

**ADDIS ABABA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**  
**COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES**



**ASSESSMENT OF FUNCTIONAL FOODS COMMONLY USED BY PEOPLE LIVES IN  
LIBOKEMEKM WORDA SOUTH GONDAR ZONE, NORTH WEST ETHIOPIA.**

**A Thesis Submitted to the Department of Biology  
Presented in Partial Fulfillment of the Requirements for the Degree of Master of  
Science (Biology)**

**August, 2017**

**AddisAbaba, Ethiopia**

**Assessment of functional food plants commonly used by people living in libokemekm  
district South Gondar Zone, Northwest Ethiopia**

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This is to certify that the thesis prepared by Milikit Haile entitled: “*assessment of functional foods commonly used by people lives in libo kemekm district south Gondar zone, Northwest Ethiopia*” and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Biology complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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## ABSTRACT

### **Assessment of functional food plants commonly used by people living in libokemekm district South Gondar Zone, Northwest Ethiopia**

MILIKIT HAILE

Addis Ababa University, 2017

Functional food can be a natural food or it can contain one or more specific components which have functional influence on the health and well-being of the consumer. It beneficially affects target functions beyond its basic nutritional functions. The aim of this study is to assess the most common functional food plants used in Libo-kemkem district, South Gondar Zone, Northwest Ethiopia. The target population consists of inhabitants living in the Yifag kebele indifferent gotti and the sample population derived from residents aged 40 years registered in the official population census of the Yifag kebele. Data was collected using a structured questioner for qualitative data and in depth interview and focus group discussion to collect quantitative data. Various ethnobotanical techniques were used to collect and analyze the data: guided field walk and observation, group discussion, preference raking use direct matrix combined with descriptive statistical analysis. A total of 34 species belonging to 31 genera and 18 families were recorded as functional food plants. *Triticum dicoccum* Schübl. And *Hordeum vulgare* L. stood first in being the most multipurpose functional food plants followed by *Allium sativum* L., and *Nigella sativa* L. and *Sorghum bicolor* (L.) Moench was the least. Seed was found to be the most frequently utilized part (36.3 %). Traditional healers use seeds of the functional foods to prepare remedies and also recommend them for their functional uses. The most frequently used functional food plants and parts might be the result of long history of intimacy in cultivating as basic food sources. Since there are different varieties of these functional food plants, seed collection and preservation is highly recommended.

**Keywords: Ethnobotany, Functional food plants Food and Medicine, Health, Libo-kemkem**

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## **LIST OF ABBREVIATION AND ACRONYMS**

LKWARDO	Libo Kemkem Woreda Agriculture and Rural development officers
CPP	Consensus value for Plant Part
CVD	Cardio vascular disease
FAO	Food and Agricultural Organization
CSA	Central Statistics Agency
GMO	Genetically modified organisms
LDL	Low density lipoprotein
Ha	Hectare

## CHAPTER ONE

### 1. INTRODUCTION

#### 1.1 Back ground of the study

During the last few decades the interest and demand for both healthy food and different beverages has increased (Ozen, *et al.*, 2012). A strong reason for this is the desire among more and more people to live healthy and long lives (Ibid). Consuming the right food and nutrients has been shown to contribute to a healthy and active lifestyle (Chen, 2011).

Today foods are not intended to only satisfy hunger and to provide necessary nutrients for humans but also to prevent nutrition-related diseases and improve physical and mental well-being of the consumers (Menrad, 2003; Roberfroid, 2000). In this regard, functional foods play an outstanding role. The increasing demand on such foods can be explained by the increasing cost of healthcare, the steady increase in life expectancy, and the desire of older people for improved quality of their later years (Kotilainen, Rajalahti, Ragasa, & Pehu, 2006; Roberfroid).

A number of factors are responsible for changing consumer attitudes toward foods and reshaping food supply trends. These include an aging population, increased health care costs, consumers' desire to enhance personal health, change in consumer awareness and expectations, advancing scientific evidence that diet can alter disease prevalence and progression, advances in food science and technology, and changes in food regulations.

Following the trends observed in consumer demand, the food industry introduced a new category of products named 'functional foods'—foods that bring science and high-technology into everyday life by promising 'certain health benefits (Niva, 2007). This interest has been fueled by increased media attention and an increasing number of consumers determined to take greater responsibility for their own health (L'Abbé *et al.*, 2008)

In Libokemkem district functional food has not been supported and improved by academic researches regarding its productivity, variety of distribution and cultivation. The objective of this paper is to assess the most common functional food used in Libokemkem district, South Gondar Zone, Northwest Ethiopia

## **1.2. Statement of the problem**

One of the greatest challenges food research is facing in this century lies in maintaining sustainable food production and at the same time delivering high quality food products with an added functionality to prevent life-style related diseases such as, cancer, obesity, diabetes, heart disease, stroke. Functional foods that contain bioactive components may provide desirable health benefits beyond basic nutrition and play important roles in the prevention of life-style related diseases

A lack of dietary diversity is a severe problem among poor populations in the developing world. There is substantial evidence that dietary diversity is extremely low among Ethiopian rural households, especially for children. However, there is little empirical evidence on factors contributing to low dietary diversity among rural household

In Libokemkem distirict, the historical and traditional utilization of functional food has not been supported and improved by academic researches regarding its productivity, variety of distribution and cultivation. There for, this study was conducted at expectation that it contributes its parts to per suit the stated problems and to enhance the awareness and how much functional food used and cultivated, in the study area.

## **1.3. Research question**

1. What species of functional food plants are usually used in the study area?
2. To describe which part of the plant parts are used commonly as a functional food?
3. What functional food usually used in the study area?
4. Which types of diseases are treated by the functional foods available in the local area?

## **1.4.Objective of the study**

### **1.4.1. General objective**

- To assess the most common functional foods used in Libokemkemworeda, South Gondar Zone, Northwest Ethiopia.

### **1.4.2. Specific objective**

- .to assess the functional food usually used in the study area
- Identify which parts of the crop or cereals commonly used in the study area.

- To identify the common diseases species of functional food plants which are grown and utilized by people in the study area

## **CHAPTER TWO**

### **2. LITERATURE REVIEW**

#### **2.1 The history of functional food**

Belief in the medicinal power of foods is not a recent event. While Hippocrates may not have started this movement, he proclaimed almost 2,500 years ago to “Let food be thy medicine and medicine be thy food.” Today, while such a statement might result in severe reprimands, if not litigations, these penalties have not deterred consumers from seeking the health benefits of foods. Increasingly, scientists are being charged with the responsibility of clarifying the role that foods play in maintaining and promoting health. The Scientific Status Summary, “Functional Foods: Their Role in Disease Prevention and Health Promotion as Clare Hassler, reviews”(2000) prepared for IFT’s Expert Panel on Food Safety and Nutrition on the primary plant and animal foods linked with physiological benefits.

A variety of foods and their components are emerging as factors capable of modifying growth, development, performance and disease resistance. Such discoveries may influence perceptions about what is appropriate nutrition, and necessitate a new vocabulary including terms from apigenin to zeaxanthin. In the process, a better understanding that adequate nutrition is more than energy and essential nutrients will emerge. Functional foods: Their role in disease prevention and health promotion ( Ch Hasler, 1998)

In the local people practice cereals used as injera, bread, forage, beso, nifro, roast, local beer, teje, firndus (honey dissolve with tella or beer), katicala etc. Most cereals used for injera and local beer, even if rice is the stable food for Asian people but in our district today rice serves for injera and beer.

Ethno botany is the scientific investigation of plants as used in indigenous cultures in food, medicine, magic, rituals, building, household utensils and implements, fire wood, pesticides, clothing, shelter and other purposes and is also used to define local community plant resource

needs, utilization and management. Hence, ethnobotanical study is very crucial for biodiversity and human society and to understand how it is valued and influenced by human activities within different human societies (Yeneayehu, et al., 2017).

## **2.2. Anthropology and functional food**

Since the evolution of *Homo sapiens*, human populations are living with strong affiliation with their environment. The practice of using natural resources has begun since time immemorial. This intimate interaction to their environment let the human population to develop the deep knowledge all about their environment, especially about plants and animals of their surroundings. Much of the information indicated that the human-plant interaction is more pronounced than the human-animal interaction. This might be due to the easier access of plant resources than animal resources. Thus, more academic interests featured in ethno botany than the other fields of ethno biology. This let the history of ethno biology to reside within the history of ethno botany (Tigist, 2013).

Food, in the first instance, is what grows on farms, comes from the sea, is gathered from the jungle, sold in the market, and appears on our tables at meal times. However, as a cultural phenomenon, food is not simply an organic product with biochemical qualities that may be utilized by living organisms to sustain life; rather, food is both the substance and symbol of social life, a means by which people communicate with each other, and, an embodiment of that communication itself (Linn, 2011). .In fact, Anthropologists have long been interested in diets, especially in the socio cultural determinants of food; the nutritional and medical consequences of particular consumption patterns, which includes pattern of food; and the changing patterns of food production and markets, also, the awareness of the socioeconomics of hunger, famine and food aid ( Linn,2011).

