

***DETERMINANTS OF RURAL HOUSHOLD FOOD  
INSECURITY IN SOUTH WEST SHOA ZONE: A CASE  
STUDY OF SODO DACHI DISTRICT***

**By:**

**TEFERA JAMBO ALEMU**



***A Thesis Submitted to the School of Graduate Studies of Jimma University  
in Partial Fulfillment of Requirements for Award of the Degree of Master  
Science in Economics (Economics Policy Analysis)***

**JIMMA UNIVERSITY  
COLLEGE OF BUSINESS AND ECONOMICS  
MSC IN ECONOMICS**

**JUNE, 2017**

**JIMMA, ETHIOPIA**

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Under the Guidance of

Badassa Wolteji (PhD)

and

Jibril Haji (Msc)



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## ***DECLARATION***

I hereby declare that this research entitled “Determinants of Rural Household Food Insecurity: A Case Study on Sodo Dachi District of South West Shoa Zone”, has been carried out under the guidance and supervision of Badassa Wolteji (PhD) and Jibril Haji (Msc).

The research is original and has not been submitted for the award of any degree or diploma to any university or institutions.

**Declared by**

**Date**

**Signature**

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## ***CERTIFICATE***

This is to certify that the thesis entitled “Determinants of Rural Household Food Insecurity: A Case Study on Sodo Dachi District of South West Shoa Zone”, submitted to Jimma University for the award of the Degree of Master of Economics (Economics Policy Analysis) carried out by Tefera Jambo, under our guidance and supervision.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or diploma.

**Main Adviser’s Name**

**Date**

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**Co-Advisor’s Name**

**Date**

**Signature**

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## **Abstract**

*This study seeks to address these issues by assessing socio-economic and institutional factors that pressure food insecurity of households in rural areas of Sodo Dachi District. The analysis was based on survey data gathered from 270 sample rural households selected purposively following probability proportional sampling procedure. Primary and secondary data were used. The data regarding household determinants were analyzed using descriptive statistics and binary logit model. Inferential statistics such as t-test and chi-square ( $\chi^2$ ) tests were also used to describe characteristics of food insecure and secure groups. This study followed a consumption based calorie deficiency indicator to measure the household food insecurity status using seven days recalling. The survey result showed that about 60% and 40% of sample respondents were food insecure and secure respectively. The empirical results estimated using the survey data to identify the determinants of food insecurity among rural households in the study area revealed mixed impressions. Among variables considered, marital status, slope of land owned by the households, crop type grown by the households, family size, farming experience, the number of livestock units in TLU, credit service and income earned per year showed theoretically consistent and statistically significant effect on food insecurity in the study area, except farming experience which is not consistent with the proposed hypothesis. Generally, the findings suggest that, rural household food insecurity could be reduced through all-inclusive and well-judged combinations of involvements aiming at enhancing income diversification opportunities in rural areas such as off-farm activities, promoting education, improving credit service, limit population size through integrated health and education services, improving rural infrastructural facilities such as roads and introduce appropriate livestock production packages among others. These areas could provide entry points for policy intervention to reduce food insecurity.*

**Key Words:** *Food insecurity, Food security, Logistic model*

## ***ACKNOWLEDGMENT***

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## ABBREVIATIONS

ADLI	Agricultural Development Led Industrialization
AE	Adult Equivalent
CSA	Central Statistical Agency
ETB	Ethiopian Birr
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
HRD	Humanitarian Requirements Document
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Centre
IFPRI	International Food Policy Research Institute
IFRCRCS	International Federation of Red Cross and Red Crescent Societies
MDG	Millennium Development Goal
MoFED	Ministry of Finance and Economic Development
NGO	Non Governmental Organization
PSNP	Productive Safety Net Program
SDDADO	Sodo Dachi District Agriculture Office
SDG	Sustainable Development Goals
TLU	Tropical Livestock Units
UN	United Nation
UNDP	United Nations Development Program
UNICEF	United Nations Children`s Fund
USD	United States Dollar
WFP	World Food Program
WFS	World Food Summits

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1. Background of the Study

Ethiopia is one of the fastest growing economies in Africa. In the last decade, the Ethiopian economy registered a growth of 11% per annum on average in Gross Domestic Product (MoFED, 2014) compared to 3.8% for previous decades (World Bank, 2015). As such, it is rated as one of the fastest growing non-oil exporting economy in the world. Expansion of the services and agricultural sectors account for most of this growth, while manufacturing sector performance was relatively modest.

However, Food insecurity remains a challenge with a growing and more demanding population. Ethiopia is one of the most food-insecure and famine affected countries. A large portion of the country's population has been affected by chronic and transitory food insecurity. The situation of chronically food insecure people is becoming more and more severe. It is highly linked to recurring food shortage and famine in the country, which are associated to recurrent drought. According to FAO (2010), more than 41% of the Ethiopian population lives below the poverty line and above 31 million people are undernourished.

Food insecurity is a lifelong, critical challenge in Ethiopia which is Africa's second populous country after Nigeria. Over 80% of Ethiopian population live in rural areas and are heavily dependent on rain fed agriculture which makes them extremely vulnerable to changes in weather conditions (Christensen et al., 2007; Andersen et al., 2009; World Bank., 2010; Oxfam International, 2010). The current El Niño drought conditions led to a sharp deterioration in food security; the estimated number of food insecure people was 4.5 million due to this vulnerable shock in August, 2015 (FAO., 2015), and by the end of the same year this figure had more than doubled. According to Humanitarian Requirements Document (HRD, 2016), 10.2 million Ethiopians are considered to be food insecure in 2015/16.

Millions of dollars have been dispersed by governments, donors, international aid agencies, and multi-lateral development bodies in the developing countries including Ethiopia to

address the problem of food insecurity and hunger. Ethiopian government and international donors put into practice different types of responses to food insecurity to achieve food self-sufficiency and reduced food aid dependency. Especially after implementation of Productive Safety Net Program (PSNP) in 2005, ample resources were devoted each year by the Government and its partners to reduce both chronic and transitory food insecurity problems. They in turn claim to address the supply and demand side at national and household level, taking into account the diversity of the national economy. Three pillars of the strategy were implemented including increasing the availability of food (supply side responses) through domestic (own) production (i.e. increasing the level and stability of production, increasing food reserve, and influencing international food markets); ensuring access to food (demand based responses) for food-deficit households (i.e. improving income, productive assets available to vulnerable groups, and other market and non-market transfer); and strengthening emergency response capability. Despite the many programs and projects on food security, there are still millions of food insecure people around the world with many of them living in developing countries particularly in Africa (FAO, 2013).

In its first phase of five year (2010/11-2014/15) growth and transformation plan, the Ethiopian government had placed special emphasis on agriculture and rural development specifically to reduce rural poverty and in general to improve overall economic growth. The major focuses of the intervention were reducing food insecurity status of rural households and making the country free from foreign aid by ensuring farmers possible maximum benefits from the agricultural sector (MoFED, 2015). Yet despite progress made food insecurity still remain as number one development agenda. The country faced severe drought leading to failed harvests and shortages of livestock forages in 2015. Food insecurity and malnutrition rates are alarming with some 10.2 million people in need of food assistance and aid in 2016 and causing inflationary pressure that sustain food insecurity problem existed for several decades (AEO, 2016)<sup>1</sup>. So, this study was aimed at assessing and analyzing the possible determinants of food insecurity at household level.

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<sup>1</sup> African Economic Outlook(AEO) 2016 ([www.africaneconomicoutlook.org/africa/ethiopia](http://www.africaneconomicoutlook.org/africa/ethiopia))

## 1.2. Statement of the Problem

Food insecurity is a perennial problem in the rural area of Ethiopia due to its vulnerability to expanding natural and man-made disasters for which institutional capacities and technological solutions are not yet developed. The agricultural sector is subsistence agriculture largely detached from helpful research and extension services (Mitiku and Legesse, 2014). Ministry of Finance and Economic Development (MoFED, 2013) reported that among the varieties of shocks Ethiopian households face, food insecurity and food price shocks are the most common. A large portion of the country's population has been affected by chronic and transitory food insecurity (African Development Bank, 2014). In the history of Ethiopia, drought initiated production failures occurred in the 1984/85, and 1989/90s. Three years of successive poor rains in pastoral areas of the country was led to 100,000 deaths in 1999-2000; crisis years were also experienced in different parts of the country in 2003, 2008, 2011 and 2013 (DFID, 2014).

In this direction, Catley *et al.* (2016) cited by Abduselam (2017) reviewed that, the 2015 El Niño<sup>2</sup> drought is one of the strongest droughts that have been recorded in Ethiopian history. Furthermore, there is evidence that climate is already changing leading to serious drought. The drought pattern has been 10 years in case for Ethiopia, but at present time the cycle period is becoming shorter and shorter which leads to serious food security problems in every three years. The main causes of food insecurity are high population growth rate, high reliance on small-size and rain-fed agricultural holdings, susceptibility to drought, land degradation and decreased productivity, lack of access to input, high limited access to basic service, lack of access to credit and market, lack of income generation opportunity and alternatives, information lag on market, agricultural technology and etc.

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<sup>2</sup> El Niño: - is a naturally occurring event in the equatorial region which causes temporary changes in the world climate. Now, El Niño has come to refer to a whole complex of Pacific Ocean sea-surface temperature changes and global weather events.

The Government of Ethiopia released the 2015 Humanitarian Requirement Document (HRD). The document identifies humanitarian food and non-food requirements for vulnerable groups in the country following on the multi-sectoral ground assessment conducted at the end of 2014 (UNICEF, 2015). According to HRD an estimated 2.9 million people require relief food assistance in 2015, an increase from 2.7 million for the same period in 2014. All of the above data indicate that food insecurity situation in Ethiopia has been a long-standing challenge to the government, donors, and other international organizations.

Several studies analyzed factors that determine food insecurity at national and household levels in Ethiopia. Drought, Per capita land holding, livestock availability, education, household per capita income from agricultural and non-agricultural activities, soil fertility and conflicts have been some of the major and commonly cited factors in the literature (Sene, 1981; Madeley and Devereux, 2000; Demeke, 2002; Mulugeta, 2002; Workineh Nigatu, 2004; Gebre-silassie and Samuel, 2005; Alem, 2007; Bogale and Shimelis., 2009; Amsalu et al., 2012; Meseret, 2013). However, the findings indicated the problem of food insecurity has big diversity and complex, which range from the global, regional, country, local, household to individual level. External factors that commonly bring food insecurity in one place may not necessarily be same in the other places and food insecurity as well as its determinants could be varying over time.

According to South West Shoa Zone Agricultural Coordination report of the Safety Net Program beneficiaries in the year 2017 more than half of the total population of the district were targeted as beneficiaries and less number of population recorded from the program implies that, the district population are being affected by food insecurity worse than others. Empirical data is required to design and implement appropriate food security interventions. Therefore, this study attempts to fill this gap by conducting an empirical research on the determinants of rural households' food insecurity that is needed to guide policy decisions, device appropriate interventions and efforts to combat vulnerability to food insecurity, using the latest rural households' survey data in 2017. It was anticipated that the results obtained would add to the wealth of information currently available on the determinants of food insecurity in the district in particular and Ethiopia in general.

### **1.3. Objectives of the Study**

#### **1.3.1. General Objective**

To identify and analyze the main determinants of rural households' food insecurity in Sodo Dachi district of South West Shoa Zone, Oromia Regional state of Ethiopia.

#### **1.3.2. Specific Objectives**

- i. To examine socio-economic and institutional characteristics of rural households in the study area
- ii. To determine the status of household food insecurity among rural households in the study area and
- iii. To investigate main determinants of food insecurity in the study area.

### **1.4. Significance of the Study**

This study was focused on evaluating determinants of rural household food insecurity in Sodo Dachi district of Ethiopia. Evaluation of factors related to food insecurity is relevant as it helps to provide empirical evidence to either validate or deny the existing arguments in relation to the factors bringing food insecurity. The results of the study will help policy makers and other stakeholders to design appropriate policies and interventions at district, zonal, regional and national level and used as a reference for further study on related topics.

### **1.5. Scope and Limitation of the Study**

The study was focused on determinants of rural households' food insecurity in Sodo Dachi district of South West Shoa Zone. This could be seen as the foremost scope and limitation of this study. Other districts of the zone were beyond the scope of the study. The study also focused on rural households, while urban households were beyond the scope of this study. Absence of reliable data in the district office was also presented limitation to this study. To overcome this problem, primary data was collected from targeted households.



## **1.6. Organization of the Paper**

The rest of the paper has organized as follows. Chapter two presents a review of past literature on food insecurity and related issue. Chapter three outlines the research methodology, chapter four provided results and discussion, chapter five conclusion and recommendations and finally References and Appendixes.

# CHAPTER TWO

## 2. LITERATURE REVIEW

### 2.1. Basic Concepts and Definitions of Food (In) security

Food (in) security, as a concept, originated in 1970`s. A number of definitions have been developed by different authors at different times. The United Nations Food and Agriculture Organization`s (FAO, 1996) defined food security as when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

The World Bank (1996) defined food security as, year round access to the amount and variety of food required by all household members in order to lead active and healthy lives, without undue risk of losing such access. The International Federation of Red Cross and Red Crescent Societies (IFRCRCS, 2006) also defined food security in a generalized form just based on the three important pillars: food availability, food access and food utilization. Food availability in a country, region or local area means that, food is physically present because it has been grown, manufactured, imported and/or transported there. For example it is available because, it can be found on markets, produced on local farms, land or home gardens and arrives as part of food aid. Food access is the way different people can obtain the available food. Food utilization on the other hand, is the way people use the food and is focused on the quality of the food, its preparation and storage method, nutritional knowledge as well as on the health status of the individual consuming the food.

