods from all around Africa has revealed that they are quite healthy and not inferior to domesticated varieties. Wild grains, seeds and kernels provide significant amounts of calories, protein and oil (Ruffo el al., 2002).

Potassium levels are high in all Leary vegetables and fruits. Wild foods can also improve palatability; for example, using leaves with a mucilaginous sap that gives the food a slimy texture is a well-known method of aiding swallowing of accompanying foods (Knavish 1993). According to UNICEF (1990), the benefits of wild foods in terms of texture and flavor are especially important for youngsters, who are frequently unable to ingest the quantities of bulky staple foods required to achieve their nutritional requirements.

2.3. Plant and people interactions

Traditional people around the world possess unique knowledge of plant resources on which depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995).This implies that humans are dependent on other organisms for their life. Although various animal and mineral products contribute to human welfare, the plant kingdom is the most essential to human well-being especially in supplying his basic needs. The indispensable dependency of humans up on plants for their livelihoods was primarily started by domestication and dates back to 10,000 years (Martin, 1995). Over centuries, indigenous people have developed their own locality specific knowledge on plant use, management and conservation (Cotton, 1995). Plants have been used as a

source of food in Ethiopia from time immemorial to combat food insecurity and human sufferings the shortage of food (Asfaw Z. *et al*., 1999).

Ethiopians have used traditional medicines and wild food plants for many centuries, the use of which has become an integral part of the different cultures in modern Ethiopia (Tamene S., 2011). The indigenous peoples of different localities in the country have developed their own specific knowledge of plant resource uses, management and conservation (Pankhurst, 1965). As a result, the study of indigenous knowledge about natural resources is becoming increasingly important in defining strategies and actions for conservation (Khanal, 2006). In most scenarios, the traditional knowledge in Ethiopia is passed verbally from generation to generation and valuable information can be lost. As a result, Proper identification and documentation of wild food plant resources associated with indigenous knowledge must be an urgent task.

2.4. Indigenous people and indigenous knowledge on useful plants

Indigenous people refer to who follow traditional, non- industrial lifestyle in areas that they have occupied for generations (Balick and Cox, 1996). Indigenous knowledge refers to the accumulation of knowledge, rules, standards, skills, and mental sets, which are possessed by local people in a particular area (Quanash, 1998). It is the result of many generations‟ long years‟ experiences, careful observations and trial and error experiments (Martin, 1995). Ethno botany is mainly focused on indigenous. Ethno botany is mainly focused on indigenous peoples since the relationships between plants and people are clearer in indigenous societies (Balick and Cox, 1996). Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility (Martin, 1995; Cotton, 1996; Khanal, 2006). Systematic application of this indigenous knowledge is important for sustainable use of resources and sustainable development (Thomas, 1995). Biodiversity and traditional knowledge of its various

properties and uses have long provided and continue to provide vital resources for medicine discovery and health care (SCBD, 2010). In addition, indigenous knowledge can provide problem solving strategies for local communities, especially the traditional societies. For example, previous studies on medicinal plants (Balemie K. *et al*., 2003; Giday M. and Ameni G., 2003; Tekle haymanot T. and Giday M., 2007;Yinger H. *et al*., 2008) have shown that the traditional societies in Ethiopia have good plant use and management knowledge, which will have valuable contribution to conservation activities in the country. This knowledge is still underutilized resource in the development process of Ethiopia. But, Indigenous knowledge of medicinal plants in Ethiopia is unevenly distributed among community members (Asfaw Z., 2001). Therefore, special effort is needed to understand and disseminate this knowledge through ethno botanical studies.

2.5. Diversity and Conservation of Wild Food Plants

For many plant species, habitat loss is the most serious hazard to their survival (UNEP 1995). While the rate of extinction due by human activity is unknown, it is well understood that species loss and genetic diversity degradation occur most frequently in the tropics (Myers, 1988; Whitmore and Saver, 1993). This is due to significant deforestation rates in many tropical countries (FAO, 1993). Some efforts have been made to retain areas of natural vegetation and provide varying levels of protection. This remains a vital and urgent undertaking, but it is apparent that severe disruption and devastation will not end soon (Whitmore and Saver, 1993). Myers (1988) and UNEP (1991) proposed that it is important to analyze not only diversity in pristine environments but also the impact of alternative uses and management practices on biodiversity to conserve as much as possible where disturbances and deforestation cannot be prevented and to improve the conservation value of areas already degraded.

In Tanzania, as a consequence of increasing deforestation, exploitation, changes in land use systems, the wild food plants are declining and many of these food plants are in the danger of extinction (Mwihomeke *et al*. (2000). A solution for this has been suggested by Ruffo *et al*. (2002), that there is a need for these food plants to be domesticated, starting with those that have high nutritive value and are easy to propagate. The conservation of natural resources in Tanzania is now carried out by numerous sectors including wildlife, forestry and national environmental facility and the government supports all these. Yet, there has been reluctance in conserving wild food plants compared to other economically important resources such as timber.

2.6. Diversity of wild edible plants in Ethiopia

In Ethiopia, the number of wild food plant species is enormous. Several studies recorded the occurrence of wild food plants at different spots of the country. This information is found in botanical monographs, glossaries, and informal notes as well as in the rich oral tradition of the different communities (Asfaw Z. and Tadesse M, 2001). However, documentations of wild food plant species most often appear collected with other edible life forms under the general residence of wild food plants. So far, only two more or less comprehensive documentations of wild food plants are available for country reference. One is that of Bekele A. *et al*. (1993) who documented 199 useful tree and shrub species out of which 123 species regarded usable for food and medicines. Another important nationwide documentation of wild food plants comes from the work of Asfaw Z. and Tadesse M. (2001). They later documented 203 wild food plant species consumed nationwide, of which wild fruit constituting 61.6%. Besides, from about 370 indigenous food plant species reported drawing from various studies by Teketel D. and Eshetie A., (2004), 182 species belonging to 40 families are indicated to be edible fruit or seed bearing plants.

2.7. Wild Plants Resources

According to Getahun A. (1994), the term “wild” when applied to plants or plant species it refers to those that grow spontaneously in self-maintaining populations in natural or semi natural ecosystems and can exist independently of direct human action. The term is contrasted with “cultivated” or “domesticated” plants or plant species that have arisen through human action, such as selection or breeding, and that depend on management on their continued existence.

Wild plants may be transferred from forest or other ecosystems to trailside or near human habitations as well as in to fields so that they are readily available and easily collected (Ruffo et al., 2002). According to FAO (2005), the minimal form of domestication seems quite common and is practiced by many people in the world. The use of wild foods as the component of local response to increasing food insecurity is widely documented and this give rise to famine foods such as wild vegetables, berries, nuts, fruits, insects, etc. In periods of limited food stress, such foods may be eaten occasionally and more often by children and poorer sectors of society (Mzava, 1993). However, in periods of heightened food insecurity such foods may be widely consumed. In reality, there is continuum resulting from development of co-evolutionary relationships between human and their environment (Bell, 1995).

Over time, people have indirectly shaped many plants. Some have been domesticated in home gardens and in the fields together with farmers cultivated food and cash crops. Thus the term „wild food is used to describe all plant resources that are harvested or collected for human consumption in forests, savannah and other bush land areas (Chamber, 1990). Wild-foods are incorporated into the normal livelihood strategies of many rural people, pastoralists, shifting cultivators and hunter-

gatherers (Olani G., 2001). They are usually considered as a dietary supplement to farmer's daily food consumption, generally based on their crop harvest, domestic livestock products and food purchases on local markets (FAO, 1995 and FAO, 1999; Bell, 1995). For instance, fruits and berries, from a wide range of wild growing plants are typically referred to as wild food (Guinand and Lemessa D., 2000).