Anthropologists have explored the food code presented in myth and retold in ordinary and ritual food preparations as a way in which people mark social distinctions, complementarities, and transformations. Indeed, food categories serve as the cultural marker of identifying one's self with others. For example, in Africa, where the basic staple is porridge, ranging from "thick" to "thin, watery gruel", different groups distinguish themselves

Food is the most important thing a mother gives a child; it is the substance of her own body, and in most parts of the world mother's milk is still the only safe food for infants. Thus food

becomes not just a symbol of, but the reality of, love and security. All animals eat, but we are the only animals that (cooksaua. Rev.Anthropol.2002). Ethnographic questions answer Seven subsections examine classic food ethnographies: single commodities and substances; food and social change; food insecurity; eating and ritual; eating and identities; and instructional materials. The richest, most extensive anthropological work among these subtopics has focused on food insecurity, eating and ritual, and eating and identities.

### **2.3 Functional food and Ethno medicinal in Ethiopia**

Most traditional medical practices in Ethiopia rely on an explanation of disease that draws on both the “mystical” and “natural” causes of an illness and employ a holistic approach to treatment (Bishaw Mengiste, 1991). Western medicine became more incorporated into the Ethiopian medical system. Despite Western medicine becoming more wide spread in Ethiopia, Ethiopians tend to rely more on traditional medicine. Conventional medical services remain concentrated in urban areas and have failed to keep pace with the growing population, keeping health care access out of reach for most Ethiopians living in rural. Because traditional medicine is culturally entrenched, accessible, and affordable, up to 80% of the Ethiopian population rely on traditional remedies as a primary source of health care (Pankhurst, 1990; Kebede Deribe et al., 2006 and Mulugeta, 2014). Traditional plant remedies are the most important source of therapeutics for nearly 80% of the developing world population .The same is true in Ethiopia where medicinal plants play a significant role in supporting the country’s primary healthcare system about 95% of traditional medicine preparations in Ethiopia are mentioned to be of plant (Zemedu Asfaw, and Ensermu Kelbessa et al, 2013) Origin Traditional healers still depend largely on naturally growing plant species and the important medicinal plants are under threat (Sebsebe Demissew, et al, 2009) Ethiopia is one of the 12 centers of origin (Vavilov centers) of cultivated crops, most of which are food crops. There are 11 cultivated crops, which have their center of genetic diversity in Ethiopia .There are: *Coffea arabica* (Coffee), *Eragrostis tef* (TEFF ) *Ensete ventricosum* (ENSET), *Coccinia abssinica* (ANCHOTE), *Guizotia abssinica* (Nigerseed/NUG), *Brassica carinata* (GOMENZER), *Carthamus tinctorius* (sun flower/SUF), *Sorghumbicolor*(Sorghum/MASHILA), *Hordeum vulgare* (Barley/GEBIS), *Linnum usitatissimum* (Linseed/TELBA) and *Ricinus communis* (Castor bean/GULO).

## **2.4 Commonly used functional food**

According to Path rage Kamal Pereraetal (2011). Mushroom might have a big potential for the prevention or cure of diabetes more than in other plant species. Epidemiological and experimental studies have shown positive effects of regular coffee-drinking on various aspects of health, such as psychoactive responses (alertness, mood change) neurological (infant hyperactivity, Alzheimer's and Parkinson's diseases) and metabolic disorders (diabetes, gallstones, liver cirrhosis). And gonad and liver function ( José G Dórea, 2005).

The spice ginger is the underground rhizome of the ginger plant, known botanically as *Zingiberofficinale* Roscoe. Ginger is widely used around the world in foods as a spice. Ginger extract has blood pressure-lowering effect(Trinidad *et al.*, 2012). Garlic (*Allium sativum*) and onion (*Allium cepa*) are two food ingredients widely used in our gastronomy. Garlic, besides to be used like food, has been used as medicinal plant for over 4000 years for a variety of ailment including head ache, intestinal worms and tumors. In folk medicine, garlic and onion have been used for centuries in several societies against microbial infections. Recent chemical characterization of their Sulphur compounds has allowed stating that they are the main active antimicrobial agents. Garlic has been proven to inhibit the growth of gram- positive, gram-negative and acid-fast bacteria, as well as toxin production origin as broccoli, green leafy vegetables, oranges, carrots, garlic, fiber, oats and tomato which are common plant species in Ethiopia. Amaranth has various health benefits and medicinal properties including those which are very useful in preventing a retarded growth in children, increase the flow of breast milk, valuable in preventing a premature old age, important in all bleeding tendencies, considered highly beneficial in treatment of gonorrhoea and benefits patients with cardiovascular disease (Mersha Ashagre Eshete., et al. 2016)

Recently, considering the western consumers' trend on Functional Foods and health benefits, certain researches to increase functionality of Ethiopian traditional foods is carried out. ( Hirut Belay., 2016).

## **2.5. Some diseases known being treated by functional food plants and their products**

In recent years, "functional foods" have become increasingly popular. Defined as foods or food components that may provide a health benefit beyond basic nutrition, functional foods

are widely believed to offer consumers an increased ability to reduce the risk of certain health problems including cancer, osteoporosis, and even childhood blindness. The food industry has produced new products enriched with “functional” compounds such as soy or vitamin E and emphasized the new-found value of old products containing essential nutrients(David, B., 2000).

Honey, a natural substance produced by honeybees, is composed of a complex mixture of carbohydrates, water, and a small amount of proteins, vitamins, minerals, and phenolic compounds. Fructose, glucose and maltose are among the various types of sugars present in honey. Used for millennia as both food and medicine, honey has been associated with improved antioxidant capacity, modulation of the immune system, antimicrobial activities, influence on lipid values (through anti hyper cholesterol effects) and regulation of glycemic responses, among other benefits ( Manuel E. et al 2011).Primarily honey has been used as an energy source, but recent research has examined the use of honey as an ergogenic aid (a food or ingredient that helps an athlete's performance) and wound healing agent, both of which were once considered merely age-old anecdotes. In the time of the ancient Olympics, athletes were reported to eat special foods, such as honey and dried figs, to enhance their sports performance ( The George Mateljan foundation., 2009) Honey mainly consists of sugars and water. Apart from sugars, honey also contains several vitamins, especially B complex and vitamin C, together with a lot of minerals. Some of the vitamins found in honey include ascorbic acid, pantothenic acid, niacin and riboflavin; while minerals such as calcium, copper, iron, magnesium, manganese, phosphorus, potassium and zinc are also present. Honey has been used for its healing, nutritional and therapeutic properties since ancient times. Its antibacterial potentials even against multi-drug resistant bacteria, such as *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Acinetobacterbaumanni* have been proved. Honey is well known for its anti-inflammatory and antioxidant capacities, which may be useful for the prevention of chronic inflammatory process like atherosclerosis, diabetes mellitus and cardiovascular diseases. The antibacterial, anti- inflammatory and antioxidant properties of honey will be reviewed here (Kazazis, C., 2014).

The biological function of milk is to supply nutrition and immunological protection to the young mammal. In some species, milk is the only food consumed for weeks or months.

Therefore, it must furnish all nutritive requirements for maintenance and growth, such as energy, amino acids, minerals, and vitamins.

Raw milk has thus a better effect in the prevention of osteoporosis (brittleness of the bones), atherosclerosis (degradation of the blood vessels). Prevention of the inflammation of the arteries, as well as prevention of the risk factors that increase the chance for this inflammation of the arteries, all diseases in which oxidative stress play an important role: inflammations, aging, diminished fertility of the man, schizophrenia, long diseases, cancer, Goat milk does contain more vitamin B3, and the composition in fat of goat milk is more favorable for human consumption.

The most important differences are situated in the health effects: milk as so-called 'functional food'. The concentrations in health improving elements differ (vitamin B3, certain fat acids and amino acids). The other 'micro structure' also makes goat milk easier to digest than cow milk (Frank Van Boxstael 2007) them. Consumption of low-cholesterol butter and spread with added calcium in Italy was investigated and reported that less than 5% of the respondents consumed these products. Consumption of different functional foods (yogurts fortified with vitamins or minerals, juice fortified with vitamins or minerals, ready-to-eat breakfast cereals fortified with vitamins or minerals, energy and wellness drinks fortified with vitamins or minerals, quarks fortified with vitamins or minerals) were investigated in Finland and it was reported that total 67.5% of the respondents consumed these products (Özen, A. E., 2014). Probiotic juice and yogurt, products with added fiber and low-salt were also commonly consumed by Finns

According to Clare M. Hasler (2004). Oats, Whole Grains Cereal grains Reduces risk of cardiovascular disease (CVD). According to Dr Joëlle Sambuc Bloise (2014) Chewing gum Helps maintain strong and healthy teeth (IBID) Table sugar Helps maintain good GI condition Helps improve bowel movement (IBID) Yoghurt and milk products containing lactic acid bacterium, as well as prune-based products. Use for the proper function of intestine. Foods citrus fruits. Several epidemiological studies have shown that citrus fruits are protective against a variety of human cancer. Although oranges, lemons, limes, and grapefruits are a principal source of such important nutrients as vitamin C, folate, and fiber, Elegbede et al. (1993) have suggested that another component is responsible for the

anticancer activity. Citrus fruits are particularly high in a class of phytochemicals known as the limonoids (Hasegawa and Miyake, 1996). Oranges, lemons, limes, and grapefruits are a principal source of such important nutrients as vitamin C, folate, and fiber. Citrus fruits are particularly high in a class of phytochemicals known as the limonoids.

