

DETERMINANTS OF HOUSEHOLD FOOD INSECURITY IN RURAL ETHIOPIA

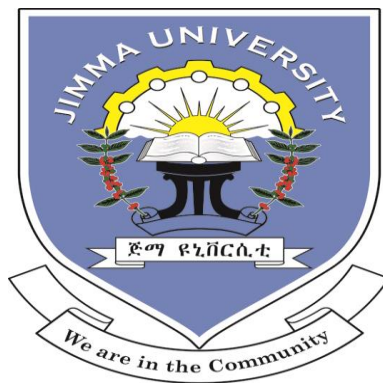
THE CASE OF MASHA DISTRICT OF SHEKA ZONE SNNPR, ETHIOPIA.

**A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF JIMMA
UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTERS OF DEVELOPMENT ECONOMICS**

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JUNE, 2021

JIMMA, ETHIOPIA

DECLARATION

I, Enyew Ayele hereby declare that the research work entitled; “Determinants of household food Insecurity: The Case of Masha Woreda, South West Sheka Zone, SNNPR Region, Ethiopia” submitted by me for the partial fulfillment of MSC program in department of Development Economics under the guidance of Menyahil Alemu (Assist. Prof.) and Esubalew Ayalew. The thesis is original work and it has not been presented for the award of any other Degree or Diploma in any university.

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CERTIFICATION

This is to certify that the thesis entities “Determinants of household food Insecurity: The Case of Masha Woreda, South West Sheka Zone, SNNPR Region, Ethiopia” submitted to Jimma University for the award of Degree Masters of science in Development Economics is record of valuable Research work carried out by Enyew Ayele my Guidance and supervision. Therefore, we hereby declare no part of this thesis has been submitted to any other university or institution for the award of any degree or diploma.

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APPROVAL SHEET

As members of the Examining Board of the Final Open Defense, we certify that we have read and evaluated the thesis prepared by Enyew Ayele entitled: “Determinants of household food Insecurity: The Case of Masha Woreda, South West Sheka Zone, SNNPR Region, Ethiopia”. And recommend that it be accepted as fulfilling the thesis requirements for the award of the degree in Master of Science in Development Economics.

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Acknowledgement

My first and heartfelt thank will goes to the Almighty God for everything he brought in my life. I would also like to thank my Advisor Menyahil Alemu(Assistance Professor) and EsubalewAyalew (Assistance Professor) for their dedication, valuable advice, continuous, precious guidance and support throughout the study of this research. He was ready and available to give me guidance, support and contributions.

I would also like to thank my family and friends, who encouraged and supported me at all times. Their love, support, encouragement, dedication, and many priceless sacrifices contributed to the successful completion of my Ms.c studies. Without their assistance, this work would not have been possible.

Table of Contents

| Contents | Page |
|--|-------------------------------------|
| Acknowledgement | i |
| Table of Contents..... | ii |
| List of Table..... | iv |
| Acronyms | v |
| <i>Abstract</i> | v |
| CHAPTER ONE | 1 |
| Introduction | 1 |
| 1.1. Background..... | 1 |
| 1.2. Statement of the Problem..... | 4 |
| 1.3. Objectives of the Study..... | 6 |
| 1.4. Significance of the Study..... | 6 |
| 1.5. Scope and Limitations of the Study | 7 |
| CHAPTER TWO | 2 |
| Literature Review..... | Error! Bookmark not defined. |
| 2.1. ConceptandDefinitionofFoodInsecurity | 2 |
| 2.1.1. Food Insecurity Situation in Ethiopia | 5 |
| 2.1.2 Measurement and Indicators of Food Insecurity..... | 7 |
| 2.2. IndicatorsofFoodInsecurity | 7 |
| 2.2.1. Measuringfoodinsecurity | 9 |
| 2.4. ConceptualFrameworkoftheStudy..... | 14 |
| CHAPTER THREE | 16 |
| Research Methodology..... | 16 |
| 3.1 Description of Study Area | 16 |
| 3.2 Sampling Techniques and Sample Size..... | 18 |
| 3.2.1. Sampling technique | 18 |
| 3.2.2 Sample size Determination | 19 |
| 3.3. Nature and source of Data | 20 |

| | |
|--|-------------------------------------|
| 3.4 Methods of Data Analysis | 20 |
| 3.4.1 Measuring food insecurity status of the households | 20 |
| 3.4.2. Descriptive analysis | 21 |
| 3.4.3. Measurement of the extent of food insecurity | 21 |
| 3.4.4. Econometric method | 23 |
| 3.5. Definition of Variables and Hypotheses | 35 |
| 3.5.1. Dependent variable | 26 |
| 3.5.2. Independent variables | 26 |
| CHAPTER FOUR | 32 |
| Results and Discussion | 32 |
| 4.1. Descriptive Results | 32 |
| 4.1.1. Food insecurity status of the sampled households | 32 |
| 4.1.2. Demographic characteristics of households | 33 |
| 4.1.3. Economic factors | 36 |
| 4.1.4. Institutional factors | 38 |
| 4.1.5. Household food deficits | 41 |
| 4.1.6. Causes of household food deficits | 42 |
| 4.2. Extents of Households Food Insecurity | 43 |
| 4.3. Econometric Model Results and Discussion | 44 |
| 4.3.1. Diagnostics of the econometric model | 44 |
| 4.3.2. Determinants of food insecurity | 44 |
| CHAPTER FIVE | 50 |
| Conclusion and Recommendations | 50 |
| 5.1 Conclusion | 50 |
| 5.2. Recommendations | 52 |
| REFERENCES | 54 |
| 7. APPENDICES | Error! Bookmark not defined. |

List of Table

| | |
|---|----|
| Table 1. Distribution of sampled kebeles and households | 18 |
| Table 2. Summary of variables definition, measurement, and hypothesis | 31 |
| Table 3. Kilo calories per day per adult equivalent of the sampled households | 32 |
| Table 4. Categorical variables and food insecurity status | 34 |
| Table 5. Food insecurity status and demographic characteristics of the households..... | 35 |
| Table 6. Food insecurity status of the households and the economic factors..... | 37 |
| Table 7. Food insecurity status and institutional factors | 39 |
| Table 8. Distribution of household heads by the number of months of food shortage | 42 |
| Table 9. Major causes of households' food deficit | 43 |
| Table 11. The maximum likelihood estimates of logit model..... | 45 |

Acronyms

| | |
|---------|---|
| ACAPS | American Council of Academic Plastic Surgeons |
| BOFED | Bureau of Finance and Economic Development |
| CSA | Central Statistical Agency |
| CSAE | Centre for Studies of African economics |
| DRMFSS | Disaster Risk Management and Food Security Sector |
| EHNRI | Ethiopian Health and Nutrition Research Institute |
| EU | European Union |
| FGT | Foster, Greer and Thorbecke |
| FS-DPPO | Food Security, Disaster Prevention and Preparedness Office |
| FSP | Food Security Program |
| FAO | Food and agriculture organization |
| HDI | Human Development Index |
| IFRC | International Federation of Red Cross |
| IFAD | International fund for agricultural development |
| MDGs | Millennium Development Goals |
| MOFED | Ministry of Finance and Economic Development |
| NCFSE | New Coalition for Food Security in Ethiopia |
| PASDEP | Plan for Accelerated and Sustained Development to End Poverty |
| PSNP | Productive Safety Net Program |
| SDPR | Sustainable Development and Poverty Reduction |
| SNNPRS | Southern Nations, Nationalities and Peoples Regional State |
| SSA | Sub-Saharan Africa |
| UNDP | United Nations Development Program |
| WFP | World Food Program |
| WM | Welfare Monitoring |

Abstract

Even though the struggle to achieve food security at the household level in the rural areas of Ethiopia dates back a long before, it has remained a challenging goal until today. The design and implementation of effective measures to reduce household food insecurity needs an in depth understanding of its covariates. As a result, this study was conducted with the general objectives of assessing situation, extent and severity of food insecurity and identifying factors affecting food insecurity situation in Masha woreda Sheka zone SNNPR. In order to achieve these objectives, data on demographic, socio-economic and institutional characteristics of the households was collected from 150 randomly selected households in three randomly selected kebeles of the woreda. Relevant secondary data was also gathered. The results from descriptive statistics showed that the total surveyed households, 62 percent were food insecure. In addition, results revealed that there was statistically significant difference between food insecure and food secure households with regard to different demographic, economic and institutional factors. Adult equivalent, age and dependency ratio had significant and positive effect on food insecurity while sex, cultivated land, livestock ownership in tropical livestock unit, oxen ownership, fertilizer use and income from safety net had a significant and negative effect on food insecurity. Finally based on the finding of study recommendation was made on important that the zonal and regional government should integrate development of the rural sector to spread small-scale industries throughout the rural areas and the reorientation of economic activity through promoting off-farm and non-farm employment opportunities, Use of fertilizer was found to had a negative and significant impact on household food insecurity. Furthermore, price rise in agricultural input (like fertilizer) and shortage of agricultural input were also the important causes of food deficit in the area. Therefore, government should mobilize large amount of funds to increase its supply. But as a short-term alternative to chemical fertilizer, the extension system should promote preparation and use of compost, use of organic fertilizers eradicate household food insecurity situation in study area.

Key words: *Food insecurity, FGT indexes, logit, Masha.*

CHAPTER ONE

INTRODUCTION

1.1. Background

Food is both a basic need and a human right as enough food in terms of quantity and quality for all people is an important factor for a healthy and productive life as well as for a nation to sustain its development (FAO (2014); Sani and Kemaw 2017). Besides, enough food in terms of quantity and quality is a key for maintaining and promoting political stability and insuring peace among people (Idrisa et al. 2008). However, reports indicated that about 1.4 billion poor people were living on less than US\$1.25 a day and 1 billion of them live in rural areas where agriculture is the main source of livelihood, especially in sub-Saharan Africa and Southern Asia (IFAD 2011). Furthermore, FAO (2015) reported that about 795 million people in the world were food insecure, with many more suffering from ‘hidden hunger’ caused by micronutrient or protein deficiencies. Moreover, different studies depicted that food insecurity occurred in most countries to varying degrees, and 75% of the food insecure people lived in rural areas of developing countries, in which two thirds of these lived in just seven countries (Bangladesh, China, Democratic Republic of Congo, Ethiopia, India, Indonesia and Pakistan) (Keatinge et al. 2011; Khush et al. 2012; Sani and Kemaw 2017).

As a part of Africa and developing world, Ethiopia is one of the most food-insecure and famine affected countries as large portion of the country’s population has been affected by chronic and transitory food insecurity (Abduselam 2017). Over 30% of the population is below the food poverty line, unable to afford the minimum caloric intake for a healthy and active life (CSA (Central statistical agency) 2014). Furthermore, FAO (2012) finding figured out that 52% of the rural population was food insecure i.e. consume below the minimum recommended daily intake of 2100 kcal/ AE /day, which led the rural households to temporarily depend on relief food assistance. As a result, more than 8.5 million people were in need of emergency food aid and assistance (WFP2017). Moreover, under-nutrition has been a persistent problem as 44% of children in the country were stunted, 10% of children were considered to have low weight-for-height (wasting) and 29% of children were considered to have underweight (low weight-for-age). Besides, under-nutrition was predominant in rural areas in which stunting accounts for 46%, wasting accounts for 10%, and

underweight accounts for 30% of rural children in the country (CSA (Central statistical agency) 2011).

In 2000, world leaders committed themselves to the Millennium Development Goals (MDGs). The first goal is to eradicate poverty and hunger, including “to reduce by half the proportion of people who suffer from hunger” between 1990 and 2015. However, by 2003 from the review made by World Food Summit, in Rome, the proportion of world population that was undernourished had only decreased from 20% to 17% (823 to 820 million people). It is predicted that many regions will not reach their MDG targets, particularly sub-Saharan African (SSA) countries where a third of the population is food insecure and there is an actual increase (through population growth) in the number of hungry people (FAO, 2004).

Historically, Ethiopia has been relatively food secured in the Imperial period. However, since the late 1950s domestic food supply failed to meet the requirements of the people, both at national and household levels. In line with this, the food insecurity problem became an important agenda through time. Over a period of two and half decades, the proportion of the population deemed food insecure rose from 5% in the 1970s to over 20% in 2003. Analysis of historical data on people affected by drought shows that the number has been increasing at a both chronic and transitory food insecurity problems continue at the household level in Ethiopia. Across the country, an estimated 7.6 million (or 11 percent of the rural population) were considered chronically food insecure, meaning each year they are relying on resource transfers to meet their minimal food requirements. In addition, over the past four years between 2.2 and 6.4 million additional people were food-insecure or not able to meet their food needs in the short term due to transitional factors. They are temporarily dependent on relief food assistance (FAO/WFP, 2012).

From this, it can be understood that even if domestic production is the first and prime source of food supply of the country, it could not feed the total population of the country. Food aid import supplemented and is supplementing a lot to fill the gap between food demand and food supply. The country received 795 thousand metric tons of food aid annually between 1990 and 1999, which was about 10% of total domestic grain production. Food aid shipments increased to 997 thousand metric tons (equivalent to 11.5% of national production) between 2002 and 2003 (Berhanu, 2004). Moreover, the shipment of food aid continued increasing from 400 thousand metric tons in 2006 to more than 850 thousand metric tons in the year 2010 (FAO/WFP, 2010).

Agriculture is of main economic values in Masha Woreda as the majority of the population of the area is engaged in it. This agricultural activity is mainly of a mixed type which targets at cultivating staple food crops for almost all the population, 'inset' and rearing of animals. There is also an activity of bee keeping using modern as well as local bee hives from which an average farmer gets about 25-45 kg of honey per season. The area is also known for its significant meat and milk products from the domestic animals like goat, sheep, cow and others. In addition to agricultural activities, there are also transactions among rural dwellers in small Keble markets in which people buy and sell products like coffee and honey. The center of this Woreda is Masha town; it serves as a large market place, and seat of governmental institutions like Zonal administration and nongovernmental organizations like micro enterprises, private clinics, hotels and the like(non-Timber forest product, 2004).

Agro climatically, the area is largely Woinadega type comprising about 75% of the total area, 22% and 3% are in Dega and kola types. The Woreda receives all the year-round rainfall. There is large forest cover in the Woreda. The relief feature of the Woreda is a rugged terrain comprising hilly areas which impose their respective influence on agricultural and settlement patterns of the population.

The infrastructural development is very low and is no electric supply except in the Woreda capital, telephone stations, health centers, pure water supply and other basic infrastructures. There is no high school in all the 19 Kebeles except one high school at Masha city administration serving all the students of the Woreda. There are 3 health centers dispersed among the Woreda to serve all the population of the Woreda. In addition, there ill equipped and worker deficient health posts in all Kebeles (2007 Census conducted by the CSA).

1.2. Statement of the Problem

As part of Sub Saharan Africa, Ethiopia is facing with the problems of poverty and food insecurity. A recent study figured out that about 23 million Ethiopian live under the basic poverty line and food insecurity remains a major challenge UNDP (2016). Furthermore, UNDP (United Nations Development Program 2016) Showed that around 44.2% of children under five were malnourished and stunted mainly caused by climate change, drought and the spread of diseases. Moreover, different scholars depicted that the food insecurity and poverty incidence were higher in rural areas constituting around 30.4% of the total population live under poverty line, while merely 25.7% for the urban dwellers consuming below the minimum recommended daily intake of 2200 kcal/adult equivalent (AE)/day FAO (Food and Agriculture Organization,2017).

In addition, Hill and Porter Hill, R.V. and Porter, C. (2015) also reported that in the country 43% and 46% of the total and rural population, respectively, were vulnerable to absolute poverty, and 55% and 56% of the total and rural community, respectively and experienced different types of shocks. Porter, C. (2012) argued that the vulnerability of rural households was mainly attributed to shocks such as food price increase, occurrence of drought, crop damage and job loss that impact consumption by restricting their physical access and nutritional content of the products consumed.

In Ethiopia, the number of food-insecure population was increased from 5.6 million in December 2016 to 8.5 million in August 2017(ACAPS, 2018). An estimated 3.6 million children and women in Ethiopia were acutely malnourished in 2017(IFRC, 2018). The main causes of food insecurity in Ethiopia are prolonged drought, conflict and insecurity, crop disease, etc. According to FAO (2018), in Ethiopia, prolonged drought conditions are severely affecting the livelihoods in most southern and southeastern pastoral and agro-pastoral areas of SNNPR, southern Oromia and southeastern Somali Regions, where cumulative seasonal rainfall was up to 60 percent below average. In these areas, pasture and water availability have declined to extremely low levels, severely affecting crop production and livestock conditions, leading to large scale animal deaths. More than one million people are displaced in Ethiopia, most of whom have been displaced by conflict starting in

September 2017 and many of whom are displaced along the Oromia-Somali regional border (FEWS, NET and WFP, 2018).

In the near-time, this displacement has disrupted households' ability to engage in their typical livelihoods activities, such as seasonal cultivation and rising of livestock, and has resulted in food security crisis in the region where conflict has been reported to be most severe. Another factor driving the food security crisis in Ethiopia is the fall armyworm outbreak, which affects large parts of the country; especially maize-producing parts of SNNPR, Western Oromia, Amhara, Gambela, and Benshangul Gumuz (ACAPS, 2018; FEWS, NET and WFP, 2018).