2.8. Wild food plants

Wild edible plants are with one or more parts that can be used for food if gathered at the appropriate stage of growth, and properly prepared. Edible wild plants could be weeds growing in urban areas to native plants growing in deep wilderness (Hinnawi, 2010). Plants have been the source of food materials from the dawn of human civilization (Arnold, 1995 cited in Khanal, 2006). For instance, about 300 million people obtain part or their entire livelihood and food from wild, forests in the world (DMP, 1982). Over 70% of the wild edible plants are consumed when food scarcity is high and at times of starvation (Cunnigam, 2001; Teklehaymanot T. and Giday M., 2010). On the other hand Addis G. *et al.* (2005) stated that wild plants in Ethiopia are used as source of food both at times of plenty and of food shortage. Despite agricultural the fact that societies primarily rely on crop plants, the tradition of eating wild plants has not completely disappeared, their nutritional role and health benefits being reported in many surveys worldwide (Pardo-de-Santayana *et al*., 2007).

Thus, wild edible plants still play an important role in human nutrition especially in the time of starvation (Khanal, 2006).

Globally, an estimated 1.02 billion people are undernourished (FAO, 2009) Wild food plants are of high nutritional content such as protein, vitamin B2, and vitamin C, which used as alternatives to conventional vegetables in the human diet (Mengistu F. and Herbert, 2008). According to many

sources, the amount of vitamins, minerals and other nutrients in wild food is on the average greater in wild foods (Hinnawi, 2010). Research supports that some of these foods, as part of an overall healthful diet, have the potential to delay the onset of many age-related diseases (Arnold, 1995 cited in Khanal, 2006).

2.9. Wild Edible Plants and Their Role in Combating Food Insecurity

According to FAO (2010), more than 35% of Ethiopian people are food insecure. The country's ever increasing population along with recurrent drought, war and poor agricultural practices with low productivity, have pulled the country into a vicious circle of food insecurity. In addition, over dependence on a limited number of food sources and poor efforts to diversify dietary sources aggravate the country's food insecurity problem. Many WEPs in Ethiopia were reported as emergency, supplementary or seasonal food sources to avert food insecurity in households of Ethiopian cultural groups. However, consumption of wild edibles is more common in food insecure areas than in other areas in the country (Tekle haymanot and Giday, 2010). Despite the wide availability and utilization of WEPs in Ethiopia, ethno botanical information on cultural, socioeconomic and nutritional values of Ethiopian plants is limited. Hence, there is still a need for documentation, nutritional analysis and domestication of WEPs to assist in the nationwide effort to combat food insecurity and ensure dietetic diversity.

2.9.1. Typical famine-food plants

Famine food consist of a variety of plants of which leafy and tender parts of stalk, pseudo stem, fruits and roots are mainly used for human consumption (Guinand and Ugas, 1999). Many of the root type of famine food plants are drought tolerant and can stay in the soil intact for a long time. Most of the leafy type famine food plants are locally classified as „weeds" sprouting and flourishing

after rains (Webb and Braun, 1994). There are two main periods of maximum consumption of famine food plants. The first period is while farmers are waiting for the upcoming crop harvest and, the second main period is when they run out of food stocks from the previous harvest and are hence facing a food shortage.

Many famine food plants are consumed during times of food scarcity in southern Ethiopia's Konso special regions. These include Dobera glabra, Sterculia africana, Amorphophallus gallaensis, Arisaema specie (bagana in Konso), and Carallumasprengeri (Webb and Branu, 1994). Arisaema species are corm plants that are traditionally classified into three primary kinds based on how they are prepared for consumption: normal bagana, litota, and romitta, all of which grow in farmland. Compared to bagana and romitta, the littota type is recommended because of its somewhat acceptable taste.

Teketay D. and Eshete A. (2004) and Balemie K. and Kebebew F. (2006) both state that Ethiopia has a large number of famine wild food plants. Some of them include Amorphophallus gallaensis, Arisaema species, Dobera glabra, Portulaca quadrifida, Carallumasprengeri, Opuntia ficusindica, Guizotia scabra, Sporobolus indicus ("muryi/harataa" in Oromiffaa), and Bidens pachyloma ("chuqii" in Oromiffaa).

2.10. The status of wild Food plants in Ethiopia

According to Lawton (1982), the vast woodlands of Ethiopia are mostly regenerating, after long time degradation that was reported in these areas in the 1980s. The main cause of degradation was the increasing demand of the local communities for agricultural land, fuel, for wood production. Presently, the increased interest in wild food plants has been prompted by the rediscovery of the role of edible wild food-plants to small-scale livelihoods and has resulted in a rapid rise in interest among

conservations, foresters, protected area managers, social development advisers and indigenous rights groups (Campbell *et al*., 1993). Campbell *et al.,* (1993) further reported that this has generated a proliferation of studies in to the potentials of wild food plants for income generation and as a means of involving local people in forest management and benefit sharing to ensure sustainable utilization of these resources. Previous study by Ruffo *et al* (2002) revealed that despite the fact that many wild food plants are used by the majority of rural population, they are still not as much appreciated or valued as some of the introduced food plants such as mango, orange or cabbage.

This is to say, these wild food plants are still regarded as inferior and only appropriate for the poor. Studies by FAO (1990) and Knavish (1993) have revealed that there has been a widespread decline in knowledge about wild food plants, especially among young and those who live in urban areas.

2.11. Need for Assessing Wild food plants

According to FAO (2001), biological resource quantification or inventory aims at understanding, which resource is more useful commercially and what consequences of exploitation are on the resources base itself. This can provide information for sensible and appropriate management of biological resources. For biologically sustainable harvest levels of a product to be determined, there must be a minimum set of good information available on the resource species in terms of abundance, distribution and reproductive biology. Experience has shown that the assessment of different biological resources was done by using inventory and participatory resource assessment techniques to determine species composition, structure and diversities. However, the formal resource assessment of forest products, especially food plants in developing countries is relatively new and has received little attention to date. Due to inadequate data for each of the above methods and variations in utilities of wild food plants in forest ecosystem, Wong *et al.,* (2001) asserted that field

of plant products, utilization potential and conservation strategies for specific forest ecosystems are essential and can significantly improve our understanding about the missing information and statistical data on wild food plants. Furthermore, existing information on wild food plants availability, utilization pattern and conservation aspects are often based on case studies, often unclear, inconsistent and contradictory. In many cases methodologies to collect and analyze viable key information do not exist.

2.12. Threats of wild Edible plants in Ethiopia

Ethiopian wild edible plant species as elsewhere in Africa is faced with problems of continuity and sustainability (Wondimu T.*et al*., 2006). There are two main sources of threats to wild edible plants i.e. manmade and natural causes. The rapid increase in population, urbanization, timber production, overgrazing, destructive harvesting, invasive species, commercialization, honey cut, agricultural land expansion and habitat destruction are human caused threats to wild food plants. Likewise, natural threats including recurrent drought, bush fire, disease and pest outbreaks cause the extinction of wild edible plant species (Balemie K. and Kebebew F., 2006).

According to Birhanu T. and Molla E. (2017) in Benishangul Gumuz currently some of the remnant forests with large numbers of the wild edible plants are subjected to frequent deforestation by the local community. This is attributed mainly to human population pressure and its associated effects. Agricultural land expansions, wild fire, fuel wood collection, overgrazing, and overharvesting are the main reasons for the destruction of wild edible plants.