Over the last decade, evidence has been accumulating in support of the cancer preventative effect of limonene. Crowell (1997) showed this compound to be effective against a variety of both spontaneous and chemically-induced rodent tumors. These compounds provide to garlic and onion their characteristic odor and flavor, as well as most of their biological properties. Flavonoids, abundant in onion but practically absent in garlic, and a small amount of non-volatile water-soluble sulphur compounds found in garlic, as S-allyl cysteine (SAC). The biological effects of additional functional constituents of intact garlic and onion, such as lectins (the most abundant proteins in garlic and onion), saponins such as b-chlorogenicin, fructan, pectin, vitamins B1, B2, B6, C, E, allixin and organo-selenium compounds

The garlic variety and manufacturing process are important considerations with having different biologically active compounds. Dr. Firas S. Al-Azzeh. Consumption of other functional foods like eggs with omega-3 fatty acids, spread with added calcium, low-fat mayonnaise, low-fat cheese, low-cholesterol butter, nuts, energy drinks, vitamin or mineral enriched foods, and weight loss products were also investigated among European citizens. While fatty fish was consumed by 12.3% of the Belgium respondents, nuts were consumed by 14% of them. Low-fat products like mayonnaise and cheese were consumed by 5% of the Belgium respondents; however, low-fat meat was consumed by 22% of ashiemine özen .

According to Shivani Gupta et al (2015) Garlic (*Allium sativum*) has been traditionally used for the treatment of different diseases since ancient times. The present study aims to evaluate the antimicrobial activity of aqueous extract of *Allium sativum* against multidrug resistant clinical isolates of pathogenic bacteria found in human urine in cases of urinary tract infection (UTI).

According to, Trinidad P. Trinidad et al (2011) Zingiber is rhizomes used as traditional medicine for gastrointestinal illnesses, motion sickness and inflammatory diseases.

According to International food Information council foundation (2011) carrots, pumpkin, sweet potatoes, cantaloupe, spinach, matoes uses neutralizes free radicals which may damage cells; bolsters cellular antioxidant defenses; can be made into vitamin A in the body. In a study conducted by S.A. El Sohaimy (2012). Oats and barley Reduce risk of cardiovascular disease. Protect against heart disease and some cancers; lower LDL and total cholesterol.(IBID) Corn, soy, wheat, wood oils Lower blood cholesterol levels by inhibiting cholesterol absorption(from African Journal).And Sorghum is one of the leading traditional food crops in Ethiopia comprising 15-20% of the total cereal production in the country (Gebreyesus 2012). Sorghum is a major food cereals throughout the country. And also functional food.

According to J. Bradley Morris (2002) Sesame seed contains lecithin which has antioxidant and hepatoprotective activity and ranges from 58 ppm to 395 ppm. There fore Traditional medical practice has been in existence before the development of modern medicine in the country and still continues to be widely accepted and used in the prevention and treatment of ailments (Getaneh Gebeyehu., 2011). According to Joint FAO/WHO Workshop, (2004) Fruit and vegetables are an important component of a healthy diet and, if consumed daily in sufficient amounts, could help prevent major diseases such as CVDs and certain cancers.

## **CHAPTER THREE**

### **3. MATERIALS AND METHODS**

#### **3.1. Description of the study area**

##### **3.1.1. Geographical location**

In the Amhara Regional State, LiboKemkem is one of the district located in south Gondar at the North West part of Ethiopia. The town of the district is located 645 kilometers from Addis Ababa to the North and 85 kilometer from the regional city of Bahir Dar to the North. It is located at 37°15'36" E to 38° 06'36" E of longitude and 11° 54'36" N to 12°22'48" N of latitude. Kemkem is bordered in the North by Semien Gondar Zone, in the South by Rib River which separates it from FogeraWoreda, in the West by Lake Tana, and in the East by

EbinatWoreda. The elevation of the woreda ranges from 1800-2850masl (woreda communication office, 2015)

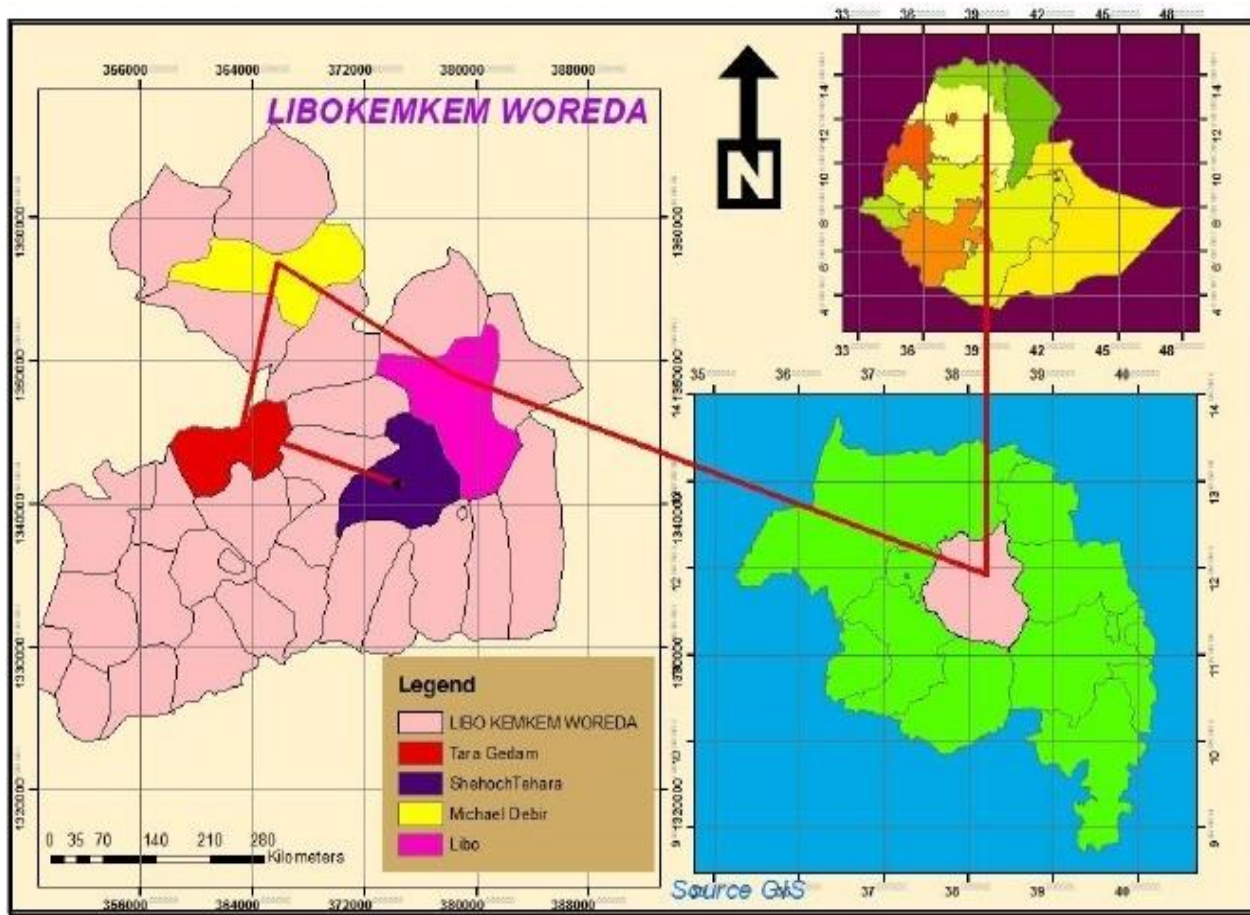


Figure 1: Map of LiboKemkemWoreda: Libokemke District in Reign of Amihara country Ethiopia

### 3.1.2. Climate

The agro-climatic zone of the Woreda consists 78% is Woinadega and 22% is Dega. The study area has uni modal type of rain fall with mean annual rainfall reaches 1300mm per a year. Accordingly, it has two rainy seasons these are Kiremt and Belg. Mostly the rain received during June –September and has short rainy season from March- May. The mean annual temperature of the study area for the past ten years was 19°C and the highest temperature received during February, March and April.

