



**DETERMINANTS OF HOUSEHOLD FOOD INSECURITY IN
MERTI WOREDA OF ARSI ZONE OROMIA REGION**

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ACRONYMS AND ABBREVIATIONS

CIDA	Canadian International Development Agency
CSA	Central Statistical Authority
DFID	Department for International Development
ENI	Ethiopian Nutrition Institute
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
FGT	Foster, Greere and Thorbecke
FNU	Food and Nutrition Unit
HFS	Household Food Security
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGADD	Inter Governmental Authority for Drought and Development
LPF	Linear Probability FUNCTION
MOFED	Ministry of Finance and Economic Development
MOPED	Ministry of Planning and Economic Development
TLU	Tropical Livestock Unit
UNDP	United Nations Development Program
USAID	United States Aid for International Development
VIF	Variance Inflation Factor
WIBS	Woreda Integrated Basic service

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ABSTRACT

A better understanding of factors affecting the status of food security is required for the organization of technical research, the development of policies and for shaping the direction of action for food self-sufficiency. Consequently, this study is expected to generate ideas that would be useful to reveal the seriousness of the problem and identify the determinants of household food insecurity. Primary data were collected from sample respondents through personal interview using structured questionnaire. The study was also supplemented by secondary data collected from various sources. Data on demographic, socioeconomic and biophysical characteristics of the sample respondents were presented, organized and discussed using various tools of both descriptive statistics and econometric analyses. Attempts were made to look in to the specific characteristics of the food secure and food insecure groups using T-test (tests of significance). Binary logit model was used to identify the continuous and discrete potential variables capable of affecting the food security status in the woreda. The mode results reveal that among 10 explanatory variables included in the logistic model, 8 were found to be significant in the woreda. These significant variables include family size (FASZ), dependency ratio, (DPR) cultivated land size (CLSZ), livestock ownership (TLU) number of ox owned (NUOXEN), amount of credit received(CREDIT), income from shoat (SHOAT), and off farm income (OFFINC). Thus, identifying analyzing, and understanding those elements that are responsible for household food security in places like Merti woreda needs urgent research undertakings and the results are believed helps to guide policy decisions, appropriate interventions and integrated efforts to combat food security at the district and household levels. Therefore, consideration of determinants of food insecurity of the households is important because it provides information that would enable to undertake effective measures with the aim of improving household livelihoods in general and food security in particular.

Key words

Household food insecurity, Determinant, Abomsa

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

The latest FAO estimates indicates that global hunger is 821 million people are estimated to be chronically undernourished for developing countries FAO or the same source indicates that 780 million people in developing countries were estimated to be chronically hunger. Despite this overall progress in developing countries as a whole, there is still considerable room to reduce undernourishment and improve food security. (FAO, 2019) The series of African food crises in the seventies and eighties have led to sustained interest in the various factors that influence peasant food security. The roles of crop conditions, government policy and peasant access to economic resources have received particular attention (Yared, 2019).

Deepening food crises in several developing countries especially those in Sub-Saharan Africa (SSA), has increasingly become the concern of many researchers, planners, donors and international development agencies, who have given high priority to the study of food system and the problem of food insecurity (Gezahegn, 2015). Despite the available resources and the efforts made by governments in SSA, food insecurity remained one of the most crucial issues.

The deteriorating situation of food security in Ethiopia is caused by population pressure, draught, shortage of farm land, lack of oxen, deterioration of food production capacity, outbreak of animal and plant disease, poor soil fertility, forest attack, shortage of income, poor farming technologies, weak extension service, high labor wastage, poor social and infrastructural facility, and pre and post-harvest crop loss. (Mequannet, 2015)

To address food insecurity problem, the government of Ethiopia is taking a strong leadership role with programs that meet the varying needs of vulnerable households. A serious of successive droughts had already weakened Ethiopians food situation, with poor and erratic rainfall over the last two years. Ethiopia lies within one of the most food insecure regions in the world, with a large number of its population living at subsistence levels and dependent on farm

production highly vulnerable to severe draughts. The smallholder peasant sector is the most important agricultural sub sector in the country. Its emphasis is on food grain crops where considerable improvements of cultivation practices, management and marketing need to be realized. The production volume of food grain crops as well as the per capita food production has shown tremendous fluctuations thus resulting in severe food shortage in the country. The main reasons for these are stochastic shocks such as recurrent draught, lack of incentives for the small-scale food producers and poor extension services for the small peasant households (Mulugeta 2016)

The country is one of the largest countries in Africa, and the second most populous. Its per capita income, however, is among the lowest in the least developed countries and depends heavily on smallholder agriculture. Low agricultural production leads to low income and the lowest calorie intake of 1,845 Kcal per person per day (Abreha, 2016). Ethiopia has been facing challenging problems. The country is generally characterized by poverty, high population growth rate, severe environmental quality degradation and recurrent drought (World Bank 2012; Getachew 2015; Markos 2017). This resulted in poor performance of agricultural production for several years, to the extent that the country could not adequately feed its population from domestic production. This manifested itself in the prevalence of food insecurity, both chronic and transitory, which has almost become a structural phenomenon affecting the way of life for a large proportion of the population of the country. The per capita gross domestic product (GDP), is one of the lowest in the world.

Although food self-sufficiency has remained the stated goal of the Government of Ethiopia, the problem of food insecurity has continued to persist in the country. Many households have already lost their means of livelihood due to recurrent drought and crop failures (Ayalneh, 2013). Therefore, what is needed now is to comprehensively address the problem of food insecurity in the country. Hence, a study of this sort in addressing the problem has an important role at least in clearly identifying specific factors and the severity of the problem that pertain to the area.

Food insecurity, in Merti woreda in general and Abomsa (town of the woreda) in particular is a serious problem. The woreda is categorized into food insecure woreda. Similarly, a food demand situation analysis report of the year 1995-1999 showed that the total average annual production in the woreda meets only 55% of total demand of food on the base of 2100 kcal minimum

recommended nutritional requirement (WHBoPED). This implies that a good number of people of the woreda are food insecure for a number of months in a year.

1.2 Statement of the problem

Poverty, inequality and food insecurity are the most crucial and persistent problems facing humanity. As the scale of human activities expands the capacity of eco-systems to regenerate the natural resource base becomes an increasingly binding constraint to further growth and development. With respect to agriculture, the combined effect of population growth on the developing countries, of increase per caput income of changes in dietary pattern linked inter alias to growing urbanization, will bring about sustainable increases in demand for food and other agricultural products (ostas et al., 2018)

Both transitory and chronic food insecurity are severe in Ethiopia. Moreover, food insecurity is one of the defining features of rural poverty affecting millions of people particularly in moisture-deficit and pastoral areas. Even in years of adequate rainfall and good harvests, these people remain in need of food assistance (FDRE, 2015). Food insecurity has become a constant challenge for millions of households in rural Ethiopia. In Wello and Hararghe, for example, there have been very few years without famine relief distribution since the 1970s, even in moderately dry or non-draught years. In the central Ethiopian highlands, where government development resources are believed to have been concentrated, food insecurity is now permanent. Despite massive reforestation programs, few trees have survived, and deforestation and soil erosion continue to affect wider areas each year with great loss to agricultural and pastoral production (Getachew, 2009). Moreover, the same source further explained that at the root of Ethiopia's food deficit is its low agricultural productivity, cereal yields stagnated at around 1.2 tons per hectare. The decreasing size of farm has led to a shorter fallow periods and even continuous cropping, and limited efforts to recycle crop residues or other organic matter into the soil have resulted in farmers having to invest in chemical fertilizer to produce enough for their subsistence requirement.

Coming from the other side too, the challenge of inadequate growth of food production, high population growth rate and inappropriate government intervention in the economy as well as the

prolonged civil war have made achieving food security, whereby each person has economic and physical access to sufficient food to lead a healthy and productive life, an arduous goal. Rural households are vulnerable to food insecurity not simply because they do not produce enough, but either they hold little in reserve or they usually have scant saving and few other possible sources

of income to obtain adequate food to meet their daily subsistence food energy requirements (Ayalneh, 2013) The problem of food insecurity has big diversity and a multiple dimension, which ranges from the global, regional, country, local, household to individual level; more attention is only given to the country level so far. Moreover, the various, complex and interrelated causes of household food security and local responses during crisis situation are not studied in detail, especially at a household level. Thus, identifying, analyzing, and understanding those elements that are responsible for variation in household food security in places like Merti district are needed to guide policy decisions, appropriate interventions and integrated efforts to combat food insecurity at the district and household level. This study attempts to reveal the seriousness of the problem and identify the major determinants of food security at the household level.

Merti woreda is categorized as a food deficit woreda of Oromia regional state. Although a substantial food aid is distributed annually and some commercial food distribution is also made during severe draught years. Agriculture in the rural part of the woreda is rudimentary and low in productivity. The Woreda Integrated Basic Service (WIBS) has been functioning in regional state Administrative Council. One of the activities of this program is to ensure the rural household food security through provision of credit (Planning and Economic Development Office, 2000)

In addition to the general identification of food insecurity of the World, regional and country level, disaggregated information on the incidence of food insecurity is required both for proper policy design and adequately targeted interventions. This entails identification of different categories of the food insecure at the local and household level by sector of economic activity, occupational characteristics, and social status by age and gender (Kostas et al., 2001). Hence, the researcher has taken the initiative to study this problem and to analyze with the factors that are associated with household food insecurity and the severity of the problem in Merti woreda.