According to ACAPS (2018), food security situation in Ethiopia remain acute in 2018 with the reduced output of 2017 harvests, decreased food access as a result of poor purchasing power. The problem of food insecurity greatly varies among households residing in the same country. In Ethiopia, some households frequently face the problem of food insecurity, even in areas where there are no aforementioned drivers of food insecurity. Although a number of efforts have been done to achieve food security at the household level in the rural areas of Ethiopia, it has remained as a challenging goal even today. In Ethiopia, the poor performance of food security at household level is associated with poor institutional forms and dependency on rain-fed agriculture, which is highly vulnerable to drought which leads to loss of rural household's lives and livelihoods in every three years (Abduselam, 2017).

A number of studies made use of various methodologies to identify determinants of food insecurity in different parts of Ethiopia. According to these studies, ownership of livestock, farmland size, family labor, farm implements, employment opportunities, market access, levels of technology application, and levels of education, health, weather conditions, crop diseases, rainfall, oxen, and family size are identified as major determinants of food insecurity (Shiferaw, *et al*, 2003; Yared, *etal*, 1999; Webb, *et al*, 1992, Biruk kemawu 2019). No similar studies have been conducted for Masha woreda; therefore, this study takes as its objective the determination of factors influencing food insecurity in the study area. It was anticipated that the results obtained would add to the wealth of information currently available on the determinants of food in security in Ethiopia. The researcher was fill the gap rural house hold food insecurity issues that are not yet assessed by other researcher in study area.

Consequently, this study was focus on answering the following research question.

1. What is the food insecurity situation of rural farm households in the Masha woreda?
2. What are the roots causes of rural farm households' food insecurity in the study area?
3. What are the major determinates effects in farm household's food insecurity?

1.3. Objectives of the Study

The general objective of the study was to assess factors affecting farm households' food insecurity situation in Masha woreda of Sheka zone. The specific objectives of this study were:

- ❖ To assess rural farm households' food insecurity situation, food insecurity gap and its severity in Masha woreda;
- ❖ To identify the possible major sources of food insecurity in study area.
- ❖ To determine the extent of food insecurity status of households in study area.

1.4. Significance of the Study

As discussed above, food insecurity problem is a persistent problem in the country as well as the region in which many woredas were affected, particularly Masha woreda, the current study area. The problem is encompassing large number of people living in the woreda. Mitigation of the food insecurity problems of various targeted groups requires an understanding of the extent and determinant. Thus, the significance of this study is that relevant data on the extent, determinants and farmers way of mitigating the problem of food insecurity in the study area are generating. The results of the study will be useful to woreda as well as zonal level planners, policy makers, researchers and development actors in both the governmental and non-governmental organizations working in the study area. Moreover, the study results will be used as a spring board for other studies on food insecurity of farm households.

1.5. Scope and Limitations of the Study

This study was being carried out in Masha District, Sheka Zone SNNPR. The study was focused on identifying some of the factors that were expected to influence household food insecurity in rural parts of the Masha Woreda. The study did not make a comparative analysis of food insecurity problems between urban and rural Kebeles. The study was concerned about transitory food insecurity faced by farm households for any magnitude ranging from mild to severe and hence did not deal with causes of chronic food insecurity. In determining the available calories by the household head, the study used cereal products only and it did not include other products (oil seeds, fruits, etc) which might be consumed by the household in the year under study. This means the aggregate production (yield) consists of cereal output of the household only. In addition, of the different nutrients derived from the consumption of cereal foods, only calories were considered.

In the study area there was a lack of related research that had been done previously on food insecurity situations. This led to a lack of reference on household food insecurity situations in the study area. The researcher is self-sponsored according to the increment of educational fees and COVID-19 is challenged to conduct this study.

CHAPTER TWO

Literature Review

In this, chapter definition of basic concepts food insecurity situation in Ethiopia methodological issues on food insecurity indicators and measurements.

2.1. Concept and Definition of Food In security

Food insecurity was the flexible concept that has evolved considerably over time and many attempts were made at definition in research and policy usage. Even, Maxwell and Smith (1992) listed nearly around 200 definitions of food in security which together traces the development in the definition of the concept of food security.

Food insecurity as a concept originated only in the mid-1970s, in the discussions of international food problems at a time of global food crisis. At that time, food insecurity was mostly concerned with national and global food supplies (Maxwell and Frankenberger, 1992). With regard to its (food insecurity) cause, the food crisis in Africa in the early 1970's stimulated a major concern on the part of the international donor community regarding supply short falls created by production failures due to drought and desert encroachment as the major cause. Food supplies shortfall as the major cause of food insecurity was given weight at the 1974 World Food Conference. This understanding of the concept of food insecurity was manifested by the definition that was given in the World Food conference of 1974. According to the World Food Conference of 1974 food insecurity was defined as: 'Unavailability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices' (Clay, 2002).

However, the limitations of the food supply focus came to light during the food crisis that again affected Africa in the mid-1980s. It became clear that adequate food availability at the national level did not automatically translate into reduction of food insecurity at the individual and household levels. It became clear that there are countries in the world, regions within Countries, villages within regions, households within villages and individuals within household those are not able to meet their food needs. That is, it is possible for individuals to be food secure in a food-insecure household, just as it is possible for individuals to not be poor in a poor household, depending on the intra household allocation of resources. It means that we can measure and report the number of people

who are in food-insecure households (with not all of them necessarily food insecure themselves). When a household contains one or more food-insecure persons, the household is considered food insecure. Researchers and development practitioners realized that food insecurity occurred in situations where food was available but not accessible because of an erosion to people's entitlement to food. Sen's (1981) theory on food entitlement had a considerable influence in this change in thinking, representing a paradigm shift in the way that food insecurity was conceptualized (Maxwell and Frankenberger, 1992).

The household food insecurity approach that evolved in the late 1980's emphasized both the availability (supply side) and stable access to food (demand side). Thus, food availability at the national and regional level and stable and sustainable access at the local level were both considered essential to household food security. Interest was centered on understanding food systems, production systems, and other factors that influence the composition of food supply and a household's access to that supply over time. As a result, in 1983, FAO expanded its concept to include securing access by vulnerable people to available supplies, implying that attention should be balanced between the demand and supply side of the food insecurity equation. Accordingly, food security (absence of food insecurity) was defined as 'Ensuring that all people at all times have both physical and economic access to the basic food that they need'(Clay, 2002).

By the mid-1990s food insecurity definition was broadened to incorporate food safety and also nutritional balance, reflecting concerns about food composition and minor nutrient requirements for an active and healthy life. Food preferences, socially or culturally determined, now became a consideration. The potentially high degree of context specificity implies that the concept had both lost its simplicity and was not itself a goal, but an intermediating set of actions that contribute to an active and healthy life. Consequently, in 1996 World Food Summit adopted useful working definition which has international acceptance as "Food security, at the individual, household, national, regional and global levels [is achieved] when 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" (FAO, 1996).

At the World Food Summit of 2009, this definition was confirmed, and the concept was extended and specified by adding that the "four pillars of food insecurity are availability, access, utilization, and stability"; it was emphasized that "the nutritional dimension is integral to the concept"(FAO,

2009). These four pillars are:

Food availability: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

Food access: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

Utilization: Utilization of food through adequate diet, clean water, sanitation and health care or each a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

Stability: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

With regard to time dimension, food insecurity is divided into chronic food insecurity (the inability to meet food needs on an ongoing basis) and transitory food insecurity (the inability to meet food needs is of a temporary nature). That is, chronic food insecurity occurs when a household runs a continually high risk of inability to meet the food needs of household members (Maxwell and Franken Berger, 1992). Structural factors contributing to chronic food insecurity include poverty (as both cause and consequence), the fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2004).

On the other hand, transitory food insecurity occurs when a household faces a temporary decline in the security of its entitlement and risk of failure to meet food needs is of a short duration. It occurs for a limited period of time. Transitory food insecurity is sometimes divided in to two sub categories: cyclical (where there is a regular pattern to food insecurity, for example, the 'lean season'

that occurs in the period just before harvest); and temporary (which is the result of a short-term, exogenous shock such as droughts or floods). More generally, transitory food insecurity results from a temporary decline in household access to food due to crop failure, seasonal scarcities, temporary illness or unemployment, instability in food prices, production, household income or combination of these factors. But, the main triggers of transitory food insecurity in Ethiopia are drought and war. Finally, the cyclical type of food insecurity is caused by seasonality (FAO/WFP, 2006).

In general, a household can be said to be food secure only if it has protection against all kinds of insecurity. The average access to food over the long term should be nutritionally adequate, and a household should be able to cope with short-term changes without sacrificing the nutritional needs of any of its members. In the above definitions of food security, basic principles and definitions of food security, that is, “availability, access and utilization and stability” were stressed in the definitions cited above. Therefore, for the purpose of this study, the definition put forwarded by World Food Summit (1996) and further confirmed by FAO (2009) was taken as a working definition of food security and the household was considered as the key unit of food insecurity analysis.

2.1.1. Food Insecurity Situation in Ethiopia

Historically, Ethiopia has been relatively food secured in the Imperial period. But the condition in the balance between food demand and food supply in the country changed starting from the late 1950s. Even at the time the problem was limited to some part of the country. For example, towards the late 1950s drought and famine were phenomena concentrated in the two northern regions, Tigray and Eritrea (it was part of Ethiopia). The famine of 1972-73 was concentrated in Wollo province which suffered from a crop failure and a subsequent devastating famine. The Afar pastoral community areas were also affected. The 1973-75 famine extended to the eastern region and affected specifically the eastern part of Hararghe province. In 1984, drought and famine affected most of Ethiopia, as did the famine of 1999/2000 (in Somali region) and 2003. During the latter, many areas known for their good agricultural performance were affected by drought and famine. Examples include many areas of Arsi zone in the Oromia region (Berhanu, 2004).

Thus, Ethiopia has been structurally food insecure since at least 1980. The food insecurity problem continued increasing and affecting large number of population. The food gap was 0.75 Million tons in 1979/80 which rose to 5 million tons in 1993/94, falling back to 2.6 million tons

in 1995/96 (Deveruex and Sussex, 2000). During the late 1980s, 52% of Ethiopia's population consumed less than the recommended daily allowance of 2,100 kcal, but in the record harvest year of 1995/96, this proportion fell only to 43%. This figure approximates the 40% of rural households who farm less than 0.5 hectares, which is inadequate to meet subsistence food needs even in good rainfall years. Ethiopia suffers from structural as well as transitory food insecurity, requiring substantial commercial and concessional imports in non-drought years and extremely high levels of food aid in drought years (Deveruex and Sussex, 2000).

The extent of food insecurity in Ethiopia has become alarming and its coverage in drought periods has reached as high as 45 percent of the population. Although the food insecurity is predominantly chronic, it is frequently aggravated and turns out to be more acute, and on the average over five million people were enlisted for a daily relief food ration per annum, even when the weather and market conditions appear to be normally good. Consequently, since the country is dependent on agriculture, crop failure usually leads to household food deficit. The absence of off-farm income opportunities, and delayed food aid assistance, leads to asset depletion and increasing levels of destitution at household level (FSP, 2003).

Thus, due to the failure of domestic production of the population, food aid was used to fill the food gap. For instance, the country received 795 thousand metric tons of food aid annually between 1990 and 1999, which was about 10% of total domestic grain production. Food aid shipments increased to 997 thousand metric tons (equivalent to 11.5% of national production) between 2002 and 2003. In these periods the numbers of beneficiaries were ranging between 2.7 million beneficiaries in 1996 and the record high of 13 million people in 2003. From 1996 to 2003 alone, an average of 870 000 tons of food aid has been provided annually, primarily through relief response (Abdullah *et al.*, 2004). Similarly, in 2004, more than 7.8 million beneficiaries received relief food aid and in 2005, a peak of 3.8 million beneficiaries was assisted through relief food interventions, while 4.8 million were assisted through the PSNP (FAO/WFP, 2006). Therefore, according to FAO/WFP (2006), overall food security indicators are poor with domestic grain production falling behind the population increase and pervasive depletion of the household asset-based taking place. The growing scale of the structural food deficit is highlighted by the fact that the country needs to produce an extra 750,000 tons of food annually to keep pace with population growth (PASDEP, 2005; FAO/WFP, 2006).

Due to persistency of the problem of food insecurity in Ethiopia, food insecurity has been given a priority under the national poverty reduction strategies. The Sustainable Development and Poverty Reduction Paper (SDPR) covering the period 2002–05 recognized the need to improve food availability and access. The PRSP was followed by the Plan for Accelerated Sustained Development to End Poverty (PASDEP), which covered the period 2005–10 and included food insecurity policy as part of its agricultural development policy. This priority was maintained in the current poverty reduction strategy for the period 2010–15, the Growth and Transformation Plan (EU, 2012).

Different factors were attributed as the cause of the problem of food insecurity. In Ethiopia, hunger and famine are increasingly caused by a multitude of factors and complex interrelationships factors like: underlying poverty, depleting coping capacity as a result of asset depletion, lack of savings from previous harvests, poor agricultural harvests, and shortage of productive farm lands and increasing population. Dependence on unreliable and low-productivity rain fed agriculture may well be the primary determinant of household food insecurity in Ethiopia (Deveruex, 2010). The major listed causes of transitory and chronic food insecurity in Ethiopia are: Recurring drought, limited source of alternative incomes, population pressure, limitations in technology, lack of product diversification and market integration, limited capacity in planning and implementation, environmental degradation and limited access to credit (WFP, 2006).

2.1.2 Measurement and Indicators of Food Insecurity

2.2. Indicators of Food Insecurity

Food insecurity is a broad and complex concept that is determined by interrelated agro-physical, socioeconomic, and biological factors (von Braun *et al.*, 1992). Consequently, its assessment requires multi-dimensional consideration since there is no universally established indicators which serve as a measuring tool.

Along with the development of the concept of food insecurity many indicators were identified and classified in to different groups by different researchers. For instance, Frankenberger (1992) classified the different types of indicators in to two main categories: ‘process indicators’ which reflect both food supply and food access and ‘outcome indicators’ which serve as proxy for food consumption. Food supply indicators provide information on the likelihood of shock or disaster that

will adversely affect household food insecurity. But, the importance of indicators that measure food access become apparent when it is realized that household food insecurity was occurring despite the availability of food. These indicators provide information on the capacity of the population affected by shock or disaster to with stand the effect. But, according to Frankenberg (1992) their use as indicator is location specific.

Household food insecurity outcome indicators include all direct and indirect indicators. Direct indicators of food consumption include those indicators which are closest to actual food consumption rather than to marketing channel information or medical status. Indirect indicators are proxy indicators for food consumption like using food in storage during critical time of the year to assess the household food insecurity status but people may be reluctant to discuss food in storage due to culture). Many of the indicators that are appropriate for one area may not be appropriate for another. So that aggregation of the information at the regional or national level is difficult (Hoddinot, 2001a; Frankenberger,1992).

Coping strategy which is practiced by the household to ensure their future income generating capacity in addition to maintaining their level of consumption is another indicator of household food insecurity. These includes change in cropping and planting pattern, migration to towns in search of urban employment, increased petty of commodity production, sale of possession, sale of productive asset, sale of firewood and charcoal. But, that, these strategies would also vary by region, community, household, sex and age. Furthermore, the type of strategies employed also would vary depending up on the severity and duration of potentially disruptive condition (Haddad *et al.*, 1991).

Chung *et al.* (1997) proposed two types of indicators. First, generic indicators are those that can be collected in a number of different settings and are derived from well- defined conceptual frame work of food security. Household dependency ratio is an example of generic indicators. Second, field work may also reveal a set of location specific indicators. This indicator typically carries meaning only within a particular study area because of cultures or socio-economic factors. Location specific indicators can be identified only from detailed understanding of local condition. This understanding of location specific indicators is best obtained by using qualitative data collection.

Given that food insecurity is multi-faceted concept, no one indicate or encompasses all dimensions of availability, access, utilization and stability (Chung *et al.*, 1997). Consequently, FAO(2003)

classified indicators of food security depending on the component of food security. They include: food stability and availability indicators, food access indicators and food utilization indicators (FAO, 2003). Popular indicators of food security tend to provide information on only one of these dimensions at a time (Hoddinot *et al.*, 2009).

Similarly, Hoddinot *et al.* (2009) divided indicators into primary and proxy indicators corresponding to each aspect of food insecurity. The most commonly used primary indicators include; dietary energy intake, calorie availability and perception of dietary adequacy and acceptability. In addition, proxy indicators commonly used are: Food frequency, dietary diversity, meal frequency, coping strategies and food security scales. Most of these indicators are difficult to quantify, highly context sensitive and require great care in interpretation.

To sum up since food insecurity is a multi-faceted concept there is no universally agreed rule as to which specific indicator to use for assessing household food insecurity. Indicators should be defined in ways that are appropriate to the local food insecurity conditions and purpose of analysis (USAID, 1999). Furthermore in choosing which indicator to use several considerations should be made like: resource availability, relevance and accuracy and timeliness (Frankenberger, 1992). Thus, in this study direct survey of calorie intake per adult equivalent per day would be used to compute proxy indicators of household food insecurity.