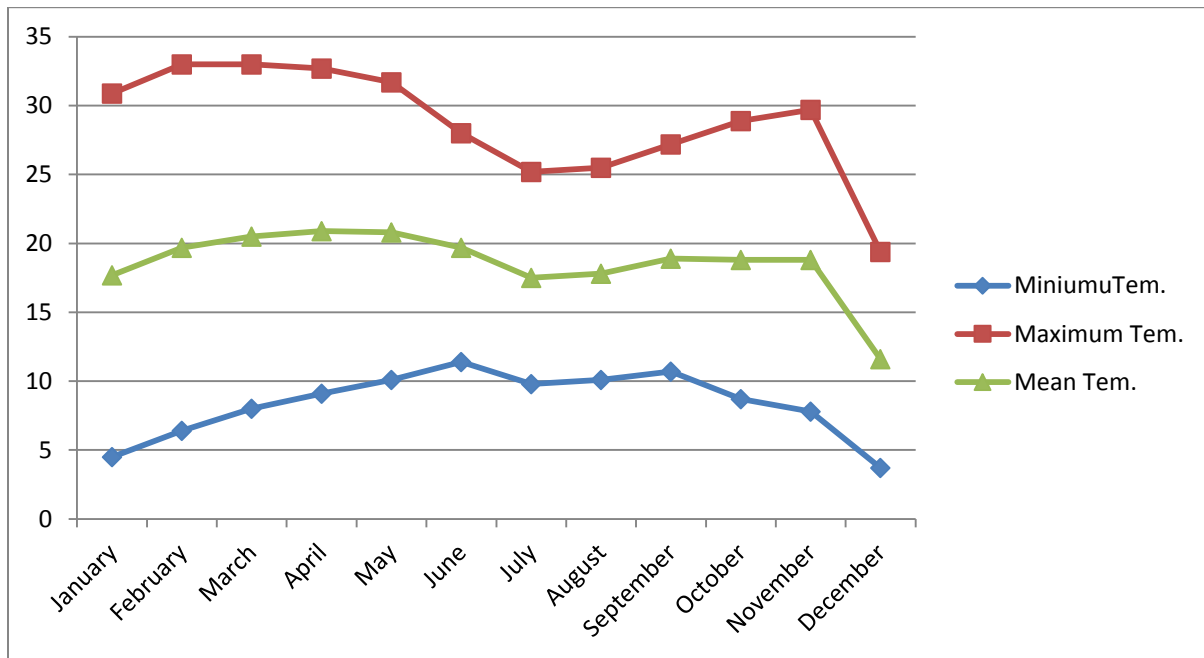


Figure 2: Temperature of LiboKememek Woreda

(Source: Bahir Dar meteorology station 2014/15)

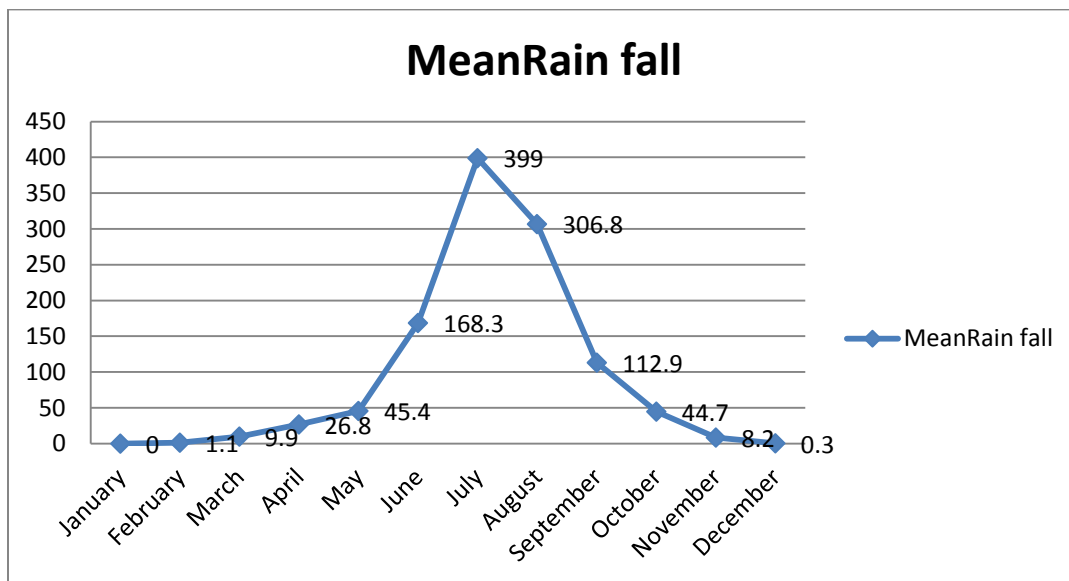


Figure 3: Rain fall of LiboKememek Woreda

(Source: Bahir Dar meteorology station 2014/15)

### 3.1.3 Geology and soil

The geology of the study area is mainly characterized by Basaltic rocks and Pyroclastic rocks, unconsolidated Pyroclastic (e.g. Ashes, Pumices, and Scoriae) and consolidated pyroclastic (e.g. Tuffs, ignimbrites) and also few parts of the study area is characterized by undifferentiated unconsolidated sediments (FAO SEA, 1997). The soils of the study area are predominantly Leptosols, Nithosols, Vertisols and Luvisols. LiboKemkem is characterized by plain, mountainous, ups and down, depression and swampy areas which account 42%, 21%, 30%, 1% & 6% respectively. Arno and Rib are the major rivers in the district which drain in to Lake Tana. A survey of the land in this district shows that 51% is cultivated land, 8.3% is pastoral land, 5.9% forest or shrub land, 17.98% covered with water and 17.3% is considered as degraded part (WADO, 2015).

### 3.1.4 Land use and land cover

According to the Woreda environmental protection, land administration office annual report (2014), the total area of the Woreda is about 108,157 hectares. Areas covered by bush, shrubs and natural forests are found in the mid latitude areas and specifically around the church. The general land management described as follows Table.1.

**Table 1:** Land use and land cover in Libo-kemkemDistrict(LKWARDO, 2015).

No	Land use area	Hectare	%
1	Cultivated	55,313.07	51
2	Grazing land	8,969.6	8.27
3	Forests	6,398.9	5.9
4	Waterbody	19,500.9	17.98
5	Costruction and other services	6507.4	6
6	Others	11767.6	10.85
	total	108,457	100

### 3.1.5 Population and socioeconomic condition

According to CSA (2007), the total population of LiboKemkem district is estimated 198,435 of which 100,987 are male and 97,448 are female. From this, the urban population is 22,054

and rural population is 176,381 with a total of 45,399 households. LiboKemkem district has an estimated population density of 198.49 persons per square kilometer and average family size is 4.37. The district is totally inhabited by Amhara people and predominantly (96.19%) are followers of the Orthodox Christians and (3.69%) are followers of Muslim faith. The most important social and economic problems are the pervasive poverty and the high population growth rate with declining agricultural production. The economic bases of the community in the district were the rain fed and irrigation farming practices and free range livestock rearing. Mixed agriculture remains to be the main livelihood activity. The dominantly growing crops in the study area include Garlic (*Allium sativum*) wheat (*Triticum* sp.), potato (*Solanum tuberosum*), barley (*Hordeum* sp.), teff (*Eragrostis* sp.), sorghum (*Sorghum bicolor*), bean (*Vicia faba*), chickpea peas (*Pisum sativa*), Onion (*Allium Cepa*), Tomato (*Solanum Lycopersicum*) and maize (*Zea mays*). The average household land holding size was 1 hectare. Agriculture is an important livelihood resource that plays significant role to household sustenance, income generation. Cattle, sheep, goat, pack animals and poultry are the most common domestic animals raised in the rural area (LKWARD, 2015). In addition there is the production of honey in the study area.

The socio-economic and political center (zone) of the district is Debre Tabor. There are also other socio-economic and political centers in the district are Addis Zemen, Ambo Meda, and Yifag. During the market day, the people from different localities come and exchange agricultural products, manufactured goods, clothes, different animals etc. In order to put in practice the socio-cultural activities and to solve problems, the community has different traditional social and cultural organizations like Mahiber, Eder, Ekub and YehagerShmaglie

### **3.1.6 Common disease in the study area**

As any other tropical country, the people from the study area suffer from communicable and Non-communicable diseases. According to a study by (LKWHO), the most common disease in the study area is febrile disease for children while Diarrhea and pneumonia are highly common among people above five years old. Respiratory and other internal health complications are also significant health problems in the study area (Table 2).

**Table 2:** Top ten disease in study area under five years of age and above five years age with the estimated frequency of prevalence (LKWHO, 2016.)

	A type of disease	Prevalence	
		Under five years of age	Above five years of age
1	AFI ( acute febrile disease illness)	Highest	Less common
2	AURI (acute upper respiratory truck infection)	Highest	Less common
3	Dyspepsia	Highest	Not reported
4	Helminthiasis	Very high	Less common
5	pneumonia	Very high	Highest
6	Malaria	Very high	Less common
7	Trauma	high	Very high
8	Infection of skin and subcutaneous	Very high	Less common
9	Other or unspecified infection and parasite disease	High	Less common
10	Diseases of musculoskeletal system and connective tissue	High	Less common
11	Diarrhea	Highest	Less common

### 3.2. Study design and Sampling

Cross-sectional study design was used to investigate and documented the Functional Food cereals in Libo-kemikem district. Collecting of journals and other literatures was employed from September 30- November 12, 2016. Reconnaissance survey was conducted from October 5 to November 5, 2016. Developing proposal and its submitting has completed in November 27, 2016. Data gathering was carried out from December 22, 2016 to the first two weeks of March, 2017 and then developing of thesis is accomplished from the mid of April to the end of June, The target population were consist of all inhabitants living in the Libokemkem District, and the sample population derived from residents aged between 24 and 90 years old registered in the official population census of the Yifag kebele. The sampling technique included stratification according to municipality size, age and sex of inhabitants, but I took it by both purposive sampling and simple random sampling technique.

### **3.3 Data collection tools**

Data were collected semi structured interview The in-depth interview, and group focus discussion was prepared first in English and then translated to Amharic language and translated back to English by language expert so as to see the consistency of the tool. The validity and reliability of the questionnaire was tested by 5% of the respondents at adjacent kebele of Yifag. After pretest, discussion was carried out with data collectors and facilitators and some corrections and changes made on the questionnaires by principal investigator. supplemented with qualitative in-depth interview was conducted in March 2017 in Libo-kemekm district. 50 informants and local disease healers aged 40 years and above were included in the study. Data were collected by face to face interviewing administer questionnaire and in-depth interview. Informants selected by simple random sampling technique methods.