2.12.1. Loss of wild food resources

Threats of wild plants are mostly caused by human beings (Rodgers and Homewood, 1982). Results from this array of human threats, rates of extinction are now estimated to be between 1,000 and 10,000 times greater than in the past (Pearce and Moran , 1994). Recent global and national

information sources show significant and still increasing loss of biological resources in most tropical regions including Ethiopia. The factors leading to the loss of the biological resources including wild food plants are described below:-

2.12.1.1. Habitat loss, fragmentation and degradation

Wild plants, by definition, grow in natural or semi- natural ecosystems in different biomes around the world (Ruffo *et al*., 2002). At present all these have been greatly affected and modified by human activities such as the conversion for other uses (agriculture, pasture, urbanization, industrial, etc.) and these lead to removal of large proportions of natural ecosystems and replace them with a greatly modified matrix, with in which small remnants of the native ecosystem remain (FAO, 2001). According to Getahun A. (1974), one of the consequences of habitat loss, fragmentation or degradation is the loss of large number of wild species that are threatened, including many that are used by farm households.

2.12.1.2. Overexploitation and over harvesting

The increase in the number of urban dwellers who still rely on traditional plant-based remedies has added to the pressure on wild resources and has led several species to face to a serious risk of population loss and genetic erosion through unsustainable harvesting practices such as decortications (Rodgers and Homewood, 1982; Pearce and Moran, 1994). However, overharvesting is encouraged by market requirements. There is a widely held perception that plants collected from the wild are more effective than cultivated ones (Ruffo *et al*., 2002) and this idea is even used as a marketing strategy . It may however, have the effect of allowing producers to charge higher prices. Sustained harvesting of plant species for which there is a commercial demand may lead to genetic erosion (UNEP, 1991). People use many wild plant species for medicine, clothing, shelter, firewood, fiber,

timber production and fulfilling of cultural and spiritual needs throughout the world (Asfaw Z., 1997). The primary causes of this problem are loss of taxa with the associated indigenous knowledge.

2.13. Conservation practices of wild Edible plants

The concept of Sustainability is now seen as the guiding principle for economic and social development, particularly with reference to biological resource. (Amenu E., 2007.The objective of conservation is to conserve maximum diversity within each species to ensure that its genetic potential will be available in the feature ideally all plants should be conserved as evolving population in their natural ecosystem. However, this is not practically feasible for all species. Plants genetic resource can be conserved in-situ or ex-situ the two systems are complementary and are being adapted in to the conservational strategy in Ethiopia (Demessie A., 2001).

In broader sense conservation is achieved through in-situ and ex-situ means. In-situ conservation is conservation of species in their natural habitat (Asfaw Z., 2001). Ethiopia has polices and strategies that support the development and utilization of plant resources in a sustainable manner. These policies are reflected under various sectors including environmental protection, development of the natural resources and diversification of the domestic and export commodities. (Bekele E., 2007).

The reviewed research outputs on WEPs of the country indicate the need for conservation as well as documentation (Balemie and Kibebew, 2006; Addis, 2009; Asfaw, 2009; Tekle haymanot and Giday, 2010; Fantahun and Hager, 2010). Conserving Ethiopian WEPs in situ (in their natural habitat as in nature reserves and parks) or ex situ (e.g. in field gene banks, botanic gardens or cold rooms) is mandatory (Tekle haymanot and Giday, 2010).Work with communities to evolve improved methods of managing trees and other plants have many potential benefits for conservation

and sustainable development (Hamilton *et al.*, 2003).

In Benishangul Gumuz Regional State of Kamashi Zone understanding of the local people about the importance of conserving the wild edible plants, only some in situ (in original/natural habitat) conservation methods like planting in the form of fences and protected pasture land in different worship areas (churches, mosques) and in their farm field/farm margins are being practiced in the study area. This indicates that the necessary conservation measures are not being taken in the area, and hence the wild edible plants are not free from threats (Birhanu T. and Molla E., 2017).

CHAPTER THREE

3. MATERIALS AND METHODS

3.1. DESCRIPTION OF THE STUDY AREA

The Sokoru district in Jimma Zone in the Oromia regional state served as the study's location. One of the Woreda in Ethiopia's Oromia region is Sokoru. This Woreda shares most of the same land as the current Woreda, including its administrative capital, Sokoru, and is named for the former awraja of the same name. The Sokoru district was located in the Jimma Zone of Oromia Regional State, roughly 156 km southwest of Addis Ababa and 100 km east of Jimma town. Tiro afeta Woreda borders Sokoru Woreda on the west; Omo Nada Woreda borders it on the south; the Southern Nations, Nationalities and People region borders it on the north and east; the Gibe River delineates its northerly boundary.

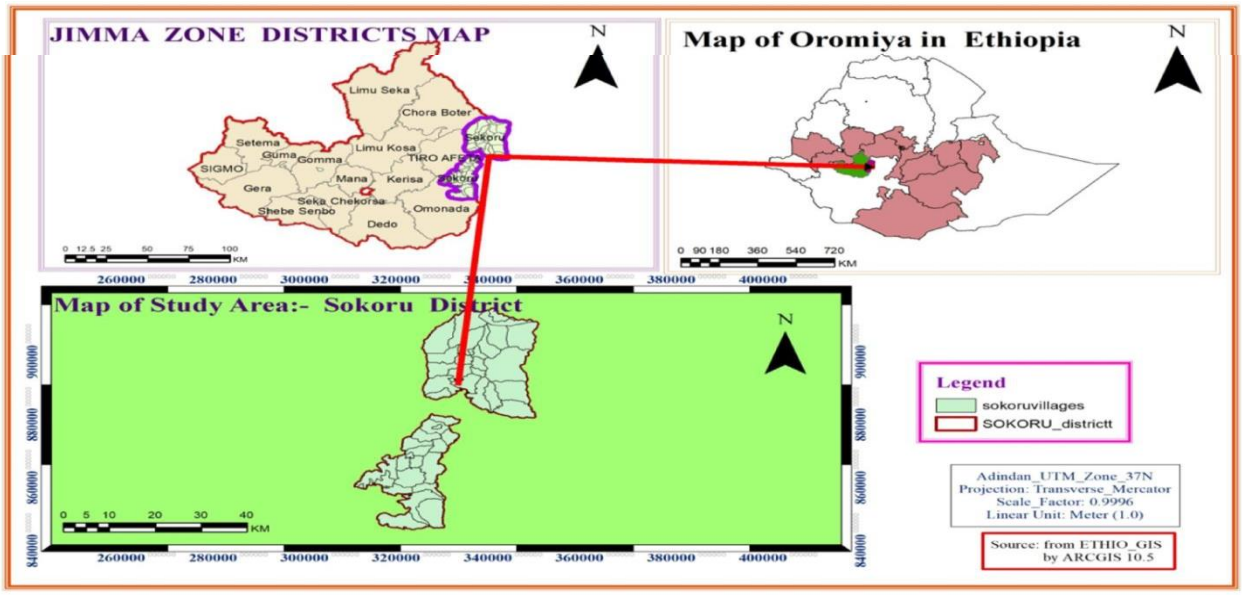

Figure 1. Location map of the study area (Source: from ETHIO-GIS)

3.1.1. Study population and socio-cultural

The Central Statistical Agency (2005) reported that there were 157,552 people living in this Woreda, with 79,305 men and 78,247 women. Of these, 19,676 people, or 12.49% of the total population, reside in urban areas. Sokoru's estimated population density is 170.6 persons per square kilometer, with an estimated size of 923.44 square kilometers. The Oromo (77.73%), Yem (8.19%), Kebena (3.69%), Hadiya (3.4%), Amhara (2.7%), and Gurage (1.72%) were the six major ethnic groups recorded in Sokoru; the remaining ethnic groups were 2.57% of the total population.

83.74 percent of people spoke Afan Oromo as their first language, 4.62% talked Amharic, 3.8% spoke Kebena, 3.43 percent spoke Yemsa, 3.1% spoke Hadiya, and the rest 1.31 percent spoke all other primary languages.

The majority of the people identified as Muslims, with 91.63% of them saying they adhered to this religion; 6.99% stated they followed Ethiopian orthodox Christianity, and 1.19% identified as Protestants (PHCE Vol.1, 2007).