Food insecurity can be approached in different ways. It is a multi-disciplinary concept which takes into account of technical, economic, social, cultural and political dimensions (FAO, 2010). It also states, the concept of food security must form part of the broader concept of food strategy, which in itself forms parts of a socio-economic development strategy and poverty reduction policies. Nowadays, widely used definition of food security is a condition where all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Conversely, food insecurity was defined as Limited or uncertain availability of

nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

A research report for Department of Environment, Food and Rural Affairs (Lambie-Mumford et al, 2014) used a similar definition: “Household food security is assured when members are confident of having economic and physical access to sufficient, acceptable food for a healthy life.” This definition also takes into account availability, access and utilization. It believes that food availability is achieved when sufficient quantities of food are available to all individuals, where as food insecurity is defined as lack of access by people to enough food for an active and healthy life. It describes the phenomenon of food deficit in the household and the community level, which results from the deterioration of food production capacity or lack of income to purchase adequate food.

## **2.2. Theoretical Frameworks**

A clear understanding of the theory of food insecurity is an essential element to better understand household food insecurity status and its determinants. Different researchers have come out with a number of theories to explain food insecurity. However, Devereux (2001) argues that there is no single and complete food insecurity theory developed. Food insecurity theories vary according to the interest and ideological differences of authors. Household food insecurity situation in rural areas is whether the household cannot produce sufficient food from own production or sell livestock and purchase food grain of the right quality in the market place. This implies unavailability of enough food and the incapability of the household to acquire it determines household food insecurity. Therefore, it is possible to group the existing theories, which emphasized on availability and entitlement. As a result, model of food in/security such as Food Availability Decline (FAD) and Food Entitlement Decline (FED) were considered for this study.

### **2.2.1. Food Availability Decline (FAD) Theory**

Food Availability Decline Theory explains that famine or food shortage occurs when there is an aggregate decline in food supply. According to this theory people starve because of a local, national or regional decline in food availability to a level below the minimum necessary for survival. However, FAD theory has been criticized for its only dealing with supply side which disregards the demand side. This theory said nothing about people's income and purchasing power. Furthermore, it failed to address the vulnerability differences and access to food from outside the affected area (Sen, 1981; Devereux, 2001). According to FAD theory, a decline in food availability may be attributed to many factors. The two most important and frequently used factors are: Demographic factors and climatic factors.

#### **2.2.1.1. *Demographic Factors***

There are two competing theories regarding the relationship between population growth and food availability. One argues that population increases in a geometric progression while food production increases in arithmetic progression. Therefore, unless population increase is checked, it tends to outstrip food production and famine or starvation will occur. This argument is originally the work of Thomas Malthus who developed the theory of rapid population as a cause of food shortage or famine. Malthus' theory, however, is criticized for his failure to consider the technological improvements in agriculture which would enhance productivity.

The second theory on population and food availability argues large population size as positive stimulus for growth. Proponents of this view are Easter Boserup and Karl Marx. For Marx's model, the root causes for food insecurity are related to the organization of production. Boserup considers population growth as a favorable factor for agricultural production. She recognizes population growth as a force favoring technological innovations that expands agricultural production thereby reducing vulnerability to food shortage and hunger (Millman & Kate cited in Degefa, 2005). Devereux (2001) also argues that famine or food shortage is not necessarily related to population growth. He reasoned out that, countries such as China, Russia and West Europe have histories of famine and that in spite of much larger populations, famine doesn't occur today in these countries.

### **2.2.1.2. *Climate Factors***

Many scholars argue that climatic factors such as too much rainfall or lack of rainfall cause crop failure and can lead to food shortage or famine. Some associate the recent incidence of famine with that of global climatic change. Climatic variability like drought or flooding have adverse impact and can cause reduced crop yield, livestock losses, and drinking water shortages. These have social consequences such as forced sale of household assets, ecological degradation, increasing price of food and therefore food become inaccessible to poorest households, unemployment and out-migration, diseases outbreak, destitution, hunger or famine (Glantz Ribot cited in Zenebe, 2001). However, opponents of climatic based explanations argue that famine could occur without any abnormal weather due to various socio-political and economic processes.

### **2.2.2. Food Entitlement Decline (FED) Theory**

According to the Food Entitlement Theory, food availability at global or national level alone could not bring food security at household level. Thus, has contributed significantly to the shift of emphasis to household and individual level of analysis. A household may suffer from food shortage in a country where adequate food is available. Thus, food shortage becomes a matter of lack of access that is either inability to produce or being unable to purchase food. Households become food insecure because of failure in entitlement. A growth in domestic production does not necessarily prevent famine or hunger as far as what is produced is not equally distributed and the entitlement system that determines access to food is not changed. Sen (1981) argues that, one is entitled to food through four possible sources of entitlement. It could be through trade, production, application of one's labor or through gift and transfer. The ability of a person to command food is therefore determined by what he owns (endowment) and the bundles of alternatives that can be obtained through exchange entitlement.

The strong points of FED approach is, its potential capacity to identify which groups of people will be more vulnerable by various threats of availability or access to food. However, the model has also certain weaknesses and is subject to criticism. The main limitations are

its failure to consider intra-household distribution of food, exclusion of entitlement through aid food and non legal transfer of resources (Maxwell and Smith, 1992; Devereux, 2001).

Trade-based entitlement, according to Sen (1981), is the entitlement of an individual where she/he can buy with the commodity or cash owned. On the other hand, Production based entitlement describes ownership of what one produces using ones owned resources or using others resources through mutual agreed trade conditions. Own labor entitlement explains about the sale of one's own labor and hence trade and production based entitlements that are related to one's own labor. Inheritance and transfer entitlement refers to one's right to own resources that are willingly given by others in the form of inheritance, remittance, gifts, food aid and transfer from the state in the form of pension food ration or social security.

In general, based on their area of concern and interest, researchers emphasized on one aspect of the problem and overlooked the other aspects. For instance, proponents of FAD theory emphasis on food availability but availability alone did not ensure accessibility. On the contrary, the proponents of FED theory overlooked the importance of availability. The availability component is very crucial to ensure access to food.

### **2.3. Global and Sub-Saharan Africa Food Insecurity Situations**

Food insecurity remains a challenge with a growing and more demanding population. It perceived at the global, national, household and individual levels (Khan et al. 2012). Globally, about 805 million people are estimated to be chronically undernourished in 2012-14, down more than 100 million over the last decade and 209 million lower than in 1990-92. In the same period, the prevalence of undernourishment has fallen from 18.7-11.3% globally and from 23.4-13.5% for developing countries (FAO, 2014). The same source also indicated that, 791 million people in developing countries were estimated to be chronically hungry in 2012-14, down by 203 million since 1990-92.

However, according to the report of food and agricultural organizations of United Nations report on food crises (FAO, 2017), 108 million people in 2016 were faced Crisis level food insecurity or worse. This represents a 35% increase compared to 2015 when the figure was almost 80 million. The acute and wide-reaching effects of conflicts left significant numbers

of food insecure people in need of urgent assistance in Yemen, Syria, South Sudan, Somalia, northeast Nigeria , Burundi and Central African Republic.

Africa is the most vulnerable continent to problems of food insecurity compared to the rest of the world. The type of food insecurity observed in Africa, specifically in sub-Saharan Africa is a combination of widespread chronic food insecurity, resulting from continuing or structural poverty, transitory emergency-related food insecurity, which occurs in periods of intensified pressure caused by natural disasters, economic collapse, or conflict (FAO, 2004). The major challenge to food security in Africa is the underdeveloped and underperforming agricultural sector that is characterized by over-reliance on primary agriculture, low fertility of soils, ecological degradation, significant food crop loss both pre- and post-harvest, low levels of education, social and gender inequality, poor health status, cultural insensitivity, natural disasters, minimal value addition and product differentiation and inadequate food preservation that result in significant commodity price fluctuation(Mwaniki, 2005).

The world demand for food is growing rapidly due to population increase and farmers are expected to produce significantly large amounts of food to meet this pressing demand. Agriculture is expected to play a leading role to arrest the situation and feed a global population that will number 9.6 billion in 2050, while providing income, employment and environmental services (FAO, 2014). Food insecurity has become a global challenge particularly in Sub-Saharan Africa where the rate of population growth far exceed the quantity and quality of food needed to feed the population. The current available estimates indicate that about 795 million people in the world just over one in nine were undernourished in 2014–16 whereas the projection in Africa alone was 233 million people (FAO, 2015; WFP, 2015).

## **2.4. Overview of Food Insecurity in Ethiopia**

Food insecurity in Ethiopia had been and still is the most series problem of the country's Economy. MoFED (2013) reported that among the varieties of shocks Ethiopian households face, food insecurity and food price shocks are the most common. In spite of its vast agricultural potential, Ethiopia has been trapped in the state of food insecurity and poverty. The country has been chronically dependent on food aid and it is currently one of the largest

recipients of food aid in Africa. The food security situation has been extremely unstable due to the combination of environmental, socio-political and developmental instabilities.

Food shortages and high levels of malnutrition continue to affect a large number of people in several parts of Ethiopia. Veen and Tagel (2011) stated in their study, food insecurity among the Ethiopian population is widespread. Degye *et al.* (2013), also determined food security status of households based on their daily calorie availability in Central and Eastern highlands of Ethiopia and stated that majority of households were food insecure or calorie-deficient. The study identified 26 food items consumed in each food group, of these food items, only 40% of the households consumed more than three food groups.

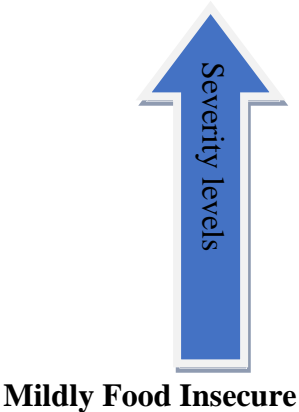
Decline in production of cash crops, livestock productivity and price instability are associated with income shortage which leads to food insecurity. Grain prices fell below the historic average (Shumete, 2009). These reduced prices created a disincentive for input use by producers. He also quoted the notion of one woman concerning food insecurity anxiety in Southern part of the country as “When you would get up in the morning, you would begin to worry if you are going to have enough food to make dinner and if you did have enough food to get through today and tomorrow would be another headache”.

Nowadays, conflicts, political instability, floods and failed rains caused by *El-Nino* have sparked a sharp rise in the number of people going hungry in the different parts of the world. Ethiopia also confronted the worst drought because of climate change and other factors. Triggered by *El-Nino*, the drought has a significant impact by limiting agricultural production, straining livelihoods and exacerbating food insecurity among poor and vulnerable households. According to Humanitarian Requirements Document (HRD, 2016), about 10.2 million people were in need relief food assistance in Ethiopia in 2015/16. This figure is greater than the number of population in need of food assistance in 2002. It is therefore possible to conclude that 2015/16 drought is more serious than 2002 drought. At present different nations are providing financial support to the country. It was predicted that, as the impact of *El-Nino* continued throughout 2016, Ethiopia is likely to experience both prolonged drought and intense flooding in various parts of the country that will further deteriorate food security over the coming few years.



Vulnerable groups employ different survival strategies/mechanisms to handle hazard situations of food insecurity by mobilizing all available resources to resist the food insecurity problem in Ethiopia. These mechanisms range from adjusting available resources to involving in criminal activities to cope up with food insecurity problems (Shumete, 2009). The dimensions, causes, and consequences of food insecurity differ widely within the country. Similarly, the severity levels of food insecurity and the survival strategies differ among household and communities of the country.

Table 1: Food insecurity levels and survival strategies

Severely food insecure	Survival Strategies/mechanisms
 <p data-bbox="245 1108 542 1146"><b>Mildly Food Insecure</b></p>	<ul style="list-style-type: none"> <li data-bbox="721 730 878 762">➤ Begging</li> <li data-bbox="721 800 1430 831">➤ Looking for help from religious or social institution</li> <li data-bbox="721 869 1170 900">➤ Farmland pledging and the sale</li> <li data-bbox="721 938 1227 970">➤ Daily wage labor, use of child labor</li> <li data-bbox="721 1008 1300 1039">➤ Firewood collection and charcoal burning</li> <li data-bbox="721 1077 1365 1108">➤ Crop and Livestock adjustment, Asset disposal</li> </ul>

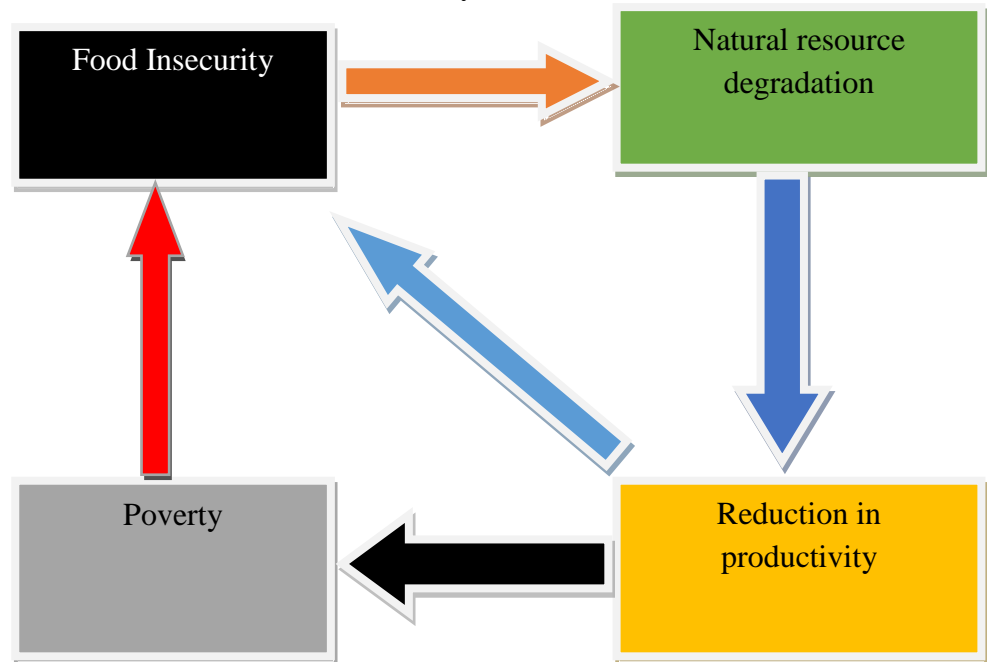
Source: Based on Shumete (2009)

Agricultural sector is the pillar of Ethiopia’s economy. Most of the agriculture is carried out in the rural areas where the rural population accounts 85% of the country’s population. The sector contributes 85% of labor force employment, 90% of foreign exchange and 50% of gross domestic product. Most importantly 90% of the agricultural output is contributed by small scale farming (Abebaw *et al.*, 2010).