### **3.4 Data analysis procedure**

#### **3.4.1 Descriptive statistics**

A descriptive statistical method such as percentage and frequency were employed to analyze and summarize the data on functional foods, associated knowledge as well as use and conservation. The most useful information gathered on functional foods reported by local people were medicinal value, methods of preparation, route of application, disease treated, dosage, part(s) and habit used. Seven categories of plant use- reported and relative frequency of stem, leaf, seed, fruit, tuber, bulb and rhizome and trees species was tabulated and analyzed statistically. On plant species and families were tabulated, bar graphs and pie-charts were drawn and proportions were then determined.

#### **3.4.2 Informant consensus**

Key informants were contacted at least two times for the same ideas and the validity of the information was proved and recorded. Consequently, if the idea of the informant deviates from the original information, it was rejected since it was considered as irrelevant information. As a result only the relevant ones were taken into account and statistically analyzed. This method was adopted from Alexiades (1996). Similarly, use diversity of medicinal plants gathered from the study area was qualitatively analyzed for seven groups of

plant uses reported by informants' until it reaches saturation point. In order to evaluate the reliability of information recorded during the interview at least four times.

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

Where, ICF= Informants Consensus Factor

nur = number of use citation in each category

nt= number of species used

### **3.4.3 Preference ranking**

Preference ranking was conducted following Martin (1995) for six most important medicinal plants used in treating the most prevalent disease hypertension. Seven functional foods were listed for this exercise. Each informant was provided with six functional food reported to cure hypertension disease with leaves of functional food used being paper tagged name and asked to assign the highest value 6 , for the most preferred species, against this illness and the lowest value 1, for the least preferred plant and in accordance of their order for the remaining ones. The value of each species was summed up and the rank for each species was determined based on the total score.

### **3.4.4 Direct matrix ranking**

Based on information gathered from informants, six multipurpose functional food plant species were selected out of the total plants. Five use diversities of these plants were listed for seven purposely selected key informants to assign use values to each species in their respective localities. The five use values include functional food, fodder, food, construction and spice. Direct matrix ranking is used to compare multipurpose use of a given species and to relate this to the extent of its utilization versus its dominance (Martin, 1995). Each key informant was asked to assign use values (5= best, 4= very good, 3= good, 2= less used, 1= least used and 0= not used). Consequently, for each key informant use values for the five multipurpose functional food species, average value of use diversities for the species was taken and the scores of each species were summed up and ranked.

## CHAPTER FOUR

### 4. RESULT

#### 4.1. Age group, educational and material status of informants

In this study, different categories of age group participated. Informants' age ranges between 20 and 88, of which most people are between the age of 31 and 60 (33 %). See Table 3 below

Table 3: Ages of informant in the study area

Informant's age	No. of informants	Percentage (%)
20-30	3	6
31-40	11	22
41-50	11	22
51-60	11	22
61-70	5	10
71-80	6	12
81-88	3	6

About 36% of the informants were illiterate followed by those who are able to write and read 22%. Of the total informants, 42% were married and few were single (Table 4).

Table 4: Educational and marital status of informants

EDUCATIONAL	Grade	%	Marital status	M	F	Total	Percent %
Illiterate	18	36	Married	31	7	38	76
Writing and reading	11	22	single	4	2	6	12
Twelve grade completes	21	42	Divorced	0	2	2	4
			Widow	2	2	4	8
			Total	37	13	50	100

#### 4.2. Functional food and their parts used in study area

A total of 34 species belonging to 31 genera and 18 families were collected and identified in the study area (Table 6). This finding (Table 6, Figure 4). Indicates that most cereals are used as functional food in the study area. In terms of family distribution, Poaceae stood first contributing 8 (23.53%). Species, followed by Fabaceae 5 (14.71%). Species, Solanaceae and Rutaceae 3 (8.82%) species the third and the fourth respectively.

Table 5: Functional food and their parts

No	Scientific name	Family name	English name	Local name	Parts used
1	<i>Allium cepa L.</i>	Alliaceae	Onion	Keyshinkurt	bulb
2	<i>Allium sativum L.</i>	Alliaceae	Garlic	Nech shinkurt	bulb
3	<i>Brassica carinata A.Br,</i>	Brassicaceae	Kale seed	Gomenzer	Seed
4	<i>Brassica nigra L</i>	Brassicaceae	Black mustard	Senafich	Seed and leaf
5	<i>Capsicum annum L</i>	Solanaceae	Chili	Berbere	Fruit
6	<i>Cicer aestivum L.</i>	Fabaceae	Chickpeas	Shinbera	Seed
7	<i>Cinnamomum zoylanicu L.</i>	Lauraceae	Ceylon	Kerefa	bark
8	<i>Citrus limon(L.) Burm.f.</i>	Rutaceae	Lemon	Lomi	Fruit
9	<i>Citrus sinensis (L) osb</i>	Rutaceae	Orange	Birtukan	fruit
10	<i>Coffea arabica L.</i>	Rubiaceae	Coffee	Buna	Seed
11	<i>Croton macrostachyus Del.</i>	Euphorbiaceae	Croton	bisana	Leaf
12	<i>Cucurbita pepo L.</i>	Cucurbitaceae	Pumpkin	Duba	seed
13	<i>Eragrostis tef (zucc.) Troteer</i>	Poaceae	Tef	Tef	Seed
14	<i>Guizotia abyssinica(L.f)</i>	Asteraceae	Niger seed	Nug	Seed
15	<i>Horedeum vulgare L.</i>	Poaceae	Barley	Gebbs	seed
16	<i>Lactuca sativa L.</i>	Asteraceae	Lettuce	Selata	Leaf
17	<i>Lepidium sativum L.</i>	Brassicaceae	Garden cress	Feto	Seed
18	<i>Linum usitatissimum L.</i>	Lineaceae	Lin seed	Telba	Seed

19	<i>Lupinus albus L.</i>	Fabaceae	white lupin	Gibto	Seed
20	<i>Lycopersicon esculentum Mill</i>	Solanaceae	Tomato	Timatim	Fruit
21	<i>Musa acuminata L.</i>	Musaceae	Banana	Muze	fruit
22	<i>Nigella sativa L.</i>	Ranunculaceae		Tikurazemud	Seed
23	<i>Oryza glaberrima</i>	poaceae	Rice	Ruze	Seed
24	<i>Rhamnus prinoides L.Herit</i>	Rhamnaceae	Shinyleaf buckthorn	Gesho	Leaf
25	<i>Ruta chalepensis L</i>	Rutaceae	Fringed rue	Tenadm	seed
26	<i>Saccharum officinarum L.</i>	Poaceae	Sugarcane	Shenkora ageda	Stem
27	<i>Sesamum orientale (Ollv.)Engl.</i>	Pedaliaceae	Seism	Selit	seed
28	<i>Solanum tuberosum L.</i>	Solanaceae	Potato	Dinch	Tuber
29	<i>Sorghum bicolour L.</i>	poaceae	Sorghum	Zengada	Seed
30	<i>Trigonella foenum- graecum J.M.Suttie</i>	Fabaceae	Fenugreek	Abish	seed
31	<i>Triticum dicoccon Schank.</i>	poaceae	Oat	Ajja	Seed
32	<i>Vicia faba L.</i>	Fabaceae	Bean	Bakela	Seed
33	<i>Zea mays L.</i>	poaceae	Maize	Bekolo	Seed
34	<i>Zingiber officinale (Linn.f)</i>	zingberaceae	Ginger	Zingible	Rhizom e