3.1.2. Climate

Based on data from the Central Statistical Agency of Ethiopia (CSAE, 2010), this district is located between 900 and 2,300 mm above sea level. The region experiences two distinct temperature ranges: 25.30°C to 12.10°C (average 20.30°C) and 1458 mm of yearly precipitation. The district was situated between latitudes 7° 55' and 7°.92' N and longitudes 37° 25' and 37°.42' E. The district's agro-ecology was composed of Woina-Dega 60%, Dega 20%, and Kola 20%.

3.1.3. Topography and Soil

The altitude of this Woreda extends from 1160 to 2940 meters above sea level, with the highest points being Ali Shashema, Ali Derar, and Kumbi. Perennial rivers include the Gilgel Gibe, a tributary of the Gibe and the Kawar, while seasonal streams include the Melka Laku. A survey of the land in this Woreda reveals that 36.6% is cultivable, 16.8% pasture, 17.2% forest, and the remainder 29.4% is built up or degraded (Government of Oromia Region; Last accessed 1 August 2006).

3.1.4. Economic Activities

Agriculture is the primary economic sector of the Sokoru administrative district. Crop farming and animal husbandry were the primary sources of revenue in traditional times. Maize, sorghum, teff, seasam (salit), nug (niger seed), and cash crops such as mango, orange, papaya, avocado, apple, and coffee were among the most common crops farmed in the area. Cows, sheep, goats, horses, donkeys, chickens, and so on are examples of livestock. Green peppers, potatoes, tomatoes, Godere, and sweet potatoes are among the vegetables planted in various kebeles (Source SWAO, 2018).

3.2. The research design and population

To complete the investigation, a cross-sectional study design would be used, with essential data collected from Sokoru district residents in 2023. Sokoru District is home to 210 of the 1205 households that comprise the population. The study population consisted of a sample of all households living in specific kebeles who contributed information or data to this study.

A preliminary survey was conducted to gain an understanding of the culture and socioeconomic features of the people in the study area of Sokoru districts. The Office of Agriculture, elders, and kebele administrative workers were also consulted throughout the survey before selecting a specific study area. Informants for this study included male and female ≥18 age groups from families in

purposively and randomly selected kebeles based on their altitudinal difference. The study identified and documented the richness and consumption of wild edible plant species in Jimma Zone, Sokoru district, through semi-structured interviews, group discussions, observation, and guided field observations by key informants.

3.3. Research Methodology

3.3.1. Study Site Selection

From January 2023 to January 2024, the study was done in Sokoru district, Jimma zone, Oromia Regional States, Southwest Ethiopia. A preliminary survey was conducted to obtain an overview of the culture and socioeconomic features of the communities in the research area. During the survey, the Sokoru Woreda Office of Agriculture (SWOA), elders, and kebele administrative personnel were all consulted before selecting a specific research region. Sokoru Districts were chosen at random from 18 districts, and four kebele were chosen based on agro-ecological factors and the high use of wild edible plants in the study area.

3.3.2. Sample size determination and selection of informants

3.3.2.1. Sample size determination

The sample size for collecting quantitative data for this research, to ensure the required representative sample size of households from the four kebeles was determined using Cochran‟s (1977) formula as indicated by Bartlett and Higgins (2001).

$n=N/1+N(e^2)$, Where as:- **n**= sample size for the research;

N = total number of households in all certain kebeles;

e = maximum variability or margin of error 5% (.05);

1 = the probability of the event occurring

Sokoru district administrations reported a total of 325 families in Sokoru kebele, 280 in Kelta kebele, 290 in Gengalata kebele, and 310 in Daka kebele. As a result, the sample size was established based on a total of 1205 households.

The required sample size was 210 responses. The sample size for each kebele was estimated as the ratio of the number of households in each kebele to the total number of households in the kebele. As a result, the sample size for Sokoru kebeles entire household is 57 (325 x 210/1205 = 57). The same formula was used for the remaining research kebeles. The same calculation was used for the study kebeles, and three to four key informants (a total of 14) were purposefully selected from each kebele based on their knowledge and recommendations from locals, while the remaining general informants (respondents) (196 in total) were selected at random.

According to the above methodology, about 210 respondents were selected from 1205 total households in the study area, with 140 male and 70 female respondents coming from four kebeles in Sokoru District, Jimma Zone, Oromia Regional State, and South West Ethiopia. The researcher would employ simple random sampling methods.

Table 1: Number of General and Key informants four Kebeles of Sokoru districts.

Kebeles	Number of key informants in each kebeles			Number of house hold Respondents			Total respondents		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Yero Sokoru	3	1	4	33	20	53	36	21	57
Kelta	2	1	3	30	16	46	32	17	49
Daka	2	2	4	34	16	50	36	18	54
Gengalata	2	1	3	34	13	47	36	14	50
Total	**9**	**5**	**14**	**131**	**65**	**196**	**140**	**70**	**210**

3.3.2.2. Informant selection

a. Key Informant and Focus Group selection

Key informants were carefully selected from the study site based on their knowledge of WEPS, the socioeconomic and cultural backgrounds of individuals who have lived in the villages for an extended period of time, and recommendations from local kebele administrators, knowledgeable elders, and kebele agricultural and development officials. Martin (1995) stated that when documenting indigenous knowledge possessed by knowledgeable traditional elders or specific social groupings, the selection of key informants is critical. Furthermore, age categorization was carried out in accordance with Chandra *et al*.'s (2010) work, which divided them into age groups. When interviewing people about a specific topic, samples should be drawn from several social groups (Höft *et al*., 1999). Three or four key informants from each kebele, for a total of 14, were selected for focus group discussions across all four kebeles. Focus group discussions were conducted with members of both sexes aged 18 and above.

b. General Informant selection

The general informants were selected using a systematic random selection procedure. The village registrations were used to pick a random number of villagers or houses for interviews. The names of household heads were to be sampled from the register using a systematic random sampling technique because they were listed at random, and this form of sampling minimizes selection bias.

3.4. Plant specimens collection and identification

Based on ethno botanical information provided by informants, specimens gathered during a guided field walk were counted, numbered, and given vernacular names on separate sheets. The majority of

species identification was conducted at the National Herbarium of Addis Abeba University in Ethiopia, using taxonomic keys from published volumes of Ethiopian flora with the assistance of taxonomists.

3.5. Data collection

Ethnobotanical data was collected over two field trips from Februarys to May 2023. The data was gathered through prepared semi-structured interviews, observation, focus group discussions, and guided field walks with key informants to get ethnobotanical wild food plant information and indigenous knowledge of the local communities. All interview and focus group questions cover data sets such as local names, plant portions used, plant species types, consumption techniques, and management/conservation practices in the area. Native translators assisted with all interviews and group discussion questions for informants in the Afan Oromo language. The location and time of the discussion were determined by the informants' interests.

3.5.1. Questionnaire

A questionnaire would be produced and given to office workers and other kebele employees in order to gather information regarding the diversity and use of wild edible plant species. The questionnaires featured both open and closed questions. All questionnaires were circulated, gathered, and analyzed, and the results were given in the form of tables and paragraphs.

3.5.2. Semi-structured interviews

A semi-structured interview would be used to collect information from farmers. Semi-structured interviews were conducted in locations where the informants were most comfortable and at times

that they preferred. Group interviews were conducted to collect data or information on the local name of the wild edible plant, portions used methods of preparation, dangers and management, and other pertinent information. Interviews and discusses were based on a checklist of topics or questions prepared before of time in English and translated to the Afan Oromo language by a native translator, and the researcher gathered information from the villagers using technical means.

3.5.3. Guided field walk and direct observation

During the trip, key informants were interviewed after participating in guided field walks. Based on informants' ethnobotanical information, voucher specimens were collected at the festal (bag), numbered, labeled using local names, and identified in the field. The data would be gathered by direct observation, questionnaires, and interviews. Data observation would be employed as an additional tool when the farmers were in use. During field observations and investigations, available information on WEPs was documented in the prepared questions (checklists). The information gathered would be quantified and organized for analysis.