The nature of mass poverty and the alarming rate of environmental degradation are closely related. Poverty in the rural area is resulted mainly from the reduction of agricultural productivity or stagnation of the agricultural sector. The solution to poverty and food insecurity is productivity growth. Unless there is productivity growth, incomes and employment cannot be raised much over the long run, and redistribution of resources cannot be effective if there is not much income to redistribute. Growth is itself an effective option

for reducing poverty and food insecurity. The chain between poverty, natural resource degradation and food insecurity is depicted hereunder (Figure 1).

Figure 1: Chain between Food insecurity and other factors



Source: Own conceptualization

Ethiopia has grown at a rate between 8 percent and 11 percent annually for more than a decade and the country is the fifth-fastest growing economy among the 188 IMF member countries. Gross Domestic product of the country grew 8 percent in 2016 compared to last year. This rate is 24-tenths of one percent less than the figure of 10.4 percent published in 2015 ([www.countryeconomy.com](http://www.countryeconomy.com)). This growth has been driven by sustained progress in the agricultural and service sectors. Yet despite progress toward eliminating extreme poverty, Ethiopia remains one of the poorest countries in the world, due to rapid population growth and a low starting base. Changes in rainfall associated with world-wide weather patterns resulted in the worst drought in thirty years in 2015/16, creating food insecurity for millions of Ethiopians. The GDP per capita in Ethiopia averaged USD 247.72 from 1981 until 2015, reaching an all time high of USD 486.27 in 2015.

## **2.5. Empirical Literature Review**

### **2.5.1. Causes and Dimensions of Food Insecurity**

In the real world there are so many factors that may cause food insecurity. The factors that cause food insecurity are wide and vary from place to place. But, the very important causes draw out from natural disasters up to man-made policy issues. There is no one single means for the food crisis to exist. A plentiful of factors including drought, poverty, rising food prices, unemployment, landlessness, lack of drinking water and civil conflict are all commonly cited as contributing factors of food insecurity (Anna Rabin, 2011).

Hamza and Iyela (2012) stated that climate change has the potential to adversely affect net farm revenues of small-holder farmers with increasing land fragmentation due to population growth translating to worsening food insecurity situations. They argued that, focusing on measures of vulnerability, adaptation options and the development of adaptive capacity to reduce the adverse impacts of climate change needs to be necessary in the rural areas of Ethiopia.

FAO (2012) reported that some factors such as natural hazards, armed conflict, population growth, land holding size, unsustainable exploitation of the fragile ecosystem, low-agricultural productivity, neglected pastoralist, weak knowledge and information systems, narrow livelihood base, uneven effects of liberalization of the markets, weak infrastructure, poor health including HIV/AIDS, and low standards of education are causative for food insecurity to exist. In Ethiopia, for example, almost 40 percent of farming households have less than 0.5 ha of land, and more than 60 percent have less than 1 ha, for which they use this land as a primary source of their income to support a family members of about six to eight on average. More-over the supporting environment do have influence like weak economies, reduced aid, lack of pro-poor policies or measures to ensure food security over centralized governance, aid responses, and the global environment (FAO, 2012).

Identifying determinants of food insecurity requires examining the major dimensions of food insecurity. Food availability addresses the supply side of food security and is determined by the level of food production, stock levels and net trade. However, it became obvious that an

adequate supply of food at the national or international level does not in itself guarantee household level food security. This shows that household level food security can only be achieved under the condition whereby in addition to food supply at national level, households have entitlement to those food items. Therefore, it is useful to understand the aggregate as well as more specific indicators like macroeconomic and demographic factors in food consumption analysis (Suresh, 2009). This idea was supported by the argument that the green revolution in Asia of the 1960s and 1970s, with its package of improved seeds, farm technology, better irrigation and chemical fertilizers, was highly successful at augmenting food supplies. But this was not automatically translated into improvements in food security of all people. This insight highlighted the problem of a lack of effective demand. Even if people have money, if there is no food available in the market, people are at risk of food insecurity. Sen (1981) and Suresh (2009) in their study stated that the mere presence of food in the economy or in the market does not necessarily entitle a household or a person to consume it. They argued that, it can be affected by different factors like infrastructures; road and market outlets to buy food items which determine as well as more specific households physical access to food.

Food utilization has become increasingly prominent in food insecurity discussions since 1990s. Utilization is commonly understood as the way the body makes the most of various nutrients in the food. This food insecurity dimension is determined by people's health status. General hygiene and sanitation, water quality, health care practices and food safety and quality are determinants of good food utilization by the body. According to Suresh (2009), the consumption of foods, both in quantity and in quality that is sufficient to energy and nutrient requirements is a basic measure of food utilization. It is not just about quantity of food consumed, but also about quality and that body must be healthy to enable the nutrients to be absorbed.

### **2.5.2. Determinants of Food Insecurity**

Several factors have been identified as the main determinants of food insecurity by different scholars. These factors have been grouped into various categories such as socio-economic and institutional characteristics. Mitiku and Legesse (2014) in the study of determinants of rural households food security revealed that factors such as, family size, cultivated land size, total farm income, off-farm income and livestock ownership of households had significant influence on household food security status. It is therefore reasonable to say that these factors should be addressed at household level to realize food insecurity. In addition, a study by Kidane *et al.* (2006) using a logistic regression procedure in Koredegaga peasant association, Oromia Zone showed that, farm land size, ox ownership, fertilizer application, education level of household heads, household size, and per capita production were determinants of rural household food insecurity. Their analysis of partial effects revealed that an introduction to fertilizer use and an improvement in the educational level of household head resulted in higher changes in the probably of food security. This indicates that, the adoption of agricultural technologies such as fertilizer and increasing the educational status of households plays an important role in determining rural households' food insecurity in particular and improving economic growth in general. Therefore, there is a need to look for policy options which are targeted at enabling farmers to increase consumption of agricultural technology and improve rural households' food security level.

Much of the literature on food insecurity analyzed factors that influence seasonal food insecurity of rural households using appropriate regression models. Wilma *et al.* (2003) used a logistic regression model to predict seasonal household food insecurity. According to their findings, the probability of a household being seasonally food insecure decreased, when the household has a vehicle, has many types of appliances, their toilet facility is water-sealed, has more bed rooms, the mother is employed and the educational attainment of the mother is high. This shows that households that have other source of income and educated household member may be less food insecure than the other.

Another study by Ramakrishna *et al.* (2002) made an assessment on food insecurity situation in North Wello Zone of Ethiopia using a binary logistic regression model. Their results

pointed out that, cereal production, educational status of the household head, fertilizer consumption, household size, land size, and livestock were found to be the most determining factors of household food insecurity. Along with food availability and entitlement factors, the study suggested that attitudinal variables also influence food insecurity. Another study by Amsalu *et al.* (2012) entitled An Empirical analysis of the determinants of rural households food security in Shashemene District of Ethiopia justified this one. Similarly, according to Haile *et al.* (2005) cited by Hiwot Yirgu (2014), stated, fertilizer use is taken to be a proxy for technology in most literatures. How a given technology is being used is a key point in determining the level of production and it can be actually influenced by many government interventions, incentives and disincentives (Foster 1992). Calorie intake and food security are influenced by use of fertilizer as it boosts agricultural production (Rutsch as cited in Haile *et al.*, 2005).

The result of the study by Fekede *et al.*, (2016) in Hawi Gudina district, West Hararghe zone on determinants of farm household food security showed that family size, livestock ownership, distance from market centre, access to non-farm activity and cash crop production were statistically significant variables in determining food security. By using binary logit model, their study also pointed out, the probability of being food secure increase with high livestock ownership, access to non-farm activity and producing cash crops while large family size and far from market centre reduce the probability of household to be food secure. They stated that, this might be due to the fact that households in the study area owned large number of livestock, engaged in non-farm activity and producing cash crops and though absence of family planning and enough market. Thus, study findings recommended, promotion of family planning program, develop infrastructure, provision of non-farm activity and agricultural input and training for community should be considered to improve household's food security and reducing food insecurity.

Birara *et al.* (2015) on Assessment of Food Security Situation in Ethiopia showed that Population pressure, drought, shortage of farmland, deterioration of food production capacity, plant and animal disease, frost attack, shortage of cash income, poor farming technologies; and pre and post harvest crop loss are major causes of food insecurity. Depending on reviewed document, they stated that, Sale of wood or charcoal, small scale

trading, institutional and societal income transfer systems, limiting size and frequency of meal were major coping strategies. Therefore to address food (in) security issue in Ethiopia, the household head and members of the household should engage in different income generating activities for means of living and coping mechanism and also the government of Ethiopia should incorporate different research outputs to design programs and tackle food insecurity. Thus, there is a need to do further research to identify this problem and to contribute for improved food security in Ethiopia.

Several studies analyzed factors that determine food insecurity at national and household levels in rural areas. drought, per capita land holding, livestock availability, education, household per capita income from agricultural and non-agricultural activities, soil fertility and conflicts have been some of the major and commonly cited factors in the literature (Madeley, 2000 Ramakirshina and Demeke 2002; Workineh Nigatu, 2004; Gebre-silassie and Samuel 2005). External factors that commonly bring food insecurity in one place may not necessarily be same in the other places and food insecurity status and the determinants could be varying over time. They concluded that there is a trade-off between factors that determine food insecurity in the rural area of Ethiopia. However, generally, ensuring food security remains a challenge in Ethiopia with a growing and more demanding population.

The bulk of the empirical evidence available on the analysis of food insecurity in Ethiopia are mainly based on caloric intake and self reported status of households' food consumption behaviors' as a measure of food security. Majority of the studies were carried out at the level of specific district and region and fail to capture the diversity in agro-ecology and livelihood patterns in the country. However, in Sodo Dachi district, nothing studies on household level determinants of food insecurity and food security status was done before. This study, therefore, attempts to fill in such gap and there is a need to look for policy options which are targeted at enabling households' to be food secure.

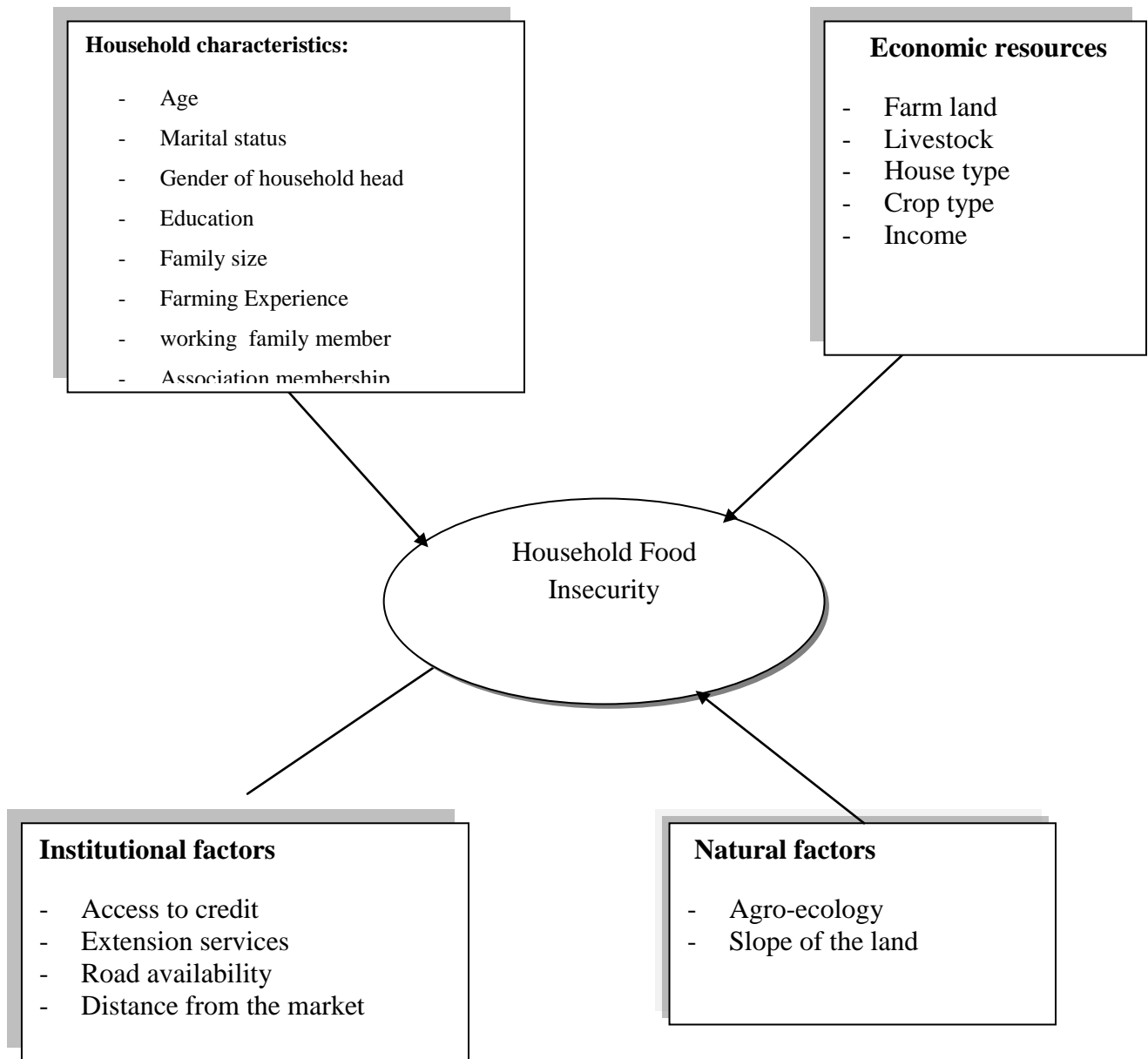
## 2.6. Conceptual Framework

The dimensions of household food insecurity and its determinants are important to undertake studies on food insecurity. Food insecurity has been determined by several factors over time from different perspectives. These factors were classified into socio-economic factors and institutional factors. Socio economic factors include household related variables such as household characteristics (demographic characteristics) and ownership, while institutional factors include access to the market, road, information, credit and other external variables. These factors are framed to show the household food insecurity issues cannot be seen in isolation from these broader factors.