2.2.1. Measuring food insecurity

Measuring the required food for an active and healthy life and the degree of food insecurity is a question to be addressed in a food insecurity study. According to Von Braun *et al.* (1992), given the multiple dimensions of food insecurity, there can be no single indicator for measuring it. Different indicators are needed to capture the various dimension of food insecurity at the country, household and individual levels:

Country level: Food insecurity at the country level can to some extent be measured in terms of demand (requirement) and supply i.e. the quantities of available food and needs. However, national-level measures inherently lend themselves only to addressing national-scale food availability shortfalls, not international access and utilization concerns.

Household level: Food insecurity at the household level is best measured by direct survey of dietary

intake (in comparison with appropriate adequacy norms). However, they measure the existing situation and not the downside risks that may occur. The level of, and changes in socio economic and demographic variables such as real wage, employment, price ratio and migration properly analyzed can serve as proxies to indicate the status of and change in food insecurity. Indicators and their risk pattern needs to be continually measured and interpreted to monitor food insecurity at the household level.

Individual level: Anthropometrics information can be a useful complement because the measurements are taken at the individual level. Yet such information is the outcome of Changes of health and sanitation environment and other factors. Most importantly, this information indicates food insecurity after the fact.

Income and consumption has been the most commonly used measurement of food insecurity. But measurement method based on income has three further limitations: 1) they cannot be used for determining the location of food insecurity, 2) it has limited use for understanding the cause of food insecurity, 3) it focuses only on the diet quantity to the exclusion of other important aspect of food insecurity such as diet quality and vulnerability (Smith *et al.*, 2006). Thus, consumption is a better measure of longer-term household welfare as it is subject to less temporal variation than income. In addition, households are less likely to under report their consumption level more than they do with their income (MoFED, 2008).

Consequently, most analyses of food insecurity rely on measuring food consumption. Hoddinot (2001a) made comparison of different outcome measures of household food insecurity namely, individual intake, household calorie acquisition, dietary diversity and indices of household coping strategies in terms of time requirement, cost, skill and susceptibility to misreporting. Household calorie acquisition is found to be better measurement. Hoddinot (2001a) briefly discussed them as follows:

Individual food intake data: This is a measure of the amount of calories, or nutrients, consumed by an individual in a given time period, usually 24 hours. To generate these data, there are two basic approaches used. The first is observational. An enumerator resides in the household throughout the entire day, measuring the amount of food served to each person, and the amount of food prepared but not consumed ("plate waste") is also measured. In addition, the enumerator notes the type and

quantity of food eaten as snacks between meals as well as food consumed outside the household. The second method is recall. The enumerator interviews each household member regarding the food they consumed in the previous 24-hour period. This covers the type of food consumed, the amount consumed, food eaten as snacks and meals outside the household. Data collected on quantities of food are expressed in terms of their caloric content, using factors that convert quantities of edible portions into calories. These intake data are compared with minimum calorie requirement. Despite its advantages in terms of accuracy, it is unlikely to be an indicator that can be feasibly collected as part of many development projects (Hoddinot, 2001a).

Household caloric acquisition: This is the number of calories, or nutrients, available for consumption by household members over a defined period of time. The principal person responsible for preparing meals is asked how much food she prepared over a period of time. After accounting for processing, this is turned into a measure of the calories available for consumption by the household. To generate these data, a set of questions regarding food prepared for meals over a specified period of time, usually either 7 or 14 days, is asked to the person in the household most knowledgeable about this activity. This measure produces an accrued estimate of the number of calories available for consumption in the household. Because the questions are retrospective, rather than prospective, the possibility that individuals will change their behavior as a consequence of being observed is lessened. The level of skill required by enumerators is less than that needed to obtain information on individual intakes. On average, it took around 30 minutes per household to obtain these data, an amount of time considerably less than that required to obtain information on individual intakes (ibid, 2001a).

Dietary diversity: This is the sum of the number of different foods consumed by an individual over a specified time period. To generate these data, one or more persons within the household are asked about different items that they have consumed in a specified period. These questions can be asked to different household members where it is suspected that there may be differences in food consumption among household members. Even though it is simple to use, the simple form of this measure does not record quantities. If it is not possible to ask about frequency of consumption of particular quantities, it is not possible to estimate the extent to which diets are inadequate in terms of caloric availability (ibid, 2001a).

2.3. Empirical Studies on the Determinants of Food Insecurity

Causes of food insecurity facing farm households in various developing regions, particularly Africa, Latin America and Asia, have been documented in some literature. For instance, the study was made in Koredegaga peasant association, Oromia zone, Ethiopia using the data carried out by Centre for Studies of African Economies (CSAE, 2003) in collaboration with Addis Ababa University. This study used logit regression model to identify the determinants of food insecurity in the selected area. The empirical evidence revealed that farmers' access to fertilizer, educational level of the household heads, farmers' access to land, farmers' access to family planning improve the problem of food insecurity in the study area (Habtom *et al.*, 2005).

The study was also conducted in Amhara regional state by using Household Income, Consumption and Expenditure (HICE) and Welfare Monitoring (MW) surveys conducted by Central Statistical Agency (CSA) in the year 1999/00 to identify the important determinants of household food insecurity. The study utilized Tobit model. The empirical analysis revealed that household size, education, agricultural income, and share of food in total expenditure, participation in off-farm activities had affected the households' food insecurity significantly. The result of the study also revealed that although the ownership of livestock has an impact on the food insecurity of rural households it was found insignificant because of lower quality and quantity of the possession (Frehiwot, 2007).

Similarly, the study was also conducted in Bangladesh using logistic regression model to identify the determinant of household food insecurity. Variables like sex of the household head, education level of the household head, total land owned, dependency ratio, household occupation and access to safety net programs were obtained significantly affecting food insecurity status of households. The sex of the household head and dependency ratio were revealed affecting food insecurity positively, where the other variables affected the household food insecurity negatively (Farid and Wadood, 2010).

The study in Nigeria using the binary logistic regression method identified income and age of the household head as the important determinants of food insecurity. They affected food insecurity negatively, implying that gainfully employed and older household heads were tend to be less food insecure (Areneand Anyaeji, 2010).

Lewin and Fisher (2010) using logistic regression model examined the socio-economic characteristics of the farm households, agronomic factors, and government policies that affected food insecurity in rural Malawi. They found that the probability of the household to be food insecure was significantly influenced by land size holding, access to market, availability of irrigation, extension visit, education level of the household head, and farm input price. They also found that those households who had access to safety-net had lower probability of being food insecure.

Using probit model the dynamics of food insecurity transitions among rural households in South Western Nigeria was examined and it was found that, the educational level of the household head, farm size, access to extension, access to credit, access to remittance, and farming experience were negatively related with probability that the household would fall to food insecurity. But household size, age of the household head and dependency ratio were positively related with the food insecurity (Ayantoye *et al.*, 2011).

The empirical study conducted by Zerihun (2009) and Indris (2012) in different part of Ethiopia had used logit model. Their work result showed that adult equivalent family size affected food insecurity status of households positively whereas livestock holding, off/non-farm income and sex of the household affected food insecurity status of households positively. In the work of Zerihun (2009), land holding, number of oxen owned, income obtained from safety net and quantity of fertilizer used had significant and negative effect on food insecurity. Furthermore, in the work of Indris (2012), age of household head and dependency ratio had significantly and positively affected the food insecurity status of the households.

The empirical study undertaken in the southern regional state of Ethiopia in Wolayita, showed that majority of the rural households (74.2%) are food insecure. A binary logistic model was used to determine the factors, which influence households' food insecurity status. The results obtained from the analysis indicated those households with large family sizes, large dependents, and young heads were food insecure. Livestock ownerships, farm inputs, employment in off farm sectors had negative impact on the household food insecurity status (Adugna and Wogayehu, 2011).

The study was also conducted in Kenya to understand the determinants of food insecurity with a bias on the link between gender of the household head and food insecurity. Their result from both descriptive and econometrics methods showed that female headed household in general were more

likely to be food insecure compared to their male counterparts. The result further revealed that female headed household food insecurity decreased with quality of extension workers, land quality, farm size while distance to the market increased the probability of food insecurity (Kassie *et al.* 2012).

2.4. Conceptual Framework of the Study

Figure 2 outlines the food insecurity frame work, highlighting the three dimensions of availability, access, and utilization, and the nature of their relationship to one another, as well as a brief description of their determinants.

As indicated in Figure 2, food availability is a function of the combination of domestic food stocks, commercial food imports, food aid, and domestic food production, as well as the underlying determinants of each of these factors. Use of the term availability is often confusing, since it can refer to food supplies available at both the household level and at amore aggregate (regional or national) level. However, the term is applied most commonly in reference to food supplies at the regional or national level (USAID, 1999).

Food access is influenced by the aggregate availability of food through the latter's impact on supplies in the market and, therefore, on market prices. Again, figure 2 indicates that accesses further determined by the ability of households to obtain food from their own production and stocks, from the market, and from other sources. These factors are, in turn, determined by the resource endowment of the household which defines the set of productive activities they can pursue in meeting their income and food security objectives (ibid, 1999).

Food access also is a function of the physical environment, social environment and policy environment which determine how effectively households are able to utilize their resources to meet their food security objectives. Drastic changes in these conditions, such as during Periods of drought or social conflict, may seriously disrupt production strategies and threaten the food access of affected households. To the extent that these shocks often lead to the loss of productive assets such as livestock, they also have severe implications for the future productive potential of households and, therefore, their long-term food security (ibid, 1999).

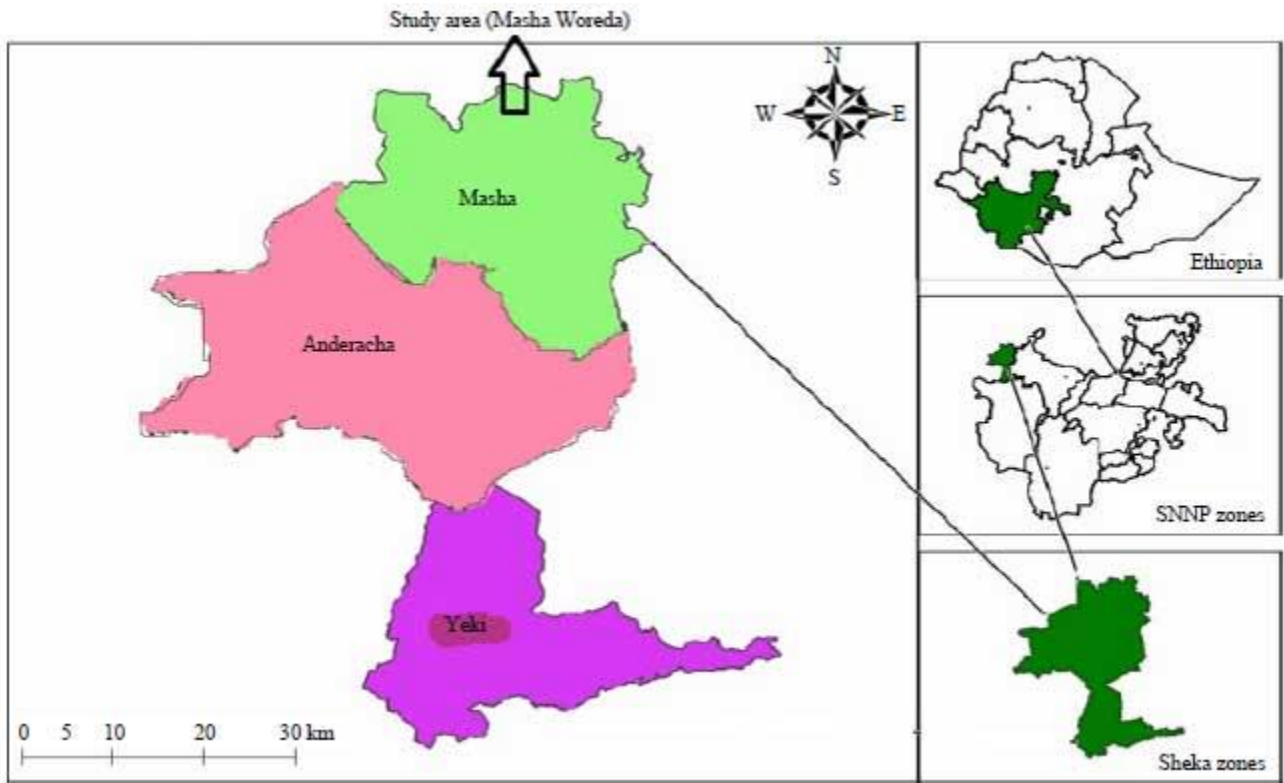
To cope with those shocks and minimize potential declines in food access, households typically adjust their consumption patterns and reallocate their resources to activities which are more insulated from the influence of those risks. In drought periods, for example, households may shift their labor resources from crop production on on-farm wage employment or sell-off small assets to ensure continued income. They may also adjust their consumption patterns, reducing their dietary intake to conserve food and relying more on loans or transfers and less on current crop production and market purchases to meet their immediate food needs. Overtime, as a crisis deepens, household responses become increasingly costly, leading to the loss of productive assets which can ultimately undermine future livelihoods and, again, their long-term food insecurity status (ibid).

Food utilization, which is typically reflected in the nutritional status of an individual, is determined by the quantity and quality of dietary intake, general child care and feeding practices, along with health status and its determinants. Poor infant care and feeding practices, inadequate access to, or the poor quality of, health services are also major determinants of poor health and nutrition. While important for its own sake as it directly influences human well-being, improved food utilization also has feedback effects, through its impact on the health and nutrition of a household members, and therefore, on labor productivity and household income-earning potential (ibid).

CHAPTER THREE

Research Methodology

3.1 Description of Study Area



Sheka is a Zone in the Ethiopian Southern Nations, Nationalities and Peoples' Region (SNNPR). Sheka is bordered on the south by Bench Maji, on the west by the Gambela Region, on the north by the Oromia Region, and on the east by Keffa (2007 Census conducted by the CSA).

Based on the 2007 Census conducted by the CSA, this Zone has a total population of 199,314, of whom 101,059 are men and 98,255 women; 34,227 or 17.17% are urban inhabitants. The seven largest ethnic groups reported in this Zone were the Shakacho (32.41%), the Amhara (22.17%), the Kafficho (20.16%), the Oromo (7.39%), the Bench (5.23%), the Sheko (4.24%), and the Majang (1.73%); all other ethnic groups made up 6.67% of the population. Shakacho is spoken as a first language by 33.44%, 26.98% speak Amharic, 20.15% Kafa, 6.54% speak Oromiffa, 5.24% Bench, and 4.35% Sheko; the remaining 3.3% spoke all other primary languages reported. 39.93% were

Protestants, 39.39% of the population said they practiced Ethiopian Orthodox Christianity, 15.09% were Muslim, and 3.51% practiced traditional beliefs.

Masha is one of the Woredas in the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Part of the Sheka Zone, Masha is bordered on the south by Anderacha, on the west and north by the Oromia Region, and on the east by the Keffa Zone.

This woreda has a total population of 40,810, of whom 20,116 are men and 20,694 women; 6,787 or 16.63% of its population are urban dwellers. The majority of the inhabitants were Protestants, with 56.5% of the population reporting that belief, 32.82% practiced Ethiopian Orthodox Christianity, 7.15% practiced traditional beliefs, and 1.56% was Christians

Masha, Woreda the administrative centre of Sheka Zone and the capital of Masha woreda is located 676 kms southwest of Addis Ababa and 950 kms from Hawassa, the capital of Southern Nation's, Nationalities and People's Regional State (SNNPRS) in which the Zone of Sheka is situated.

This Woreda is bordered on to east by Gesha Woreda of Keffa Zone, on to west by Sele Nonno Woreda of Oromia region, on to south by Diddo-Lallo Woreda of Oromia region and onto north by Andracha Woreda of Sheka Zone. The Woreda has a total land area of about 90,802.82 hectares. Out of this land area about 23.9% is cultivated, 2.8% is grazing land, 40.5% is covered by forest, 5.5% arable land, 5.9% non-arable land and 21.4% is settled land area. This Woreda lies between 1600-2400m above sea level and receives 2000mm rain fall. Agro climatically, the area is largely Woinadega type comprising about 75% of the total area, 22% and 3% are in Dega and kola types.

The Woreda receives all the year-round rainfall. There is large forest cover in the Woreda. The relief feature of the Woreda is a rugged terrain comprising hilly areas which impose their respective influence on agricultural and settlement patterns of the population. The Woreda is drained by relatively bigger rivers in the Woreda like Meneshi, Wonani, Tatamayi and Gahamayi.

3.2 Sampling Techniques and Sample Size

3.2.1. Sampling technique

The existence of three different agro-climatic zones in the woreda is the base for applying stratified random sampling techniques in this research. As a result, three stages stratified random sampling technique with probability proportional to size was used to draw three kebeles and 150 households. In the first stage, following the agro-climates, the *kebeles* of *Woreda* were stratified into three strata namely *woinadega* (having 10kebeles), *dega* (having 6 kebeles) and *kola* (having 3 kebeles) . In the strata namely Wollo kebele and *Yinna kebele* and one *kebele* from *kola* namely *Chago kebele* were randomly selected. Finally, a total of 150 households were randomly selected from respective lists of farmers in the three *kebeles* using probability proportional to size as shown in Table.1.