3.6. Data Analysis

The data gathered using various ethnobotanical approaches were entered and analyzed using descriptive statistics (mean and percentage) and regression analysis on the Statistical Package for the Social Sciences (SPSS) software. It was utilized to estimate the frequencies of WEPs use, proportion of growth types, portions used, and to see the relationship between Wild Edible Plants citation and demographic variables. All information from observations, interviews, and questionnaires would be examined. The relevant points of the questionnaire would be sequenced based on the study's purpose, and the analysis would be translated into percentage tables and graphs. The interview points will also be sequenced and analyzed. The results will be examined and presented.

3.6.1. Descriptive statistics

The ethno botanical data of the reported wild edible plants and their related indigenous knowledge were analyzed using descriptive statistics such as percentages, tables, and charts, as well as Microsoft Excel spreadsheets. The studied data were aggregated and displayed in tables, percentages and graphs.

3.6.2. Direct matrix ranking

Following (Martin, 1995 and Cotton, 1996), direct matrix ranking was used to examine a given species' multipurpose use and its relationship to the extent of its utilization vs its dominance. Priority ranking was used to identify risks to wild edible plants based on their level of destructiveness. To identify threats to wild edible plant species, ratings ranging from 1 to 5 were assigned: 1 is the least detrimental threat, and 5 is the most destructive. Based on information received from informants, six multipurpose plant species were selected out of the total wild edible plants. To undertake this activity, ten(10) key informants were selected from other key informants based on their activities during the interview. Each key informant was requested to assign usage values. (5= best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used).

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Taxonomic Diversity of Wild Edible Plant Species

Table 2: Shows lists of the reported wild edible plants in the study area, organized by local name, family name, scientific name, habits, habitat, parts used, and manner of consumption and preparation**.**

No	Local name	Family	Scientific name	Parts used	Ha bit	Habitat	Mode of consumption
1	Agamsa (Oro)	Apocynceae	*Carissa spinarum* L	F	Sh	NF&F	The fruit is eaten raw
2	Wadessa (Oro)	Boraginaceae	*Cordia africana* Lam	F	T	NF,H&F	The fruit is eaten raw
3	Haregresa (Amh)	Cucurbitace ae	*Zehnaria scabra* (Lf) sond	L	H	NF,H & F	Leaves eaten after cooked with salt
4	Koshim(Amh)	Flacourtiaceae	*Dovyasis abyissinica* (A.Rich) warb	F	T	NF	The fruit is eaten raw
5	Harbu (Oro)	Moraceae	*Ficus sur* Forisk (Eng)	F	T	NF	The fruit is eaten raw
6	Injori (Amh)	Moraceae	*Morus mesozygia* Stapf	F	Sh	H	The fruit is eaten raw
7	Badessa (Oro)	Myrtaceae	*Syzygium guinaense* (wild) *oc subsp. Guiaense*	F	T	NF &F	The fruit is eaten raw
8	Zayituna(Oro)	Myrtaceae	*Psidium guajava* L	F	Sh	NF,H &F	The fruit is eaten raw
9	Gora (Oro)	Rosaceae	*Rubus volkensi* Engl	F	C	NF	The fruit is eaten raw
10	Hudha (Oro)	Olacaceae	*X.americana* S	F	Sh	NF	The fruit is eaten raw
11	Akukku(Oro)	Flacourtiaceae	*Flacourtia indica* (Bimf) *meri*	F	T	NF	The fruit is eaten raw
12	Mexxi(Oro)	Arecaceae	*Phoenix reclinata* Jacq	F	T	NF,H & F	The fruit is eaten raw
13	Kasmira(Amh a)	Rutaceae	*Casimiro aedulis*(La.) *Liave and lex.*	F	Sh	NF&F	ıe fruit is eaten raw
14	Kookii (Oro)	Rosaceae	*Prunus persica* (L) *Batsch*	F	T	NF	The fruit is eaten raw

Key Abbreviation:-Sh=Shrub, F=Fruit, T=Tree, C=Climber, NF= Natural forest, F=Farmland, H=Habit, HG=Home garden, L=Leaves, St=Stem

In the study area, 14 WEPs were documented, with 10 families being gathered and recorded (Table 2). Moraceae, Myrtaceae, Flacourtiacea, and Rosaceae (two species) were the plant families with the most wild edible plants, with the others contributing only one wild species.

4.2. Wild Food Plants and Their Multi-purpose Values in the Study Area

Table 3: List of Wild Food Plants and Their Multi-purpose Values in the Study Area

No	Local name	Scientific name	Multi-purpose Values in the Study Area					
			Only food	Food andfire	Food and construction	Food and charcoal	Food and medicine	Source of income
1	Agamsa (Oro)	*Carissa spinarum* L		■				
2	Wadessa (Oro)	*Cordia africana* Lam			■			
3	Haregresa(Amh)	*Zehnaria scabra* (Lf) *sond*				■		
4	Koshim (Amha)	*Dovyasis abyissinica* (A.Rich) warb		■				
5	Harbu (Oro)	*Ficus sur* Forisk (Eng)				■		
6	Injori (Amh)	*Morus mesozygia* Stapf	■					
7	Badessa (Oro)	*Syzygium guinaense (*wild) *oc subsp.guiaense*				■		
8	Zayituna(Oro)	*Psidium guajava* L	■					
9	Gora (Oro)	*Rubus volkensi* Engl					■	
10	Hudha (Oro)	*X.americana* S					■	
11	Akukku(Oro)	*Flacourtia indica (*Bimf) *meri*			■			
12	Mexxi(Oro)	*Phoenix reclinata* jacq	■					
13	Kasmira(Amha)	*Casimiroa edulis(*La.*) Liave and lex.*						■
14	Kookii (Oro)	*Prunus persica (*L*) Batsch*	■					
		Total	**4**	**2**	**2**	**3**	**2**	**1**
		Percentage	**28.57**	**14.29**	**14.29**	**21.42**	**14.29**	**7.14**
		Rank	**1st**	**3rd**	**3rd**	**2nd**	**3rd**	**6th**

To determine the proportion of response (each multi-purpose plant) given by key informants, multiply the total number of responses by 100 and divide by the number of key informants (14 key informants).

According to the 14 key informants, only 4 plants were used mainly for food in the research area.

So, Percentage of response was= $\frac{\text{Total number of species x100\%}}{\text{Number of key informants}} = \frac{4 \text{ x100\%}}{14} = \frac{400}{14} = \mathbf{28.57\%}$

Among the 14 wild edible plant species identified in the study area, 10 (71.43%) were reported to have multipurpose roles, while 4 (28.57%) have only a food role (Table 3). From ten (71.43%) multipurpose wild edible plant species, two (14.29%) were utilized for food and firewood, two (14.29%) for food and construction, three (21.42%) for food and charcoal, two (14.29%) for food and medicinal, and one (7.14%) for source of economic value (Table 3).

Table 4: Multi-purpose Values in the Study Area

	Multi-purpose Values of WEPs	Respondents (R1-R10)											
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Rank
1	Only food	4	5	3	4	2	4	3	4	5	4	38	1st
2	Food and fire	3	2	4	3	4	2	2	3	4	4	31	2nd
3	Food and construction	3	4	2	4	5	4	2	2	1	3	30	3rd
4	Food and charcoal	4	2	3	3	4	3	2	1	3	4	29	4th
5	Food and Medicine	2	2	3	4	2	1	2	4	3	2	25	5th
6	Source of income	2	1	2	3	2	3	1	2	4	1	21	6th

Use values given from 0 to: 5 = Excellent, 4 = Very good, 3 = Good, 2 = Less, 1 = least and 0= No use

The information obtained from key informants in this study suggested that Wild Edible plant species were used for a variety of purposes in the study area. Direct matrix ranking of wild edible plant species aided in determining the importance of multipurpose use of wild edible plant species in the area. As a result, only food, food and firewood, food and construction, food and charcoal, food and medicine, and source of income were regarded as the most versatile uses.