1.3 Objective of the Study

1.3.1 General objective

The general objective of the study is to found out of the determinants of household food insecurity in Merti woreda Oromia region.

1.3.2 Specific Objectives

1. to identify the determinants of food insecurity among the household;
- 2.to examine the livelihood strategies of households;
- 3.to identify the socio-economic characteristics of the food-secured and the food-insecure households

1.4 Significance of the Study

Having clear information on the status of food security and its determinants in the study areas can provide with basis for a detailed analysis on food security status and information that will enable effective measures to be undertaken so as to improve food security status and bring the success of food security development programs. A better understanding of factors affecting the status of food security is required by organizations concerned with community development, researchers, and development policies makers. Hence such studies also provide directions for further research, extension and development schemes that would benefit the farming population.

1.5 Scope and Limitation of the Study

The study was conducted to identify the determinants of food insecurity at the household level and to assess the severity of the problem at this level. The study covers only 98 sample households in the study area. Moreover, the study deals with a limited number of households and focused on the determinants of food insecurity. Besides to this, the data were collected at one-time period and during the time of Covid-19 pandemic. The scope of this study was limited by time, budget, the disease of covid-19 and other limitation. Even if the study was restricted in

terms of its coverage its outputs can be used as a spring board for more detailed and area specific studies.

1.6 Organization of the Thesis

This thesis is organized in to five chapters. Chapter one deals with background information, statement of problem, objectives, significance and scope of the study. Chapter two contains the review of literature which focuses on concepts and definitions of food security, sources of food insecurity, food security situation in Ethiopia, food security strategy of Ethiopia, indicators of food insecurity, and livelihood strategies. Description of the study area, data source and sampling, data analysis, determinants of food insecurity, model specification, and definitions of variables are stated in chapter three. discussion of results presents in chapter four and finally chapter five contains summary, conclusion and recommendation of the study.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Concepts and Definitions

The conceptual framework of food security has undergone considerable evolution, reflecting the changes in perception of the world food situation over time, as it is inherently linked with the interrelationship between population and food production problems. However, much attention was focused on the term ‘food security’ which was first highlighted as a technical concept at 1974 World Food conference (Abassa2016). During 1970s the concept of food security was conceived as adequacy of food supply at global and national levels (Maxwell and Smith, 2012).

attainment of food self-sufficiency and eventually reduce their dependency on an unstable international grain market. Likewise, the unit of analysis was limited to aggregate production and consumption at macro levels. However, the African food crisis of the early 1980s and the following debate on ‘food access’ brought a drastic change in the contemporary understanding of food security and its respective unit of analysis. After the debate the focus of unit of analysis shifted from national and global to household and individual levels (Maxwell and Smith, 2012). Equating national food security with food self-sufficiency is such a problem that needs to be clearly understood. Attaining macro-level food self-sufficiency does not assure the achievement of food security at micro-level. This leads us to a further distinction between macro (food supply insecurity) and micro (food consumption insecurity) dimensions of the problem (FAO, 2016).

The same source also stated that Regarding the linkage, having enough food availability at the national or local level or food self-sufficiency for that matter is only a necessary but not a sufficient condition for ensuring that households have adequate access to food. Similarly, food

access, is only necessary conditions and not sufficient conditions for the next stage to be met (i.e., consumption). Food self-sufficiency, which is usually confused with food security, refers to producing all the required food domestically and is a pre-condition for food security while food security itself is a necessary condition for nutritional wellbeing.

Food security historically referred to the overall regional or even global food supply and shortfalls in supply compared to requirements. The term has been applied more recently at a local, household or individual levels (Foster, 2017) and has been broadened beyond notions of food supply to include elements of access. Conventionally, food security is defined as access by all people at all times to enough food for an active and healthy life (World Bank, 2016). Most definitions of food security vary around that proposed by the World Bank (2016); major components of the most common definitions are summed up by Maxwell and Frankenberger from over thirty reviewed definitions as "secure access at all times to sufficient food for a healthy life" The USAID (2012) defines food security as: "when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life." Food security is a broad and complex concept that is determined by agro physical, socioeconomic and biological factors (von Braun, et al. 2018). According, to this definition, food security has three fundamental elements.

Food availability is achieved when sufficient quantities of food are consistently available to all individuals within a country. Such food can be supplied through household production, other domestic output, or commercial imports or food donation.

Food access is ensured when households and members of the household have adequate resources to obtain appropriate food for a nutritious diet. Access depends on income available to the household, on the distribution of income within the household, and on the price of food

Food utilization is the proper biological use of food, requiring a diet providing sufficient energy and essential nutrients, potable water and adequate sanitation. This aspect, thus focuses more on nutrition, and in this it differs from the normative definition by the World Bank (2016).

The conceptual framework of food security has progressively developed and expanded based particularly along with the growing incidence of hunger, famine and malnutrition in developing

countries. The concept of food security attained wider attention in the early 1980s after the debate on ‘access’ to food and the focus of unit of analysis shifted from national and global level to household and individual levels (Debebe, 2017). The history of thinking about food security since the World Food Conference can be conceptualized as consisting three shifts are: from the global and the national to the household and the individual, from a food first perspective to a livelihood perspective, and from objective indicators to subjective perceptions.

Food security is defined, in its most basic form, as access by all people at all times to the food required for a healthy life. Access to the needed food is necessary, but not a sufficient condition for a healthy life. A number of other factors, such as the health and sanitation environment and household and public capacity to care for vulnerable members of society, also come in to play Von Broun et al (2019).

Food security has three major components: availability, access and utilization (Haddad, 2017) Food availability refers to the need to produce sufficient food in a way that generates income for small-scale producers while not depleting the natural resource base, and to the need to get this food into the market for sale at prices that consumers can afford. According to Kifle and Yoseph (2016) availability is basically the household’s capacity to produce the food it needs.

The second component relates to people’s ability to get economic access to this food. Economic access is typically constrained by income. If households cannot generate sufficient income to purchase food, they lack an entitlement to the food. The third component concerns an individual’s ability to use food consumed for growth, nutrition, and health. In an environment lacking clean water, sanitation, child care, and health facilities, the ability to use food to promote health and nutrition will be impaired (Haddad, 2017). When any of the above food security components threatened seasonally or otherwise, households are said to resort to what are known as “coping strategies” These strategies involve behavioral changes with regard to food choice, frequency of eating, seeking other income sources, borrowing from kin, etc. In addition to this, households begin to sell their belongings or “assets” such as livestock, tools, personal possessions or household goods. The type of coping The many definitions and conceptual models all agree in that the defining characteristic of household food security is secure access at all times to sufficient food. Moreover, there are four core concepts, implicit in the notion of “secure access to enough food all the time.” These are sufficiency of food, defined mainly as the

calories needed for an active, healthy life; access to food, defined by entitlement to produce, purchase or exchange food or receive as a gift; security, defined as the balance between vulnerability, risk and insurance; and time. where food insecurity can be chronic, transitory or cyclical (Maxwell and Frankenberge). A well elaborated understanding of underlying conceptual framework for food security should focus not only on the availability of food, but also on access (demand) and utilization (Webb and Von Broun, 2017; SLE 1999; cited in Ayalneh 2017).

The concept “access” is the question of whether individuals and households (and nations) are able to acquire sufficient food. In other words, access indicates the ability of households to get command over food. For sufficient calorie intake, food availability in space and time may be a necessary but not a sufficient condition, for it does not guarantee effective demand for food. Accordingly, a decline in food availability does neither create hunger nor does necessarily improve household food security. Hence ‘accesses to food plays a critical role in securing command over food which in turn is determined by production, exchange or transfer (Debebe, 2017). Moreover, variability in food supply, market and price variability, risks in employment and wages, and risks in health and morbidity, and conflict are also an increasingly common source of risk to food entitlements. Chronic food insecurity is a continuously inadequate diet caused by the inability to acquire food. It affects households that persistently lack the ability either to buy enough food or to produce their own. Transitory food insecurity, on the other hand, is a temporary decline in a household’s access to enough food. It results from instability in food prices, food production, or household income-and in its worst form it produces famine (World Bank, 2006). Transitory food insecurity can be further divided into cyclical and temporary food insecurity (CIDA, 1989, cited in Maxwell and Frankenberger, 2012). Temporary food insecurity occurs for a limited time because of unforeseen and unpredictable circumstances; cyclical or seasonal food insecurity when there is a regular pattern in the periodicity of inadequate access to food. This may be due to logistical difficulties or prohibitive costs in storing food or borrowing.