Table 1. Distribution of sampled kebeles and households

| Stratum | Number of kebeles | Sampled kebeles | Household per kebeles | Sampled households |
|-----------|-------------------|-----------------|-----------------------|--------------------|
| Woinadega | 10 | Wollo kebele | 912 | 39 |
| Dega | 6 | Yina kebele | 1350 | 58 |
| Kola | 3 | Chago kebele | 1234 | 53 |
| Total | 19 | 3 | 3496 | 150 |

Source: Field survey, 2021

3.2.2 Sample size Determination

There are several approaches to determining the sample size. These include using a census for small populations (i.e. to use the entire population as the sample), imitating a sample size of similar studies, using published tables, and applying formulas to calculate a sample size. Several formulas were developed to determine the sample size. But the simplified formula to calculate the sample size was provided by Yamane (1967) which is given:

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

Where n is the sample size, N is the population size, and e is the level of precision.

Thus, following Yamane (1967), to determine the required sample size at 95% confidence level, degree of variability = 0.5 and level of precision 8%.

$$n = \frac{3496}{1 + 3496(0.08)^2} = \frac{3496}{23.374} = 149.565 \approx 150$$

Therefore, a total of 150 farm households were included in the sample.

3.3. Nature and source of Data

The study primarily relied on primary data which was collected by using a semi-structured interview questionnaire. Before embarking on collection of primary data, enumerators were trained on the content of the questionnaire. To check similar understanding by all enumerators a pilot test was conducted. The primary data collected by the semi-structured questionnaire focus mainly on those factors believed to have an effect on the food insecurity status of households. The important sub-groups included in the questionnaire were: demo graphic characteristics, household assets, crop output and coping mechanisms used, use of modern agricultural input, livestock ownership, agricultural extension services, marketing services, credit services, off/non- farm employment and household consumption in last seven days.

Furthermore, focus group discussion was conducted with *kebele* leaders in which they were asked to express their feeling and to expose their experience regarding the issue under study. Relevant secondary data sources available both at *woreda* and zonal level were also assessed to supplement the primary data.

3.4 Methods of Data Analysis

3.4.1 Measuring food insecurity status of the households

The household food insecurity status was measured by direct survey of household consumption. The principal person responsible for preparing meals was asked how much food was prepared for consumption from purchase, stock and/or gift/loan/wage over a period of time. In this study, a seven-day recall method was used since such a measure gives more reliable information than the household expenditure method (Bouis, 1993). According to Gulled (2006), these seven days recall period is selected due to the fact that it is appropriate for exact recall of the food items served for the household within that week. If the time exceeds a week, for instance 14 days, the respondent may not recall properly what he has been served before two weeks.

Therefore, the consumption data colleting on the basis of seven days recall method, were converted in to kilo calorie using the food composition table manual adopted from Ethiopian Health and Nutrition Research Institute (EHNRI, 1997). Then, in order to calculate the households' daily caloric intake, the total households' caloric intake for the last seven days was divided by seven. The

household's daily caloric intake per adult equivalent was calculated by dividing the household's daily caloric intake by the family size after adjusting for adult equivalent using the consumption factor for age-sex categories.

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 insecure if it fails to meet this minimum and secure otherwise.

3.4.2. Descriptive analysis

Descriptive statistical tools were employed to explain the food insecurity situation of households with respect to demographic, socio-economic and institutional variables. The specific descriptive statistics used in this study include: tabulation, frequency, percentages, mean, and standard deviation. Statistical tests like t-test and chi-square test were also used to compare food insecure and food secure households in the study area based on different demographic, socio-economic and institutional factors.

3.4.3. Measurement of the extent of food insecurity

Many development agencies seek to improve the household food insecurity. That is the objective of targeting is to produce the greatest decrease in the percentage of individual who are food insecure. But, targeting is not nearly as straightforward as is often suggested. Indeed, it is possible that targeted intervention may be more costly and less effective. As a result, targeting should be assessed against a benchmark, such as the impact on reducing the severity of food insecurity. This problem could easily be handled by using FGT indices (Hoddinot, 2001b).

Even though the model is widely used for poverty measurement studies; several researchers used the FGT model to determine the incidence and severity of food insecurity (Abebaw, 2003; Aschalew, 2006; Frehiwot, 2007; Zerihun, 2009). Consequently, to estimate headcount ratio, food insecurity gap and to assess the severity of household food insecurity the Foster, Greer and Thorbecke (FGT) index was employed which was widely used for poverty measurement studies.

The class of FGT index was specified as follow:

$$P\alpha = \frac{1}{n} \sum (Z - y_i)/Z)^\alpha; \text{If } y_i > z \text{ then } z - y_i = 0$$

Where: n ; is the number of sampled households,
 Q ; is the number of food insecure households,
 z ; represents the cut-off between food security and food insecurity where in this case 2200kcal/AE/day,
 y_i ; is a measure of per adult equivalent food calorie intake of the i^{th} household
 α ; is the weight attached to the severity of food insecurity.

According to Hoddinot (2001b), most commonly, α is assumed to take the values of 0, 1 and 2. Giving no weight to the severity of food insecurity is equivalent to assuming that $\alpha = 0$. This index does not show the depth of food insecurity below the recommended minimum calorie requirement or do not capture differences among the food insecure households. That is, it does not tell whether the food insecure is only slightly or substantially below the minimum recommended level of calorie intake of 2,200 kcal/AE/day. Then, the formula collapses to:

$$P_0 = q/n$$

The above formula is called head count ratio (P_0). It shows the proportion of households below the commonly accepted minimum level of per capita household calorie intake.

Giving equal weight to these verity of food insecurity among all food-insecure households is equivalent to assuming that $\alpha = 1$. Then the formula collapses to (P_1):

$$P_1 = \frac{q * Z - \sum y_i}{Z} \tag{4}$$

The above formula is called food insecurity gap (P_1) and it measure show far the food insecure households, on average, are from the minimum recommended level of calorie intake. Therefore, it shows the calorie, as percentage of minimum recommended level, which is required to bring each of the food insecure individuals to the line. That is, the total amount of increase in food security needed to eliminate food insecurity among all food in secure households which is calculated by adding up the caloric shortfall of all individuals for whom availability is less than the requirement.

To focus on the most food insecure households the best way is using the third measure known as severity of food insecurity gap (P_2). Here $\alpha=2$. This index gives those further away from the given minimum energy requirement level a higher weight in aggregation than those closer to meet the daily recommended energy level (Hoddinot, 2001b). Then, the severity of food insecurity is specified as follows:

$$P_2 = 1/n \sum_{i=1}^q \frac{(z - y_i)^2}{z} \quad (5)$$

3.4.4. Econometric method

Choosing an appropriate model and analytical technique depends on the type of variable under investigation. Ordinary least squares method deals with cases where the dependent variable of interest is a continuous variable. But in many applications, the dependent variable of interest is not a continuous scale; it may have only two possible outcomes.

Similarly, in this study, the dependent variable Y (household food insecurity) is dichotomous variable taking value 1 if the household is food insecure and 0 otherwise. In the case where the dependent variable is dichotomous, probability regression models are the most fitting to study the relationship between dependent and independent variables. In the case where the response variable is qualitative, it is the probability of the dependent variable given independent variable that is determined. The most common qualitative regression models are linear probability model, logit model, and probit model (Gujarati, 2004).

Linear probability model like a typical linear regression model, determine the conditional expectation of the dependent variable given independent variable. Beside this, the model is encountered with many problems like non-normality and heteroscedastic variances of the disturbance U_i and the probability fails to fall in between 0 and 1 values. For this reason, linear probability model is not attractive model and it is fallen out of use in many practical applications. These problems could be easily solved by using probit and logit models. In these two models the probability will fall in between 0 and 1. In most applications these two models are quite similar. The main difference being the logistic distribution has slightly fatter tails, that is to say, the conditional probability P_i approaches zero or one at a slower rate in logit than in probit. Therefore,

there is no compelling reason to choose one over the other. In practice many researchers choose the logit model because of its comparative mathematical simplicity (Gujarati, 2004).

Therefore, in this study will use logit model is chosen for its simplicity and less complexity of its interpretation.

Then, following Gujarati (2004) logit model is specified as follows:

$$P_i = E(Y=1/X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_i X_i)}} \quad (6)$$

For ease of exposition, the probability that a given household is food insecure is expressed as:

$$P_i = \frac{1}{1 + e^{-z_i}} \quad (7)$$

The probability of being food secure is 1-P_i:

$$1 - P_i = \frac{1}{1 + e^{z_i}} \quad (8)$$

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \quad (9)$$

Thus: is the ratio of the probability that a household will be food insecure to the probability of that it would be food secure. It is the odds ratio in favor of food insecurity. Taking the natural log of equation (9) we have:

$$L_i = \ln \left(\frac{P_i}{1-P_i} \right) = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (10)$$

Where, P_i is the probability that the household would be food insecure ranges from 0 to 1 and Z_i is a function of n explanatory variable and is expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (11)$$

Where, β_0 is an intercept and $\beta_1, \beta_2, \dots, \beta_n$ are the slopes of the equation and L_i is logs of odds ratio in favor of food insecurity which is not only linear in parameters but also linear in terms of explanatory variables. If the disturbance term U_i is introduced, the logit model will become:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + U_i \quad (12)$$

Before the execution of the above specified logit model, the explanatory variables were tested for the existence of multi colinearity where the explanatory variables are highly inter correlated. In the presence of multi colinearity, it becomes difficult to separate the effect of each explanatory variable on the explained variable (Maddala, 1992). In this study, variance inflation factor (VIF) will be used to detect the degree of linear relationship among the explanatory variables. In this method, each explanatory variable would be regressed on all other explanatory variables and coefficient of determination would be computed for each subsidiary regression.

Following Gujarati (2004), VIF is specified as follows:

$$VIF (X_j) = \frac{1}{1-R_j^2} \quad (13)$$

Where: X_j is the j^{th} explanatory variable

$$R^2$$

J is the coefficient of determination when the variable X_j is regressed on the other explanatory variables.

As a rule of thumb, if the VIF value exceeds 10, it can be concluded that multicollinearity is the problem.

3.5. Definition of Variables and Hypotheses

3.5.1. Dependent variable

In this study, household food insecurity status was taken as the dependent variable which is explained by different demographic, socio-economic and institutional factors.

Household food insecurity status (HFINS): It is a dichotomous dependent variable in the model taking value 1 if the household is food insecure and 0 otherwise. Households' food insecurity status was determined by comparing total kilocalories consumed in household per adult equivalent per day with the daily minimum requirement of 2200kcal/AE/day.

Households who fail to get 2200kcal/AE/day will be considered as food insecure and otherwise food secure.

3.5.2. Independent variables

Different demographic, economic and institutional factors such as family size in adult equivalent, sex of the household head, age of the household head, dependency ratio, educational level of the household head, size of land cultivated, livestock owned in TLU, number of oxen owned, contact with development agents, proximity to nearest market centers, fertilizer use, improved seed use, credit received, income from safety net, and income from employment in off/non-farm activities were hypothesized to affect household food insecurity status.

Variables definition and hypothesis are given as follows.

Family size (FMSZEAE): It refers to total family size in the household adjusted to adult equivalent consuming unit to capture the difference in food consumption by age and sex within the household. Zerihun (2009) and Indris (2012) concluded in their study that the higher the family size in adult equivalent, the higher would be the level of consumption which requires large quantity of food entailing positive relationship with food insecurity status. Thus, it is hypothesized in this study that family size in adult equivalent affects food insecurity status positively.

Sex of household head (SEXHH): It is a dummy variable taking a value of 1 if the household head is male and 0 otherwise. Sex of the household head is an important determinant of food insecurity. This is because, according to Abebaw (2003) and Abonesh (2006) male headed households are in a better position to pull labor force than female headed ones.

In addition, Kassie et al. (2012) concluded in their study that due to differences in access to resources female headed households are more likely to be more food insecure than male headed households. Therefore, it is hypothesized that male headed households are less likely to be food insecure.

Age of the household head (AGEHH): It refers to the period from his/her birth to the time of interview and was measured in years. According to Abebaw (2003) age of household head is negatively related with food insecurity in that households acquire experience and knowledge in farming and accumulate wealth through time which will enable them to be food secure than younger households. But according to Indris (2012), age of the household head is positively related with food insecurity in that food insecurity increases with the increase of age due to the fall in labor force of an individual so as to participate in different income generating activities which in turn helps households to access food. As a result, the sign of age is pre-indeterminate.

Land cultivated (LANDCULT): This refers to cultivated land size measured in hectares.

Since it reflects ownership of an important resource, it is expected that, it would decrease the likelihood of household to become food insecure. That is, households with large cultivated land size will be expected to produce more and to be more food secure than those with less cultivated land. Thus, size of cultivated land and food insecurity will be expected to be negatively related in accordance with the results of different researchers (Lewin and Fisher, 2010; Arene and Anyaeji, 2010).

Dependency ratio (DEPRATIO): It measures the number of members in non-working age group supported by those in the working age group; therefore, it is a measure of the pressure on productive households. It is calculated by dividing household members below age of 15 and above 64 to that number of member in the age range of 15 up to 64. Arene and Anyaeji (2010) and Indris (2012) concluded in their study that dependency ratio positively affects food insecurity status of households. Thus, in this study it is hypothesized that dependency ratio contributes positively to the household's food insecurity status.

Livestock owned (TLU): It refers to the number of livestock owned by the household in terms of tropical livestock unit (TLU). Livestock contribute to household's economy in different ways: as a source of pulling power, source of cash income, source of supplementary food, and means of transport.

In addition, livestock are considered as a means of security. Thus, households with more number of livestock have a better chance to be food secure and thus, have less risk of food insecurity. Adugna and Wogayehu (2011) in their study in Wolayita found that households with less number of livestock have more probability to be food insecure than households with more number of livestock.

Education level of the household head (EDUCLEVEL): This refers to the formal years of schooling attained by the household heads. Educational attainment by the household head will lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs and diversification of household incomes which, in turn, will enhance household's food supply. Thus, negative relationship between education level of the household heads and household's food insecurity is expected in this study in accordance with many other studies result (Frehiwot, 2007; Ayantoye et al., 2008; Lewin and Fisher, 2010; Arene and Anyaeji, 2010).

Oxen owned (NUMBOXEN): It refers to the number of oxen owned by the household to undertake its farming activities. Oxen are one of the important farm assets and are the major source of traction power in the study area. Abebaw (2003) noted that there is a symbolic relationship between crop production and oxen ownership in the mixed farming system. In addition, oxen provide manure and draught power to crop cultivation and therefore used to boost crop production. Therefore, ownership of more oxen power will enable households to have better chance to escape serious food shortages. The same result was also obtained by Habtom et al. (2005) in Koredegaga, Oromia region, Ethiopia. As a result, it is expected that number of oxen owned and food insecurity be negatively related.

Contact with development agents (CONDTA): It refers to the frequency that a farmer visited development agents for technical guidance. The higher the contact between the farmer and the development agent, the more information and technology flows from the latter to the former which in turn widens the household's knowledge with regard to the use of improved variety and agricultural technologies. Therefore, those farmers with frequent contact are likely to produce more and become food secure than others and thus, reduce risk of food insecurity.

Lewin and Fisher (2010) in their study in Malawi, found that farmers who are less frequently visited by the development agent are more food insecure than those farmers with frequent contact.

Proximity to market center (PROXMRKT): It refers to the distance between the farmers' home and the nearest market that the household usually made transaction which is measured in kilometers.

Proximity to market center (PROXMRKT): It refers to the distance between the farmers' home and the nearest market that the household usually made transaction which is measured in kilometers. This is included because proximity to market center creates access to additional income by providing non-farm employment opportunities and easy access to inputs, extension and transportation. It is therefore hypothesized, in this study that the nearer the household to the market center, the less would be the probability of being food insecure. The same result was also obtained by Lewin and Fisher (2010). Therefore, in this study it is hypothesized that proximity to market center is positively related with food insecurity.

Fertilizer use (FERTIUSE): It refers to the use of chemical fertilizers such as UREA and DAP to improve farm productivity. Here, it is measured as the total amount applied in the farm land of the household in the survey year in kilograms. Fertilizer use has often been perceived as improving farm productivity per unit area. Thus, households using more kilograms of fertilizer are expected to be more food secure than others. Zerihun (2009) and Adugna and Wogayehu (2011) concluded in their study that households using more quantity of fertilizers will more food secure than others. Hence, fertilizer use is hypothesized contributing negatively to food insecurity²⁹

Improved seed use (IMPRSEED): It refers to those seeds that come out of research centers.

Use of improved seed is expected to give better or more yield than local seed per unit area which in turn reduces the probability that the household become food insecure. As a result, households using improved seeds on their farm land have more potential of producing more crop output which in turn helps them to reduce risk of food insecurity. Adugna and Wogayehu (2011) concluded in their study that households not using improved seeds have more probability of being food insecure than others. As a result, use of improved seed is hypothesized to be negatively related with food insecurity.

Credit use (CREDITU): It refers to the amount of money borrowed from different sources. According to Abebaw (2003), credit for the purpose of consumption or purchase of agricultural inputs like improved seed, chemical fertilizers, etc improves the food security status (reduce risk of food insecurity) of the households. Consequently, households who are getting the amount of credit they required were expected to have more probability of being food secure than others. The result of Ayantoye et al. (2008) in Nigeria also confirms this result. Similarly, in this study it is hypothesized that the amount of credit received is negatively related with food insecurity.