The results of the preference ranking of six multipurpose use of WEPs in Sokoru district from four kebeles (Y/Sokoru, Daka, Kelta, and Gengelata) by 10 key informants randomly selected from 14 informants showed that only food, food and firewood, food and construction, food and charcoal, food and medicine, and source of income were the first, second, third, fourth, fifth, and sixth multipurpose use of Wild Edible plant species in the study area, respectively (Table 4).

4.3. Direct Matrix ranking

Direct matrix ranking was used to determine the relative value of each plant species. *Syzypium guinaense* (Wild) (Badessa (Oro)), *Psidium guajava* L (Zayituna (Oro)), and *Cardia africana* Lam (Wadessa (Oro)) ranked first, second, and third in a direct matrix ranking of six most popular multipurpose wild food plant species in Sokoru district (selected four kebele) as perceived by ten key informants chosen at random from 14 key respondents. In contrast, *Phoenix reclinate* jacq (Mexxi (Oro)) and *Carissa spinarum* (Agamsa (Oro)) were the listed ranked (Table 5).

Table 5: Result of direct matrix ranking on six Multi-purpose WEPs based on 10 key informants in Sokoru district**.**

No	Local name	Scientific name	Multi-purpose Values in the Study Area							
			Only food	Food and fire	Food and construction	Food and charcoal	Food and medicine	Source of income	Total	Rank
1	Agamsa (Oro)	*Carissa spinarum* L	4	1	1	4	4	1	15	5th
2	Wadessa (Oro)	*Cordia africana* Lam	1	2	5	4	5	1	18	3rd
3	Injori (Amh)	*Morus mesozygia* Stapf	5	4	1	2	1	4	17	4th
4	Badessa (Oro)	*Syzygium guinaense (*wild)	5	4	5	4	5	4	27	1st
5	Zayituna(Oro)	*Psidium guajava* L	5	3	2	3	3	5	21	2nd
6	Mexxi(Oro)	*Phoenix reclinata* Jacq	4	3	1	1	2	3	14	6th

Use the following values from 0 to 5: 5 = Excellent, 4 = Very Good, 3 = Good, 2 = Less, 1 = Least, and 0 = No Use.

People in the study area depend greatly on the forest for a variety of functions, including medical, building, charcoal manufacturing, fencing, shade, and firewood. Thus, identifying such multi-purpose plant species in the research area is critical for conservation and management purposes. This is because the most valuable should be prioritized for conservation and management before extinction takes them away (Cunningham, 2001). This signifies that these multi-purpose plant species have been employed to meet the local community's basic needs in all of their key daily living activities.

4.4. Parts of Wild edible plants used in the study area.

According to table 2, the most commonly used plant parts among the 14 WEP species recorded in the study region were fruits, which accounted for 13 (92.86%), and leaves, which accounted for 1 (7.14%). The study's findings suggested that fruits were the most commonly used plant parts, consumed fresh and without cooking (Table 2). This finding is consistent with Ayele D. (2017)'s study on wild edible plants in Benishangul Gumuz, Kamashi district, Ethiopia, which showed that the fruit and leaves of wild edible plant species were highly consumed by the study area's indigenous peoples.

4.5. Mode of Utilization WEPS in the study area

The majority of wild edible plant species were discovered to be consumed fresh and raw 13 (92.86%), although others were eaten cooked 1 (7.14%) (Table 2). Fruits were the most commonly used edible plant parts in the study area that were not cooked. This could be due to their wonderful taste, which is easily available and eaten from the wild without any preparation. This is consistent with Tamene B., (2000) and Wondimu T.*et al.,* (2006).

4.6. **Role of WEP Species in house hold food security**.

Wild edible plants can be classified into three categories based on their eating patterns. These include those consumed during periods of sufficient food production to supplement staple food, to fill the gap of seasonal food shortage, and during famine.

4.6.1. Supplementary role of wild edible plant species in the study area

Table 6: Ranking of wild edible plants that have a supplementary function in family food security.

Scientific Name	Local Name	Number of respondents					
		Y/Sokoru (n=57)	Kelta (n=49)	Daka (n=54)	Gengelata (n=50)	Total	Rank
Syzygium guinaense (Wild)	Badessa(Oro)	10	13	5	-	28	5th
Psidium guajava L	Zayituna (Oro)	7	11	14	13	45	1st
Cordia africana Lam	Wadessa (Oro)	9	12	13	10	44	2nd
Ficus sur Forisk (Eng)	Harbu (Oro)	12	6	9	15	42	3rd
Carissa spinarum L	Agamsa (Oro)	6	7	6	2	21	6th
Morus mesozygia Stapf	Injori (Amh)	13	-	7	10	30	4th
	Total	57	49	54	50	210	

This study reported that 6 (42.85%) among the 14 identified WEPs were used to supplement the traditional food supply (Table 6). WEPs *Psidium guajava* (Zayituna (Oro)), *Cordia africana* Lam (Wadessa (Oro)), and *Ficus sur* Forisk (Harbu (Oro)) were ranked first, second, and third, respectively. According to informants, these edible plants were chosen because they tasted good. This is consistent with previous research, which showed that farmers use wild food in addition to their regular diets (UP, 2000; Guinand & Dechassa, Lemessa, 2000).

4.6.2. Seasonal role of wild edible plant species in the study area

Table 7:- Rank of wild edible plants was having seasonal role in house hold food security.

Scientific Name	Local Name	Number of respondents					
		Y/Sokoru (n=57)	Kelta (n=49)	Daka (n=54)	Gengelata (n=50)	Total	Rank
Dovyalis abyissinica (A.Rich) *Warb*	Koshim (Oro)	22	18	20	16	76	1st
Rubus volkensi Engl	Gora (Oro)	15	12	18	7	52	2nd
Phoenix reclinate jacq	Mexxi (Oro)	12	7	11	20	50	3rd
X.americana S	Hudha (Oro)	8	12	5	7	32	4th
	Total	57	49	54	50	210	

Many people in the study area used wild edible plants to supplement their diets. Out of 14 wild edible plants, 4 (28.57%) were employed to supplement the seasonal food shortfall (Table 7). Wild edible plants *Dovyalis abyissinica* (Koshima (Oro)), *Rubus volkensi* Engl (Gora (Oro)), and *Phoenix reclinatae* jacq (Mexxi (Oro)) were placed first, second, and third, respectively, based on seasonal functions. Various sections of Ethiopia used them to fill seasonal food deficits (Guiand & Lemessa, 2000; Getachew, 2005; Hunde *et al.*, 2001).

4.6.3. Emergency role of wild edible plants in the study area

Table 8: Rank of wild edible plants used at emergency time.

Scientific Name	Local Name	Number of respondents					
		Y/Sokoru (n=57)	Kelta (n=49)	Daka (n=54)	Gengelata (n=50)	Total	Rank
Zehnaria scabra Lf	Haregresa (Amh)	18	14	12	18	62	3rd
Flacourtiaindica(Bimf)	Akukku (Oro)	16	18	20	16	70	2nd
Prunus persica (L) Batsch	Kokii (Oro)	23	17	22	16	78	1st
Total		57	49	54	50	210	

From the identified wild edible plant species in the study area, three (21.42%) are consumed during famine (Table 8). *Prunus persica* (L) Batsch (Kokii (Oro)), *Flacourtiaindica* (Bimf) (Akukku (Oro)), and *Zehnaria scabra* (L) (Haregiresa (Amh)) were ranked first, second, and third accordingly.