It was hypothesized that several factors enhance food insecurity of households in rural areas. A household with less farming experience, less formal education level and higher number of family member and less working family member is likely to be food insecure. Thus, the less farming experience, formal education level, higher number of family member, less working family member, the higher the likelihood of households to be food insecure. Land and livestock ownership have negative effect on food insecurity of rural households. If a household owns livestock, he would have better sources of income for instance animal products. This increases likelihood of food secure. Household's participation in off-farm employment to support the income obtained from farming activities thereby to improve food consumption also determines the food insecurity. Better access to information has negative effect on food insecurity. Households can get information from local farmers associations, extension services and information media. Thus, improvement in access to information could decrease households' tendency of food insecurity. Moreover, the institutional factors and other external factors such as infrastructural facilities for instance credit, road accessibility, market and market related information, agro- ecologies and the nature of the land owned by the rural households plays a crucial role in reducing rural households' food insecurity through improving production and productivity. Generally, these variables and their relationship can be presented diagrammatically hereunder.



Figure 2: Determinants of food insecurity



Source: Own conceptualization

# CHAPTER THREE

## 3. METHODOLOGY

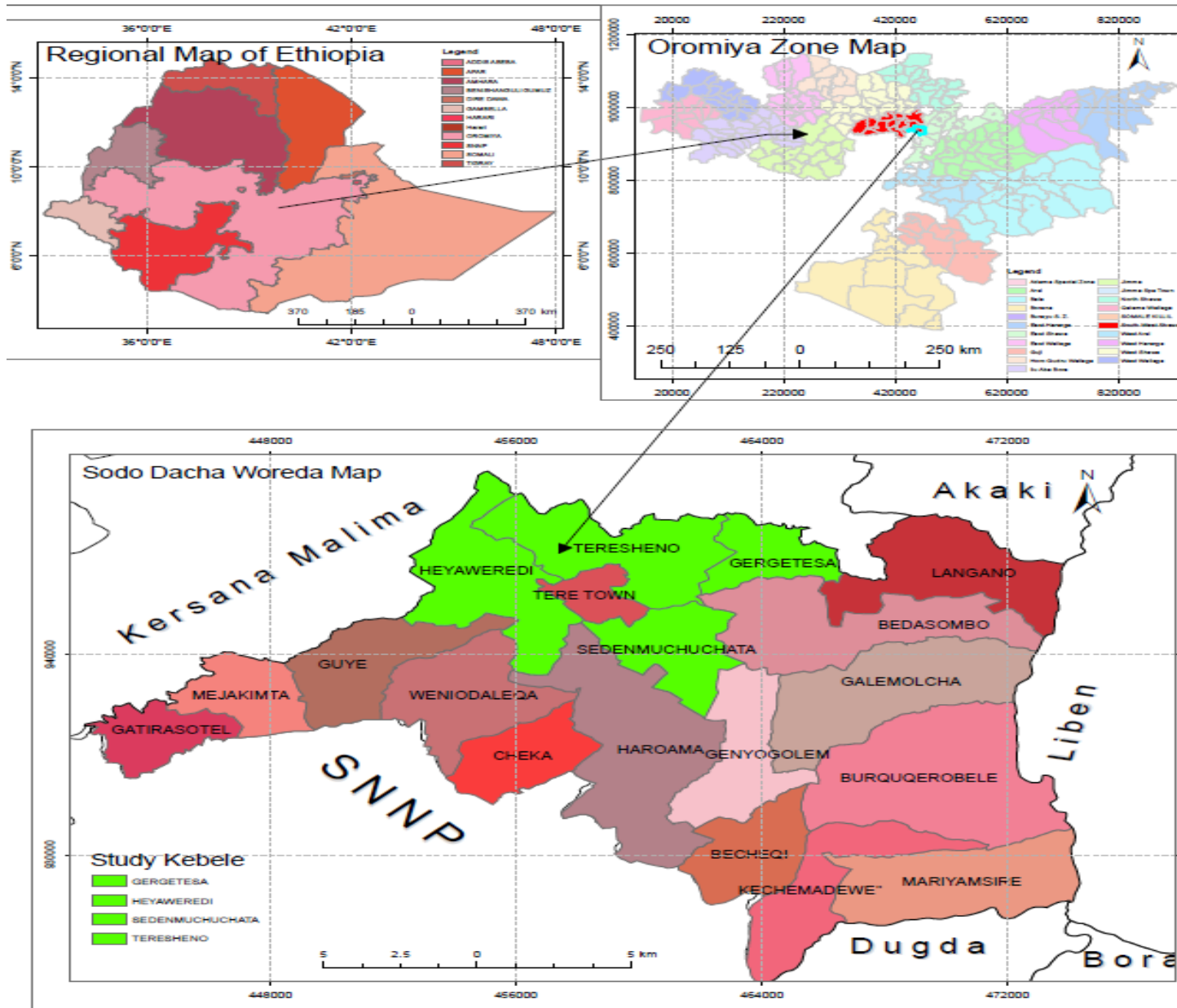
### 3.1. Description of the Study Area

This study was conducted in Sodo dachi district, South West Shoa Zone, Oromia Regional state of Ethiopia. Sodo dachi district is situated on 8°36' to 8°71' north and 38°34 to 38°71' east. The district is located at 74km south of Addis Ababa; the capital city of the country. It is bordered on the south and south west by SNNPR state, on the north by Kersa malima district and Akaki and on the east by Dugda Bora district and Liben. Its climate is characterized by tropical and warm to cold humid temperate. This district receives an average temperature that ranges from 10-19 °C and the rainfall that ranges from 974-1319 mm annually. The highland part of the district is characterized by moderate with an average temperature of 10-15 °C and 1170-1319 mm rainfall. The vegetation type in the district is juniperous forest, podocarpus, sub afro alpine region with discontinuous canopy and larger trees limited in spatial cover. Most parts of the woodland are interspersed with cultivated land. The cultivated landscape includes home gardens in the living quarters, small-scale nearby farms and distant farm that stretch out from the residential sites. The spatial layout in home gardens, crop fields, and adjacent areas presents a complex pattern of crop distribution. Only a small proportion (10.91%) of the land is under dense shrub-open grassland. Bush, shrub, and grassland are often intermixed with intensively and moderately cultivated land in the buffer zone between the highland and midlands especially in northeast part of the district. The climate of a year is characterized by two rainy seasons, mainly summer and scattered spring. Summer season lasts for five months (June to October) while spring season lasts for three months (March to May) bimodal rainfall pattern prevails (SDDADO, 2017).

The district has a population of 57,629, of which more than 85% depend on agriculture for their livelihood and majority of them are smallholders owning a plot of less than 5 hectares. The major agricultural crops grown in the district include wheat, maize, teff, beans, potato and vegetables amongst others (SDDADO, 2017). Although, agriculture has been the main

activity in the district, agricultural productivity remains low. The high potential for agricultural production with low productivity might be resulted in food insecurity. This was the reason which has made this area to be chosen for this study to identify factors contributing to food insecurity of rural households in the study area. Generally, Sodo dachi district is shown below on the map depicted hereunder.

Figure 3: Map of the study area



Source: SDDADO, 2017

### 3.2. Research Design

Primary data whereas collected using a household survey design. This was preferred because it allows collection of primary data where the population is large. The study used descriptive survey design and the design was preferred because it allows analysis of both quantitative and qualitative data. Descriptive survey also helps to describe characteristics of targeted individuals or groups.

### 3.3. Sampling Procedures and Sample Size

This study targeted rural households in Sodo dachi district of south west shoa zone, Oromia regional state of Ethiopia. Two stage sampling technique was used to identify respondents for the study. In the first stage, purposive sampling of *kebeles* was done selecting Terre shino, Saden mucucata, Garagatessa and Hayaweradi. These kebeles experience relatively similar agro climatic conditions. On the second stage, random sampling was applied to choose appropriate sample from selected Peasant Associations (PAs), due to the fact that, the exact number of food secure and insecure households were unknown.

As suggested by Yamane (1967), since the population number (number of targeted population) is known in the study area, the following formula can best provide the required sample size for this study.

$$n = \frac{N}{1 + N(e^2)} \dots\dots\dots (1)$$

Where;  $n$  is sample size,  $N$  is the population size; total number of the households in the study area,  $e$  is allowable margin of error ranging from 0.05 to 0.1 percent. Margin of error shows the percentage at which the opinion or behavior of the sample deviates from the total population. Therefore, for this study, allowing margin of error ( $e = 0.06$ ), the total sample size became:

$$n = \frac{10048}{1 + 10048 * (0.06)^2}$$

$n = 270.3052$  showing that a total sample of 270 was required for this study.

### **3.4. Methods of Data Collection**

The study used structured questionnaire as the data collection instrument. To administer questionnaire, permissions were obtained from concerned body of Sodo dachi district office. The permit was mainly used to get the required number of households from respective PAs and administer questionnaire to the respondents. Before starting final data collection, the questionnaire was pretested. This helped to determine the time required to complete each questionnaire and convenience of getting the data from respondents. The questionnaire was translated to local language (*Afaan Oromoo*). Pretest interview would be done by a researcher while the final data collections were, by the researcher assisted trained development agents working in the respective peasant associations. To support the data collected from the households, secondary data were used from different published or non-published research journals, different reports of *the district* sectoral offices.

### **3.5. Method of Data Analysis**

#### **3.5.1. Measuring Food Insecurity Status**

It is very difficult to measure food insecurity status in developing countries like Ethiopia, where a large share of consumption concerns own products. Household food insecurity status is the application of food insecurity concept at family level, by taking into account individuals in the household as the focus of concern. It can be measured by different methods obtaining data on calorie deprivation indicators, monetary poverty indicators and dietary diversity indicators (IFPRI, 2012). Though, different authors preferred consumption based measurements than others due to different reasons. The first reason argued is that the questions organized are of retrospective than prospective (Hoddinott, 2001), it better to capture long-run welfare and it better reflects households ability to meet their basic needs (FAO, 2002), it is less vulnerable to seasonality and life-cycle (CSA, 2005). The reliability of income data in subsistence farming where record keeping is limited is always questionable (Tesfaye, 2003 cited in Gulled, 2006); almost all amount of income being invested only on food items by the rural poor. According to Heady, D. and Ecker, O. (2012), even though it is less likely to predict individual nutrition outcome, it better indicate the households' food insecurity status.

In this study, the household food insecurity status was measured based on the amounts food consumed by the rural households within a specified period of time in past, i.e. seven days recalling method. These seven days recall period was selected due to the fact that it is appropriate for exact recall of the food items served for the household within that week. Then the results were compared with the minimum subsistence requirement per AE per day of 2,200 Kcal which is set by the Ethiopian Government (MoFED, 2008). Accordingly, this value of minimum subsistence requirement was used as a cut-off point between food secure and insecure households in which case the household is said to be food secure if it meets this minimum and insecure otherwise.

### **3.5.2. Econometric Model Specification**

A variety of statistical models could be used to analyze the relationship between these explanatory variables and food insecurity. Conventionally, linear regression analysis is widely used in most economic and social investigation because of availability of simple computer packages, as well as ease of interpreting the results. However, results derived from linear regression analysis may lead to fairly unreasonable estimates when the dependent variable is dichotomous. Therefore, the use of the logit or Probit models is recommended as a universal remedy of the drawback of the linear regression model (Gujarati, 2003). However, which model to choose between logit and Probit is difficult for they are similar in most applications, the only difference being that the logistic distribution has slightly flatter tails. This means that there is no binding reason to choose one over the other but for its comparative mathematical and interpretational simplicity many researchers tend to choose the logit model (Hosmer, 1989; Ramakrishna *et al.* 2002; Wilma *et al.*, 2003; Kidane *et al.*, 2005; Fekede *et al.*, 2012; Mitiku *et al.*, 2012; Birara *et al.*, 2015). Therefore, this study employed the logit model following the foot step of these researchers. The dependent variable in this case, food insecurity, was a binary variable which took a value one if a household was found to be food insecure, zero otherwise.