Income from safety net (SAFET): This refers to income earned from safety net by working on safety net public works or through direct support. Therefore, households who have received higher income from safety net are more likely to reduce the risk of food insecurity than others. Zerihun (2009) concluded similar result in his work. As a result, income received from the safety net is expected to affect food insecurity negatively.

Income from off/non-farm activities (NONAOFRM): It refers to the sum total of earnings generated in the survey year from activities outside farming like retail trading business, casual work on wage basis, etc. When crop production output and income earned from sales of livestock and livestock products are inadequate, households often look for other income sources other than agriculture to push themselves to the threshold of securing access to food (Abebaw, 2003). Consequently, income earned from such activities enables households to reduce the probability of being food insecure. As a result, it is hypothesized that households who managed to earn higher off/non-farm income are less likely to be food insecure.

Table 2. Summary of variables definition, measurement, and hypothesis

| Variable | Variable type | Variable definition and measurement | Hypothesis |
|--------------------------|---------------|--|------------|
| Food insecurity status | Dummy | 1 if the household is food insecure ;0 otherwise | |
| Sex | Dummy | 1 if the household is male; 0 otherwise | - |
| Family size | Continuous | Family size in adult equivalent | + |
| Age | Continuous | Age of the household head in years | +/- |
| Dependency ratio | Continuous | Ratio of dependents to independents | + |
| Education | Continuous | Educational level of the household head in years | - |
| Land size | Continuous | Land cultivated in hectares | - |
| Fertilizer | Continuous | Fertilizers applied in KG | - |
| Seed | Continuous | Improved seeds used in KG | - |
| Livestock | Continuous | Livestock owned in TLU | - |
| Oxen | Continuous | Number of oxen owned | - |
| Contact with Das | Continuous | Frequency of contact with Das | - |
| Credit | Continuous | Amount of credit received | - |
| Proximity to mark center | Continuous | Proximity to market center | + |
| Off/non-farm income | Continuous | Income from off/non-farm activities | - |
| Income safety | Continuous | Income from safety net | - |

Source: Own computation, 2021

CHAPTER FOUR

Results and Discussion

This chapter presents the descriptive and inferential results. Descriptive results are discussed in section 4.1. Section 4.2 presents and discusses the status, gap and extent of households' food insecurity. While the final section deals with the results of econometric model.

4.1. Descriptive Results

4.1.1. Food insecurity status of the sampled households

Results of food insecurity status of the sampled households based on the minimum recommended calorie requirement of 2200 kcal/day/AE shows that out of the total surveyed households, 62 percent were food insecure while only 38 percent were food secure.

Table 3. Kilo calories per day per adult equivalent of the sampled households

| Kilocalories per day per adult equivalent | Food insecure (62%) | Food secure (38%) | Total households (100%) | t-value |
|---|---------------------|-------------------|-------------------------|----------|
| Minimum | 1475.12 | 2205.46 | 1475.118 | |
| Maximum | 2190.90 | 3359.07 | 3359.065 | |
| Mean | 1898.83 | 2552.48 | 2147.22 | 18.01*** |
| Standard deviation | 137.23 | 302.08 | 383.74 | |

Note: *** Significant at 1% probability level

Source: Field survey, 2021

Results in Table 3 shows that the mean per capita calorie intake of the sampled household was 2147.22 kcal, which was lower than the minimum calorie requirement of 2200 kcal. Food insecure and food secure households were getting the mean calorie of 1898.83 and 2552.48 kcal/AE/day respectively. The average and maximum calorie intake of food insecure households were below the minimum energy required for an individual to live a healthy life.

There was statistically significant mean difference in per capita calorie intake between food secure and food insecure households at one percent probability level. Thus, the study area could be classified as food insecure given the fact that majority (62%) of the surveyed households were not getting the minimum daily energy requirement for an individual to live healthy life.

4.1.2. Demographic characteristics of households

This subsection discusses different demographic characteristic of households which includes sex, marital status, age, family size in AE, dependency ratio and educational level of the sampled household heads which were hypothesized to differentiate between food insecure and food secure households in the study area.

Sex of the household heads

According to the survey results presented on Table 4, from the total sampled households, male headed households accounted for 80 percent while female headed households accounted for 20 percent. With this participation, female headed households were more food insecure which accounted for about a quarter of the total food insecure households or 83.33 percent of the total female headed households. On the other hand, the proportion of male headed households was 73.12 percent of total food insecure households or 56.67 percent of total sampled male headed households. In addition, male headed households accounted for about 91.23 percent of the total food secures households or 43.33 percent of the total male headed households. However, the proportion of female headed households out of total sampled food secure households or total female headed households were 8.77 percent and 16.67 percent respectively. There was statistically significant proportion difference between food secure and food insecure households in terms of sex at one percent probability level. Thus, the result shows that there was great disparity of food insecurity status due to sex difference among the household heads.

Table 4. Categorical variables and food insecurity status

| Categorical variables | Food insecure | | Food secure | | Total | | χ^2 -value |
|-----------------------|---------------|------------|-------------|------------|------------|------------|-----------------|
| | Frequency | Percent | Frequency | Percent | Frequency | Percent | |
| Sex | | | | | | | |
| Male | 68 | 73.12 | 52 | 91.23 | 120 | 80 | 7.24*** |
| Female | 25 | 26.88 | 5 | 8.77 | 30 | 20 | |
| Marital Status | | | | | | | |
| Single | 4 | 4.30 | 1 | 1.75 | 5 | 3.33 | 6.29* |
| Monogamy | 69 | 74.19 | 48 | 84.21 | 117 | 78.00 | |
| Divorced | 1 | 1.08 | 1 | 1.75 | 2 | 1.33 | |
| Widowed | 5 | 5.38 | 5 | 8.77 | 10 | 6.67 | |
| Polygamy | 14 | 15.05 | 2 | 3.51 | 16 | 10.67 | |
| Total | 93 | 100 | 57 | 100 | 150 | 100 | |

Note: *** and * Significant at one and ten percent probability level respectively.

Source: Field survey, 2021

Marital status of the household heads

Table 4 shows that out of the total sampled households, 78 percent were monogamous whereas 10.67, 6.67 and 1.33 percent were polygamous, widowed and divorced respectively. Only 3.33 percent of total sampled households were single. The marital status of the household heads shows significant proportion difference between food secure and food insecure households at ten percent probability level.

Age of the household heads

According to the results presented in Table 5, the average age of the sampled household heads was 42.22 years (SD=7.07). The average age of food insecure household heads was 44.08 years (SD=7.33) whereas it was 39.19 years (SD=5.47) for food secure household heads. There was statistically significant difference in the mean age of household heads between

Food insecure and food secure households at one percent probability level. The result then shows that food secure households were younger than their counterparts so that they were relatively in a good position to manage their resources and become more productive.

Family size

Table 5 shows that the mean family size in AE for the sampled households was 4.47 (SD=1.18). The mean family size in AE was 4.72 (SD=1.26) and 4.04 (SD=0.89) for food insecure and food secure households respectively. The mean family size in adult equivalent exhibited statistically significant difference between food insecure and food secure households at one percent probability level. Therefore, all other things remaining constant, the result showed that the food requirement of the food insecure households would be greater than those of the food secure households.

Table 5. Food insecurity status and demographic characteristics of the households

| Food insecurity Status | Statistic | Age | Family size | Dependency ratio | Education |
|------------------------|-----------|----------|-------------|------------------|-----------|
| Food Insecure | N | 93 | 93 | 93 | 93 |
| | Mean | 44.08 | 4.72 | 1.82 | 1.73 |
| | SD | 7.33 | 1.26 | 0.84 | 2.4 |
| Food secure | N | 57 | 57 | 57 | 57 |
| | Mean | 39.19 | 4.04 | 1.36 | 2.64 |
| | SD | 5.47 | 0.89 | 0.4 | 2.89 |
| Total households | N | 150 | 150 | 150 | 150 |
| | Mean | 42.22 | 4.47 | 1.64 | 2.08 |
| | SD | 7.07 | 1.18 | 0.74 | 2.65 |
| | t-value | -4.34*** | -3.62*** | -3.88*** | 2.08** |

Note: *** and ** significant at 1 and 5 percent probability level respectively

Source: Field survey, 2021

Dependency ratio

Results presented in Table 5 shows that the mean dependency ratio of the sampled households was 1.64 (SD=0.74). The mean dependency ratio was 1.82 (SD=0.84) for food insecure households and 1.36 (SD=0.4) for food secure households. There was statistically significant mean difference of dependency ratio between food insecure and food secure households at one percent probability level. Thus, the result showed that food insecure households had high dependency burden than their counterparts which may increase vulnerability of households to food insecurity.

Educational level of the household heads

According to the survey results presented in Table 5, the mean educational level of the sampled household heads was 2.08 with a standard deviation of 2.65. The mean educational level of the household heads was 1.73 (SD=2.4) and 2.64 (SD=2.89) for food insecure and food secure households respectively. The statistical test of the mean educational level of the household heads shows that there was statistically significant difference between food insecure and food secure households at five percent probability level. This showed that food secure households had achieved more grade level than food insecure households which may help them to reduce the risks of food insecurity.

4.1.3. Economic factors

This subsection presents the economic factors affecting the food insecurity status of the households which include the size of cultivated land, livestock owned in TLU, number of oxen owned and income earned by engaging in off/non-farm activities.

Cultivated land

According to the survey results presented in Table 6, average cultivated land of the sampled households was 1.59ha with a standard deviation of 0.69. This average was greater than the national average of 1.18 ha (CSA, 2011). The average cultivated land was 1.37ha (SD=0.63) and 1.95ha (SD=0.65) for food insecure and food secure households respectively. There was statistically significant difference between food insecure and food secure households in their mean cultivated land at one percent probability level. The result showed that food insecure households were relying on very small pieces of land than the food secure households to meet their food requirement and other obligations.

Table 6. Food insecurity status of the households and the economic factors

| Food insecurity Status | Statistic | Cultivated land | Livestock owned | Oxen owned | Off/non-farm income |
|------------------------|-----------|-----------------|-----------------|------------|---------------------|
| Food insecure | N | 93 | 93 | 93 | 93 |
| | Mean | 1.37 | 2.69 | 0.71 | 188.57 |
| | SD | 0.63 | 2.23 | 0.75 | 100.29 |
| Food secure | N | 57 | 57 | 57 | 57 |
| | Mean | 1.95 | 5.79 | 1.75 | 399.68 |
| | SD | 0.65 | 4.65 | 1.37 | 151.73 |
| Total households | N | 150 | 150 | 150 | 150 |
| | Mean | 1.59 | 3.87 | 1.11 | 288.15 |
| | SD | 0.69 | 3.67 | 1.14 | 164.82 |
| t-value | | 5.36*** | 5.48*** | 6.06*** | 6.04*** |

Note: *** is significant at 5 percent probability level Source: Field survey, 2021

Livestock ownerships in TLU

The survey results presented in Table 6 shows that the mean livestock holding of the sampled households was 3.87 TLU (SD=3.67). The mean livestock holding was 2.69 TLU (SD=2.23) and 5.79 TLU (SD=4.65) for food insecure and food secure households respectively. The t- test for the equality of the means in livestock holding between food insecure and food secure households showed that there was statistically significant mean difference at less than one percent probability level.

Number of oxen owned

The survey results presented in Table 6 shows that average number of oxen owned by the sampled households was 1.11 with a standard deviation of 1.14. The average number of oxen owned was 0.71 (SD=0.75) and 1.75 (SD=1.37) for food insecure and food secure households respectively. The average number of oxen owned was appeared to be greater for food secure than food insecure households and this difference was statistically significant at less than one percent probability level.

As shown on Table 6, the average number of oxen owned by the sampled households was less than the minimum traction power needed for crop production. Consequently, the surveyed households

were asked how to access additional ox or oxen needed for their crop production activities. Different mechanisms were used by these households to access additional ox or oxen needed to carry out their farming operation. About 6, 8, and 10.67 percent of households have accessed the additional ox or oxen needed through labor exchange, share cropping and pairing of oxen with other livestock respectively. The most common means of accessing additional ox or oxen in the study area were borrowing (24.67%), pulling oxen to form pair (22.7%) and renting of oxen (28.67%).

Off/non-farm income

About 35 percent of the surveyed households had engaged in some forms of off/non-farm activities to supplement their crop and livestock production. The rest, majority of surveyed households did not participate in such activities because of limited opportunities.

Results presented in Table 6 shows that the sampled households who had engaged in off/non-farm activities had generated an average income of Birr 288.15 with its standard deviation of 164.82. Food insecure households had generated very low average income of about Birr 188.57 (SD=100.29) while their counterparts generated an average of Birr 399.68 (SD= 151.73) in the study period. The t-test for the equality of the mean of income generated showed that there was statistically significant difference between food insecure and food secure households at less than one percent probability level.

4.1.4. Institutional factors

The results of the institutional factors hypothesized to differentiate between food insecure and food secure households are presented and discussed under this subsection as follows:

Fertilizer use

According to the survey results presented in Table 7, the average amount of fertilizers used by the sampled households was 95.21 kg (SD=58.92). Food insecure and food secure households had used an average amount of 74.35 kg (SD=38.88) and 132.84 kg (SD=69.72) respectively. There was statistically significant mean difference between food insecure and food secure households in the amount of fertilizers used at one percent probability level. This showed that food secure households had used more amounts of fertilizers which may helped them to increase their crop yield and productivity and enable them to reduce the risk of food insecurity than others.

Improved seeds use

Table 7 shows that the average amount of improved seeds used by the sampled households was 59.76 kg (SD=39.32). Food insecure and food secure households had used 48.35 kg (SD=28.97) and 73.86 kg (SD=45.66) of improved seeds on their farm respectively. There was significant mean difference in the amount of improved seeds used by farmer between food insecure and food secure households to increase their production at one percent probability level. Households were asked reason for low use of improved seeds on their farms where they reasoned high price and less availability of the improved variety of maize which is the most planted crops. Thus, this problem might undermine the potential contribution of inputs for the households to escape problem of food insecurity.

Credit use

Only about 33 percent of the total surveyed households had received credit from different sources while the rest of them did not receive any. The average amount of credit received by the beneficiaries was Birr 234.41 with the standard deviation of 261.86. The mean amount of credit received by the food insecure households was Birr 186.39 (SD=108.9) while the average amount of credit received by the food secure households was Birr 288.70 (SD=361.00). There was no significant difference in the mean amount of credit received between food secure and food insecure households (Table7).

Table 7. Food insecurity status and institutional factors

| Food insecurity status | Statistic | Fertilizer | Improved seed | Credit | Contact with DA | Income from safety net | Proximity to market center |
|------------------------|-----------|------------|---------------|--------|-----------------|------------------------|----------------------------|
| Food Insecure | N | 93 | 93 | 93 | 93 | 93 | 93 |
| | Mean | 74.35 | 48.35 | 186.39 | 2.95 | 771.86 | 14.71 |
| | SD | 38.88 | 28.97 | 108.9 | 1.84 | 271.34 | 3.45 |
| Food Secure | N | 57 | 57 | 57 | 57 | 57 | 57 |
| | Mean | 132.84 | 73.86 | 288.70 | 4.21 | 960.48 | 14.14 |
| | SD | 69.72 | 45.66 | 361.00 | 2.52 | 332.06 | 2.66 |
| Total households | N | 150 | 150 | 150 | 150 | 150 | 150 |
| | Mean | 95.21 | 59.76 | 234.41 | 3.43 | 828 | 14.49 |

| | | | | | | |
|---------|---------|---------|--------|---------|---------|-------|
| SD | 58.92 | 39.32 | 261.86 | 2.2 | 301.59 | 3.18 |
| t-value | 6.45*** | 3.77*** | 1.38 | 3.52*** | 2.72*** | -1.07 |

Note: *** and ** significant at 1 and 5 percent probability level Source:

Field survey, 2021

Friends, relatives and microfinance institution were the most important sources of credit for about 55, 35 and 10 percent the sampled households respectively in the study area. To the enquiry of the purpose of taking credit, about 28.57, 24.40, and 22.45 percent of the beneficiary households replied that purchase of agricultural inputs, family consumption and Social obligation was their major reason for taking credit, respectively. About 14.8, 6.12 and 3.66 percent reasoned health, purchase of other livestock and purchase of oxen respectively.

To the enquiry of the reason of not taking credit, about 55.56 percent said they fear the inability of its repayment at the time it matures while about 19.8 percent replied they had enough capital during the survey year, the remaining 4.24 percent of those not taking credit, fear the high interest rate attached with the credit.

Contact with development agents

In the survey results presented in Table 7, about 80 percent of total sampled households had contact with the development agents of the woreda's agricultural and rural development office. The mean contacts of the sampled households were 3.43 with its standard deviation of 2.2. The mean contacts with development agents for food insecure and food secure households were 2.95 (SD=1.84) and 4.21 (SD=2.52) respectively. There was statistically significant mean difference between food insecure and food secure households in that food secure households had more number of contacts than their counterparts. The result was in agreement with the hypothesis made that the more the number of contact between the farmer and development agent the less the probability of households to become food insecure.

Income from safety net

According to the survey results presented in Table 7, about 56 percent of the total surveyed households were the beneficiaries of the program where the mean annual income was Birr 828 with its standard deviation of 301.59. The mean annual income was Birr 771.86 (SD=271.34) and Birr 960.48 (SD=332.06) for food insecure and food secure households during the survey year

respectively. There was statistically significant mean difference in the amount of income earned between food insecure and food secure households.