2.2. Sources of Food Insecurity

households faced a variety of risks, which may vary from natural to man-made factors (Debebe, 2017). Drought (climate) could be considered as a major cause of famine. Hansen (2006) provided a purely scientific, meteorological definition of drought and a definition that relates drought to human activities. Devereux (2013) and Mesfin(2016) argue that one cannot

completely ignore climate, by saying “climatic shocks are neither a necessary nor sufficient cause of famine.” With widespread crop failures, natural or other disasters as well as the risk of fluctuation in production are some of the risk condition contributing to food entitlement failure. Moreover, variability in food supply, market and price variability, risks in employment and wages, and risks in health and morbidity, and conflict are also an increasingly common source of risk to food entitlements.

(Table 1). Sources of risks of food insecurity and the affected population groups

Risks	Households and people at risk of food insecurity
Crop production risk (pests, drought, and others)	- Smallholders with little income diversification and limited access to improved technology, such as improved seeds, fertilizer, irrigation, and pest control
Agricultural trade risks (disruption of exports or imports)	- Landless farm laborers smallholders who are highly specialized in an exported food - Urban poor Poor, net food-purchasing households
Food price rises (large, sudden price rises) Unemployment risks	- Wage-earning households and informal-sector employees (that is, in poor urban areas and when there is sudden crop production failure, in rural areas)
Health risks (Infectious diseases, for example, resulting in labor productivity decline)	- Entire communities, but especially households that can -not afford preventive or curative care and vulnerable members of these households
Political and policy failure risks	- Households in war zones and areas of civil

Demographic risks
(Individual risk affecting large groups)

unrest - Households in low potential areas that are not connected to growth centers via infrastructure

- Women, especially when they have no access to education - Female-headed households - children at weaning age - The aged

Source: Tesfaye from von braun 2012

2.3 Food Security Situation in Ethiopia

The gap between crop production and total supply became wider showing the importance of food imports in the country's food supply structure. The lowest production occurred during the 1984/85 peak famine year. the production per capita of the country exhibits a declining causing a rise of food aid per capita. This suggests that the country's crop production was unable to keep pace with the growth of its population. Per capita food supply or availability is net domestic supply divided by the total population of the country. Both per capita food production and food availability indicate the country's capability to feed its population from domestic production and food imports. The ratio of net production to the net food supply measures the degree of the country's self-sufficiency in food crop production. The ratio was consistently less than 100 percent indicating that the country process in which they combine activities to meet their various needs at different times. A common manifestation of this at the household level is 'straddling' where by different members of the household live and work in different places, temporarily (e.g. seasonal migration) or permanently. Social patterns such as this clearly complicate and underline the importance of viewing households and communities within their wider context. Since goods, financial resources and people are all mobile, an accurate picture of livelihoods cannot be gained if artificial boundaries are drawn. Thus links between urban and rural centers will need to be explored, as will the implications for decision-making and asset usage of split families. The more choice and flexibility that people have in their livelihood strategies, the grater their ability to withstand-or adapt to-the shocks and stresses of the vulnerability context (Kostas et al., 2001)As a result, the populations of the country have been facing food shortage or undernutrition, even in normal years (when the country is not struck by droughts). The fact that the economy depends largely on agricultural production, which is very vulnerable to natural, and man-made

disasters makes it subject to famine. Households' inability to cope with food insecurity due to successive production failures manifested itself as famine (Bezabih, 2018). According to the review made by Webb and von Braun (2014), the first traceable famine in Ethiopia occurred during 253-242 BC. Several incidences of famines were reported since then. The most recent tragic famines were experienced in 1984/85 and it was prevalent in the central and north Eastern Highlands and the low land pastoral areas of eastern and southern regions.

According to report of (EC, 2007) the country's chronic food insecurity is categorized into three elements, which are distinct but nevertheless linked. First of all, there is insufficient production/supply, with the development of supply being hampered by unsuitable agricultural production techniques, a high number of fragmented smallholder farming, which only allow traditional agriculture, environmental degradation, inadequate rainfall, lack of access to inputs and credit, pre-and post-harvest losses as well as underdeveloped trading systems. On the demand side, the weak purchasing power created by the endemic poverty of the population is preventing the development of market conditions, which could encourage an increase in production.

Finally, historical factors (with the economy having experienced years of negligence and war) plays on these first two elements since the country has to overcome several years of war, famines and neglect of food insecurity (EC, 2007). The above discussion reveals that food insecurity is a complex problem, where it involves different factors beyond food production, consumption and distribution systems. In order to overcome this complex problem, the economic policy of the country must give due emphasis to tackling household food insecurity. Particularly in areas including food production, food prices and the operation of food markets, employment opportunities, access to economic assets and basic services such as education, health, water supply, credit, extension and infrastructure to break the food insecurity cycle. Above all, directing all rural development efforts towards achieving the households' food security in a well-planned and integrated manner would help to address food insecurity problems.

A general picture of food security problem in the country has been shown in previous section. To design effective policy and take appropriate measures, however requires a dis-aggregated description of the problem. Identification of the source, duration and the characteristics of

affected population are a useful approach in this regard. Although poverty is a common characteristic of food insecure households, they may be differently categorized depending on access to land, diversity of income sources, and state of development of the economy and so on (Braun, et al, 2014).

(Debebe, 2017; Maxwell and Frankenberer, 2012). The major categories under chronic food insecurity is: rural resource poor, rural settlers, urban poor and urban unemployed; while the transitory food insecure include rural pastoralist in drought areas, rural population affected by the civil war, rural refugees and urban vulnerable to policy reform (World Bank, 2015). There are also important differences in household food security issues in rural and urban contexts. In urban areas, HFS is primarily a function of the real wage rate (that is, relative food prices) and of the level of employment. Further, the miserable health environment in poor urban areas sometimes makes the urban food security situation qualitatively different from the rural situation. Difference in calorie consumption and requirements exist between rural and urban. Finally, as it is mentioned at the beginning of this section there have been shifts in the thinking of food security. These shifts can be reflected in successive definitions of the term which are listed as an example in the Annex Classification of food insecure groups in Ethiopia.

Table -2 classification of food insecure groups in Ethiopia

Rural	urban	Others
Chronic	Resource poor household	Low income hh employed in
	-land scares	the informal sector groups
	-ox-less	outside the labor market
	-Female household head	-elderly
	-Elderly	-disable
	-Poor non-agricultural household	-Some female household
	-newly established settlers	head
		Refugees displaced people
		Ex-solders

transitory	Less resource-poor hh vulnerable to shocks, especially but not only drought -farmers and others in drought-prone areas -other vulnerable to economic shocks, e.g. in low potential areas	Urban poor vulnerable to economic shocks especially food price rises	Groups affected by temporary civil unrest
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Source: Maxwell and Debebe, 2017

Depending on the above food insecurity profiles of the country, the food insecure households in the study area can be identified and categorized into those resource poor households, who belong to members of different socioeconomic and demographic groups. These include farming households whose farm land is very small and have soil infertility problem, those without any ox and possess few livestock, those who earn and produce relatively small amount of income and farm produce, and those who are unable to purchase food for all household members and for whom there have been few alternative form of off-and non-farm employment. It is difficult to know exactly how many households are food insecure due to definitional and measurement problems and inadequate data (von Braun, 2017). However, as mentioned earlier efforts were made by various studies IFAD (2014) as cited by Aseres 2015), World Bank, (2018); MoPED, (2018); and Maxwell and Debebe, (2017) to arrive at rough estimates of the number of food insecure people in Ethiopia. Accordingly, based on the measurements/indicators, social category and size, IFAD (2014) estimates the household food insecure population. A review of food security policies and strategies in Ethiopia reveal that the government as well as donors were trying to address the problem but most efforts been on transitory food insecurity. Regarding the chronic food insecurity problem, it was only after the workshop on developing a food and nutrition strategy in 1986 that the awareness and attempt started. The preparation of the national disaster prevention and preparedness strategy (NDPS) and the national food and nutrition strategy (NFNS) were some of the efforts made (Aseres, 2005).

The Ethiopian Social Rehabilitation Fund, Safety-net programs and various Social Action Programs, which assist food insecure, are some of the attempts to address the prevailing problems Furthermore, another policy and strategic framework for food security has been

predicated on the National Food Security Strategy of 1996; the Agricultural Development Led Industrialization (ADLI) strategy; and the National Policy on Disaster Prevention and Management (NPDPM) (FDRE, 2006). The food security strategy addresses both the supply and demand sides of the food equation, which means it addresses both the availability and entitlement respectively. It gives due attention to three major areas: increasing food and agricultural production; improving food entitlement; and strengthening capability to manage food crises. The food production component focuses on the availability and distribution of improved technologies in areas of reliable rains. And expansion of irrigation schemes in areas where there is insufficient rainfall. The food entitlement, strategy aims at reducing food insecurity through introducing alternative poverty reducing development schemes. There are three components of the food entitlement strategy: employment/income support scheme, targeted programs and nutrition intervention. The overall

aim is the transfer of resources to the vulnerable population. The emergency capability involves maintaining food security reserves for emergency interventions (FDRE, 2001).