Following Gujarati (2003), the functional form of logit model is specified as follows:

$$P(i) = \frac{1}{1+e^{-Z}} = \frac{e^Z}{1+e^Z} \dots \dots \dots (1)$$

Let assume that i is a linear function of a single explanatory variable x (the case where i is a linear combination of multiple explanatory variables is treated similarly). We can express  $Z_i$  as follows:

$$Z_i = \beta_0 + \beta_1 x_i$$

And the logistic function can now be written as:

$$Z(x) = \frac{1}{1+e^{-(\beta_0 + \beta_1 x_i)}} \dots \dots \dots (2)$$

Note that  $Z(x)$  is interpreted as the probability of the dependent variable equaling a case rather than non-case. It is clear that the response variables  $Y_i$  are not identically distributed:  $P(i) = \text{Prob}(Z = 1 | X)$  is the response probability. The non-response probability  $(1 - P_i)$  is:

$$1 - p_i = \text{prob}(Z_i = 0 / X_i)$$

$$1 - p_i = 1 - \frac{e^Z}{1+e^Z} = \frac{1}{1+e^Z} \dots \dots \dots (3)$$

Note that the response and non- response probabilities both lie in the interval [0, 1]. However, there might be a problem with non-linearity in the previous expression, and this can be solved by creating the odds ratio and its log-transformation.

$$\text{Odd ratio} = \frac{P_i}{1-P_i} + \frac{\text{Prob}(Z_i=1/X_i)}{\text{Prob}(Z_i=0/X_i)} = \frac{e^Z}{\frac{1}{1+e^Z}} = e^Z \dots \dots \dots (4)$$

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i \ln e = Z_i = \beta_0 + \beta_k X_i \dots \dots \dots (5)$$

$L_i$  is called the logit, thus, the log-odds is a linear function of the explanatory variables. The above transformation has certainly helped the popularity of the logit model. Accordingly, the logit (Binary logit regression) model has been presented as follow.

$$Z = \beta_0 + \beta_1 Age + \beta_2 Gend + \beta_3 Agroec + \beta_4 Marst + \beta_5 Famsize + \beta_6 Workage + \beta_7 Htype + \beta_8 Farms + \beta_9 FarmE + \beta_{10} Slop + \beta_{11} Livest + \beta_{12} Edul + \beta_{13} Irrig + \beta_{14} Dist + \beta_{15} Road + \beta_{16} Cred + \beta_{17} Exten + \beta_{18} Assmem + \beta_{19} Incsour + \beta_{20} Inc + ei.....(6)$$

Where,

$Z$  = Food insecurity status with values reflecting 1 for food insecure, 0 otherwise,  $Age$  is age of the households,  $Gend$  is gender of household head,  $Agroec$  is Agro ecology of the area,  $Marst$  is Marital status of household head,  $Famsize$  is family size of household,  $Edul$  is educational level of household head,  $Work age$  is Working member of household, type is house type of household owned,  $Farms$  is farm size land hold,  $FarmE$  is farming experience of household head,  $Slop$  is slope of the land owned,  $Livest$  is livestock number,  $Irrig$  is Irrigation practice,  $Dist$  is distance from the nearest market,  $Road$  is road type,  $Cred$  is credit accessibility,  $Exten$  is extension services,  $Assmem$  is any farmer association membership,  $Incsour$  is income source of household,  $Inc$  is income per year,  $\beta_0$  is constant,  $\beta_1$  to  $\beta_{20}$  is coefficients of respective explanatory variables and  $e$  is the error term.

### 3.6. Definition and Hypothesis of Independent Variables

The dependent variable for this study was household food insecurity. It would be hypothesized to be a function of the following variables. The variable was dummy and represented by 1 for the food insecure households and 0 otherwise. All the explanatory variables hypothesized to have impact on food insecurity are summarized in the Table below



Table 2: Definition and prior assumptions of the variables used in empirical analysis

Variables	Variable Type	Description	Hypothesis
Food Insecurity	Dummy	1=Food insecure 0=Otherwise	
Age	Continuous	Age of household head in years	-
Gender	Dummy	Gender of household head; 1 = male, 0 = female	+/-
Agro-ecology	Continuous	1= Woynadega 2= Dega 3=Kola	+/-
Educational level	Dummy	1=Illiteracy 2=Primary 3=Secondary 4=Tertiary	-
Marital status	Dummy	1=Single 2= Married 3=widowed/divorced	+/-
Family size	Continuous	Total number of family members	+
Working age	Continuous	Number of working family member	-
House type	Dummy	1=Zatched 2=Iron sheet 3= both	+/-
Farm size	Continuous	Total area of land owned in hectares	-
Slope of the land	Dummy	1= Gentle 2=Medium 3= Level	+/-
Farming Exp	Continuous	Farming experience in years	-
Livestock	Continuous	Livestock owned in numbers(TLU)	-
Crop type	Dummy	1= Wheat 2= Teff 3= Maize 4= Others	+/-
Distance	Continuous	Distance from the nearest market in km	+
Road type	Dummy	1= Sunshine road 0= all weather road	+/-
Credit accessibility	Dummy	1=yes, if accessible 0= no, otherwise	-
Extension services	Dummy	1=Yes, if got services 0 = no, otherwise	-
Association memb	Dummy	1= yes, if member 0= no, otherwise	-
Income source	Dummy	1=Agriculture, 2= non agriculture, 3= both	+/-
Income	Continuous	Income per year in ETB	-

Source: - Own definition (2017).

### 3.7. Model Tests

This study has utilized cross sectional type of data which has an advantage on autocorrelation problem that is common in time series data and somehow in panel data. Variance inflation factor (VIF) and contingency coefficient was computed to detect the problem of Multicollinearity across continuous and categorical independent variables, respectively. According to Gujarati (2003), these techniques of variance inflation factor and contingency coefficient can be defined in terms of multiple correlation coefficient and chi-square as the followings:

Variance inflation factor is a measure of how much the variance of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related. It is used to describe how much Multicollinearity (correlation between predictors) exists in a regression analysis. Multicollinearity is a problematic because it can increase the variance of the regression coefficients, making them unstable and difficult to interpret. Mathematically VIF:

$$\text{VIF}(X_i) = \frac{1}{1 - R_i^2} \dots\dots\dots(7)$$

Where, VIF is variance inflation factor,  $R_i^2$  is coefficient of determination and  $X_i$  is explanatory variables

Contingency coefficients can be used to estimate the extent of the relationship between two categorical (dummy) variables, or to show the strength of a relationship. Testing empirical research involves testing hypotheses suggesting that the value of one variable is related to that of another variable. Mathematically contingency coefficients have shown as follows:

$$C = \sqrt{\frac{\chi^2}{N + \chi^2}} \dots\dots\dots(8)$$

Where, C is contingency coefficient,  $\chi^2$  is chi- square of random variables and N is total sample size.

# CHAPTER FOUR

## 4. RESULTS AND DISCUSSION

This chapter presents the results of the study pertaining to various objectives. Descriptive results are discussed in section 4.1 and Section 4.2 presents the econometric model results.

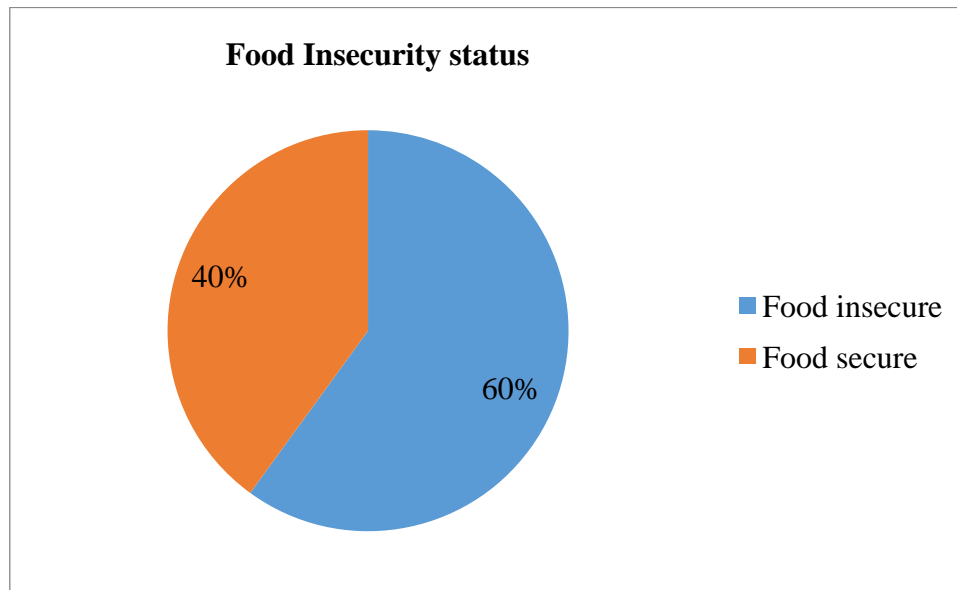
### 4.1. Descriptive Analysis

#### 4.1.1. Households Food Insecurity Status

In this study, households' food or calorie acquisition/consumption per adult per day was used to identify the food insecure and food secure households. The data regarding the amount of foods consumed by the household within the past seven days were converted into the calorie equivalent. After converting the household size into adult equivalent (AE) (Appendix 2), the converted calorie consumption was divided into pre found adult equivalent and seven to find out single day's calorie consumption per a single adult equivalent. Then, the amount of calorie consumed by a single adult equivalent (kcal/AE/day) was determined. The results obtained were compared with the minimum requirements per day per adult equivalent of 2200 kcals set by Ethiopian Government (MoFED, 2008). Therefore, the households whose calorie consumption or acquisition less than the cut-off point were categorized as food insecure and food secure otherwise.

Accordingly by taking into account, 2200 kcal as a benchmark, only 108 sample households' (40%) were found to be able to meet the minimum subsistence requirement and 162 households' (60%) were, found to be unable to meet their minimum subsistence requirement.

Figure 4: Households Food Insecurity status



Source: Own survey result, 2017.

#### **4.1.2. Results of Dummy Variables**

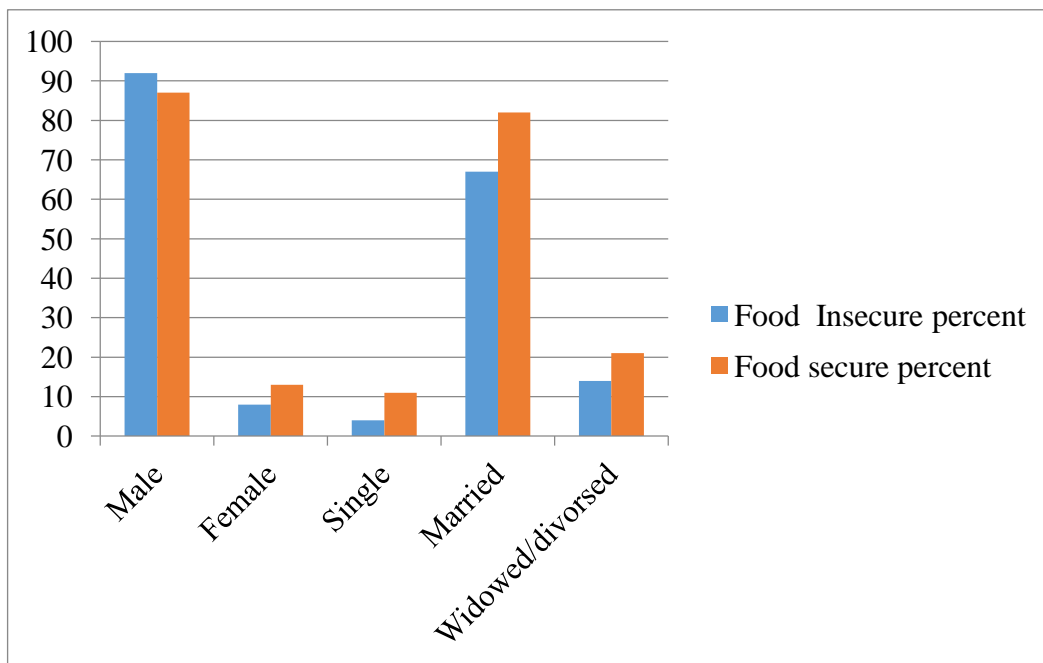
##### **4.1.2.1. Results on Gender and Marital Status**

The results presented in Figure 5 show that, about 90% of the households were male headed and 10% were female headed. The results showed that the proportions of male headed households were higher in both cases. Among the food secure households, the higher proportion of male headed households could be due to better exposure that the male heads have to different technologies and trainings delivered by extension agents. According to IFPRI (2012), male heads are more likely to attend community meetings and visit demonstration compared to female heads. This could possibly make male headed households to be more food secure. On the other hand Women are disadvantaged through traditional norms and cultural practices. Ogato *et al.*, (2009) in their study stated that, the causes of food insecurity are not shared equally, in Ethiopia. They stated that, the role of gender significantly impacts on opportunities. Almost all of household tasks are carried out by women and girls, such as collecting fuel wood, fetching water, cooking, washing, cleaning and childcare. The head of the household is traditionally male and is the principal

decision maker. This could possibly make male headed households to be more food insecure.