Famine foods are utilized only when there are no alternatives and a chronic food shortage exists (Getahun A., 1974; Guinand & Lemessa D., 2000; Balemie K. & Kebebew F., 2006).

4.7. Management and Conservation of Wild Edible Plants

Table 9:-.Traditional Management and conservation Practice of wild food plants in Sokoru district

No	Traditional management and Conservation	Number of respondents in district						
		Kelta (n=49)	Daka (n=54)	Y/Sokoru (n=57)	Gengelata (n=50)	Total	Ave	Rank
1	Conservation of WEPs Planting in the form of fence	6	7	9	3	25	11.90	3rd
2	Conserve WEPs from church and Mosque	5	8	6	7	26	12.38	2nd
3	Conserve WEPs by practicing from farm land	3	5	4	6	18	8.57	4th
4	No traditional practice to conserve WEPs	35	34	38	34	141	67.14	1st

The research study showed that 67% of respondents reported no efforts to conserve wild food plants. Whereas (33%) of them stated that there are general conservation methods for natural resources, which include wild edible plants, natural habitat conservation methods such as planting in the form of fences 25 (11.90%), protected WEPs churches and mosques 26 (12.38%), and in their farm fields are being practiced in the study area 18(8.57%) (Table 9).

This shows that the necessary conservation measures are not being implemented in this area, and hence the wild edible plants are not free from threats. Some wild edible plant species are multipurpose plant species that are widely utilized by local communities but are facing major risks in the study area. According to the study, local populations prioritize the immediate usage of wild food plants over their long-term sustainability, resulting in a damaging harvesting technique. Certain plants, however, have been safeguarded for spiritual and cultural reasons. As a result, these locations are ideal for conservation because cutting and harvesting are prohibited in these zones. This was demonstrated to be a good strategy for the protection of wild edible plants through cultivation (Mosissa D., 2017)

4.8. Factors Threatening WEPs in the study area.

Table 10:-Direct Matrix ranking of ten respondents on six factors perceived as threats to wild food plants.

No	Factors threatening WEPs	Respondents (R1-R10)											
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Rank
1	Fire wood	3	4	2	4	5	4	2	2	1	3	30	3rd
2	Charcoal making	3	2	4	3	4	2	2	3	4	4	31	2nd
3	Construction and Building	2	1	2	3	2	3	1	2	4	1	21	6th
4	Wild fire	2	2	3	4	2	1	2	4	3	2	25	5th
5	Agriculture expansion	4	5	3	4	2	4	3	4	5	4	38	1st
6	Over grazing	4	2	3	3	4	3	2	1	3	4	29	4th

(Values: 1 = least harmful, 5 = most destructive)

According to the information gathered from key informants in this study, threats to wild food plants are increase from time to time in the study area. Direct matrix ranking of WEPs helped in identifying the most serious WEP threats in the area. Accordingly, agricultural expansion, construction and building, firewood gathering, and charcoal production were identified as the most threatening factors.

The result of the preference ranking of six most threatening factors of wild edible plant species in Sokoru district from four kebele (Y/Sokoru, Kelta, Daka, and Gengalata) by 10 key informants randomly selected from 14 informants showed that, Agricultural expansion, Charcoal Making, and Fire wood collection were the first, second, and third most threatening factors, respectively, whereas overgrazing, wild fire, and construction and building were the fourth, fifth, and sixth the list threatening factors of WEPs in the study area.

Ethnobotanical research conducted in Ethiopia (Balemie K. and Kebebew F., 2006; Hunde D. *et al*., 2011; Addis G. *et al.*, 2013; Regasa T. *et al*., 2014) and elsewhere. Shitayeh A.*et al.* (2008) showed a similar pattern of danger factors to WEPs and associated traditional knowledge.

CHAPTER FIVE

5. DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1. DISCUSSION

Wild edible plants have one or more portions that can be used for food if harvested at the appropriate stage of growth and managed appropriately. Edible wild plants can range from weeds growing in urban areas to native plants growing in deep wilderness. Although wild edible plants serve a crucial role during times of food scarcity, little attention has been given to their protection. Non-cultivated plants provide significant amounts of supplementary food and contribute significantly to generating additional income in Jimma zone, Oromia Regional State, Ethiopia; however, there is no documented information on wild edible plants (WEPs), and biodiversity conservation and management practices are not practiced in the area. Wild vegetation resources, particularly wild food plants, are highly at risks area. As a result of various human activities, the physical and species composition of much of the area's natural vegetation and vital wild food plants are decreasing. The collection and documentation of ethnobotanical knowledge before it is lost forever is an essential and urgent undertaking. As a result, the purpose of this study was to investigate and document wild edible plants used by the Sokoru District communities.

Preliminary survey was conducted to gain an overview of the culture and socioeconomic elements of the communities in the study area of Sokoru districts. The Office of Agriculture, elders, and kebele administrative workers were also consulted during the survey before selecting a specific study area. Sample size was determined using both purposeful and systematic random sampling. The study identified and documented the diversity and utilization of wild edible plant species in the Sokoru

district through semi-structured interviews, group discussions, observation, and guided field observation by key informants.

In the research area, 14 WEPs were documented, with ten families collected and recorded (Table 2). Moraceae, Myrtaceae, Flacourtiacea, and Rosaceae (two species) were the plant families with the most wild edible plants, while the rest of the plant families contributed only one species.

Among the 14 wild edible plant species identified in the study area, 10 (71.43%) were reported to have multipurpose roles, while 4 (28.57%) were found to have only a food role (Table 3). From ten (71.43%) multipurpose wild edible plant species, two (14.29%) were used for food and firewood, two (14.29%) for food and construction, three (21.42%) for food and charcoal, two (14.29%) for food and medicine, and one (7.14%) for income value.

According to the information gathered from key informants in this study, wild edible plant species are used for a variety of purposes in the study area. Direct matrix ranking of wild edible plant species helped in determining the role of multipurpose use in the area. As a result, only food, food and firewood, food and construction, food and charcoal, food and medicine, and source of income were considered the most varied uses.

The result of the preference ranking of six multipurpose use of WEPs in Sokoru district from four kebeles (Y/Sokoru, Daka, Kelta, and Gengalata) by 10 key informants randomly selected from 14 informants suggested that only food, food and firewood, food and construction, food and charcoal, food and medicine, and source of income were the first, second, third, fourth, fifth, and sixth respectively the multipurpose use of Wild Edible plant species in the study area.

According to table 2, the most commonly utilized plant parts among the 14 WEP species recorded in the study area were fruits, which accounted for 13 (92.86%), followed by leaves, which accounted for one (7.14%). The results of the study suggested that fruits were the most often utilized plant parts and were consumed fresh, without cooking.

The majority of wild edible plant species were discovered to be eaten fresh and raw 13 (92.86%), while others were eaten cooked 1 (7.14%). According to this study, 6 of the 14 detected WEPs (42.85%) were utilized to supplement the regular food supply. Many people in the study area used wild edible plants to fill nutritional gaps. Four (28.57%) of the 14 wild edible plants were employed to fill a seasonal food shortfall. During hunger, three (21.42%) of the known wild edible plant species in the study area were consumed.

The study's findings indicated that 67% of respondents said they made little or no effort to conserve wild food plants. Whereas (33%) of them stated that there are general conservation methods for natural resources, which include wild edible plants, natural habitat conservation methods such as planting in the form of fences 25 (11.90%), protected WEPs churches and mosques 26 (12.38%), and in their farm fields are being practiced in the study area 18(8.57%).

In this study, the information gathered from the key informants was indicated that the threats of wild food plants increase from time to time in study area. Direct matrix ranking of WEPs helped to identify the most threatening factors of WEPs in the area. Accordingly, agricultural expansion, construction and building, fire wood collection and charcoal making were to be the most threatening factors.