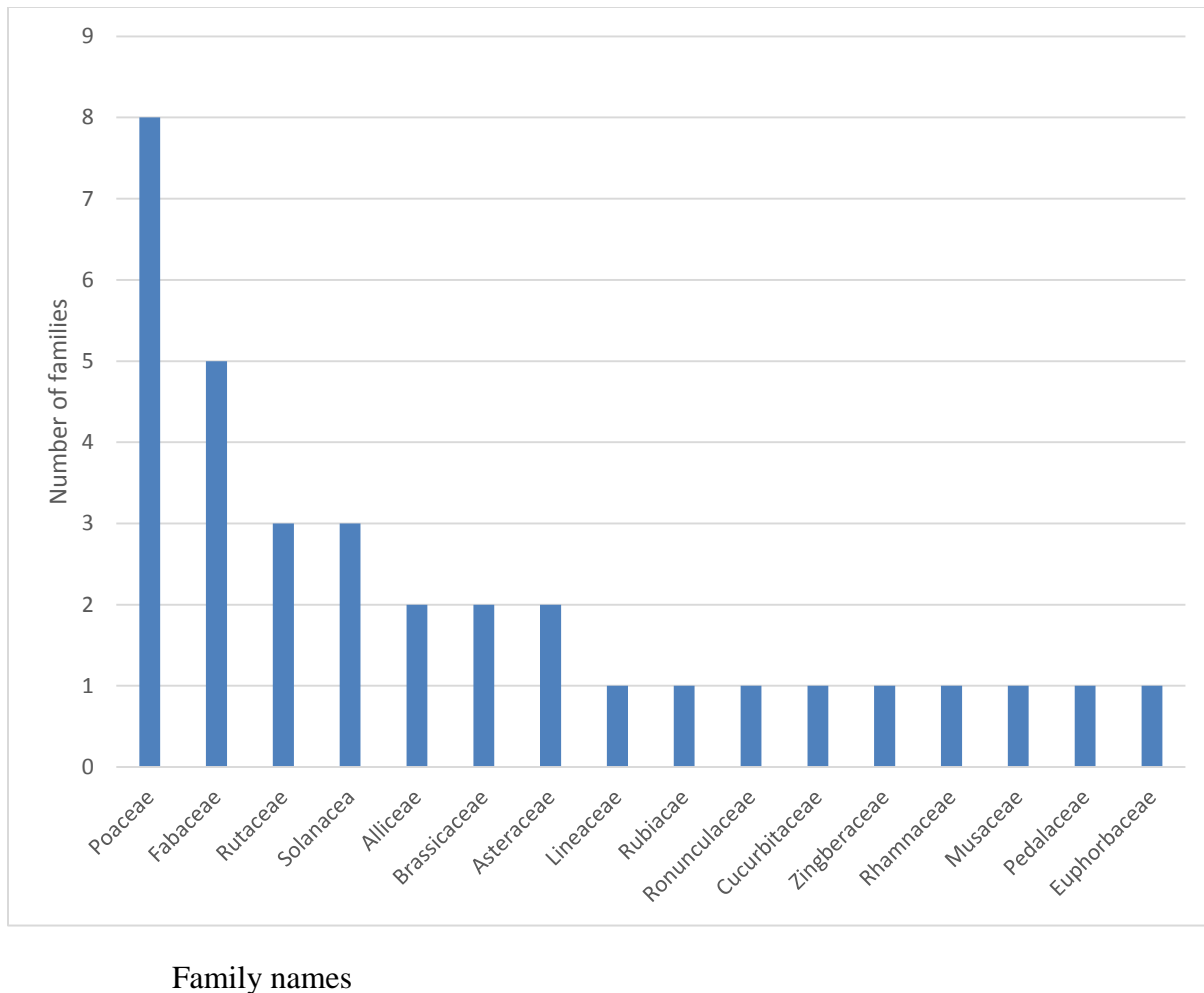


Figure 4: Distribution of the species in families (source from exile)

### 4.3. Plant parts used

Seed (36.3%) was used by the people very frequently in formulation of the remedies as compared to other plant parts. Fruits contribute 13.3%, while the other parts of the functional food plants studied contribute less (Table 7, Figure 4).

Table 6: Parts that used in functional food

Parts of functional food use	No.. of functional food	Percentage(ccp)
Seed	18	36.3
Fruit	4	13.3
Leaves	3	10
Bulb	2	6.6
Tuber	1	3.3
Stem	1	3.3
Rhizome	1	3.3

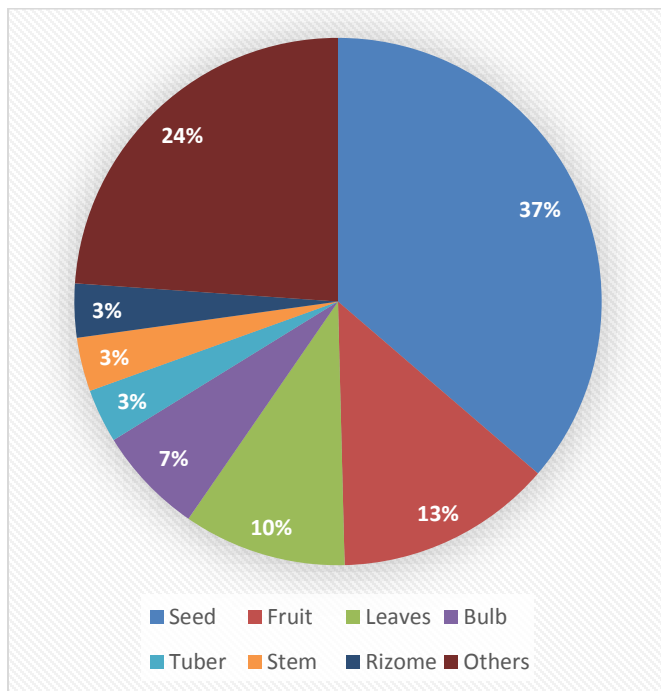


Figure 5: Parts of functional food used as a medicine LibokemekemWoreda, 2017

#### 4.4. Disease and functional food plants used

About 43 human ailments which are prevented or cured by utilizing the 34 functional food plants were documented. Of these, 15 diseases were the most frequently mentioned diseases by the informants. These common diseases are listed in Table 7 with the corresponding functional food sources used in the study area. For example, Gastric ulcer prevented and

treated by six functional food, Accident wound treated by three functional food, Bone fracture repair by three different foods, Malaria also treated by five functional food, Hypertension prevented by seven functional food plants. Febrile disease mostly a symptom of malaria) is very common and most people cannot afford to buy the drug in every relapsing period. Thus, use alternative treating methods, which include functional food plants.

Table 7: List of disease and the corresponding functional food

Disease in the study area	Functional food	How to use
Gastric ulcer	Linseed	Boil seeds and cool then drink
	Sugar	Direct to chew the sugar crystal
	Sugar can	To roust sugar can
	Papaya	To drink papaya juice
	Water	To drink warm water and vomit then the patient get relief.
	Barley	To drink barley powder mix water
Accident wound	Alcohol(Katicala)	Wash the wound by alcohol
	Pepper powder or chili	To add pepper powder on the wound
	Salt	To wash the wound by salt solution and avoid at least salt intolerant bacteria.
Bone fracture	Hoof soup	To boil cattle hoof and drink
	Young hen soup	To prepare and drink and eat
	Oat Soup	To drink after preparation
Malaria	Butter	To drink boiled butter before breakfast.
	Goat bile	To drink fresh goat bile before food
	Rump(Lat)	To boil the rump and drink
	Senafich	To eat Senafich with enjera for malaria
	Garlic	A spoon mixed garlic with honey
	Selit	For malaria
Poisoning	Yogurt	To drink and neutralize
Constipation	Buttermilk	To drink a lot and soften the feces
	Linseed	Boiled seeds and drink it before break fast
	Lettuce	To eat per day
	Gomen	Boiled and eat
	Germinate bean	Simply boiled and eat.
	Banana	To eat single raw fruit daily
Stomach ach	Honey	To swallow a spoon of Honey for stomach disturbance , anthrax,
	Feto	To eat feto with enjera for lack of apatite and increase saliva

	Linseed	Boiled and drink morning time
	Arsenic bush or senafich	To eat senafich with injera
Hypertension	Lupinus	Lupinus changes to alcohol and drink
	Sama	To eat as abesha gomen
	Shifraw or Moringa	A dry leaves to use as tea
	Kerefa	Crashed by teeth drectly
	Parsley or Dinblal	Boiled and drink as a coffee
	Lettuce	To uncooked lettuce for certain time
	Bean	Boiled banana at any time
Diarrhoea	Rice	To boil rice drink the solution and eat the rice itself.
	Millet bread	To eat millet bread mix with oil chili
	Lean meat	To eat lean meat with chili or mitmita before breakfast .
Eye disease specially affected by welding gas	Potato	To cut potato tuber in circle and put the eyes attend of the day
Spider infection	Lintels	Chewed lintels seeds and creamed infected area of the body.
Heavy drinker(intoxicate)	Sorghum	To eat or give raw sorghum for intoxicated person as soon as the alcoholic substance neutralized.
	Yogurt	To drink yogurt to avoid intoxication and hung-over
	Water	Baptized by cold water reduce intoxication
	Shiro	To avoid hangover
Lacteal mother	Young hen soup	To drink young hen soup lacteal woman regain her energy again.
	Oat soup	Oat soup more support anew born mother than other cereals soup.
t onicle	The shoot of gesho,	To sip squeezed shoot of gesho
Respiratory problem or cough	Garlic	Raw garlic cloves are crushed or chopped and mix with honey for cough.