Proximity to market center

Local market center called Masha is the market center where the households included in the survey undertakes their transaction. Results presented in Table 7 shows that the mean distance of food insecure households to the nearest market was 14.71 Km while it was 14.14 Km for their counterparts. Even though it seems that food insecure households were travelling more distance than food secure households, statistical test for the equality of mean distance showed no significant difference between the food insecure and food secure households.

Most of the marketing problems that they faced arise from the time they sell their produce. Low price (59.33%) and low bargaining power (10.67%) were the first and second pressing marketing problem that households faced since majority of household sale their produce right after harvesting between December and February. About 7.33 percent of households raised transportation problem as their marketing problem.

Furthermore, households were asked reason of selling when the price was very low to which about 47 and 30 percent of the households responds that they sale their produce to pay land taxes and for their family needs respectively. Households accounted at about 17 and 6 percent responds they need money to settle debts and for social obligation.

4.1.5. Household food deficits

In this specific survey out of the sampled households only 34 percent reported that what they produced in the reference year was enough to feed their family. While the remaining 66 percent reported food deficit of an average 3.5 months during the survey year with the minimum of one month and a maximum six months. Among households reporting food deficit, 9 percent of them were from food secure households while the majority (91%) were from food insecure households. Right after harvesting until March, majority of the households were able to fulfill their food needs from their own produce, after which the number of households started significantly Falling.

As a result, they started rationing their available foods. Food consumption started to decline in April getting bad between May and June and become worse in the summer two months of July and

August. In September the intensity of the problem started declining because households started using unripe foods from their own produce to smooth their consumption until the time of harvest.

Table 8. Distribution of household heads by the number of months of food shortage

| Number of months of food shortage | Food insecure | | Food secure | | Total households | |
|--------------------------------------|---------------|---------|-------------|---------|------------------|----------|
| | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| 1 | 0 | 0 | 3 | 33.33 | 3 | 3.03 |
| 2 | 16 | 17.78 | 5 | 55.56 | 21 | 21.21 |
| 3 | 32 | 35.56 | 1 | 11.11 | 33 | 33.33 |
| 4 | 16 | 17.78 | 0 | 0 | 16 | 16.16 |
| 5 | 17 | 18.89 | 0 | 0 | 17 | 17.17 |
| 6 | 9 | 10.00 | 0 | 0 | 9 | 9.09 |
| Total | 90 | 100 | 9 | 100 | 99 | 100 |
| Mean (SD) | 3.68 (1.25) | | 1.78 (0.67) | | 3.5 (1.33) | |
| t-value | | | | | | -4.47*** |

Note: *** Significant at 1% probability level

Source: Field survey, 2021

Based on the results presented on Table 8, among households reporting food deficit about 24 percent of households were facing food deficit of up to two months while about 50 percent of them were facing food deficit from 3 to 4 months. The remaining 26 percent were facing food deficit from 5 to 6 months. The average number of months of food shortage for food insecure and food secure households were 3.68 (SD=1.25) and 1.78 (0.67) respectively. There was statistically significant difference between food insecure and food secure households in the average number of month of food shortage at one percent probability level. Thus, the result shows that food insecure households were facing more number of months of food shortage than their counterparts.

4.1.6. Causes of household food deficits

Households who had reported to had food deficit in the survey year were also asked to list the cause of food deficit in order of their importance. Food insecure and food secure households accounted at about 73.12 and 57.89 percent mentioned the delay and absence of adequate rainfall as the first and the most pressing problem respectively.

Table 9. Major causes of households' food deficit

| Cause of food deficits | Food insecure (%) | Food secure (%) | Total (%) |
|--|-------------------|-----------------|-----------|
| Delay and absence of adequate rainfall | 73.12 | 57.89 | 67.33 |
| Insect or pest infestation | - | 1.36 | 0.52 |
| Shortage of oxen | 26.88 | 5.26 | 18.66 |
| Shortage of cultivated land | 46.24 | 20.25 | 33.33 |
| Shortage of agricultural input | 8.25 | 15.25 | 10.91 |
| Less fertile land | 11.83 | 37.54 | 21.6 |
| Lack of credit | 10.13 | 7.69 | 9.2 |
| Poor health of farmer | 6.15 | 4.51 | 5.52 |
| Divorce | 3.26 | - | 2.02 |
| Weed infestation | 2.25 | 3.25 | 2.63 |
| Price rise in agricultural input | 26.00 | 34.04 | 29.06 |
| Shortage of labor | 6.00 | 2.25 | 4.58 |

Source: Field survey, 2021

Shortage of cultivated land was the second most important cause of food deficit for about 46.24 percent of food insecure households where less fertility of land was the respective cause for about 37.54 percent of food secure households. Shortages of oxen, price rise in agricultural input and less fertility of land were the third, fourth and fifth most important causes of household food deficit for about 26.88, 26 and 11.83 percent of food insecure households respectively. While for about 34.04, 20.25 and 15.25 percent of food secure households the respective causes were price rise in agricultural input, shortage of cultivated land and shortage of agricultural input respectively. In addition, poor health of farmer, shortage of labor and weed infestation were also the causes of households' food deficit in the study area.

4.2. Extents of Households Food Insecurity

The incidence of food insecurity, food insecurity gap and severity of food insecurity among the sampled households were measured by using the FGT measure of poverty. They were respectively measured by using head count index (Po), the food insecurity gap index (P₁) and the

severity of food insecurity (P_2).

In the study area, the head count index or the incidence of food insecurity was found to be 0.62 implying that 62 percent of sampled households could not meet the minimum recommended energy requirement. In other words, head count ratio of 0.62 for 150 sampled household's means, 93 (62%) sampled individuals were deemed food insecure.

To address how far the food insecure households were below the minimum energy requirement, food insecurity gap was calculated from the survey data. Accordingly, the food insecurity gap index (P_1) came out to be 0.085. This means that the extent of calorie deficiency gap for the sample household was 187 Kcal/AE/day. That is, an average of 187 Kcal/AE/day of additional energy food was needed to lift households out of food insecurity.

Furthermore, to address the most food insecure segment of the sample households' severity of food insecurity was calculated. Hence, the survey result revealed that the severity of food insecurity in the study area was 0.014 which means that the severity of food insecurity among the sampled household was 1.4 percent.

4.3. Econometric Model Results and Discussion

4.3.1. Diagnostics Tests

Binary logit model was used in this study to identify the underlying determinants of food insecurity in the study area. But, before running the model, variance inflation factor (VIF) was used to check multicollinearity problem whose result showed that there was no serious problem of multicollinearity among the explanatory variables.

4.3.2. Determinants of food insecurity

To identify the determinants of food insecurity, fifteen explanatory variables were hypothesized to affect the food insecurity status of the households in the study area. The model which was estimated using STATA version 15. revealed the following results (Table 11).

Table 11. The maximum likelihood estimates of logit model

| Variables | Coef. | Std. Err. | P> Z | ME |
|--|---------|-----------|------------|----------|
| SEXHH | -2.040 | 0.806 | 0.011 | -0.377 |
| AGEHH | 0.164 | 0.059 | 0.006 | 0.03 |
| EDUCLEVEL | -0.222 | 0.092 | 0.216 | -0.041 |
| FAMSZEAE | 0.994 | 0.377 | 0.008 | 0.184 |
| DEPRTIO | 1.287 | 0.505 | 0.011 | 0.238 |
| LANDCULT | -1.793 | 1.037 | 0.084 | -0.331 |
| FETRIUSE | -0.017 | 0.010 | 0.085 | -0.003 |
| IMPRSEED | -0.016 | 0.010 | 0.124 | -0.003 |
| TLU | -0.242 | 0.139 | 0.081 | -0.045 |
| NMBOXEN | -0.884 | 0.513 | 0.085 | -0.163 |
| CONTDA | -0.040 | 0.170 | 0.813 | -0.0074 |
| CREDITU | -0.001 | 0.003 | 0.641 | -0.00025 |
| PROXMRKT | 0.053 | 0.087 | 0.539 | 0.0099 |
| NONAOFRM | -0.003 | 0.002 | 0.225 | -0.00047 |
| SAFET | -0.002 | 0.001 | 0.006 | -0.00035 |
| Constant | -11.916 | 3.214 | 0.245 | |
| Percent correctly predicted (count R ²) ¹ | | | 86.00% | |
| Sensitivity ² | | | 88.17% | |
| Specificity ³ | | | 82.46% | |
| LR chi-square | | | 108.350*** | |
| Log likelihood | | | -45.434 | |
| Number of observation | | | 150 | |

1. Based on 0.5 cut value

2. Correctly predicted food insecure group based on 0.5 cut value

3. Correctly predicted food secure group based on 0.5 cut value

Note: ***, **, * are significant at 1%, 5% and 10% probability level respectively.

Source: Model output

The estimated value of chi-square was 108.35 which was significantly higher than the critical chi-square value of 30.58 with 15 degrees of freedom at one percent significance level. Thus, we can say that at least one of the parameters of the determinants of food insecurity included in the model was significant or the hypothesis that all the coefficients, except the intercept were equal to zero was rejected, implying the model was a good fit (Table.11).

The predictive efficiency of the model as a measure of goodness of fit test in the logistic model was also seen by using the overall predictive efficiency (Count R^2). Results in Table 11 showed that out of 150 total surveyed households, 86 percent (i.e. 129 households) were correctly predicted by the model. In addition, regarding the predictive power of the model within the group, 88.17 and 82.4 percent of food insecure and food secure households were correctly predicted by the model. Therefore, the model is good enough in classifying the surveyed households into food insecure and food secure households and it is appropriate for the data.

The logit model results also revealed that among fifteen explanatory variables considered, nine were statistically significant (Table 11). These include, age of household head, sex of the household head, family size in adult equivalent, dependency ratio, cultivated land size, fertilizer used, livestock holding in TLU, number of oxen owned and income from safety net. They significantly affected households' probability of being food insecure at different probability levels. The signs of all explanatory variables were as expected. They are discussed in details as follows:

Sex of household heads it had significant and negative relationship with the household food insecurity status. It was significant at 5 percent probability level. The negative sign showed that male headed households were more likely to be food secure than female headed households. Other factors remaining constant, food insecurity decreased by 37.7 percent for male headed households than female headed households. The possible explanation was the differential access to production resources where male had more access to production resources like cultivated land than females. This was similar with the work of different individuals (Firew, 2007; Zerihun, 2009 and Indris, 2012). Thus, it can be inferred from the result that sex difference in headship of the farm households was one cause of households' food insecurity.

Family size it was found statistically significant (at one percent probability level) and had positive relationship with the household food insecurity status. The positive sign showed that the probability that the household was food insecure increased as the family size in adult equivalent increases. Other

variables remaining constant, increased in the family size in adult equivalent by a unit, increased the probability that the households were food insecure by 18.4 percent. The underlying reason was the fact that as family size increased, with limited resources additional family member increased the vulnerability of households to food insecurity by contributing more to consumption than to production. The result was in conformity with the works of Zerihun (2009) and Indris (2012).

Age of household heads it had significant (at one percent probability level) and positive relationship with the household food insecurity status. The positive sign showed that the probability that the household was food insecure increased as the age of household head increases. Other variables remaining constant, increased in the age of the household head by one year, increased the probability that the household was food insecure by 3 percent. The possible explanation was that with the small pieces of land supporting the households, as the age of the household head increased, labor force of an individual would fall so as to participate in other different income generating activities which in turn increased exposure of households to food insecurity. This result was in conformity with the works of Indris (2012).

Dependency ratio it had positive and significant relationship with the household food insecurity status. It significantly affected the food insecurity status of households at 5 percent probability level. The positive sign showed that the probability of becoming food insecure was high for households where productive members were less than unproductive members. Other variables remaining constant, the probability that the household was food insecure increased by 23.8 percent as the dependent age group increased by a unit. The possible reason was that high dependency ratio results in large numbers of dependents in the households with less contribution to production of households which in turn increased risk of food insecurity to the household. This was in conformity with the works of Adugna and Wogayehu (2011) and Indris(2012).

Land cultivated it had significant (at ten percent probability level) and negative relationship with the household food insecurity status. The negative sign showed that the probability that the household was food insecure decreased as cultivated land increases. Other variables remaining constant, increased in cultivated land by one hectare, decreased the probability that the household was food insecure by 33.1 percent. The possible explanation was that, when cultivated land increased, households would be able to minimize its production risks or would be able to produce more which

in turn helped to reduce food insecurity problem of his family. This result was in conformity with the hypothesis of this study and the works of Zerihun (2009).

Fertilizer use it was found statistically significant (at ten percent probability level) and had negative relationship with the household food insecurity status. The negative sign showed that the probability that the household was food insecure decreased as the amount of fertilizer used increased. Other variables remaining constant, increased in the amount of fertilizers applied by one kilogram, decreased the probability that the household was food insecure by 0.3 percent. The possible explanation was that, increased in the use of fertilizer increased productivity and production. In addition, in the descriptive results it was shown that, less fertility of cultivated land was among the major cause of household's food deficit in the area which in turn was increasing the problem of food insecurity in the area. As a result, use of increased amount of fertilizer could minimize the problems and furthermore could improve the problem of food insecurity. This result was similar with the results of Adugna and wogayehu(2011).

Livestock holding it had negative and significant relationship with the household food insecurity status. It significantly affected the food insecurity status of households at ten percent probability level. Other variables remaining constant, increased in the number of livestock holding in TLU, decreased the probability that the household was food insecure by 4.5 percent. The possible explanation was the fact that, households with large number of livestock in tropical livestock unit had better chance of earning more income from livestock production. This in turn helped households to buy foods when they faced shortage and invested for the purchase of farm input which increased production and thus ensuring food security at the household level. Similar result was also obtained by Indris (2012).

Number of oxen owned variable was found statistically significant and had negative relationship with the household food insecurity status. It significantly affected the food insecurity status of the households at ten percent probability level. Other variables remaining constant, increased in the number of oxen owned by one, decreased the probability that the household was food insecure by 16.3 percent. The possible explanation was that oxen as the most traction power in the area, helped households to produce more by themselves or to earn income by renting their oxen to others which in turn helped households to access food. Similar result was also obtained by Zerihun (2009).

Income from safety net it had negative and significant relationship with the household food insecurity status. It was significant at one percent probability level. The negative sign showed that, households with large income from safety net had more probability of becoming food secure than others. The possible explanation was that the program provided additional income for the households with which they purchased foods from the market when their stock was very low and thus ensuring food security for their family. Other variables remaining constant, increased in income from safety net by one Birr, decreased the probability that the household was food insecure by 0.035 percent. The result was in conformity with the result of Zerihun (2009).

CHAPTER FIVE

Conclusion and Recommendations

5.1 Conclusion

This study was undertaken in Masha woreda of west Sheka zone with the objectives of measuring food insecurity situation, food insecurity gap and its severity, identifying the determinants of food insecurity rural households in the study area. To achieve these objectives the study relied primarily on primary data which were collected by conducting household survey from 150 randomly selected households in three randomly selected kebeles of the woreda.

Data were analyzed using both descriptive statistics and econometric method. The descriptive statistics were used to study the demographic, socio-economic and institutional factors in relation to food insecurity status of households. The econometric method in which logit model was specified and estimated was used to analyze the determinants of food insecurity in the study area. In addition, FGT model was used to compute the incidence, extent and severity of food insecurity among sample households in the study area.

The sample households were classified into food secure and food insecure groups based on kilocalories (kcal) actually consumed by the households during the previous seven days of survey date either through own produce or other means. Total amount of food commodity consumed by each household during the seven days were converted into daily kilo calories (kcal) per adult equivalent (AE) and compared with the minimum subsistence requirement. Households who were getting below the minimum subsistence requirement of 2200 kcal/AE/day were considered as food insecure and otherwise food secure the Ethiopian Government (MoFED, 2008). Accordingly, 62 percent of sampled households were living on total daily food energy level per adult equivalent of less than the minimum recommended requirement.

Results of descriptive statistics showed that the mean of age of household head, household size and dependency ratio were higher food insecure household where food secure households have higher mean value in the others variables considered. There was significant mean difference in these variables between food insecure and food secure households at different probability level.

With regard to food deficit faced by the sampled households, out of total surveyed households about 66 percent of households reported food deficit of an average of 3.5 months during the reference period. The major cause of food deficit raised by these households include delay and absence of adequate rainfall, shortage of oxen, shortage of cultivated land, price rise in agricultural input, less fertility of land and lack of credit.

Extent of household food insecurity was also measured in the study area by using FGT model. The food insecurity gap measure showed that food insecure households required 8.5 percent of minimum calorie requirement to get out of food insecurity. That is an average of 187 kcal/AE/day was needed for each food insecure households to become food secure. The severity of food insecurity was 1.4 percent in the study area.

The econometric model results revealed nine significant variables out of the hypothesized variables. Among the significant variables, age of household heads, family size in adult equivalent and dependency ratio were positively related with food insecurity. The remaining significant variables including sex, land size, fertilizer, livestock, oxen and income from safety net were negatively related with food insecurity status of households in the study area.

5.2. Recommendations

The result of this study shows that 62 percent of the surveyed households were unable to get the minimum daily energy requirement. In addition, the food insecurity gap and severity of food insecurity was also high calling for intervention. Consequently, the following recommendations were made which could be used to tackle food insecurity situation of households in the study area.