2.4. Food Security Strategy of Ethiopia

The situation of food insecurity in Ethiopia varies within a region and among the regions in the country. As a result, Ethiopia has prepared a 'Food Security Strategy' (FSS), issued in November, 1996, and updated in March, 2002. The strategy highlighted the government plans to address causality and effect of food insecurity in Ethiopia. The severity of the chronic crisis faced by millions of the people calls for renewed commitment of all and joining of hands with the government to deal with the situation in an emergency mode, also linking with the actions stipulated in the "Sustainable Development and Poverty Reduction Program" (SDPRP). The major causes and factors for transitory and chronic food insecurity in Ethiopia are discussed below (FDRE, 2003).

2.4.1 Recurrent drought

agricultural development in Ethiopia heavily depends on rainfall where the pattern is of erratic and unpredictable nature. For most small holder farming and pastoral system, rainfall is the major source of moisture for crop and livestock production. However, the frequency of drought has sharply increased its occurrence, i.e. every three to five years. Moreover, utilization of water

resources is ill developed. Irrigation and water diversion schemes are less practiced and food production has seriously been affected Limited source of alternative incomes: Limited sources of alternative income options have left the majority of Ethiopian households susceptible to ill-developed coping mechanism.

2.4.2 Population pressure:

Population pressure: uncontrolled growth rate of rural population and productivity has not increased significantly to cope up with increased population resulting in the average aggregate household consumption level does not exceed six months.

2.4.3 Limitation in technology:

Agricultural intervention had followed the same pattern of service development in the areas of fertilizer, improved seed and pesticides provision, lacking comprehensive package of interventions at household level orientation. Previsions of new technologies are at rudimentary stage; moreover, the capacity of technology multiplication is limited to disseminate the existing technologies.2.4.4

2.4.4 Lack of product diversification & market integration:

Diversification in the production pattern is limited mainly focusing on food crops. Less attention has been given to cash crops, livestock and livestock products. Markets are not integrated, and as a result, price differentials between farm gate and terminal markets vary significantly in favor of the later. Consequently, sustainable adoption of technology could not be observed. The agricultural output marketing indicates that production is challenged by inadequate market information system and inadequate rural road network.

2.4.5 Limited capacity in planning and implementation:

Implementation capacity is limited by the virtue of lack of skilled manpower and appropriate incentive mechanisms. Also, the provision of extension services has not been adequate in terms of coverage and quality of service. Development agents (DAs) to farmers' ratio to deploy appropriate service and monitoring is far from adequate. Moreover, resource constraints and lack of appropriate incentive mechanisms aggravate the problem.

2.4.6 Environmental degradation:

Natural resources are the basis for accelerated agricultural development and for meeting the food security and other basic necessities of its people. Cultivation of steep lands in the absence of conservation practice, poor farming practices and continuous cropping without nutrient recycling, overgrazing and improper land use practices are among the causes for accelerated soil erosion. In addition, crop residue and dung are increasingly being used to meet rural household energy needs, rather than being used for ameliorating soil fertility that can then increase agricultural productivity

2.5 Measuring Food Security Outcomes

Recent research on the multi-factorial nature of food security has provided a wealth of analytical insight, but measurement problems remain as a major challenge, not only for research, but particularly for targeting, program management, monitoring and evaluation (Maxwell D. et al, 2016). However, the search for viable indicators is driven by the lack of a ‘gold standard’ measure for food security. Measures of consumption, poverty and malnutrition are all used as proxy measures, indicators of assets and income are used as more distal determining factors (Chung et al., 2017; Haddad et al., 2014; Maxwell and Frankenberger, 2017; cited in Maxwell. D. et al. As further reviewed in Maxwell. D. et al (2018) the most common indicators of food security revolve around measures of food consumption (Bouis, 2016). A good measure of consumption requires data on household food consumption, household size, age and sex of individuals, as well as physical size and activity levels. Even if average size and activity levels are presumed, consumption measures capture only the physiological sufficiency elements of food security. In practice measuring calorie intake or the adequacy of household food availability over time continues to be suggested as the main ‘benchmark’ measures for food security (Chung et al., 2017). Many studies have found that process indicators are insufficient to characterize food security outcomes (Hoddinot, 2011). Accordingly, he outlined four measures of household food security outcomes: individual intakes, household calorie acquisition, dietary diversity, and indices of household coping strategies. Individual food intake data: This is a measure of the amount of, or nutrients, consumed by an individual in a given time period, usually 24 hours. There are two approaches used to collect these data. The first is observational, in that an enumerator resides in the household throughout the entire day, measuring the amount of food served to each person. The amount of food prepared but not consumed is not measured. The enumerator also 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, in that the enumerator interviews each household member regarding the food he/she consumed in the previous 24 hours' period. While calculating this outcome measure, the data collected on quantities of food are expressed in terms of their calorie content, using factors that convert quantities of edible portions into calories. Then these intake data are compared against a definition of food needs. Individual calorie requirements reflect individual characteristics such as age, sex, weight, body composition, disease states, genetic traits, pregnancy, and lactation status, and activity levels as well as climate.

Household calorie 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 was prepared for consumption over a period of time. After accounting for processing, this is turned in to a measure of the calories available for consumption by the household. While generating these caloric acquisition 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. In constructing these questions, it is necessary to specify the lists of foods exhaustively, to unambiguously distinguish between the amount of food purchased, the amount prepared for consumption, and the amount food served. And it is not also uncommon for individual to report consumption in units other than kilograms or liters. In such cases it is necessary to convert to a standard unit. In converting these data into calories, first convert all quantities into a common unit such as kilogram, then convert these into edible portions by adjusting for processing; and lastly convert these quantities into kilocalories using the standard kilocalorie conversion.

Dietary diversity: This is the sum of the number of different foods consumed by an individual over a specified time period. It may be a simple arithmetic sum, the sum of the number of different foods within a food group, a weighted sum, when additional weight is given to the frequency by which different foods consumed. The method for generating dietary diversity data is one or more persons within the household are asked about different items they have consumed in a specified period. In turn there are two possible methods of calculation for this measure. The first one is calculating a simple sum of the number of different foods eaten by that person over the specified time period. The second is calculating a weighted sum, where the weights reflect

the frequency of consumption and not in Indices of household coping strategies: This is an index based on how households adopt to the presence or threat of food shortage. The person within the household who has primary responsibility for preparing and serving meals is asked a series of questions regarding how households are responding to food shortages.

2.6 Indicators of Food Insecurity

Assessment of food insecurity is a difficult issue as there are no universally established indicators which serve as measuring tools. Food security requires a multi-dimensional consideration since it is influenced by different interrelated socio-economic, environmental and political factors. Because of this problem, assessing, analyzing and monitoring food insecurity follow diversified approaches (Debebe, 2017).

Table -3 indicators of household food security

A. supply indicators	
-metrological data	-Agro ecological models
-information on natural resources	-Food balance sheets
-agricultural production data	-Information on pest damage
-marketing information	-Regional conflicts

B. Food access indicators	
-Land use practice	-Diversification of livestock
-Dietary change	-Change of food source
-Diversification of income sources	-Access to loan/credit
-Livestock sales	-Seasonal migration
-Sale of productive assets	-Distress migration

C. Outcome indicators	
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-Household budget and expenditure	-Household perception of food security
-Food consumption frequency	-Storage elements
-Subsistence potential	
-Nutritional status	

Source Mulugeta.t 2016

Along with the development of the concept of food security, a number of food security indicators have been identified. As there are many definitions of food security. One critical dimensions of HFS is the availability of food in the area for the households to obtain. A number of factors or indicators play a role in limiting food supply or availability.

Maxwell and Frankenberger(2017) classified these types of indicators as risk of an event indicator. These are supply indicators that provide information on the likelihood of a shock or disaster event that will adversely affect HFS. They include such things as inputs and measure of agricultural production (agro-metrological data), access to natural resources, institutional development and market infrastructure, exposure to regional conflict or its consequences. On the contrary, Debebe (2017) argued that such supply indicators are in most aggregated and hardly serve to monitor food stress at household levels. Their application also varies between places depending upon the resource potentials of the area and economic activities of the people. Moreover, the report of IFPRI (2012) on improving food security of the poor explained that given the multiple dimensions (chronic, transitory, short term and long term) of food security, 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, which include:

- Food security at the country level can, to some extent, be monitored in terms of demand and supply indicators; that is, the quantities of available food versus needs, and net import needs versus import capacity (import capacity is defined as foreign exchange earnings net of debt-service obligations and other necessary foreign exchange expenditure).
- Food security at the household level is best measured by direct surveys of dietary intake (in comparison with appropriate adequacy norms). However, they measure existing situation and not the downside risks that may occur. The level of, and changes in, socioeconomic and

demographic variables such as real wage rates, employment, price ratios and migration, properly analyzed, can serve as proxies to indicate the status of, and change in, food security. Indicators and their risk patterns need to be continually measured and interpreted to monitor food security at the household level.