People in the study area use and classify their land through functional categories as grazing and farming land, home gardening area and forest land. Different crop types are cultivated in the District. Agricultural production is based on rain fed Cultivation and insignificant scale of irrigation. The major crops cultivated in the area were categorized in to eight group such as vegetable, fruit, stimulant, cereals, oil seeds, spice, crop and others. The major functional food crops grown in the area are given in (Table 8)

Table 8: Number of plant species and preparation

Crop category	Scientific name	English name	Local name (Amharic)	Disease treated by functional food
Vegetable	<i>Cucurbita pepo</i> L.	Pumpkin	Duba	constipation
	<i>Lycopersicon esculentum</i> Mill	Tomato	Timatim	Tomato creamed on the face in order to reduce <i>Tenia corporis</i> (Madiat)
	<i>Lactuca sativa</i> L.	Lettuce	Selata	To eat for hypertensive and lose of weight
	<i>Allium sativum</i> L.	Garlic	Nechshinkurt	To Mix Garlic with honey for cough ,malaria.Honey +butter+Garlic for asthma Individual cloves peeling the outer covering and chop mix with honey and butter.
	<i>Allium cepa</i> L.	Onion	Keyshinkurt	Onion tied on bugig
	<i>Solanum tuberosum</i> L.	Potato	Dinch	Retated eyes
	<i>Saccharum officinarum</i> L.	Sugarcane	Shenkora ageda	Roast sugarcane and eat for acute cough and gastritis
Fruit	<i>Citrus limon</i> (L.) Burn.f.	Lemon	Lomi	Lemon juice for internal parasite and common cold
	<i>Citrus sinensis</i> L.	Orange	Britukan	To drink boiled orange juice to reduce common cold.
	<i>Carica papaya</i> L.	Papaya	papaya	To papaya for laxative purpose when stomach become constipated.
	<i>Musa acuminata</i> L.	Banana	Muze	For constipation
Stimulant	<i>Coffea arabica</i> L.	Coffee	Buna	To drink boiled coffee for headache, common cold and to be alert any activities.
	<i>Catha edulis</i> (Vaht) Forssk.ex.Eadl	khat	Chat	To boil chat and with honey or awuza for bad spirit
	<i>Rhamnus prinoides</i> L.Herit		Gesho	Squeeze the shoot of <i>Rhamnus prinoides</i> for tonsil
	<i>Sorghum bicolor</i> L.	Sorghum	Zengada	To avoid intoxication
	<i>Hordeum vulgare</i> L.	Barley	Gebes	To drink beso or barley

Cereals				powder with water for gastritis, barley use as a tea for anemia,
	<i>Eragrostis tef</i> (Zucc.) Trotter.	Teff	teff	Teff forge ,bread to give for weak child when he or she could not walk early child hood.
	<i>Triticum dicocon</i> Schrank.	Oat	Ajja	Soup of oat for new born mother regain her potential again
	<i>Oryza glaberrima</i>	Rice	Ruse	Boiled rice and water itself reduce diarrhea
	<i>Eleusine coracana</i>	Fingermillit	Dagussa	To drink Fingermillit beer when they were took bone TV drug or local drug
Oil seed	<i>Linum usitatissimum</i> L.	Lin seed	Telb	To boil and cool linseed and drink before breakfast for strong stomach ulcer.
	<i>Guizotia abyssinica</i> (L,f.)	Niger seed	NUG	Powdered and boil then drink for series cough
	<i>Sesamum orientale</i> (Gotty)Engl.	Seism	Selit	To drink for malaria
	<i>Brassica carinata</i> A.Br.	Kale seed	Gomenzer	For stomach ache
spice	<i>Nigella sativa</i> L.		Tikurazmud	Powder of <i>Nigella sativa</i> with coffee for hypertensive and diabetic
	<i>Zingiber officinale</i> (Linn.f.)	Ginger	Zingble	Boiled Ginger drink as tea for common cold and stomach ache
	<i>Trigonella foenum-graecum</i> J.M.Suttie	Fenugreek	Abish	Fenugreek powder remain tan a broken bone, to smooth a dry skin by massaging, for gastrite
	<i>Capsicum annuum</i> L'	Chilli	berberie	Chilli power add on cutting wound
Crop	<i>Vicia faba</i> L.	Bean	Bekela	Chewed bean seeds put it on bugig of the body
	<i>Cicer aestivum</i> L.	Chickpeas	Shimbra	Chickpeas powder tied on the bugging the
	<i>Lupinus albus</i> L.	White lupin	Gibto	Prepare White lupine to ethanol alcohol and drink, and reduce hyper tension

	<i>Zea mays</i> L.	Maize	Bekolo	Maize forge prepared with for to feed new born mother and healed her lumber and To encourage sexual feeling
Other	<i>Lepidium sativum</i> L.		Feto	To eat enjera with Feto for stomach discomfort and feto solution spire on the new born cattle or cat babies to prevent to eat by their mother, and bleeding body
	<i>Senna septemtrionalis</i> L.		Senafich	Use as spice and for stomach ache, the also use as face, neck fungus

Some functional foods are not used alone, and then the people mix two or more functional food together. Honey more dominantly mixes with the other functional food (Table 9).

Table 9: Mixed functional food or non-cereal functional food

Diseases	A combination of Functional food	Use
Asthma	Honey+ Garlic+ Butter	Mix with Honey, garlic and butter to ferment seven days and to use a spoon of mixture at evening.
Head fungus	Honey+ Sheep horn roasted and grinded	Roasted and grinded sheep horn mix with honey creamed the head until it progress .
Tenia corporis (Madiat)	Honey+ coffee	Powder Coffee mix with honey and creamed on the face
Vaccine for rabies	Butter+ Milk+ Endod roots	Drink to dog. The dog never effect by the virus.
Chefie	Garlic +bisana	Garlic cloves and Croton macrostachyu pounded together put on the infected area
Stomachache	Honey+ coffee	Swallow

Dry skin	Butter +abish	Buttermix with Trigonella foenum-graecum powder massage the skin specially kids
For Evil sprit	Garlic + Fringed rue	Garlic and fringed rue pounded together smell and hung on the neck
Respiratory problem and vomit	Honey + Ruta chalepensis	To eat Ruta chalepensis powder with honey
Diherrhea	Lineenseed+teff	Eat teff bread with Powder linseed
Pain during manustration	Honey+butter	To drink milted butter with honey
Coughing	Hot injera+ Nigella sativa	Nigella sativadictly add on hot injera,and finaly eat
Anthrax	Honey	To swallow honey before breakfast

#### 4.5. Methods of preparation of Functional Food by using solvents and additive

Some of the remedies are taken with different additive and solvents; the solvent used is mostly water. The additives include butter, honey, milk, sugar, oil, saliva, boiled coffee and citrus juice (Table 10). These additives have importance in reduction of pain, to get better taste and reduced verse effects such as vomiting and diarrhea and enhance the efficacy and healing conditions and developed psychological makeup for example a black cow milk or “yamsaya wotet” as explained by informants. For example, honey with coffee powder, mixed and creamed on face for deceasing *Tenia corporis* (Madiat) and teff flour mix water to make dough, then creamed on burning part of body.

Table 10: Solvents and additives used in medicinal preparation

	Solvents and additives	No - of informants who cited the species	Percentage %
1	Honey	5	20.83
2	Milk	1	4.16
3	Butter	4	16.66
4	Water	4	16.66
5	Saliva	2	8.33
6	Coffee	2	8.33

#### 4.6. Informants' consensus factor

Informants 'consensus factor is further shown that functional food plants that are effective in treating certain diseases and well known by community members also have higher ICF values (Table 11) with the ICF values ranging from 0.25 to 0.88 per illness category

Table 11: Informant consensus factor or ICF

Disease category	No. Of spp.nt.	Use of citation or nur	ICF=nur-nt/nur-1
Malaria	4	10	.66
Pneumonia	2	5	.75
Diarrheal with dehydration	4	12	.54
Hypertension,	3	11	.8
Skin rash "chiffee", Ring worms "kukucha	2	4	.66
Common cold, Cough,	3	14	.84

Bronchitis			
Gastritis	2	5	.75
Rabies,	3	4	.33
Wound	2	4	.66
Fire burn, Skin cut	3	6	.6
Stomach ache	5	8	.42
Bone fracture	4	7	.5
Toothache	2	10	.88
Haemorrhage	2	3	.5
Fungal disease	3	4	.33
Asma	3	16	.86
Tenia corroris or madiat	2	3	.5
Dry skin	2	6	.8
Evil sprit	3	7	.66
Constipation	4	5	.25
Headache	2	10	.88

The analyses done to identify the most preferred species used to compliment the health problem related to hypertension, showed *Allium sativum* is used as the most preferred medicinal and functional plant. According to the preference score and rank, the species scored 37 mentions and ranked first indicating that it is the most effective in treating hypertension followed by *Lupinus albus* and the least effective was *Coriandrum sativum* (See Table 12).

Table 12: Preference ranking of functional food used for treating hypertension

List of functional food	R6	R13	R20	R27	R34	R41	R48	Total	Rank
<i>Allium sativum</i>	6	6	5	5	4	6	5	37	1
<i>Ruta chalepensis</i>	4	3	5	5	4	3	3	27	3
<i>Lupinus albus</i>	6	5	4	5	4	6	4	34	2
<i>Lactuca sativa</i>	2	3	2	4	3	4	3	21	4
<i>Coriandrum sativum</i>	2	3	2	3	3	2	3	18	6
<i>Cinnamomomzoyianicum</i>	4	5	4	3	3	2	3	24	5

The result of the direct matrix ranking showed that *Triticum dicocum* and *Hordeum vulgare* stood first in being the most multipurpose functional food followed by *Allium sativum* *Ruta chalepensis*, *Nigella sativa* and *Sorghum bicolor* were the least

Table 13: Direct matrix ranking to select the most preferred and multipurpose plant

Species	Spice	Function food	Food	Fodder	Construction	Total	Rank
Allium sativum	5	5	5	0	0	15	3
Hordeum vulgare	0	5	5	4	3	17	1
Ruta chalepensis	5	5	3	0	0	13	4
Sorghum bicolor	0	3	5	2	2	12	6
Nigella sativa	5	5	3	0	0	13	4
Triticum dicoccon	0	5	5	4	3	17	1

## CHAPTER FIVE

### 5. DISSCUSION, CONCLUSION AND RECOMMENDATIONS

#### 5.1. DISSCUSION

In previous studies (e.g. WHO, 2004), fruits and vegetables are mentioned as the most frequent plant species mentioned as having disease preventive function. However, as it is obtained from the result of the present study and Hirut (2016), cereals also play a great role in functionality. Cereals contain micronutrients such as vitamin folates, phenolic

acids, zinc, iron, selenium, copper, manganese, carotenoids, betaine, choline, sulphur amino acids, phytic acid, lignin's, lignans, and alkylresorcinols, which all may have potential antioxidant effects (Das *et al.* 2012). Our indigenous food plant, teff is gluten-free and has raised global interest (Kaleab Baye, 2014).