The results on the marital status indicated that overall, 76% of the household heads were married, 7% were single and 17% were widowed and divorced. About 82% were married amongst the food secure households, while the proportion was about 67% among the food insecure. Besides, about 17% of the foods secure and 35% of the food insecure household heads were single and widowed and/or divorced respectively. The proportion of married household heads was higher among the food secure as compared to the food insecure implying that being married are more likely to be food secure. This might be due to the heavy concern that the married households have to improve output at minimal possible cost over the limited and competing resources (Bonabana-Wabbi, 2002). Martey *et al.* (2013) also noted that marriage increases farmer's concern for household welfare thus increasing farmer's participation in agricultural technology adoption. This increment in agricultural technology adoption increases productivity, which can improve the welfare and reduce food insecurity of farmers.

Figure 5: Distribution of households by gender and marital status



#### **4.1.2.2. Results on Educational level, House type and Income Source**

The results presented in Table 3 shown that, the overall 49.26%, 31.48%, 14.44% and 4.81% of household were illiterate(cannot read and write), educated to primary, secondary and tertiary level of education respectively. Approximately 50% of the household in the study area were not educated. Among the food insecure, about 58.33% were illiterate while 34.26%, 3.70% and 3.70% were enrolled in primary schools, secondary schools, and tertiary schools respectively. On the other hand, amongst the food secure households, about 43.21% were illiterate while 29%, 21.60% and 5.56% were enrolled in primary schools, secondary schools, and tertiary respectively. The results revealed that more educated households were food secure, which might be the results of better education, while less educated were food insecure. Okuthe *et al.* (2013) in their study found that, education is the potential source of knowledge which enables one to understand instructions, access and comprehend information about the new technology. Households near to information and technology could increase production and productivity. Increased capability of production and productivity leads household to be less food insecure.

Round thatched roof huts houses are the most common traditional houses in the study area. In this study, house type refers to types of houses owned by the households and the results presented in Table 3 show that, about 47%, 30% and 23% of respondents in the study area lived in round hut thatched house type, iron sheet and both types of houses respectively. Among the food insecure respondents, about 43.83%, 32.72% and 23.46% were households lived in thatched, iron sheet and both type of house respectively. However, among food secure 51.85%, 25.93% and 22.22% lived in thatched, iron sheet and both thatched and iron sheet respectively. In line to this, the study generally highlighted, households with only thatched house were more food insecure than household owned both types of houses in the study area.

In rural areas of Sodo Dachi district, agriculture is the main source of income. Among the food secure households, about 80.56%, 1.85% and 17.59% obtained their income from agriculture, non-agriculture and both agriculture and non-agriculture respectively. While among the food insecure, 66.05%, 4.94% and 29.01% of the households had obtained their

income from agriculture, non-agriculture and both agriculture and non-agriculture respectively. The results indicated that, agriculture is the main source of income both for food secure and food insecure households in the study area, and non-agricultural income is less common compared to others.

Table 3: Results on Educational level, House type, crop type and income source

Characteristics	Food insecure		Food secure		Test statistics
	Freq.	Percent	Freq.	Percent	$\chi^2$ - value
<b>Educational level</b>					
Illiterate	63	58.33	70	43.21	0.000***
Primary	37	34.26	48	29.63	
Secondary	4	3.70	35	21.60	
Tertiary	4	3.70	94	5.56	
<b>House type</b>					
Thatched	71	43.83	56	51.85	0.382
Iron sheet	53	32.72	28	25.93	
Both	38	23.46	24	22.22	
<b>Income source</b>					
Agriculture	107	66.05	87	80.56	0.030**
Non-agriculture	8	4.94	2	1.85	
Both	47	29.01	19	17.59	

Note, \*\*\* and \*\* denotes significance at 1% and 5% respectively

Source: Own data manipulation, 2017

#### **4.1.2.3. Results on Agro-ecology and Slope of the Land**

In this study, agro-ecology represents the households` perception about the multitude of agro-ecological zones traditionally classified into three categories with traditional names assigned to each zone. The results presented in Table 4 show that about 42.59%, 54.94%, 2.47% of the food insecure households were living in Woynadega, Dega and kola zones respectively. In comparison, about 48.15%, 50.93%, 0.93% among food secure was living in Woynadega, Dega and kola zones respectively. This indicated that a household who lives in dega zone have been more food insecure than those who lives in other zones relatively.

Regarding slope of the land (landscape level), the results revealed that among food insecure households, about 0.62%, 24.07% and 75.31% believed that, the slope of their lands was level, medium and gentle respectively. On the other hand, among food secure households, about 30.56%, 62.04% and 7.41%, believed that the slope of their lands was level, medium and gentle respectively. Households owning gentle slope type of land were more food insecure compared to households with medium and leveled slopes. Gentle type of land is not suitable for all agricultural activities at less cost and manpower. Therefore households owning such type of land were more food insecure than others in the study area.



Table 4: Results on Agro-ecology, Slope of the land and Irrigation

Characteristics	Food insecure		Food secure		Test statistics
	Freq.	Percent	Freq.	Percent	$\chi^2$ - value
<b>Agro-ecology</b>					
Woynadega	69	42.59	55	48.15	
Dega	89	54.94	52	50.93	0.478
Kola	4	2.47	1	0.93	
<b>Slope of the land</b>					
Gentle	122	75.31	8	7.41	
Medium	39	24.07	68	62.04	0.000***
Level	1	0.62	33	30.56	

Note, \*\*\* denotes significance at 1%.

Source: Own data manipulation, 2017

#### 4.1.2.4. Results on Association Membership, Credit and Road type

The results of the categorical institutional variables are presented in Table 5 revealed that; overall 64% of the sampled respondents were members of farmers based associations while the remaining 36% were not. The results further show that about 59% of households among the food insecure were members of at least one farmer based association whereas 71.30% of households among the food secure households belonged to at least one farmer group. Farmer based associations are the potential sources of information. Unlike that of information media such as television and radio, the information obtained through membership in a given farmer group involves two way discussions which can be easily understood by the farmers. Due to this, availability of such associations may increase frequency of discussion among the member farmers, therefore enhancing communication for development (Berhe, 2014). There are some self-help associations in the study area established by neighboring households for both social and economic purposes. People also have an informal institution called *Debo*

which is temporary organized to collectively manage labor intensive activities. By organizing into *Debo*, people can manage labor intensive farm work and other activities like house construction usually in a form of reciprocity among the members. As such, existence of farmers based association could possibly decrease the food insecurity level of rural households in the study area.

Credit is an important source of finance and a means of increasing income. In Ethiopia, informal credit tends to be expensive and scarce. Banking institutions, formal credit lending and saving institutions are nonexistent in the rural areas. The major sources of credit in Sodo Dachi district include Oromia Credit and Saving Share Company (OCSSCO) and farmers based associations such as *Idir*. Surprisingly, there are no banks in the district. The households in the area usually go to the nearest *woreda* known as *Kersa malima* and others to send or receive money if any. The results showed that about 33% of the sampled respondents had accessed and used credit while about 67% of them did not access credit. Among the food insecure households, about 19% of the households were accessed credit, while the remaining 81% were not. This could be due to different reasons such as high interest rate and little knows how about the credit. Thus, the result showed that, credit accessibility among the respondents was low in general and among food insecure in particular. This revealed that credit could be one of the major determinants of food insecurity in the study area. Therefore, it is wise to deduce that, lack of credit access could worsen households' food insecurity.

A social infrastructure facility such as road accessibility is one of the most important variables in determining food insecurity. The study area is known by two types of road: namely all weather road and sunshine road. The results showed that, out of the total sampled households, 46% of them accessed all weather roads and the remaining 54% accessed only sunshine road type. Among the total food insecure households, about 35.8% and 64.2% had accessed all weather road and sunshine road respectively. Among the food secure households, about 61.11% and 38.89% accessed all weather and sunshine road respectively.

Table 5: Results on Association membership, Credit and Road type

Characteristics	Food insecure		Food secure		Test statistics
	Freq.	Percent	Freq.	Percent	$\chi^2$ - value
<b>Association Membership</b>					
Yes	95	59	77	71.30	0.000***
No	67	41	31	28.70	
<b>Credit accessibility</b>					
Yes	31	19	85	89.00	0.000***
No	131	81	23	21.00	
<b>Road type</b>					
All weather	58	35.80	66	61.11	0.000***
Sunshine	104	64.20	42	38.89	

Note, \*\*\* denotes significance at 1%.

Source: Own data manipulation, 2017

### 4.1.3. Results of Continuous Variables

#### 4.1.3.1. Results on Age, Family size and Working Member

The results of continuous socio-economic variables are given in Table 6, 7 and 8. They present the averages and *t*-values of continuous variables. Results on age showed that, the average age for the sampled household head was 38 years (Table 6). Age of household head was measured in years. The average age among food secured and insecure households were found to be 52 and 31 years respectively. This shows that majority of the households were within productive age brackets of their lives in terms of the capacity to work. On average, foods insecure were younger than food secure. This resulted from the fact that, younger men either have to wait for a land distribution or have to share land with their families. The other possible explanation for such association is that an older household head devotes his/her time on farming activities compared to young farmers. Young people spend much of their

time in towns and prefer urban life than the rural for a number of reasons. Moreover, as age increases, one can acquire more knowledge and experience becoming effective in exploiting these experiences. Hofferth (2003) argued that the higher the age of the household head, the more stable the economy of the household, because older people have also relatively richer experiences of the social and physical environments as well as greater experience of farming activities. Moreover, older household heads are expected to have better access to land than younger heads, A similar study by Obamiro *et al.* (2003) arrived at a similar conclusion regarding the relationship between age of a household head and household food security.

In relation to family size, the overall average of household size among the respondents was found to be 5. Among the food insecure, the average household size was 6 whereas it was about 2 amongst the food secure households. On average, the household size was higher among the food insecure households compared to that of food secure. This indicates that, in an area where households depend on less productive agricultural land, increasing household size results in increased demand for food. This demand, however, cannot be matched with the existing food supply so ultimately end up with food insecurity.

A family member was presented as a continuous variable and measured in household adult equivalents. The results indicated that, the overall average family member who can provide labour among the sampled households was 2. The average family member who provides labour among food secure and insecure households was about 3 and 2 respectively, showing that food secure households were having larger average family member who provide labour than food insecure. This further indicated better capacity of food secured households in terms of labour supply for their farm and other activities which might have helped them to perform labour intensive work.

Table 6: Results on Age, Family size and working family member

Characteristics	Food secure		Food insecure		Overall	Test-statistics
	Mean	SD	Mean	SD	Mean	t-value
Age(years)	52	7.12	31	9.45	38	0.56
Family size(num)	2	1.71	6	2.83	5	0.00***
Working member(num)	3	2.49	1	1.51	2	3.37***

Note, \*\*\* indicate significance at 1% while SD denotes standard deviation.

Source: own data manipulation, 2017

#### 4.1.3.2. Results on Farm size, Experiences, Livestock and Income per year

Farm size is the total area of land cultivated to food and cash crop by households, measured in hectares. The average farm size among the sampled households was 1.26 hectares (Table 7). On average, the food secure households own about 1.34 hectare of farm land while the food insecure own about 0.92 hectare of the farm land. The current study had predicted that farmers with relatively larger farm size are likely to be food secure that consistent with the proposed hypothesis. This shows that the farmers in the study area were operating on small scale production. The independent t-test showed that, the mean difference of the farm size between the food secure and the insecure was significant at 1% probability level. A Study by Edgar, *et al.* (2014) stated that, more land allows households to practice soil conservation techniques like crop rotation which enhance yields in Zimbabwe. Furthermore, they argued that, those who have more land are likely to rent it in exchange for money or farm produce and this reduces their chance of being food insecure.

Concerning the experience, the overall average farming experience of the sampled respondents was 25.74 years while that for the food secure and insecure was found to be 28.03 years and 22.31 years respectively. More experienced farmers seem to have better information and knowledge accumulated over time. Years of experience for majority of the food secure households were distributed between 21 and 35 while, for majority of the food insecure was distributed between 15 and 25. This implies that relatively most food secure had more years of farming experience.

The total number of livestock owned was presented in terms of the tropical livestock unit (TLU) giving different weights for different types of livestock's. According to Storck *et al.* (1991), TLU is a unit that represents an animal weight where, 1 is assigned for cows and ox, 0.75 for heifer, 0.25 for calf, 0.7 for donkeys and mules, 0.8 for horses, 0.1 for sheep and goat and 0.013 for chicken (Appendix 4). Accordingly, the survey results indicated that, the overall average livestock holding among the farmers was about 5.93 units. The average livestock holding was about 9.38 among food secure and 4.59 amongst the food insecure respectively. The difference was significant at 1% probability level showing the importance of livestock in attaining food security. This implies that households who possess large herd size had higher probabilities of being food secure since they can earn more income from livestock production and also get opportunity to consume animal products. Better income in turn enables them to purchase food when they are in short of their stock, and invest in purchase of farm inputs that increase food production and thus better positioned in ensuring food security at their household level, which in turn reduce food insecurity.

The average income per year among the respondents was found to be 5,660 ETB. Amongst the food secure households, the average income was about 7,380 ETB while the food insecure had an average income of 3,070 ETB. The results showed that food secure households earned more income per year as compared to their counterpart food insecure on average, which was consistent with the proposed hypothesis. This implies that, households that have access to better income opportunities are less likely to become food insecure than those households who had no or little access.