Age of the household head and sex of headed household had positive impact on food insecurity. This means probability of being food insecure was high for old household heads and female headed households. Therefore, interventions intended to help food insecure households in the area have to give priority to old aged and female headed households. Furthermore, strengthening capacity of females through education should be an integral part of the intervention.

Family size and dependency ratio positively affected the food insecurity status of households in the study area. That is households with large family size and dependency ratio had more probability of being food insecure than others. As a result, households should be educated on the need to adopt the family planning techniques so that they may bear the number of children which their resources can accommodate. Since majorities of the households in the study area are Christians, natural birth control and other alternatives should be carefully assessed by considering the culture and religion aspects of family planning facilities.

Land was the important economic factor that negatively affected household's food insecurity status in the study area. However, with an increase in population size of the *woreda*, land was becoming in short supply and the farmers were forced to produce crop on small plot of land. It is, therefore, important that the zonal and regional government should integrate development of the rural sector, the spread of small-scale industries throughout the rural areas and the reorientation of economic activity through promoting off-farm and non-farm employment opportunities. This could shift some proportion of households from entire reliance on land.

Livestock and oxen ownership were the important factors influencing food insecurity status of households in the study area. This is because, their production provided households additional income and plough power with which they could increase production and ensure food security at households' level through helping households to access input and food. So that livestock development packages must be introduced and promoted to increase their production and productivity. In addition, farmers' capital problem should be solved through enhancing rural credits to the farmers. But provision of rural credit in the area should address the religious practice of households in the area as most of households are christens. In addition, to increase their production and productivity necessary efforts should be made to provide improved water supply, sustainable forage program and veterinary services.

Income generated from safety-net was found to have negative effect on food insecurity status of households. This is because; safety nets in addition to meeting the immediate consumption needs of vulnerable households are intended to enhance productivity by allowing investment in agricultural input and prevent asset depletion of households which in turn complement household's effort to manage potential shocks. Therefore, the program should continue its operation through proper targeting and identification of beneficiaries, and its fruit should be monitored and evaluated on continuous basis.

Use of fertilizer was found to had a negative and significant impact on household food insecurity. Furthermore, price rise in agricultural input (like fertilizer) and shortage of agricultural input were also the important causes of food deficit in the area. Therefore, government should mobilize large amount of funds to increase its supply. But as a short-term alternative to chemical fertilizer, the extension system should promote preparation and use of compost, use of organic fertilizers.

REFERENCES

- Abduselam A (2017), Food security situation in Ethiopia: a review study: *Int J Health Econ Policy* 2(3):86–96. <https://doi.org/10.11648/j.hep.20170203.11>.
- Abdullah A., C. B. Barrett and P. Hazell, (2004), Food aid for market development in Sub Saharan Africa. Discussion Paper No. 5. International Food Policy Research Institute: Census 2007 Tables: Southern Nations, Nationalities, and Peoples' Region Archived 2012-11-13 at the Wayback Machine, Tables 2.1, and 3.4.
- Abduselam A (2017). Food Security Situation in Ethiopia: A Review Study. *International Journal of Health Economics and Policy* pp. 86-96.
- ACAPS (2018). Food insecurity. Retrieved from
- AbebawShimeles, (2003), Dimensions and determinants of food insecurity among rural households in Dire Dawa, eastern Ethiopia: An MSc thesis presented to the school of graduate studies of Alemaya University.
- AboneshTesfaye, 2006. The impact of small scale irrigation on households' food security and assessment of its management system: the case of Feltino and Godino irrigation scheme in Ada Liben district, East Shewa, Ethiopia. An MSc thesis presented to the school of graduate studies of Haramaya University.
- Adgolign, T.B., 2006. Theoretical and practical considerations for the selection of water harvesting techniques: Case study of Sasiga district of Oromia, Ethiopia.
- AdugnaEneyew and WogayehuBekele,(2010), Causes of household food insecurity in Wolayita: Southern Ethiopia. *Journal of Stored Products and Postharvest Research*, 3(3): 35–48.
- Arene, C.J. and R.C. Anyaeji, (2010), Determinants of food security among household in Nsukka metropolis of Enugu State, Nigeria: *Pakistan Journal of Social Science*, 30(1): 9-16.
- AschalewFeleke, (2006). Determinants and dimensions of households' food insecurity in Dire Dawa city, Ethiopia: An MSc thesis presented to the school of graduate studies of Alemaya University.

- Ayantoye, K., S.A. Yusuf, B.T. Omonona and J.O. Amao, (2011), Food insecurity dynamics and its correlates among rural households in South Western Nigeria: *International Journal of Agricultural Economics and Rural Development*, 4(1): 43-55.
- AwbareWoreda, Somali Region Ethiopia. An MSc. thesis presented to the School of Graduate studies of Haramaya University.
- Barrett, C.B., (2002), Food security and food assistance programs: Department of Agricultural, Resource, and Managerial Economics, Cornell University.
- Berhanu Adenew, (2004), The food security role of agriculture in Ethiopia. *Journal of Agricultural and Development Economics*, 1(1):138-153.
- Bouis, H., (1993), Food consumption surveys: How random are measurement errors? In: J. von Braun and D. Putez.
- CSA (Central statistical agency), (2011), Ethiopia mini demographic and health survey report, Addis Ababa, Ethiopia.
- Clay, E., (2002), Food security: Concepts and measurements: Paper for FAO expert consultation on trade and food security: conceptualizing the linkages. Rome.
- CSA (Central Statistical Agency), (2011), Report on land utilization (Private peasant holding, Meher season), Agricultural sample survey 2010/2011: Statistical bulletin, volume VII, Addis Ababa, Ethiopia.
- CSA (Central Statistical Agency), (2012), Population statistical abstract, Central Statistical Agency, Addis Ababa Ethiopia.
- Devereux, S., (2010). Food insecurity in Ethiopia: Department for International Development (DFID): <http://www.nesglobal.org/node/129>.
- Devereux, S., (2001), Livelihood insecurity and social protection: Re-emerging issue in rural development: *Development Policy Review*, 19(4): 517-519.
- Deveruex, S. and I. Sussex, (2000), Food insecurity in Ethiopia: A discussion paper for DFID.
- Dione, J., (2004), Assuring food and nutritional security in Africa by 2020: A discussion paper for IFPRI.
- DPPA (Disaster Prevention and Preparedness Agency), (2010), Time series data of Ethiopia's Disaster Prevention and Preparedness Agency.

DRMFSS (Disaster Risk Management and Food Security Sector), (2011), Food supply prospect in (2011), early warning system report: Addis Ababa, Ethiopia.

EHNRI (Ethiopian health and nutrition research institute), (1997), Food composition table for use in Ethiopia. Part III, from 1968-1997: A research project sponsored by government of Ethiopia through former ENI and EHNRI.

EU (European Union), (2012), Effectiveness of European Union development aid for food security in Sub-Saharan Africa: Special report No. 1, 2012.

FAO (Food and Agriculture Organization) (2017) The State of Food Security and Nutrition in the World. Rome

FAO (Food and Agriculture Organization of the United Nations, RomeFAO), (2012), FAO crop and food security assessment mission to Ethiopia (2015), The state of food insecurity in the world: Special report. P 25–30. Available online at <http://www.wfp.org/content/ethiopia-faowfp-crop-and-food-security-assessment-mission-april-2012>

FAO (Food and Agriculture Organization of the United Nation), (2002), Food insecurity, poverty and agriculture: ECA working paper.

FAO (Food and Agriculture Organization of the United Nation), (2003), Trade reforms and food security: Conceptualizing the linkages, Rome.

FAO (Food and Agriculture Organization of the United Nations), 2009. Declaration of the world summit on food security. Rome.

FAO (Food and Agriculture Organization of the United Nations), (1996), Rome declaration on world food security and World food summit plan of action: Rome.

FAO (Food and Agriculture Organization of the United Nations), (2004), The state of food insecurity in the world: Rome.

FAO (Food and Agriculture Organization), (2014), the state of food insecurity in the world (2014), Strengthening the enabling environment for food security and nutrition. Available online at Rome, <http://www.fao.org/3/a-i4030e.pdf>.

FAO/WFP (Food and Agriculture Organization and World Food Programme Ethiopia), (2006), Special report- FAO/WFP crop and food supply assessment mission to Ethiopia, Addis Ababa.

- FAO/WFP (Food and Agriculture Organization and World Food Programme Ethiopia), (2010), Special report-FAO/WFP crop and food supply assessment mission to Ethiopia, Addis Ababa.
- FAO/WFP (Food and Agriculture Organization and World Food Programme Ethiopia), (2012), Special-report- FAO/WFP crop and food supply assessment mission to Ethiopia, Addis Ababa.
- Farid, S. and S. N. Wadood, (2010), An econometric assessment of household food Security in Bangladesh. Bangladesh Development Studies, XXXIII (3): 97-111.
- Frankenberger, T.R., (1992), Indicators and data collection methods for assessing household food security. In Maxwell S. and T.R. Frankenberger, (1992), Household food security: concepts, indicators and measurement, technical review, UNICEF and IFAD, Rome. An MSc thesis presented to the School of Graduate Studies of Addis Ababa University, Addis Ababa.
- FSP (Food Security Program), (2003), The new coalition for food security in Ethiopia, Vol. I, Addis Ababa, Ethiopia.
- Guajarati, D.N., (2004), Basic econometrics, 4th Edition, McGraw-hillInc: New York.
- Haddad, L., J. Sullivan and E. Kennedy, (1991), Identification and evaluation of alternative indicators of food and nutrition security: Some conceptual issues and an analysis of data: IFPRI, Washington, D.C.
- Hoddinot, J., (1999), Operationalizing household food security in development projects: an introduction. Technical guide#1. IFPRI Washington, D.C. U.S.A.
- Hoddinot, J., (2001b), Methods for rural development of food security in practice: IFPRI, Washington, D.C.
- Hoddinot, J., (2001a), Choosing outcome indicators of household food security: IFPRI, Washington, D.C.
- Hill, R.V. and Porter, C. (2015) Vulnerability in Ethiopia: Food Prices and Droughts Preliminary Draft. <http://www.wfp.org/disaster-risk-reduction/leap>
- Hoddinot, J., Weismann, D., L. Bassett, and T. Benson, (2009), Validation of the world food programme's food consumption score and alternative indicators of household food security: IFPRI discussion paper.

- Idrisa YL, Gwary MM, Shehu H, (2008), Analysis of food security status among farming households in jere local government of Borno state, Nigeria: *J Tropic Agric Food Environ Ext* 7(3):199–205.
- IFAD, (2011),(International Fund forAgricultural Development, RomeIndris S), (2012),Rural groups and the commercialization of smallholder farming: targeting and development strategies (draft). In: Issues and perspectives from a review of IOE evaluation reports and recent IFAD country strategies and project designs:Assessment of food insecurity, its determinants and coping mechanisms among pastoral households: the case of Zone One Chifra District Afar National Regional State. Unpublished M.Sc. Thesis, School of Graduate Studies, Haramaya University, Ethiopia.
- IFPRI, Washington Chung, K., L. Haddad, J. Ramakrishna and F. Riely, (1997), Data needs for food policy in developing countries; Identifying the food insecure. The application of mixed method approach in India. IFPRI Washington, D.C.
- Kassie, M., Ndiritu S. W. and Shiferaw Bekele, (2012), Determinant of food security in Kenya, a gender perspective: Paper Presented to Annual Conference of Agricultural Economics Society. University of Warwick, UK.
- Lewin, P. and M. Fisher, (2010), The determinants of food insecurity in rural Malawi: implications for agricultural policy. Malawi Strategy Support Program (MaSSP). Policy note, 4:1-3.
- Maddala, G. S., (1992). Introduction to econometrics, 2nd edition. Macmillan publishing co. New York.
- Maxwell, S. and T.R. Frankenberger, (1992), Household food security: concepts, indicators and measurement, technical review, UNICEF and IFAD, Rome.
- Maxwell, S. and M. Smith, (1992), Household food security: a conceptual review. In Maxwell S. and T.R. Frankenberger Household food security: concepts, indicators, and measurements: a technical review. New York and Rome. UNICEF and IFAD.
- MoFED (Ministry of Finance and Economic Development), (2008), Dynamics of growth and poverty in Ethiopia. Addis Ababa, Ethiopia.
- ORRFSC (Oromia Regional Rural Food Security Commission), (2008), Oromia Regional Rural Food Security Commission. Addis Ababa, Ethiopia.5858.

- Porter, C. (2012) Shocks, Consumption and Income Diversification in Rural Ethiopia. *Journal of Development Studies*, 48, 1209-1222. <https://doi.org/10.1080/00220388.2011.646990>
- PASDEP (Plan for Accelerated and Sustainable Development to End Poverty), (2005), *Building progress-a plan for accelerated and sustainable development to end poverty. Volume I, Main Text*. Addis Ababa, Ethiopia.
- SWFEDO (ShallaWoreda Finance and Economic Development Office), (2012), *Physical and socio-economic condition of ShallaWoreda*. Unpublished Document.
- Smith, C.L, H. Alderman and D. Aduayom, (2006), *Food insecurity in Sub Saharan Africa*.
- TilayeTeklewolde, (2004), *Food insecurity: Extent, determinants, and household coping mechanisms in Gera Keya woreda Amhara region*. An MSc thesis presented to School of Graduate Studies of Addis Ababa University.
- UNDP (United Nations Development Programmes), (2011), *Human development report*. United Nations Development Programme, New York. USAID (United States Agency for International Development), (1999), *Food security indicators for the use in the monitoring and evaluation of food security program*.
- UNDP (United Nations Development Program) (2016) *Country Program Document for Ethiopia (2016-2020)*, First Regular Session, New York. <http://www.et.undp.org/>
- Von Braun, J., H Bouis, Sh. Kumar and R. Lorch, (1992), *Improving food security of poor: concepts, policy and programmes*. IFPRI, Washington, D.C.
- Weibe, K. and D. Maxwell, (1998), *Land tenure and food security. A review of concepts, evidence and methods*. Research Paper. University of Wisconsin, Madison.
- WFP (World Food Program), (2006), *A review of emergency food security assessment practice in Ethiopia*. A study commissioned and prepared for World Food Programme, Rome.
- Yamane, T., (1967), *Statistics: An introductory analysis*, 2nd Ed. New York: Harper and Row. Zerihun Nugusie, (2009).

APPENDIX
JIMMA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLAGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF DEVELOPMENT ECONOMICS

This questionnaire comes to you in order to gather relevant data about Determinants of Food Insecurity in rural Households: The Case of Masha Woreda, Sheka Zone, SNNPR, and Ethiopia. I honestly assure you that the obtainable data purely serves an academic research purpose. I hope, your genuine information to the questionnaire below will help me arrive at a sound and meaningful conclusion over the problem under investigation.

Thank you in advance!