- Anthropometric information can be a useful complement because measurements are taken at the individual level. Yet such information is the outcome of changes in the above indicators and of the health and sanitation environment. This information however, indicates food security after the fact. Measurement is necessary at the outset of any development intervention and investigation to identify the food insecure, to assess the security of their shortfall, and to characterize the nature of their insecurity. food security at the household level is best measured by direct measure of dietary intake and since this study bases its measurement of HFS on household calorie acquisition.

2.7 Food Security and Dimensions of Food Insecurity

Per capita food production in SSA including Ethiopia has been declining in the last three decades (Mohamed, 2005). Production growth rates during these decades declined around -0.6 percent between 1980-83 and gradually declined to -6.2 percent in 1990 (FAO). On the other hand, with a rapid population growth, the demand for food has been increasing at the rate of 2.9 percent per annum since 1997 (Yared, 2013) resulting in food imports and international aid. Despite the available resources and the efforts made by governments in SSA, food rely the number of different foods. Ethiopia having considerable agricultural potential has been self-sufficient in staple food and was classified as a net exporter of food grains till the let 1950s. It was reported that the annual export of grain to world market amounted to 150,000 tons in 1947/48 (Alemneh 2008; cited in Tesfaye and Abebe 2015). However, since 1960s, domestic food supply failed to meet the food requirements of the people. Even though sufficient amount of food has been produced in most of the good years, the average food production during the last decade remained almost stagnant. Food availability in Ethiopia is to a great extent determined by domestic staple food production by subsistence agriculture. Even though there is a marked variation among various regions, cereals including teff, sorghum, maize and wheat are predominantly produced and consumed in the country. There is a growing evidence conforming that even in the normal

years, Ethiopia has failed to domestically produce enough food to meet the subsistence needs of its population (Ayalneh, 2017).

The same source further stipulated that as cumulative effect of both natural and man-made factors, domestic grain production has rarely been above 140 kg/capita/annum since the early 1990s. Based on the recommended daily food energy requirement of kilo calorie per capita, assuming that cereals constitute 68 percent of the energy intake of Ethiopian household (FAO, 2011), and cereal can produce an average of 3700 kcal per kilogram, at least 0.42 kg of cereal is required per capita and day to meet the recommended daily subsistence requirements. This implies that an estimated 157 kg of cereal is needed per person per year. Comparing this values to domestic cereal production give us a crude picture of food self-sufficiency of the country.

Generally, the growth in production matched population growth in the 1960s and early 1970s. Since then, however, the gap between growth in production and the demand for food has drastically increased (Getachew, 2015). More recently, Ethiopia has faced far more worsened situation of food shortage.

It is very difficult to know exactly how many households are food insecure given definitional and measurement problems and inadequate data, and it is even more difficult to identify the number of food-insecure individuals given intra-household inequalities of differing kinds in different regions as well as changes over time. However, different organizations tried to estimate the food-insecure people in the country. A number of studies confirmed that there is severe food insecurity in Ethiopia covering a wide range of areas and affecting a large number of people. Over 40 percent of the estimated food insecure people in SSA are found in Ethiopia, Nigeria and Zaire (Andeson 2009; cited in Tesfaye and Debebe, 2015). The 1992 IGADD, Inter Governmental Authority for Drought and Development, food security study also indicated that Ethiopia has the highest number of food insecure in the region. Moreover, according to MOFED (2002) based on the national food poverty line stood at Birr 649.81, the proportion of people in Ethiopia who are absolutely poor during the year 1999/00 was 44.2 percent. Furthermore, based on the evaluation of 14 important socio-economic indicators (such as level of inputs and credit uses, oxen ownership, nutritional status, infant mortality, etc), five regions including the main cash crop producing areas (Wello, GamoGofa, Illubabure, Hararghe and Sidamo) were identified as the most deprived areas.

(Tesfaye and Debebe (2015) asserted that irrespective of the diverse approaches and measurement in food insecurity, the estimate and ranking results indicate that the problem is highly concentrated in structurally food deficit regions. The estimates range between 19 to 38 million and largely refer to the resource poor households in the rural areas which are always vulnerable to economic and environmental problems. They were concentrated in almost all regions except in some pocket areas of the surplus regions. Similarly, low income households employed in informal sectors and groups outside the labor market are also the most affected people in the urban center. the next table presents classification of food insecure groups in Ethiopia

Table-4 classification of food insecure groups in Ethiopia

	Rural	Urban	Others
Chronic	Resource poor households -land scarce - ox-less -female headed household elderly -poor nonagricultural households -newly established settlers	Low-income Households employed in informal sector Groups outside the labor market: -elderly -disabled -some female headed households	-refugees Displaced people Ex-soldiers

transitory	Less resource poor households vulnerable to shocks, especially but not only drought -farmers and others in drought-prone areas -other vulnerable to economic shocks.	Urban poor vulnerable to economic shocks, Especially food price rises	Groups affected by temporary civil unrest
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Source Abebaw.s 2003

Note: ‘Others’ column shows groups temporarily residing in both areas.

2.8 Determinants of Household Food Insecurity

Food security is affected by two major determinants: Availability of food and accessibility to it (Andersen, 2007). Same source also showed that human resource development, non-food factors, including education, health care, and clean water; population growth, urbanization and displacement of people greatly influence food insecurity and human nutrition. This source further stipulated that natural resource and agricultural inputs are critical determinants of food security.

Food insecurity is due to a variety of reasons, and the FAO/UNDP (1987) cited in Getachew (2015) suggested,) the relatively high density of human and livestock populations and the resulting squeeze of land resources; ii) the inability of agricultural practices to sustain the required productivity levels of land; iii) insufficient level of adoption of modern farm technology; iv) extensive and often irreversible levels of land degradation; v) the value placed on livestock, specially cattle, in the social economic system and the accomplishing desire to maintain large livestock holdings.

A case study of resource and food security (likewise food insecurity) of Merti District Arsi zone showed that sufficient conditions exist for chronic and transitory food insecurity among the households. These conditions are: first, land, one of the most important resources for food production, is scarce among the study households. Second, other household resources such as livestock have fallen dramatically. Third, due to climatic hardship, even cereal major producing areas remain deficit, leaving both cereal and cash codependent households in a disadvantaged

food supply position. Fourth, the administrative apparatus of Ethiopia (both past and present) neglected the rural sector with no or realistic development strategies to reduce risks of food insecurity. In a case study of Social and Demographic Characteristics the woreda, using logistic regression model, Demiss(2003) showed that there is a statistically significant relationship between resources held by a household and its level of food security. It was confirmed that those households which hold land less than three Timad, do not own any oxen, have a small household adult equivalent size and earn non-farm income of less than Birr 500 (or nothing at all) are those most at risk of food insecurity among the sample population. Consequently, the researcher showed that the levels of income and farm size are the most important resources determining food security when other factors such as favorable climatic conditions and low pest outbreak areas explained in FAO (2001) the problem of household food security is not simply one of agricultural output, but encompasses all factors affecting a household's access to an adequate year round supply of food. Thus, the problem of household food security is not simply one of next season's crop, but can also include factors as diverse as deforestation, seasonal variations in food supply, availability of fodder and other forest foods, shifts from subsistence to the cash economy, and even the timing of cash needs as school fees Ayalneh (2017) in his study of Land Degradation, Impoverishment and Livelihood Strategies of Rural Households in Ethiopia, showed that factors that have contributed to transitory and chronic food insecurity in rural Ethiopia are manifold and varied, ranging from political and socio-economic to environmental. Among the political factors he listed inappropriate agricultural and marketing policies, and political conflict both at national and local level. Among the socio-economic factors are demographic characteristics of rural households, inadequate resource endowments, inadequately developed infrastructure such as school, hospital and roads, etc.

Getachew (2009) in a case study of Adama Boset reported that there is statistically multiple relationship between resources owned by a household and level of food security. Accordingly, it was confirmed that amongst the sample population it is those households which hold land less than or equal to 3 Timads, do not own any oxen, have a small household adult equivalent size, are unable to use fertilizer, and earn a non-farm income of less than Birr 500 (or none at all) which are most at risk of food insecurity. Thus ox-ownership, level of income and land size are the most important resources determining food security when other factors such as favor climatic

conditions and low pest outbreak are satisfied. In other words, an increased size of land, ox-ownership, high income and use of fertilizer increase the chances of maintaining food security.

According to Hoddinott (2011) HFS issues cannot be seen in isolation from broader factors. He viewed these factors as physical, policy and social environment. And he argued that the physical factor plays a large role in determining the type of activities that can be undertaken by rural households. Government policies on the other hand toward the agricultural sector will have a strong effect on the design and implementation of household food security interventions. Likewise, the presence of social conflict, expressed in terms of mistrust of other social groups or even outright violence, is also an important factor in the design and implementation of interventions. The same source, expressed that resources or endowments that food security of households can be divided into two broad categories: labor and capital. Labor refers to the availability of labor for production. It incorporates both physical dimension-how many people are available to works well as a “knowledge” or human capital dimensions. On the other hand, capital refers to those resources such as land, tools for agricultural and nonagricultural production, livestock, and financial resources; that when combined with labor produce income. In turn the house- holds allocate this endowment across different activities such as food production, cash crop production and non-agricultural income-generating activities in response to the returns each activity generates. In addition, households may receive transfer income from different sources, which determines household income.