The result of the preference ranking of six most threatening factors of wild edible plant species in Sokoru district from four kebeles (Y/Sokoru, Kelta, Daka and Gengalata) by 10 key informants

randomly selected from 14 informants showed that, Agricultural expansion, Charcoal Making, and Fire wood collection were 1st , 2nd and 3rd respectively the most threatening factors whereas over grazing, wild fire and construction and building were 4th, 5th and 6th respectively the list threatening factors of WEPs in the study area.

5.2. CONCLUSION

Recognizing the vast amount of indigenous knowledge on the management and use of local plant resources, we should learn from the principles that underpin the success or failure of these local knowledge systems on which the people have relied for generations. As a result, this study supports for actions to respect, conserve, and maintain local people's knowledge, inventions, and practices for the sustainable use of plant resources.

The study identified 14 wild edible plant species (WEPs), demonstrating that a large diversity of WEPs exists in specific areas. The current study identified various issues preventing the conservation and promotion of wild food plants, such as a lack of community organizations responsible for resource conservation and management, which proved the domestication practice ineffective. The current study concluded that WEPs are utilized as a supplement to regular food supply, to cover the gap of seasonal food shortages, and during famines.

The preference ranking of the six most threatening factors for wild edible plant species in Y/Sokoru, Kelta, Daka, and Gengalata districts suggested that agriculture expansion, charcoal production, construction and building, firewood, and overgrazing are the most threatening factors for WEP species in the study area.

5.3. RECOMMENDATIONS

To promote the diversity and exploitation of wild edible plant species, the Woreda's society and worker office should consider the following.

- Respecting and preserving indigenous knowledge and traditions serves as essential for managing and using biodiversity sustainably.
- Office workers should educate their communities about the variety and use of wild edible plant species in their own kebeles.
- Office workers should seek guidance in the Sokoru district group on how to properly use wild edible plant species.
- Diversification of species promotes a diverse nutrition and income sources, reducing crop failure and ensuring year-round production on small plots of land.
- Practicing agroforestry practices that prioritize edible tree fruits and shrub species in home gardens and agriculture fields is a successful conservation strategy.
- Documenting ethnobotanical information on WEPs and promoting in situ and ex situ conservation measures are essential for sustainable agricultural and economic growth in the community.
- The continuous conservation of multipurpose species on cultivated areas, as well as the diversity of species in home gardens, should be supported.
- Government, stakeholders, and commercial actors should work together to implement eco-friendly technology to replace firewood consumption.
- Further research is needed on the nutritional and ethno-medicinal benefits of WEPs.

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7. APPENDICES

7.1. APPENDIX-I

I. Semi-structured interview schedule employed by informants in Sokoru Woreda (Checklist of questioners/issues prepared for data collections in the study Area)

a. General Information on respondents:

1. Date_____Keble_____sex_____Age _____
2. Occupation_____marital status_____Education level_____

b. Ethno botanical Data collection concerning wild edible plants

1. Mention the common widely used wild edible plants kebele?

   _____

   _____

2. What is local name of each wild food plant species?

   _____

3. Where do these plants grow in the area? / From where do you get these plants?

   _____

4. When do you get (collect) these wild edible plants for utilization?

   _____

5. Which plant species are used as wild foods throughout the year?

   _____

6. What is a habit of the plant? A/Tree (T), B/Shrubs(S). C/Herbs (H), D/Climber(C).
7. What parts of the plant do you used? A/Leaves, B/Fruits, C/Roots, D/stem, E/Tuber, F/seed,G/flower?
8. How do you consume each parts of the food plants? A/Raw, B/after cooked, C/after boiled?
9. What function (benefits) do you obtain after the consumption of wild edible plants?

   _____

   _____

10. Are there any division of wild food plants like famine foods, non-famine foods etc. in your areas?
11. Which types of wild edible plant do you frequently and commonly used?

    _____

12. Which plant species are the most preferred in their uses wild food and why?

_____

13. For what other purposes do you use the wild food plants?

_____

14. Are there community members who frequently depend more on wild edible plants as compared cultivated foods? Why?

_____

15. Are there treats to wild food plants? If so what are the major problems associated with them in the area?

_____

16. Are there mostly threatened (endangered) wild plant species in your area? Why?

_____

17. How do the local people manage and conserve these wild food plant species through their traditional indigenous knowledge? If so mention the management practices by the indigenous people.

_____

18. Any additional information?

_____

7.2. APPENDIX-II

II. Check lists for key informants and focus group discussion

1. Do you know this plant local name? A/Yes B/No

2. Do you think it is plant edible?

_____

3. If it is edible do you consume or utilize the plant?

_____

4. If edible which part of the plant do you use?

_____

5. How do you consume wild edible plant parts? A/ Raw B/ by cocking

6. Where do you get the wild food plants? A/ Home garden B/ in forest

7. Mention by using local names more preferable wild food plant species in your area?

_____

8. What are threats for the Wild edible plants species in the area?

_____

9. Are you conserving the wild food plants? A) Yes B) No.

A. If Yes how? Describe existing practices for conserving wild food plants in the area.

_____

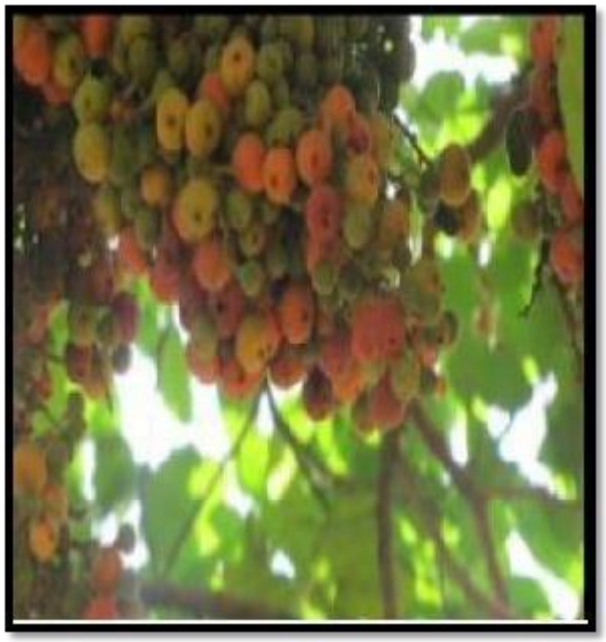
B. If No Why? What are the factors/constrains to conservation wild food plants in the area?

_____

10. Are there any concern bodies such as NGOs and Governmental bodies that support conservation/ management practice about the WEPs?

_____

Appendix Figure 1: *Carissa Spinarum* L (Agamsa) (Source: Bonsa, 2023)



Appendix Figure 2: *Ficus sur Forssk* (Eng)(Harbuu) (Source: Bonsa, 2023)

Appendix Figure 3: *Psidium guajava* L (Zayituna) (Source: Bonsa, 2023)

Appendix Figure 4: *Cardia africana* Lam (Wadeessa) (Source: Bonsa, 2023)

Appendix Figure 5: Sample fruits of *Morusmeso Zygi* Stapf (Injor)
(Source: Bonsa,2023)

Appendix Figure 6: *Phoenix reclinate* jacq (Mexxii) (Source: Masfin D.,2023)

***Morusmeso Zygi* (Injor)**
(Source:Masfin D., 2023)

***Phoenix reclinate* jacq (Mexxii)**
(Source:Masfin D.,2023)

Appendix Figure 7: Interview with **Yero Sokoru Kebele** key informants about WEPs

(Source: Masfin D.,2023)

Appendix Figure 8: Interview with **Daka Kebele** key informants about WEPs (Source: Masfin D.,2023)

Appendix Figure 9: Interview with **Kelta Kebele** key informants about WEPs **(**Source: Masfin D., 2023)

Appendix Figure 10: Interview with **Gangalata Kebele** key informants about WEPs

(Source: Masfin D., 2023)