Garlic (*Allium sativum*) has also been traditionally used for the treatment of different diseases since ancient times. The present study evaluates the power of garlic in the study area. Garlic treated asthma, cough, chifie, etc. The antibacterial activity of the paste was less when the heating temperature and time were increased (Romson *et al.*, 2011 and Trinidad *et al.*, 2012).

Among the popular food crops known in Ethiopia, sorghum plays a role in maintain health of the consumers. This food crop is used for the purpose of neutralizing alcohol or to reduce the intoxication from alcohol. Sorghum has a medicinal value having a bounty of antioxidants and photochemicals giving this grain anti-inflammatory property associated with reduced risk of diabetes, heart disease, and other chronic illnesses (Marshal, 2016). Rice is also a grain, which become widely used in the past three decades in Ethiopia. As rice is low in sodium, it is considered best food for those suffering from high blood pressure and hypertension. The rice diet, in combination with milk, creates a marvelous body balance. The naturally lactic acid in milk works with rice protein to aid in the absorption of iron.

Rice has very low fiber content, and is therefore extremely soothing to the digestive system. This makes rice an ideal food for digestive system disorders. Thick gruel of rice mixed with glassful of butter milk and a well-ripe banana given twice a day is a very nutritious diet in typhoid, gastric ulcer, stomach and intestinal cancer (Umadevi, 2012). In the present study, the local community use rice used as a dehydrating and anti-diarrhea food crop.

Honey as a byproduct of plants plays a very important role in antibacterial properties. Honey is used in the Libo-kemkem area for its immunity boosting effects and also for the purpose of healing wounds. It is also used to ease asthma, cough, gastritis, fungus and stomachache. This result is supported by Kazazis (2014) and Vallianou *et al.* (2014), which state that honey

possesses anti-oxidant and anti-inflammatory capacities, which may be useful in chronic inflammation process such as atherosclerosis and diabetes mellitus

## **5.2. Conclusion**

The findings of this study revealed that several plant species are used as functional food in the study area. About 34 functional food species were collected which have a great value to treat a wide spectrum of human diseases. These plants were distributed across 33 genera and 18 families growing over an extended area and used by the local traditional healers living in different gottis in one kebele of the study area. Out of the total collected cereal plants, reported to treat human ailments, one species to treat vaccination of dogs. The local people use functional food for primary health care and unknowingly to treat or prevent very chronic diseases and to avoid free radicals. In the study area people were rich with indigenous knowledge in using functional food role in the community. They have a wide knowledge in using functional food for various purposes such as for medicine, food, fodder, construction and spice. This knowledge is transferred from elders to youngsters entirely through oral traditions and personal experiences. But this way of knowledge transmission will lead to distortion of the original knowledge or total disappearance of the practice. The main threats to indigenous knowledge are caused by modernization, increased business work and negligence of the young generation to have the knowledge in the study area. Hence, based on the results of the study the researcher recommends the following to conserve the natural resources as well as indigenous knowledge.

## **5.3. Recommendations**

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

- ❖ Concerned body like agricultural office and the worda health office of the study area should be involved in conservation of local people indigenous knowledge in their locality
- ❖ Recognition should be given to traditional healers or their indigenous knowledge for functional food.
- ❖ Attention should be given to the usage of functional food and indigenous knowledge of traditional practitioners and Protecting, advising, licensing and encouraging their cultural knowledge.

- ❖ Governments' representative and the community themselves should be documented indigenous skills controlling and managing human diseases in the study area.
- ❖ There is a need for policies to promote/support fruit, vegetable and other functional food consumption.

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## APPENDICES A

### Lists of Informants in the Study Area.

No	. Name	Sex	Age	Marital status	Education Status	Occupation
1	Tigst Mulaw	M	55	Married	>12 Grade	Teacher
2	Nibret Melese	M	56	Married	>12 Grade	Teacher
3	Amare Mebrat	M	48	Married	>12 Grade	Teacher
4	Abay Mengstu	F	60	Divorced	>12 Grade	Agri office
5	Mulu Chane	F	40	Married	Read and write	House wife
6	Fisha Tekelay	M	43	Married	>12 Grade	Teacher
7	Fisha Abebaw	M	32	Married	>12 Grade	plumber
8	Girma Tefera	M	38	Married	>12 Grade	carpenter
	Fikade Molla	M	41	Single	>12 Grade	Teacher
10	Tamire Belay	F	28	Married	>12 Grade	Teacher
11	Tsedal Demelash	F	41	Single	>12 Grade	Agri office
12	Kassie meles	M	46	Married	>12 Grade	Teacher
13	Ephirem Derb	M	45	Married	>12 Grade	Teacher
14	Alen Much	M	30	Bachelor	>12 Grade	Agri office
15	Getalem Molla	M	25	Bachelor	>12 Grade	student
16	Yibeltal Nibret	M	24	Married	>12 Grade	Teacher
17	Getu Taye	M	62	Married	>12 Grade	Retired
18	Adina Tadess	F	50	Married	>12 Grade	Teacher
19	Aberu Mirete	F	75	Married	Illiterate	Housewife
20	Birke Tiruneh	M	80	Married	Illiterate	Farmer
21	Melese Ferede	M	85	Married	Read and write	Farmer
22	Hirut Demelash	F	47	Married	>12 Grade	Office
23	Temesgen Dagn	M	34	Bachelor	>12 Grade	Teacher
24	Densa Asmare	F	36	Married	Illiterate	House wife
25	Baye asmare	M	40	Married	Writing and	Farmer

					reading	
26	muluye simeneh	F	46	Widow	Illiterate	Farmer
27	Molla Moges	M	60	Married	Read and write	Farmer
28	Moges Belachew	M	87	Widowman	Read and write	Farmer
2	Shamble Tizazu	M	28	Married	Read and write	Farmer
30	Belay melese	M	35	Married	Read and write	Farmer
31	Maru Teshom	M	58	Widowman	>12 Grade	police
32	Abebaw Teshom	M	32	Married	Illiterate	Farmer
33	Tarekegn Haile	M	53	Married	Read and write	Farmer
34	Getnet Mekonen	M	31	Married	Illiterate	Farmer
35	Bilew Ayicheh	M	67	Married	Illiterate	Farmer
36	Tigabu Gulima	M	54	Married	Read and write	Merchant
37	She sh Gulima	F	58	Divorced	Illiterate	Farmer
38	Shumet Desse	M	37	Married	Illiterate	Farmer
3	Tsegaw Waligh	M	61	Married	Read and write	Farmer
40	Zemene Tamirat	M	76	Married	Illiterate	Farmer
41	Dele Bizuneh	M	82	Married	Illiterate	Farmer
42	Belaye Yirdaw	F	73	Widow	Illiterate	Farmer
43	A dugna Worku	M	63	Married	Illiterate	Farmer
44	Muche Yigzaw	M	73	Married	Illiterate	Merchant
45	Sendek Ferede	M	65	Married	Illiterate	Farmer
46	Tigabu Amiasalu	M	52	Married	Illiterate	Farmer
47	Ngistie tizazu	F	41	Married	Illiterate	House wife
48	Abay ayal	M	55	Married	Read and write	Farmer
4	Aseres chane	M	73	Married	Illiterate	House wife
50	Tefera Belew	M	57	Married	>12 Grade	Merchant

## APPENDICES B

Questioners/issues prepared for data collections in the study Area

1. Date \_\_\_\_\_ kebele \_\_\_\_\_

2. Name of respondent \_\_\_\_\_ sex \_\_\_\_\_ Age \_\_\_\_\_

2.1. Occupation \_\_\_\_\_

2.2 Marital status \_\_\_\_\_ .2.3. Educational background \_\_\_\_\_

3. What are the most common human health problems in your kebele?

4. Do you use functional food to treat disease in your locality?

4.1 Name some of functional food in your area

\_\_\_\_\_

4.2, which type of cereals abundant in you locality to treat diseases?

\_\_\_\_\_

4.3 Which part of the functional plants was used for treat and prevent diseases?

\_\_\_\_\_

4.4. How to Prepared \_\_\_\_\_

4.5, When used functional food, or before meal or after meal?

\_\_\_\_\_

4.6, Application methods \_\_\_\_\_

4.7, How to treat different diseases the above plant?

\_\_\_\_\_

4.8, Methods of conservation of the plant \_\_\_\_\_

5. Preparation forms (crushed, pounded, powder, with cold water/boiled/juice etc.

\_\_\_\_\_

6. Can chronic diseases prevented by functional food ? A .Yes

B. No

C. I don't know

7. Are you believe the preventive role of functional food? A .yes  B .No



8. □□□□ □□□□ □□□□ □□□□ □□□□ □□□ □□□ □□□□□□  
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## APPENDICE C

*Ruta chalepensis* in the market place



## APPENDIX D

### Tomato in the market