2.9 Livelihood Strategies

What is important to be noted is that vulnerability and poverty go hand in hand. One feature of poverty is the inability to recover from sudden shocks such as losing a job, becoming ill or a poor harvest. In the context of sustainable livelihood (SL) approach, vulnerability includes: long-term trends (such as demographic trends, e.g. migration, or changes in the natural resource base); recurring seasonal changes (such as prices, production or employment opportunities); short-term shocks (such as illness or disease, natural disaster or conflict) (DIFD, 2016).

The livelihoods approach seeks to promote choice, opportunity and diversity. This is nowhere more apparent than in its treatment of livelihood strategies- the overarching term used to denote the range and combination of activities and choices that people make/undertake in order to achieve their livelihood goals (including productive activities, investment strategies,

reproductive choices, etc.) (DIFD, 2016). The same source further stated that some version of livelihood analysis uses the term ‘adaptive strategy’, instead of ‘livelihood strategies’. Adaptive strategies are distinguished from coping strategies adapted in times of crisis. Again this source elaborated that recent studies have drawn attention to the enormous diversity of livelihood strategies at every level- within geographic areas, across sectors, within households and over time. This is not a question of people moving from one form of employment or ‘own account’ activity (farming, fishing) to another. Rather it is a dynamic process in which they combine activities to meet their various needs at different times. A common manifestation of this at the household level is ‘straddling’ where by different members of the household live and work in different places, temporarily (e.g. seasonal migration) or permanently. Social patterns such as this clearly complicate and underline the importance of viewing households and communities within their wider context. Since goods, financial resources and people are all mobile, an accurate picture of livelihoods cannot be gained if artificial boundaries are drawn. Thus links between urban and rural centers will need to be explored, as will the implications for decision-making and asset usage of split families.

The more choice and flexibility that people have in their livelihood strategies, the greater their ability to withstand-or adapt to-the shocks and stresses of the vulnerability context (Kostas et al., 2011)

2.10 The Sustainable Livelihood Framework

Different agencies involved in livelihood operations adopt different approaches of livelihoods. However, there are some communalities among them. The common thread that unites all the agencies are that most adopt the Chambers and Conway definition of livelihoods (or some slight variant on this). This definition holds that: a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihood at the local and global levels and in the long and short term’ (Chabers, R. and G. Canway 2012) sustainable livelihood for DFID is an approach to achieve poverty elimination, rather than a goal in its own right. And it stresses that there are many ways of applying livelihoods approach (there is not one single approach) but that

there is six underlying principles to these approaches: According to DFID, poverty-focused development activity should be:

- **People-Centered:** Sustainable poverty elimination will be achieved only if external support focuses on what matters to people, understands the differences between groups of people and works with them in a way that is congruent with their current livelihood strategies, social environment and ability to adopt.
- **Responsive and participatory:** poor people themselves must be key actors in identifying and addressing livelihood priorities. Outsiders need processes that enable them to listen and respond to the poor.
- **Multi-level:** poverty elimination is an enormous challenge that will only be overcome by working at multiple levels, ensuring that micro level activity informs the development of policy and an effective enabling environment, and that macro level structures and processes support people to build upon their own strengths.
- **Conducted in partnership:** with both the public and the private sector.
- **Sustainable:** there are four key dimensions to sustainability – economic, institutional, social and environmental sustainability. All are important- a balance must be focused between them.
- **Dynamic:** external support must recognize the dynamic nature of livelihood strategies, respond flexibly to changes in people's situation, and develop longer-term commitments. The sustainability of livelihoods becomes a function of how men and women utilize assets portfolios on both a short and long term basis. Sustainable livelihoods to this organization are those that are: able to cope with and recover from shocks and stresses (such as drought, civil war, policy failure) through adaptive and coping strategies; economically effective; ecologically sound, ensuring that livelihood activities do not irreversibly degrade natural resources within a given ecosystem; and socially equitable, which suggests that promotion of livelihood opportunities for one group should not foreclose options for the other groups, either now or in the future.

In general, according to DFID, what is central to the thinking behind sustainable livelihoods approaches is the need to build upon and further to develop people's existing strengths. Often it is more difficult for those who are poor to recognize the strengths upon which they could build.

Livelihood approaches propose that thinking in terms of strengths, or assets is vital. Those who are poor may not have cash but they do have other assets- their health, their labor, their knowledge and skills, their friends and family, and the natural resource around them, for example. Livelihoods approaches require a realistic understanding of these assets in order to identify what opportunities they may offer, or where constraints may lie.

2.11 Empirical Studies on Determinants of Food Security

In developing countries including Ethiopia, some of the studies that were made to identify the determinants of household food security at micro level, has been summarized below.

Chung et al. (2017) reviewed that, the diverse determinants of food security status of households. The study highlights causal relationships between the various elements of food availability, access and utilization and focuses on the links between the resources commanded by household (level off-farm and non-farm production, household income, household and individual food consumption, and nutrition). Yared (2013) and Chung et al. (2017) furthermore, identified that a range of important factors that lead to the food insecurity of household in developing world. These factors include reduction of people's food entitlement due to poor harvest, reduction in food availability; increased market prices; loss of waged labor or other resources of income, coupled with such a factors: rapid population growth, poor infrastructure, ecological constraints, limited arable lands, disease, poor water and sanitation, inadequate nutritional knowledge, civil war and ethnic conflict resulted in food insecurity

Kostas G.S., 20011 studied food poverty in Sudan. The study showed that the larger the size of the household and the lower the share of non-farm earnings, the higher the probability of absolute poverty. Better access to productive assets and longer farming experience, on the other hand, reduce the incidence of poverty.

A study by Haddad 2017 attempted to decompose changes in food (poverty) by household endowment and other characteristics. The result appears to suggest that the higher the asset ownership in terms of land and oxen, distance to roads or towns and better human capital (better education) consistently lower poverty level. So better endowed households were placed to benefit much more from the changed circumstances.

Other studies in Kenya by Wangia (2016) as cited by Getachew (2009) found that agroecological zones, total land size, number of livestock, permanent off-farm employment, and total labor used for farming influenced household food consumption and food security. Kostas G.S., 2001 as cited by the same authors, carried out a study on ‘malnutrition, household food income and, food security in rural Malawi,’ and identified small landholdings, low soil fertility, low income levels and limited employment, and labor constraints in agricultural production as the underlying causes of household food insecurity.

An empirical study in nine districts of Amhara Region by Gezahegn et al. (2015), identified that food insecurity is correlated with lack of productive assets such as land and oxen. The results of their regression analysis suggest that the increase in land holding, oxen holding, use of fertilizer, dependency ratio, agro ecology, proximity to urban center, education and age of the household as well as seed application showed significant impact in food availability. Among these land and oxen were found the most important determinants for access to household food security. A study on agricultural technology adoption in Ethiopia by Beyene (2000) proved that adoption of improved technologies is required to improve food security and quality of life of the household. The result of his research suggests that education level of the household head, size of land, number of oxen owned, proximity to the main road, and availability of the technological package and credit facility for down payment are affecting farmer’s adoption decision and household food security.

In summary, various studies were reviewed and different socio-economic and physical factors that were reported to have affected household food security status in different localities of the country.

CHAPTER THREE

3.RESEARCH METHODOLOGY

3.1 Description of the study area

Arsi zone shares boundaries with east Shewa, west Hararghe, Bale and southern Peoples Nations and Nationalities Regional State (SPNNRS) (Figure 1). Asella town is the zonal capital, located about 175 km south east of Addis Ababa. According to 2007 census, the total population of Arsi was 2,637,657 million and 90% live in rural area. Arsi zone has 20 woredas with an area of 23,679.7 km² and population density of 101 persons per km², which is larger than the regional average of 53 persons per km² (OBFED, 2002). The altitude of Arsi zone ranges from 1500 to more than 4000 meters above sea level (OBFED, 2002). The average temperature varies from 100 to 24OC. The rainfall of the zone is characterized by bimodal pattern. The study area, Merti woreda is located in this zone.

According to the 2007 national census reported a total population for this woreda is 90,408, of whom 46,759 were men and 43,649 were women, 16.2% of its population were urban dwellers. There are 32 Kebele administrative units and 25 PAs with 14,179 members. The total land The topography of the study area ranges from too high hills of Arsi mountain chains up to the deep rock cover areas of Awash river and its tributaries. The rift valley flat terrain and undulating plains of the east and western escarpments dominate the topography. The altitude of the study area ranges from 1500 m.a.s.l in the low land to 2300 m.a.s.l. in the high land. The study area encompasses three distinctive agro-ecological zones namely kola (lowland), woin dega (mid-altitude) and dega (highland).