6.1. Tables in the Appendix

Appendix Table 1. Conversion factor used to compute adult equivalent (AE)

| Age group (years) | Male | Female |
|-------------------|------|--------|
| <10 years | 0.6 | 0.6 |
| 10-13 | 0.9 | 0.8 |
| 14-16 | 1.0 | 0.75 |
| 17-50 | 1.0 | 0.75 |
| >50 | 1.0 | 0.75 |

Source: Storck, et al. (1991)

Appendix Table 2. Conversion factor used to compute tropical livestock unit (TLU)

| Animal category | TLU | Animal category | TLU |
|-----------------|------|------------------------|-------|
| Calf | 0.50 | Donkey (young) | 0.35 |
| Weaned calf | 0.34 | Sheep and goat (adult) | 0.13 |
| Heifer | 0.75 | Sheep and goat(young) | 0.06 |
| Cow and ox | 1.00 | Chicken | 0.013 |
| Donkey(adult) | 0.70 | | |

Source: Storck, et al. (1991)

Appendix Table 3. Conversion factor used to estimate Kcal of food items

| Food items | Unit | Kcal |
|--------------|------|------|
| Barley | Kg | 3723 |
| Maize | Kg | 3751 |
| Sorghum | Kg | 3850 |
| Wheat | Kg | 3623 |
| Irish potato | Kg | 1037 |
| Lentils | Kg | 3522 |
| Onion | Kg | 713 |
| Pepper | Kg | 933 |
| Milk | Lt | 737 |
| Sugar | Kg | 3850 |
| Edible oil | Lt | 8964 |
| Coffee | Kg | 1103 |
| Peas | Kg | 3553 |
| Tomato | Kg | 216 |
| Salt | Kg | 1700 |
| Rice | Kg | 3330 |

| | | |
|--------------------|----|------|
| Meat | Kg | 1148 |
| Butter | Kg | 7364 |
| Spaghetti/Macaroni | Kg | 3550 |

Source: EHNRI, 1997

6.2. Household Survey Questionnaire

Determinants of Food Insecurity of Rural Households: The Case of Masha Woreda, West Sheka Zone, SNNPR Region, Ethiopia

Part.1. General Information

1. . Kebele: _____
2. Name Of Household Head: _____
3. Household Code No.: _____
4. Date of interview: _____
5. Name of Enumerators: _____
6. Signatures: _____
7. Name of Supervisor: _____
8. Signature: _____

Part.2. Demographic, Economic and Social Characteristics of the Household

(Make a complete lists of all individuals who normally live and eat their meals together in this household, starting with the household head)

| S/N | Name of the household members | Sex Male = 1 Female = 0 | Relation to the head of household (code Below) | Age | Marital status (code below) | Highest educational level you ever completed (code below) | Religion do you practices | Ethnic (code below) |
|-----|-------------------------------|-------------------------------|--|-----|-----------------------------|---|---------------------------|---------------------|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 1 | | | | | | | | |
| 2 | | | | | | | | |

Code for 04: relation code for 06: marital status code for 07: educational level

| | | |
|--|------------------------------------|---------------------|
| Household head _____ 1 | Never married _____ 1 | Pre-school _____ 00 |
| Spouse of household head _____ 2 | Married with one _____ 2 | Class 1 _____ 01 |
| Son/Daughter _____ 3 | Divorced or separated _____ 3 | Class 2 _____ 02 |
| Spouse of son/daughter _____ 4 | Widowed _____ 4 | Class 3 _____ 03 |
| Grandchild _____ 5 | Married with more than one _____ 5 | Class 4 _____ 04 |
| Father/mother _____ 6 | | Class 5 _____ 05 |
| Other relatives _____ 7 | | Class 6 _____ 06 |
| Servant or other non-relatives _____ 8 | | Class 7 _____ 07 |

Class 7 _____ 08

Class 7 _____ 09

Code for 08: religion

Islam _____ 1
Orthodox _____ 2
Protestant _____ 3

Code for 9: ethnicity

Amhara _____ 1
Oromo _____ 2
other (specify) _____ 3

Class 10 _____ 10
Class 11 _____ 11
Class 12 _____ 12
Beyond secondary _____ 13
Mass education _____ 14
Spiritual education _____ 15
Illiterate _____ 16

2.2. Is there any of these members has been away from this household for more than month during the past 12 months? _____ Yes = 1 No = 2

2.3. If yes to 2.2 above, fill the following table:

| S/N | Name | No. of months left the household (cumulated month) | Reasons |
|-----|------|--|---------|
| 1 | | | |
| 2 | | | |
| 3 | | | |

2.4. Labor force status (for those whose age is 15 years and over): Have you engaged in productive work during most of the last 12 months? Yes = 1 No = 2

2.5. If no, what are the reasons?

- | | |
|-------------------------|----------------------------------|
| 1. Disabled | 4. Scarcity of agricultural land |
| 2. Did not want it. | 5. Sick |
| 3. No job/no employment | 6. Old |

2.6. Other (specify) _____

Part.3. Household Asset

(Ask of household head or other senior member of the household)

3.1. Does anyone in the household currently own any of the following items? Fill in the table below:

| S/N | Item | Quantity owned | Price if sold in their current status |
|-----|---------------------------------|----------------|---------------------------------------|
| 1 | Valuable –jeweler: | | |
| | -wrist watches | | |
| | -Other(specify) | | |
| 2 | Household goods: | | |
| | - bed(wooden/metal) | | |
| | -Table and chairs | | |
| | - radio/tape | | |
| | -Gas stove | | |
| | -Other kitchen equipment | | |
| | -Other(specify) | | |
| 3. | Agricultural implements: | | |

| | | | |
|--|---------------------|--|--|
| | - Grainstorage | | |
| | - Hoe | | |
| | - Maresha | | |
| | - Maneko and kember | | |
| | - Mofer | | |
| | - Erif | | |
| | - Digger | | |
| | - Wegel | | |
| | - Sickle | | |
| | - Axe | | |
| | - Other(specify) | | |

3.2. Have you sold any of the above items in the last 12 months? Yes = 1 No = 2

3.3. If yes to Question 3.2 above, fill the following table:

| Type | Number sold | Amount sold | Reason for sale |
|------|-------------|-------------|-----------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |

3.4. What type of house (observe outer walls and roofs of the main dwelling) does the household own?

1. Mud wall and corrugated iron roofs
2. Mud wall and grass roofed house
3. Grass wall and roof house
4. Other(specify)

Part.4. Agriculture: Land Resource

4.1 Do you have your own agricultural land? Yes = 1 No = 2

4.2. If yes to question no. 4.1 above, what is the total size of your landholding? ___ in ha.

1. Cultivated area _____
2. Grazing area _____
3. Fallow area _____
4. Other(specify) _____

4.3. How did you acquire your own land?

1. Inherited/gifts from family
2. Purchase
3. Land distribution
4. Other (specify)

4.4. What is the total area of land you cultivated in the last year? _____ ha.

1. Owned _____
2. Rented in _____
3. Share cropped _____
4. Received as gifts _____
5. Other (specify) _____

4.5. What is the total area of land you _____?

1. Rented out _____
2. Given out as gifts _____

3. Share cropped _____ 4. Other (specify) _____
- 4.6. If you rented out or share cropped out your land, why did not you farm yourself? _____
- 4.7. Do you think that your piece of land is enough to support our household?
 Yes =1 No =2

- 4.8. If no, state your reasons _____.
1. Small size of land
 2. Lack of agricultural input to increase productivity
 3. Large family size
 4. Infertility of land
 5. Other(specify)

Part .5. Crop output and with its deficit

5.1. List the type of crops you cultivated and their average production (including garden crops)in the last year.

| Types of crops | Area (ha) | Production (qty) |
|----------------|-----------|------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

- 5.2. Is what you produce last year enough for your family? Yes = 1 No = 2
- 5.3. If yes, what amount of grain stock was transferred to this year?_Qts
- 5.4. If no, for how long does it last?_____Months.
- 5.5. During which month is food shortages ever?_____
- 5.6. What do you think are the main cause of food deficit in order of importance?
1. Absence of adequate rainfall
 - 2.Excessrainfall
 3. In sector pest infestation
 - 4.Shortage of oxen
 - 5.Shortage of cultivated land
 6. Shortage of agricultural inputs
 7. Less fertile land
 - 8.Lack of transport
 9. Animal disease
 - 10.Lack of credit
 - 11.Poor health of the farmer
 - 12.Divorce
 - 13.Weed infestation
 - 14.Attack by wild animals & birds
 - 15.Famine
 - 16.Priceriseinagriculturalinputs
 17. Shortage of labor
 18. Other(specify)-----
- 5.7. If relief food aid are among the means to fill food deficit, for how long have you been getting it?_____Years____months.
- 5.8. Do you think that food aid is important? (Ask if the household is the beneficiary) _____
 Yes = 1 No = 2
- 5.9. If 'yes' to question no. 5.9, how?
1. Gives relief
 2. Selling it provides cash

3. Other (specify)-----
- 5.10. If 'no' to question no. 5.9, why not?
 1. It creates dependency
 2. It makes lazy
 3. It does not reach on time
 4. Other(specify)-----
- 5.11. Do you use any irrigation scheme? Yes = 1 No = 2
- 5.12. If yes what type of it? _____
 1. modern 2. Traditional 3. Both
- 5.13. If yes what types of crops did you produce using irrigation last year?

Part .6. Use of Modern Agricultural Input

- 6.1. Did you use chemical fertilizers? Yes = 1 No = 2
- 6.2. If 'yes' to question no.6. 1 for how many years have you been using fertilizer? Years.
- 6.3. Have you been using fertilizer very year? Yes = 1 No = 2
- 6.4. If 'no' to question no. 6. 3, why?
 1. Not necessary for cultivated crops 2. Not available
 3. Harmful to the soil 4. It is costly
 5. Land is fertile 6. Others(specify)-----
- 6.5. The amount of fertilizer used in the last production season is -----Kg = ----- Kg
 DAP and ----- Kg Urea.
- 6.6. Did you use improved seed on your farm in last year production period? Yes =1 No=2
- 6.7. If 'yes', how much? ----- Kg.
- 6.8. If 'no', why?
 1. Not heard about it 2. Too expensive
 3. Not available (no supply) 4. Not know its importance
 5. Not enough land 5. Other (specify)-----
- 6.9. Did you use herbicides, insecticides or fungicides in at least one of your plot in the last production year? Yes = 1 No = 2

Part .7. Livestock ownership

- 7.1. Do you own livestock? Yes = 1 No = 2
- 7.2. If yes, indicate the types and number of livestock owned

| S/N | Types of livestock | Number owned |
|-----|--------------------|--------------|
| 1 | Cows | |
| 2 | Oxen | |
| 3 | Heifers | |
| 4 | Yearling | |
| 5 | Calves | |
| 6 | Bulls | |
| 7 | Sheep | Mature |
| | | Lamb |
| 8 | Goat | Mature |

| | | |
|----|---------|------|
| | | Lamb |
| 9 | Donkeys | |
| 10 | Horses | |
| 11 | Mules | |
| 12 | Poultry | |

7.3. Do you use oxen for your farm operation? Yes = 1 No = 2

7.4. If yes, are your oxen enough for your farm operation? Yes = 1 No = 2

7.5. If you do not have enough oxen, how do you get additional oxen you need?

- | | |
|-------------------------------------|-------------------------------------|
| 1. Pulling oxen to form a pair | 2. Borrow from friends & relatives |
| 3. Oxen obtained for labor exchange | 4. Oxen obtained with sharecropping |
| 5. Manually | 6. With other livestock |
| 7. Hire from someone/renting in | 8. Others (specify)----- |

7.6. Did you sell any of your animals in the past two years? Yes = 1 No = 2

7.7. If yes, fill the following table:

| Types of animals sold | Number of animals sold | Reason for sale | Time(month of sale) |
|-----------------------|------------------------|-----------------|---------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |

Possible reasons for sale of animals:

- | | |
|---|---------------------------------|
| 1. To purchase food | 2. To purchase clothes |
| 3. To purchase agricultural inputs & implements | 4. To pay taxes and other debts |
| 5. Social obligations | 6. To purchase farm oxen |
| 7. To cover health and education expenses | 8. Others (specify) |

7.8 If you have honey hives, indicate in the following table:

| Types of beehives | Number of harvest | Number of hives | Production per hives per harvest | Total annual production | Amount sold | Amount transferred in or out as gift | | Total consumed |
|-------------------|-------------------|-----------------|----------------------------------|-------------------------|-------------|--------------------------------------|-----|----------------|
| | | | | | | In | Out | |
| Traditional | | | | | | | | |
| Intermediate | | | | | | | | |
| Modern | | | | | | | | |

Part.8. Agricultural extension services

8.1. Is there development agent or any other organization that gives agricultural extension services in your locality? Yes = 1 No = 2

8.2. If yes, has your household received agricultural extension services during the last year?
 Yes = 1 No = 2

8.3. The number of time that you visited the agricultural extension worker during the last year ____

8.4. What were the purposes of visits? _____(multiple answers possible)

- 1. To get advice on crop production
 - 2. To get advice on animals production
 - 3. To get advice on soil conservation
 - 4. Others (specify)
- 8.5. Have you participated in agricultural extension package program? Yes = 1 No=2
- 8.6. If yes, for how long? _____

Part .9. Credit services

- 9.1. Have you received any type of credit in the last year? Yes = 1 No = 2
- 9.2. If yes, what are the sources of credit? (Multiple answers possible)
- 1. Cooperatives
 - 2. Neighbors and friends
 - 3. Relatives
 - 4. Local moneylenders
 - 5. Microfinance institution
 - 6. Commercial banks
 - 7. Others (specify) _____
- 9.3. If yes, for what purposes? _____(multiple answers possible)
- 1. Purchase of agricultural inputs (seeds, fertilizers, chemicals)
 - 2. Purchase of oxen
 - 3. Purchase of farm implement
 - 4. For family consumption
 - 5. For social obligation
 - 6. To buy other livestock.
 - 7. For school fee
 - 8. For health
 - 9. Others(specify) .
- 9.4. Please can you specify the amount of credit taken _____birr.
- 9.5. At what time do you usually take credit? _____Months.
- 9.6. If no to question 9.3, why you did not take?
- 1. Fear of inability to pay
 - 2. Lack of asset for collateral
 - 3. No one to give to credit
 - 4. High interest rate
 - 5. No need for credit
 - 6. I have enough working capital
 - 7. Others(Specify) _____

Part.10. Off-farm and Non-farm employment

- 10.1. Do you or any member of your family have off farm job? Yes = 1 No = 2
- 10.2. If yes indicate the type of work and annual income:

| Family member | Types of jobs(see below) | Annual income(birr)* |
|---------------|--------------------------|-----------------------|
| 1. | | |
| 2. | | |
| 3. | | |

*if payment were made in kind, convert them into birr at price prevailing at time.

- 1. Weaving/spinning
 - 2. Milling
 - 3. Other handicrafts (pottery, metal works, etc.)
 - 4. Livestock trade
 - 5. Sale of local drinks
 - 6. Agricultural employment
 - 7. Pity trade (grain, vegetables, fruits, etc.)
 - 8. Sell of fire wood and grass
 - 9. Others (specify)
- 10.3. Has the household received remittance in the year 2011/12? Yes = 1 No = 2

10.4. If yes, its amount in birr:_____.

10.5. Has anyone in your household participated in safety net public works in the year

10.6. If yes, fill the following table:

| S/N | Member received | Type | Amount received if in kind and its units | Cash received in birr or cash equivalent of amount in kind |
|-----|-----------------|------|--|--|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4 | | | | |

*convert into cash amount given in kind

10.7. Has anyone in your household received direct aid in year 2011/12? Yes = 1 No = 2

10.8. If yes, fill in the following table:

| S/N | Member received | Type of aid | Amount received if in kind & its unit | Cash received in Birr and cash equivalent of the amount in kind* |
|-----|-----------------|-------------|---------------------------------------|--|
| 01. | | | | |
| 2. | | | | |
| 3. | | | | |

*convert into cash aid given in kind

Part .11. Marketing services

11.1. Where do you sell your farm produce?_____ (multiple answer rpossible)

1. On farm
2. Local market
3. Through services of cooperatives
4. Other (specify)___

11.2. How far is from your village, the local market that you mostly make transaction?_____ Km.

11.3. What means of transport do you use to transport your produce to the market?_____

1. Truck
2. Animal power
3. Human power
4. Others(specify)_____

11.4. When do you sell most of your produce?_____ Month

11.5. Do you get reasonable price for your produce at this particular time? Yes =1 No=2

11.6. If no why did you sell at that particular time of lower (unreasonable) price?

1. To settle debt
2. To pay taxes
3. For social obligation
4. To meet family requirement
5. Others (specify) _____

11.7. What are the problems in marketing your produce?

2. Transportation
2. Low price
3. Low bargaining power
4. Too far from market

5. Other (specify) _____

Part 12: Membership

12.1. Are you member of any cooperative in your locality? Yes = 1 No = 2

12.2. If 'yes' to Q.12.1 above, what kind of cooperative are you member?

1. Input supplier
2. Output supplier
3. Other(specify)

12.3. Are you member of the following? (Circle them if yes!)

1. 'Equb'
2. 'Edir'
3. Other (specify)

Part .13. Household Consumption

(Ask of principal home maker of household. Include both food eaten communally in household and that eaten separately by household members).

13.1. What food items were used for consumption during the last **seven days** in your household?

| Food type | Total Consumed | | Source | | | | | | | |
|------------------------|----------------|----------|---------------|----------|-----------|----------|------------|------------------------|----------|--------|
| | | | Home produced | | Purchased | | | Gift/loan/wage in kind | | |
| | Unit | Quantity | Unit | Quantity | Unit | Quantity | Price/unit | Total expenditure | Quantity | Source |
| A. Staple foods | | | | | | | | | | |
| 1.Sorghum | | | | | | | | | | |
| 2.Maize | | | | | | | | | | |
| 3.Rice | | | | | | | | | | |
| 4.Teff | | | | | | | | | | |
| 5. Wheat | | | | | | | | | | |
| 6.Lentils | | | | | | | | | | |
| 7.Beans dry | | | | | | | | | | |
| 8. | | | | | | | | | | |

| | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|
| B. Meat & Other animal products | | | | | | | | | | | |
| 1. Cow milk | | | | | | | | | | | |
| 2. Camel milk | | | | | | | | | | | |
| 3. Goat milk | | | | | | | | | | | |
| 4. Cattle meat | | | | | | | | | | | |
| 5. Camel meat | | | | | | | | | | | |
| 6. Goat meat | | | | | | | | | | | |
| 7. Sheep meat | | | | | | | | | | | |
| 8. Butter | | | | | | | | | | | |
| 9. | | | | | | | | | | | |
| C. Beverages & drinks | | | | | | | | | | | |
| 1. Coffee | | | | | | | | | | | |
| 2. Drinking water | | | | | | | | | | | |
| 3. Beverage | | | | | | | | | | | |
| 4. | | | | | | | | | | | |
| D. Fats, oils, sweeteners, snacks and others | | | | | | | | | | | |
| 1. Edible oil | | | | | | | | | | | |
| 2. Sugar | | | | | | | | | | | |
| 3. Salt | | | | | | | | | | | |
| 4. Pasta | | | | | | | | | | | |
| 5. Macaroni | | | | | | | | | | | |
| 6. | | | | | | | | | | | |
| E. Vegetables | | | | | | | | | | | |
| 1. Potato | | | | | | | | | | | |
| 2. Onions | | | | | | | | | | | |
| 3. Pepper | | | | | | | | | | | |
| 4. Garlic | | | | | | | | | | | |

Units:

gm _____ 1 sKg _____ 2 ml _____ 3 lt _____ 4

bunch _____ 5 serving _____ other (specify) _____ 7