Table 7: Results on Farm size, Experiences, Livestock numbers and Income per year

Characteristics	Food secure		Food insecure		Overall	Test-statistics
	Mean	SD	Mean	SD	Mean	t-value
Farm size(ha)	1.34	1.45	0.92	1.55	1.26	3.25***
Experience(years)	28.03	15.17	22.31	14.60	25.74	3.08***
Livestock num(TLU)	9.38	5.34	3.76	4.59	5.93	5.20***
Income/ year (ETB)	7.38	3.87	3.07	2.24	5.66	1.04***

Note, \*\*\* indicate significance at 1% while SD denotes standard deviation.

Source: own data manipulation, 2017

#### 4.1.3.3. Results on Extension and Distance from the Nearest Market

Extension service refers to demonstrations, trainings and advice delivered to the farmers mainly by development agents and other agricultural experts. It was measured in terms of the frequency of farmers meeting with extension workers during the previous agricultural season. The results indicated that, the overall average frequency of extension contact was about 0.811 (Table 8). In comparison, it was found that the average frequency of extension contact was about 0.86 per season among the food secure while that of food insecure was about 0.73. The difference in the average extension contacts between food secure and insecure was significant at 1% probability level. The results show that food secure households had better access to extension services on average as compared to food insecure justifying that the higher frequency of extension visits may have contributed toward adoption of agricultural technologies. Kassie *et al.* (2009) argued that farmers who have regular contact with agricultural experts are more likely to adopt agricultural technologies, such as improved seeds and Fertilizers. Adoption of these agricultural technologies may increase productivity and reducing food insecurity among rural households.

In relation to the distance to the nearest market place, overall average distance to the nearest market was 5.55 km. In comparison, the average distance was 2.75km among the food secure and 7.82 km among the food insecure respectively. This shows that the food secure

households were closer to the nearest market place compared to the food insecure counteract. Fekede *et al.* (2016) in their study stated that the households who are closer to market centers had better chances to be food secure than those who are away from market centers due to the reason that households nearer to market center have the probability of selling their product and purchase food from market.

Table 8: Results on Extension and Distance from the nearest market

Characteristics	Food secure		Food insecure		Overall	Test-statistics
	Mean	SD	Mean	SD	Mean	t-value
Extension(number)	0.86	0.34	0.73	0.44	0.811	2.76***
Distance (km)	2.75	1.56	7.82	2.60	5.55	1.06

Note, \*\*\* indicate significance at. 1% while SD denotes standard deviation.

Source: own data manipulation, 2017

## 4.2. Econometric Analysis of Determinants of Food Insecurity

In contrast to descriptive analysis, an econometric analysis is the method of data analysis, mainly focused on coefficients, R-square, chi-square, standard error, tests and log likelihood ratio which can be done using different software's such as SPSS and Stata. Thus, the study has utilized SPSS version 16 for data cleaning and Stata version 12 for the analysis.

### 4.2.1. Results of Model Tests

Regression models assume that perfect co-linearity does not exist among the explanatory variables. This study applied variable inflation factor (VIF) to test Multi co-linearity problem. The average VIF was found to be 2.35 which was less than 10 indicating that Multi co-linearity was not a serious problem among the continuous explanatory variables (Appendix 8). The contingency coefficients also revealed that there were no strong correlations among categorical variables; hence no explanatory variable was dropped from the model (Appendix 9). Lastly, using Ramsey regression specification error test for omitted variables (ovtest), the survey results showed that a model had no problem of omitted



variables. Likelihood ratio test was done to test whether all predictor regression coefficients in the model are simultaneously zero or not. The test results showed that the null hypothesis which says all coefficients of explanatory variables are simultaneously zero should be rejected. Therefore, it was concluded that the model was the most robust and complete.

#### **4.2.2. Determinants of Households` Food Insecurity**

To examine determinants of households` food insecurity, binary logistic model was employed. The  $Chi^2$  value given by 73.49 and the corresponding likelihood ratio statistic ( $p < 0.000$ ) suggests that, the null hypothesis of all the coefficients of the explanatory variables being simultaneously zero should be rejected. This shows that, the explanatory variables included in the model are capable of explaining the rural households` food insecurity. Odds ratio were estimated to predict the likelihood of household`s toward being food insecure. In this study, households were assigned 1 if they are food insecure and 0 otherwise.

The maximum likelihood estimates of the logit model showed that marital status, slope of land owned by the households, the number of livestock units in TLU, credit service and income earned per year were the most important and significant factors influencing household food insecurity in the study area. The discussion and interpretation of the significant explanatory variables in the model in the study area are presented hereunder (Table 9).

The result on marital status of the households head showed a negative relationship with food insecurity status. If other factors held constant, being married decreases the probabilities of being food insecure by a factor of 0.006. It is statistically significant at less than 1% probability level of significance. This can be reasoned out that, due to the heavy concern that the married households have to improve output at minimal possible cost over the limited and competing resources than whatever types of marital status (Bonabana-Wabbi, 2002). Martey et al. (2013) also noted that marriage increases farmer`s concern for household welfare thus increasing farmer`s participation in agricultural technology adoption. This increment in agricultural technology adoption increases productivity, which can improve the welfare and reduce food insecurity of farmers.

The results on the slope the land owned by the households also showed a negative relationship with the food insecurity status of the households. Owning leveled slope type of land decreased the odds of being food insecure by a factor of 0.016, other factors held constant. The results of the analysis showed that, the slope of the land was statistically significant at less than 1% probability level. The possible explanation is, leveled slope land always improves the efficiency of water, labour and energy resources utilization and is generally more easily irrigable than one where undulations require special attention. Thus households owned level types of land is less likely be food insecure than others owned lands with different slope.

Regarding livestock number, an increase in livestock number by a unit (TLU), decreased the odds of being food insecure by a factor of 0.935 other things held constant. Livestock size is statistically significant at less than 5% and negatively related with food insecurity of households in this study, which is consistent with the proposed hypothesis. Therefore, households with relatively large livestock size (TLU) were found to be less vulnerable to food insecurity. This implies that households owned large herds of livestock is less food insecure than households with smaller herds, which was consistent with the result of other studies, (Mulugeta, 2002; Tesfaye, 2003; Genene and Wegayehu, 2010; Amsalu et al. 2012; Mitiku et al. 2013; Del Ninno et al. 2001; Del Ninno et al. 2007; Amsalu and Wendimu, 2014a and Amsalu and Wendimu, 2014b). In their study they stated that, livestock are important source of income, food and draft power for crop cultivation. Households owned large number of livestock produce more milk, milk products and meat for direct consumption. Moreover, they explained that livestock ownership enables the farm households to have better chance to earn more income from selling of livestock which in turn could improve their purchasing power of stable food items, even during food shortage. Such a household could also invest in purchasing of farm inputs that increase food production and enable them reduce food insecurity. A study by Bogale A. and Shimelis A. (2009) stated that ownership of livestock acts as a hedge against food insecurity. They stated that livestock, besides its direct contribution to subsistence need and nutritional requirement, is a vital input into crop production by providing manure and serves to accumulate wealth

that can be disposed during times of need, especially when food stock in the household deteriorates.

Quite interestingly, credit accessibility by the households was negatively related with food insecurity status, in agreement with the prior hypothesis and statistically significant at less than 1% probability level. A one more households accessed with credit service, the odds ratio in favor of being vulnerable to food insecurity decrease by a factor of 0.015, other variables held constant. A possible explanation is that, credit serves as a means to boost production and expand income generating activities (Diagne, 1998; Deverux, 2001). Thus, a household which has not access to credit does not initiate investment in farm and non-farm activities and achieve food security.

The amount of household income earned per year was hypothesized to have negative influence on food insecurity. In agreement with the hypothesis, its coefficient came out to be negative and statistically significant at less than 1% probability level. The odds ratio in favour of being food insecure decreased by a factor of 0.953 as income earned per year increases by a thousand ETB. This indicates that, households who are earning better income are less likely to become food insecure than those households who had no or little income. Income obtained from any source improves the food security of the household. Income from the agricultural production may not be the only source of income for the rural household. The success of households and their members in managing food insecurity is largely dependent on their ability to get access to off-farm/non-farm job opportunities, which could serve as livelihood diversification strategies. Smallholders who solely depend on farm activities have inadequate income to purchase farm inputs and fulfill family needs and thus, they are found to be food insecure (Beyene and Muche, 2010).

Table 9: Binary Logit Regression Results

Variables	Odds Ratio	Std. Error.	z	P>z
Illiterate (reference group)	-	-	-	-
Primary education	0.848	0.746	-0.190	0.851
Secondary education	0.918	0.970	-0.080	0.935
Tertiary education	1.248	1.745	0.160	0.874
Woynadega (reference group)	-	-	-	-
Dega	1.095	0.652	0.150	0.879
Kola	1.126	2.530	0.050	0.958
Single (reference groups)	-	-	-	-
Married	0.006	0.010	-3.220	0.001***
Widowed/divorced	0.115	0.228	-1.090	0.276
Zatched house (reference group)	-	-	-	-
Iron Sheet house type	0.357	0.288	-1.280	0.202
Both Iron sheet and Zatched	0.478	0.352	-1.000	0.316
Gentle Slope	-	-	-	-
Medium slope	0.742	0.748	-0.300	0.767
Leveled slope	0.016	0.018	-3.630	0.000***
Wheat (reference group)	-	-	-	-
Teff	0.169	0.170	-1.760	0.078
Maize	0.810	0.840	-0.200	0.839
Other crops	0.432	0.551	-0.660	0.510
Agriculture (reference group)	-	-	-	-
Non-agriculture	6.182	9.634	1.170	0.242
Both Agriculture and non-agriculture	7.370	9.188	1.600	0.109
Age of household head	0.983	0.038	-0.450	0.650
Gender of household head	4.157	8.975	0.660	0.509
Family size	1.344	0.221	1.800	0.072
Farm size	0.819	0.215	-0.760	0.448
Farming experience	1.061	0.036	1.740	0.081
Livestock number (TLU)	0.935	0.029	-2.150	0.032**
Distance from the nearest market	0.993	0.046	-0.150	0.880
Credit service	0.015	0.018	-3.460	0.001***
Extension visits	3.875	3.355	1.560	0.118
Association memberships	0.449	0.551	-0.650	0.514
Income per year	0.953	0.016	-2.910	0.004***
Constant	1940.401	7103.953	2.070	0.039

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N	270
LR chi2 (27)	267.07
Prob > chi2	0.000
Sensitivity	93.52%
Specificity	95.06%
Correctly classified	94.44%

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Source: Own data manipulation

Note: -\*\*\*, \*\*, \* indicate significance at 1%, 5%, 10%, while Std. Error denotes standard error.

Odds ratio indicates the predicted changes in odds for a unit increase in the predictor.

## **CHAPTER FIVE**

### **5. SUMMERY, CONCLUSION AND RECOMMENDATION**

This section presents summary of the major findings in the study, conclusions drawn and recommendations.

#### **5.1. Summary**

This study aimed at identifying the major determinants of rural households' food insecurity in Sodo Dachi district of South West Shoa Zone. A cross sectional study design was employed to identify these determinants of rural households' food insecurity. To select respondents for the study, four kebeles were selected purposively based on relatively similarity in agro climatic condition and population size. Accordingly, primary data was collected from 270 respondents.

In order to examine determinants of rural households' food insecurity, the study assessed a single day`s calorie consumption per a single adult equivalent to measure food insecurity status. In addition, household characteristics associated with food insecurity, impact of plot characteristics, institutional and external factors on households' food insecurity was examined. Descriptive statistics and Econometric analysis were employed for analysis. During analysis, different software's such as Excel, SPSS and Stata were used.

In relation to household food insecurity status, from all 270 respondents, 60% households were found to be food insecure and 40% were food secure respectively. The marital status, slope of land owned by the households, the number of livestock units in TLU, credit service and income earned per year were found to be the important and significant determinants identified to influence household food insecurity.

## **5.2. Conclusion**

The results showed that, the larger numbers of rural households in the study area were food insecure. Having large family size creates more pressure on household food security, because more food and non food expenditure for them increases. A household with leveled type of land is less likely food insecure than others having lands with different slopes. It was concluded that, leveled type land always improves the efficiency of water, labour and energy resources utilization and is generally more easily irrigable than one where undulations require special attention. Livestock enables the rural households to have better chance to earn more income from selling livestock and its product which would further improve their purchasing power of food items during food shortage.

Households that have access to better income opportunities and credit service are less likely food insecure than others who had no or little access. Credit serves as a means to boost production and expand income generating activities. It was concluded that, lack of credit access could worsen households' food insecurity; all play a crucial role in reducing food insecurity and safeguarding food security.

## **5.3. Recommendations**

Rural household food insecurity could be decreased through different ways. However, based on the finding of the study, the policy makers should take the following core issues in to account.

Knowledge of managing various types land patterns is also needed to control agricultural activities into the most suitable areas. Land surveys are required in order to provide adequate resource information for good land use and land management. This provides farmers with information on land types that will help them manage their operations more efficiently.

Households with less or no livestock are more likely food insecure. To enable such households' food secure, the government and other development partners should encourage commercialization of livestock production. The fact that, commercialized livestock

productions have been limited in rural areas of Ethiopia might be the major constraint for commercialization.

Generally, the findings suggests that rural food insecurity in the study area could be reduced through all-inclusive and well judged combinations of involvements aiming at enhancing income diversification opportunities in rural areas such as off-farm activities, promoting education, providing credit service and livestock productivity among others.