3.2. Crop production

The arable land accounts to 37.4%; of the total area of the zone (OBFED, 2002). With regard to the farming system, mixed farming of crop and livestock is a common practice in the study area. The district's people earn their lives mainly by producing crop and cattle rearing. Teff, Wheat, maize, sorghum, and pulses and haricot-bean are crops that grow there. In fact, in the area it seems that there is the potential for the production of fruits and vegetables but production is not developed so far. Generally, teff is the leading crop both in land coverage and production followed by wheat, maize, and sorghum.

3.3. Agricultural extension

Agricultural extension services are very important in assisting farmers by identifying and analyzing their production problems and by making them aware of opportunities for

improvement. It plays significant role in increasing crop production through the use of improved seeds, fertilizers, chemicals and improved farming systems. Currently, the focus of the agricultural extension services in the area is on crops, livestock and natural resources, in an integrated development approach. With regard to the extension services of Merti district, as elsewhere in the country, development agents (DA), who live within the PAs, provide extension services. the quality and efficiency of the extension services depend partly on the number of farmers that an agent has to serve

3.4. Livestock

Livestock production is one of the most important activities in the study area. It is one of the major components of the farming system in the study district and contributes to the subsistence requirement of the population in terms of milk, and milk products and meat, particularly from small ruminants. This indicates that livestock is an important element in the farming systems of the area. Livestock plays important role in providing draught power, food and cash income. influenced livestock production. Because of overstocking, over-grazing has become prevalent. The existing grazing land alone cannot support the existing livestock population. Uses of fallow land for grazing and crop residue are other sources of feed in the area. As mentioned in the previous section, livestock plays a vital role in the farming system as sources of traction power, manure, and food and as a means of wealth (asset) accumulation. The capacity of a typical farm household to cultivate land is determined largely by the number of oxen owned by the household. Oxen power also can be obtained through borrowing or exchange for labor services. However, the production of livestock is very low due to lack of grazing land and improved breeds and poor forage management (According to with regard to non-farm activities, it is not as such commonly perceived and only very small portion of the population is engaged in this activity.

3.5. Infrastructure and communication services

One of the preconditions for a rapid economic and social development of a given society is the availability of physical infrastructures such as road, water supply, education and health,

marketing facilities, telephone and other communication services. These facilities directly or indirectly determine the production efforts to address the livelihood of the society.

Water supply: The existing water system in the urban areas of the district consist of protected springs with large pipeline distribution, but less than half of rural population is supplied with potable water. There is crucial problem of potable water supply in the rural area of the district. The majority of the population obtained drinking water from rivers located in place farther from their villages. Moreover, the water used for drinking purpose in many areas is not pure since ponds are the main sources of drinking water in the rural areas (AZFEDO, 2008).

Energy supply: the town get 24 hrs electric services. The rural population use traditional energy sources such as firewood, charcoal and animal dung. This implies that the utilization of animal dung as manure for soil fertility is not practiced in the district so that the productivity of land will be diminished and finally the soil would expose to erosion.

Market place: The market place is mostly located in the open rural villages and small towns. Market days are twice in a week. These markets are traditional in nature and are characterized by inadequate marketing facilities and services, such as good sanitation, product protection, shelter and so on. They are also constrained by deficient transportation infrastructure. Thus, the majority of the community uses pack animals (such as donkeys). Hence, most rural households transport their agricultural produce to the market centers by donkeys.

Figure 1 map of the study area



3.6 DATA SOURCE AND SAMPLING

In examining the association and interdependence between factors and household food in security, and livelihood strategies detailed and well-executed household survey is required. this

study employed both primary and secondary data. The primary data were collected from sampled households through structured questionnaire.

In this study, two stage random sampling procedure was used. At the first stage, 5 PAs out of the 25 PAs of the study area were randomly selected. In the second stage, probability proportional to size sampling technique was employed to draw sample households from the selected sample PAs. A structured survey questionnaire was designed to collect the data. Though the household head is the main respondent, a person who is responsible to prepare meal to the household was also equally important to provide information on the available food for consumption to the household for the last one week. a total of 98 sample households were selected randomly and each was interviewed for the purpose. group discussion was made with some experts and farmers. Furthermore, some observations were done through some randomly selected kebeles focused on socio economic constraints particularly food security status of the area. The questionnaire tried to encompass information on demographic characteristics, crop and livestock production, farming systems and productive resources, land use, and access to services employed by the households during time of food shortage.

3.7 Data analysis and Empirical model

3.7.1 Determinants

Food security at the household level is best measured by direct survey of income, expenditure, and consumption and comparing it with the minimum subsistence requirement (Von Braun et al, 2017). The government of Ethiopia has set the minimum acceptable weighted average food requirement per person per day at 2100 kcal (Kifle 2009). Hence for this study 2100 kcal per adult equivalent (AE) per day is employed as a cutoff between food-secured and food-insecure households.

For the purpose of this study, household's food or calorie acquisition per AE per day is used to identify the two groups. Accordingly, data on available food for consumption for the households, which were obtained through recall by the household, were converted to kilocalorie. Thus those households who have energy per adult beyond the minimum subsistence requirement (2100kcal) are deemed to be food secured, otherwise food-insecure.

Once the groups are categorized as food-secured and food-in secured, the next step is to identify the socio-economic factors. It is hypothesized that some farm and household characteristics such as household size, land size, production of output, etc., have got relative importance in determining whether the households are food secured or not.

A variety of statistical models can be used to establish the relationship between the household characteristics and food insecurity. That is to say, food insecurity is a function of a series of household characteristics. Conventionally, linear regression analysis is widely used in most economic and social investigation. This is because it has some desirable properties for specific type of inquire and data, and is widely available in computer packages. Moreover, it is easy to interpret, and there is a wide spread believe that it is a reasonable procedure even if some of the assumptions underlying it are not met in the data (Aldrich and Nelson, 1984; cited in Getachew, 2009). To examine the association between food insecurity (dependent variable) and the relative importance of independent variables, a logistic probability unit (logit for short), will be used instead; which satisfies conditions required by dichotomous dependent variable. Thus, the dependent variable in this case, food insecurity, is a dummy variable, which takes a value zero or one depending on whether or not a household is food insecure.

In the studies involving qualitative factors, usually a choice has to be made between logit and probit models. According to Amamia (2018), the statistical similarities between the two models make the choice between them difficult. However, Kmenta (2016) reported that many authors tend to agree on the logistic model since the cumulative normal functions are very close to the mid-range but the logistic function has slightly heavier tails than the cumulative normal functions. It is also argued that the logit and probit formulations are quite comparable, the main difference being that the former has slightly fatter tails; that is, the normal curve approaches the axes faster than the logistic curve.

As Hosmer and Lemeshew (2017) pointed out, a logistic distribution (logit) has advantages over the other in the analysis of dichotomous outcomes variable in that it is an extremely flexible and easily usable model from mathematical point of view and results in a meaningful interpretation. In view of this, the logistic function is selected for this study, since it represents a close approximation to the cumulative normal distribution and easy to work with. The cumulative

logistic probability model is econometrically specified as follows (Pindyek and Rubinfeld, 2014).

$$P_i = F(\alpha + \sum \beta_i X_i) = \frac{1}{1 + e^{-Z_i}} \dots \dots \dots 1$$

Where X_i represents the i th explanatory variables +

P_i is the probability that an individual is being food insecure given X_i

α and β are regression parameters to be estimated

Hosmer and Lemshew (2017) pointed out that a logistic model could be written in terms of the odds and log of odds, which enable one to understand the interpretation of the coefficients. The odds ratio is the ratio of the probability that an individual or household would be food insecure (P_i) to the probability of a household would not be food in secured.

$$1 - p_i = \frac{1}{1 + e^{Z_i}} \dots \dots \dots 2$$

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

$$\left(\frac{p_i}{1-p_i}\right) = \left(\frac{1+e^{Z_i}}{1+e^{-Z_i}}\right) = e^{(\alpha + \sum \beta_i X_i)} \dots \dots \dots 4$$

Or,

Taking the natural logarithm of equation

$$Z_i = \ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m \dots \dots \dots 5$$

If the disturbance term U_i is taken into account, the logit model becomes

$$Z_i = \alpha + \sum_{k=1}^n \beta_k X_k + U_i \dots \dots \dots 6$$

According to Hosmer and Lemshow (2017) in linear regression, the OLS method is used to estimate the parameters of the model. In this method, those values of α (constant) and β_i (coefficients of explanatory variables), which minimize the sum of squared deviation of the observed values Z_i (dependent) from the predicted values are determined. Under the assumptions of linear regression, the method of least squares yields estimators with a number of desirable statistical properties. Unfortunately, when the method of OLS is applied to a model with a dichotomous outcome the estimators no longer have these same properties.

Hence due to the above reasons and since the method of OLS does not make any assumptions about the probabilistic nature of the disturbance term u_i , in logistic regression, the parameters of the model are estimated using the maximum likelihood (ML) method (Maddala, ; Gujarati,). Due to the non-linearity the logistic regression model, an iterative algorithm is necessary for parameter estimation. Maddala noted that the ML method is a very general method of estimation that is applicable to a large variety of problems. ML method suggests to choose as estimates the values of the parameters that maximize the likelihood function. In many cases it is conventional to maximize the logarithm of the likelihood function itself and the same results are obtained. Hosmer and Lemshow (2017) conducted that the method of ML yields values for the unknown parameters, which maximize the probability of obtaining the observed set of data and such a method is preferred when large sample size is used.