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# APPENDIXES

## Appendix 1: Questionnaire

Dear respondent,

This questionnaire is prepared to find out "***Determinants of rural household food insecurity in Sodo dachi district***". Your responses to the questionnaire will help the researcher to analyze determinant of household food insecurity. This enables policy makers to come up with better policy options which enable to improve rural households' food security. All your responses will be treated confidential. Please answer the questions freely. You cannot be identified from the information you provide and no information about individuals will be given to any organization. Thus, I kindly request you to fill the questionnaire patiently and accordingly.

***INSTRUCTION: Read each question carefully and encircle questions with two or more alternatives. For questions not having alternatives, write your response on the space provided.***

### SECTION A: HOUSEHOLD CHARACTERISTICS

1. Age \_\_\_\_\_
2. Gender    1= Male                  0= Female
3. Marital status of household. 1 = Single, 2 = Married, 3 = Divorced/ Widowed
4. What is the total number of your family? \_\_\_\_\_
5. What is the number of working (18 years and above) family members in your home?  
\_\_\_\_\_
6. What is your level of your education?        1=Illiteracy        2=Primary  
    3=Secondary     4=Tertiary

7. What is the highest education level of any of your family member in years?  
\_\_\_\_\_
8. What is the major source of your income? 1= Agriculture, 2 = Non-agriculture, 3= both
9. If your answer for question 8 is agriculture, what is the level of your income per year in kg/ETB?
10. If your answer for question 8 is not agriculture, what is the level of your income per month or year in ETB? \_\_\_\_\_
11. For how long have you been practiced farming? \_\_\_\_\_

#### **SECTION B: RESOURCES AND NATURE CHARACTERISTICS**

12. Do you own land? 1 = Yes 0 = No
13. If question 13 is yes, what is the size of your land in hectare? \_\_\_\_\_
14. What is the current size of your plot under crop production in hectare? \_\_\_\_\_
15. Which types of crops are you growing? 1=Wheat 2=Teff 3=Maize  
4=Others \_\_\_\_\_
16. How do perceive the agro ecology of your area? 1 = Woynadega 2 = Dega, 3= Kola
17. How do perceive/rate the slope of your land? 1= Gentle slope 2=Medium 3= Leveled
18. Do you own livestock? 1= Yes 0 = No
19. If question 18 is yes, fill the table below

Sr.no	Type of the livestock	Number of Livestock owned	Average price (ETB)
1	Oxen		
2	Cow		
3	Bull		
4	Donkey (Adult)		
5	Donkey (Young)		
6	Goats and Sheep (Adult)		
7	Goats and Sheep (Young)		
8	Calf		
9	Weaned Calf		
10	Heifer		
11	Chicken		
12	Mules		
13	Horses		
14	Others, specify		

20. Type of house you live in? 1=Zatched 2=Iron sheet 3= both

**SECTION D: INSTITUTIONAL FACTORS**

21. Do you have access to credit? 1= yes 0= no

22. If question 21 is yes, from where you get this credit? -----,-----

23. Do you have extension services? 1=yes 0 = no

24. If question 23 is yes, how many times did you meet extension workers last season?

\_\_\_\_\_

25. Do you have access to TV, radio or any other social media? 1= yes 2= no

26. Is there any farmer's association in your village? 1= yes 2= no

27. If question 26 is yes, are you a member of that organization/s? 1= yes 2= no

28. What type road is available in your area? 1= sunshine road all 2= weather road

29. How far is your village from the nearest market in km? \_\_\_\_\_

30. How many hours does it take to you to reach the nearest market from your village?

\_\_\_\_\_

31. Household consumption expenditure

Food items consumed during the last Seven days in your household	Sources			
	Home` produced	Purchased	Gift/loan/wage in kind	Total consumed
Did your household consume any cereals?				
Teff				
Wheat				
Maize				
Barley				
Sorghum				
Peas				
Beans				
Did your household				

consume any animal product?				
Milk				
Meat				
Egg				
Butter				
Did your household consume any fruits, vegetables or root crops?				
Potato				
Tomato				
Onion				
Carrot				
Did your household consume any sugar, edible oil, salt or any other spices?				
Sugar				
Edible oil				
Coffee				

**SECTION E: QUESTIONS FOR DA`S AND OFFICE HOLDERS**

32. In your opinion, what do you think the cause of food insecurity in your District?

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33. Can you recognize that the household characteristics/variables that have relation with food security? And how they affect the food security status?

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34. Do you have any experience of identifying those households who were supposed to be food secure and insecure?

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35. How do you measure the food security status of the households in your District?

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36. In your opinion what is the food security situation in your district and surrounding area?

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Thank you in advance for your cooperation!!

**Appendix 2: Conversion factor used to calculate adult equivalent (AE)**

Age	Sex	
	Female	Male
0-2	0.4	0.4
3-4	0.48	0.48
5-6	0.56	0.56
7-8	0.64	0.64
9-10	0.76	0.76
11-12	0.80	0.88
13-14	1.00	1.00
15-18	1.20	1.00
19-59	1.00	0.88
>60	0.88	0.72

Source: World Bank (1986)

**Appendix 3: Calorie value of food items consumed by sample households**

Food items	Kcals	Units
Teff	3589	kg
Wheat	3623	Kg
Maize	3751	Kg
Sorghum	3805	Kg
Barley	3723	Kg
Peas	3553	Kg
Potato	1037	Kg



Onion	713	Kg
Meat	1148	Kg
Milk	737	Lt
Butter	7364	Kg
Egg	61	pc
Coffee	1103	kg
Edible oil	8964	lt
Sugar	3850	kg

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Source: Tilahun *et al.*, (2004); EHNRI, (2000)

#### **Appendix 4: Conversion factor used to calculate topical livestock unit (TLU)**

<b>Species</b>	<b>TLU conversion factors</b>
Cow and Ox	1
Donkey (Adult)	0.7
Donkey (Young)	0.35
Goats and Sheep (Adult)	0.13
Goats and Sheep (Young)	0.06
Calf	0.5
Weaned Calf	0.35
Heifer	0.75
Chicken	0.013
Mules	0.7
Horses	0.8

---

Source: Storck *et al.*, (1991),

## Appendix 7: Binary logit regression results

Logistic regression

Number of obs = 270

LR chi2(27) = 267.07

Prob > chi2 = 0.0000

Log likelihood = -48.180531

Pseudo R2 = 0.7349

FOODINSECU	Odds Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
_IEDULHHD_2	.8478364	.7456477	-0.19	0.851	.1512533	4.75247
_IEDULHHD_3	.9175894	.9695244	-0.08	0.935	.1156829	7.278258
_IEDULHHD_4	1.248446	1.745457	0.16	0.874	.0805939	19.33915
_IAGROEC_2	1.094984	.65182	0.15	0.879	.3409622	3.51649
_IAGROEC_3	1.126007	2.529777	0.05	0.958	.0137773	92.02767
_IMARSHHD_2	.0060486	.009594	-3.22	0.001	.0002701	.1354509
_IMARSHHD_3	.1151983	.2283031	-1.09	0.276	.0023687	5.60248
_IHOUSETYP_2	.356627	.2879235	-1.28	0.202	.0732816	1.735535
_IHOUSETYP_3	.4781489	.3516325	-1.00	0.316	.1131322	2.020878
_ISLOPE_2	.7420525	.7481584	-0.30	0.767	.1028559	5.353529
_ISLOPE_3	.0155387	.0178421	-3.63	0.000	.001637	.1475005
_ICROPTYP_2	.1689968	.1703761	-1.76	0.078	.0234277	1.219066
_ICROPTYP_3	.8096385	.8401145	-0.20	0.839	.1059373	6.187757
_ICROPTYP_4	.4321858	.5508304	-0.66	0.510	.0355464	5.254675
_IINCOMESOU_2	6.18239	9.633606	1.17	0.242	.2915989	131.0771
_IINCOMESOU_3	7.369886	9.188089	1.60	0.109	.6401206	84.85154
AGE	.9825467	.0381796	-0.45	0.650	.9104946	1.060301
SEX	4.157196	8.974584	0.66	0.509	.0604256	286.0094
FAMSIZE	1.343909	.2208533	1.80	0.072	.9738376	1.854614
FARMSIZE	.8190982	.2154987	-0.76	0.448	.4890927	1.371768
EXPERINCE	1.060607	.0357822	1.74	0.081	.9927439	1.13311
LIVESTNUM	.9347682	.0293217	-2.15	0.032	.8790296	.994041
DISTMARKET	.9930012	.0462821	-0.15	0.880	.90631	1.087985
CREDIT	.0150242	.018255	-3.46	0.001	.0013885	.1625687
EXTENSION	3.874518	3.354923	1.56	0.118	.7098508	21.14795
ASSOCMEMB	.448723	.550541	-0.65	0.514	.0405167	4.969613
INCOMYR	.9527184	.0158723	-2.91	0.004	.9221116	.9843411
_cons	1940.401	7103.953	2.07	0.039	1.484496	2536319

## Appendix 8: Multi collinearity test

### Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
Working member	4.35	0.230
Farming experience	4.29	0.233
Age of household head	4.16	0.240
Farm size	3.90	0.256
Income per year	3.43	0.292
Family size	3.09	0.323
Credit	2.73	0.367
Distance from the nearest market	2.20	0.455
Extension	1.67	0.601
Mean VIF	2.35	

## Appendix 9: Contingency coefficient test

Variables	AGROEC	GENDER	MARSHH	HOUSET	SLOPE	CROPTYP	ROADTY	ASSOCM	INCOME~	EDULHH
AGROEC	1									
GENDER	-0.03	1								
MARSHHD	0.07	-0.56	1							
HOUSETY	0.04	0.04	-0.02	1						
SLOPE	0.04	-0.03	-0.01	0.05	1					
CROPTYP	-0.05	0.03	-0.09	0.05	0.03	1				
ROADTYP	0.04	0.00	0.08	0.01	0.22	0.01	1			
ASSOCME	0.06	0.01	0.05	-0.02	0.21	0.01	0.24	1		
INCOMES										
O	0.10	-0.33	0.23	0.03	0.18	-0.05	0.34	-0.04	1	
EDULHHD	0.03	0.16	-0.13	0.03	0.15	0.00	0.11	0.02	0.05	1

## Appendix 10: Heteroscedasticity tests

### ...imtest, white

White's test for Ho: homoskedasticity against Ha: unrestricted heteroskedasticity

```
. imtest
```

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	202.00	190	0.2621
Skewness	30.61	21	0.0805
Kurtosis	0.38	1	0.5392
Total	232.98	212	0.1541

### ...hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity Ho: Constant variance

Variables: fitted values of zz

```
. hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

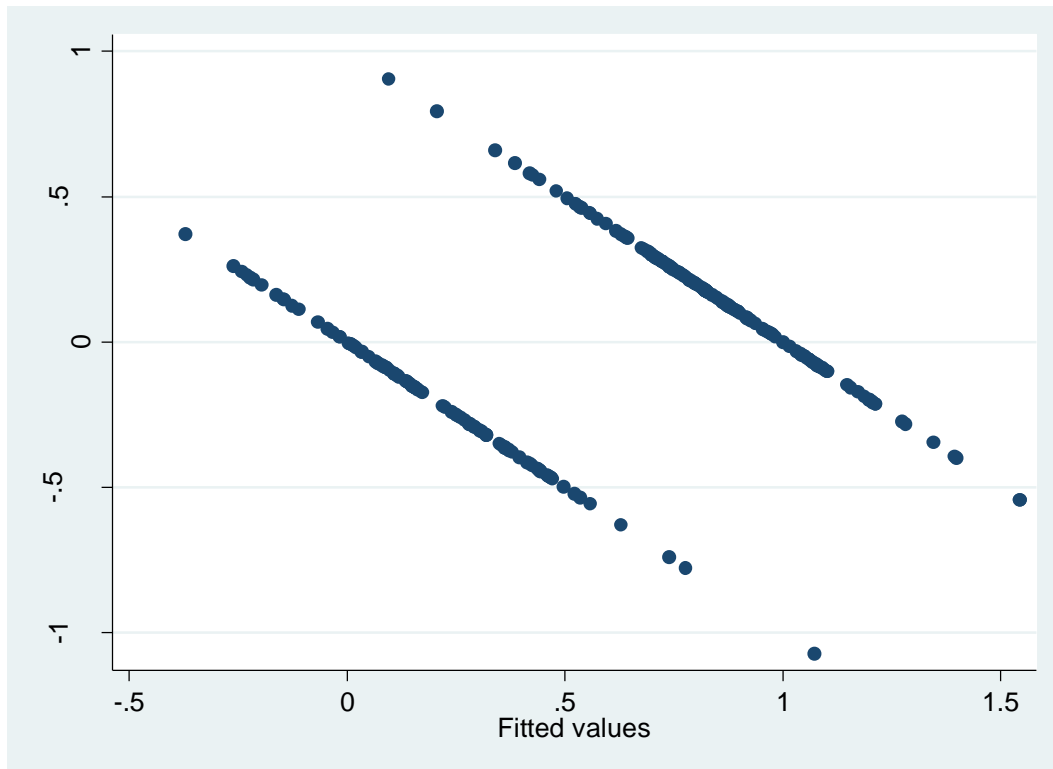
Ho: Constant variance

Variables: fitted values of FOODINSECU

chi2(1) = 0.75

Prob > chi2 = 0.3859

....rvfplot



### Appendix 11: Omitted variable tests

```
. ovtest
```

Ramsey RESET test using powers of the fitted values of FOODINSECU

Ho: model has no omitted variables

F(3, 245) = 40.62

Prob > F = 0.0000