Before delving into the model analysis, it would be necessary to check whether there is multicollinearity among the continuous variables and verify the degree of association among discrete variables. The reason is that the existence of multicollinearity will affect seriously the parameter estimates. If multicollinearity turns out to be significant, the simultaneous presence of the two variables will attenuate or reinforce the individual effect of these variables. However, omitting significantly interaction terms incorrectly will lead to a specification bias. To this, the coefficients of the interaction of the variables indicate whether or not one of the two associated variables should be eliminated from model analysis (Kothari, 2016).

According to Gujarati (1992) there are various indicators of multicollinearity and no single diagnostic will give us a complete handle over the collinearity problem. Of the various indicators of multicollinearity, the Variance Inflation Factor (VIF) is used in this study to check whether there is multicollinearity or not among the continuous explanatory variables. Where each

continuous explanatory variable is regressed on all the other continuous explanatory variables and coefficients of determination for each auxiliary or subsidiary regression will be computed. Moreover, Gujarati (1992) stated that a high R^2 obtained can only be a surface indicator of multicollinearity. Therefore, a measure of multicollinearity associated with the variance inflation factors is defined as

$$\text{VIF}(X_j) = \frac{1}{1-R^2}$$

Where R_j^2 is the coefficient of determination when the variable X_j is regressed on the other explanatory variables. A VIF value greater than 10 is used as a signal for the strong multicollinearity (Gujarati 1995).

3.7.2 Model Specification

Following the completion of the data collection, the responses were coded and entered into SPSS software program for statistical analysis. In this study a food secured household is defined as a household who have access at all time to enough food (calories required) for an active and healthy life. Accordingly, food security at household level is best measured by direct surveys of income, expenditure, consumption, and compare that with the adequacy norm (minimum subsistence requirement) appropriate to the household. Specifically, average income and expenses are commonly used to compute proxy indicators of food security.

3.8 Definitions of Variables and Working Hypothesis

it is necessary to identify the potential explanatory variables that would influence household food insecurity. Review of literatures, past research findings, experts and author's knowledge of the food insecurity situation of the study area was used to identify the potential determinants of household food insecurity. Therefore, assigning the household food insecurity as the dependent variable, the following variables are selected to analyze whether they explain household's food insecurity or not.

The Dependent Variable of the Model:

the household food security status, which is, the dependent variable for the logit analysis is a dichotomous variable representing the status of household food security. It was represented in the model by 1 for food secure and 0 for food insecure household. The information to categorize

households into two groups can be obtained by comparing the total household expenditure per AE per annum to the minimum level of expenses required to ensure survival per AE per annum. This minimum level of expense required per AE is computed based on the amount of calorie requirement by AE (2100 kcal/AE/day or 225 kg/AE/year

The Independent Variables of the model:

the independent variables expected (hypothesized) to have association with food security status, were selected based on available literature. Efforts were made to incorporate demographic, biophysical and socioeconomic factors. Accordingly, the empirical model was built using the data collected on the following variables. The associated hypotheses of the study with respect to each one of the repressors is also presented below

Family size in number (FAmSZ):

It is an important variable, which determines the household food insecurity status in the study area. As the family size increases, the number of mouths to be fed obviously increases which shares the available food in the household. Hence. in the study area, where there is a persistent drought, the expectation is that household with large number children or economically non-active family members face food insecurity because of high dependency burden. The existence of large number of children under age of 15 and old age of 65 and above in the family could affect the food security status of the household. This is due to the fact that the working age population (i.e., 15-64 years) supports not only themselves, but also additional dependent persons in the family. Thus, it is hypothesized that the family with relatively large number of dependent family members (high dependency ratio) negatively affects household food security status.

Age of the household head (AGE):

Age matters in any occupation. Rural households mostly devote their live time or base their livelihoods on agriculture. The older the household head, the more experience he has in farming and weather forecasting. and mostly they intensify and diversify their production activities. As a result, the chance for such household to be food insecure is less. In light of this, it is hypothesized that age of the household head and food insecurity are negatively related in the study area.

Dependency ratio (DPR):

In a household where adults or productive age groups are higher than the non-productive age groups, the probability of the household to be in shortage of food would be less, provided that the area provides good working atmosphere and production potential. The reverse is also true in that the higher the number of the nonproductive age groups, individuals whose ages are less than 15 years and greater than 65 years, in relation to the number of productive age groups of individual that the household has, the higher the probability of the household to be food insecure. Accordingly, households with large dependent individual are deemed to be food insecure. Therefore, it is expected for dependency ratio to be directly related with food insecurity.

Education (EDUC):

Education household head is a dummy variable taking value 1 if the household head is literate, 0 otherwise. Education equips individuals with the necessary knowledge of how to make living. Literate individuals are very ambitious to get information and use it. As agriculture is a dynamic occupation the conservation practices and agricultural production technologies are always coming up with better knowledge. So if the household head is literate he will be very prone to accept extension services and soil and water conservation practices including any other income generating activities. As a result, it is expected that education to have negative impact on food insecurity.

Cultivated land size (CLSZ):

Production output is increased either by intensification or extensification. As the cultivated land size increases, provided other associated production factors remain normal, the likelihood that the holder gets more output is high. In the study area average land holding per household or per adult is very low so that it could not support the household for an average of six months. So that households who have large cultivated land size can have a better option to diversify production and to increase its production so such a household will be in a better position in its food security status. Consequently, it was hypothesized that the larger the cultivated land the less will be the chance to be food insecure.

Irrigation (IRGN):

It is a dummy variable in the model taking value 1 if the household uses irrigation, 0 otherwise. Needless to mention in areas where agriculture is the prime mover of the livelihoods of the society moisture is very crucial. If the climatic condition in a given area is promising, then it would be far better to be supplemented with irrigation so that increased production output could be attained. therefore, since irrigation is the key technology to boost the production of the households, many agencies are trying to upgrade the existing traditional irrigation technology. As a result, many households keep on improving their production. irrigation and food insecurity are negatively related in the study area.

Total income

Income determines the household's ability to secure food. It is an important variable which explains the characteristics of food secured and food insecure households. Income earned from any source improves the food security status of the household. High-income families are less likely to be food insecure. In other words, households who managed to secure larger income from any source have better chance to secure access to food they want than those households who did not. Since large income groups in the study area are better in their food security status, it is expected that total annual income and food insecurity are negatively related.

Amount of credit received

Credit is an important source of income. Those households who received the credit they wanted have better possibility to spent on activities they want. Either they purchase agricultural input (improved seed, fertilizer, etc.,) or they purchase livestock for resale after they fattened them. All these activities increase income of the household. households who, have easy access to credit at times of food shortage coped the risk by using the credit they got directly for food consumption. Hence it was expected that credit will have a negative impact on food insecurity.

Total livestock owned

It is the total number of livestock holding of the household measured in livestock unit. Livestock play a major role in food security. Livestock are source of income for farming households. Households who have better possession of livestock are expected to be less vulnerable to food insecurity. This is so because livestock directly or indirectly contribute to household food security. The direct contribution includes meat, milk and egg for direct consumption in the household and the indirect contribution of livestock to household food security includes the draft power, manure and income from sales of livestock and livestock products which are often used for purchase of food grains during times of food shortage in the household. Therefore, it is expected that livestock holding have a negative impact on food insecurity.

Off farm income

Crop production output and income earned from sales of livestock and livestock products is inadequate in the farming households of the study area and often look for other income source other than agriculture to push themselves to the threshold of securing access to food security. So income earned from off farm activity is an important variable, which determines household food insecurity in the study area. As a result, it is expected that households who managed to earn higher off farm income are less likely to be food insecure. i.e., off farm income is expected to have a negative impact on food insecurity.

Sex of household head

Dummy variable taking value 1 if the household head is male, 0 otherwise. male-headed households are in a better position to pull labor force than the female headed ones. Moreover, with regard to farming experience males are better than the female farmers. So sex of the household head is an important determinant of food insecurity in the study area. Therefore, it is hypothesized that male-headed households are less likely to be food-insecure.

Number of ox owned

There is a symbolic relationship between crop production and ox ownership in the mixed farming system. Oxen provide manure and draught power to crop cultivation therefore used to boost crop production. As a result, it is expected that number of oxen owned and food insecurity be negatively related in the study area.

CHAPTER FOUR

4.RESULT AND DISCUSSION

In this chapter the measurement procedure of food security status of the household and findings from descriptive and econometric analyses are presented and discussed. The descriptive analyses used are tools such as mean, percentage and standard deviation. Econometric analysis was employed to identify the most important factors that affect the food security status of the household.

4.1 Measuring the Food Security Status of the Household

Though food security at the household level is best measured by direct survey of income, expenditure, and consumption and comparing it with the minimum subsistence requirement, in this study households' food or calorie acquisition per AE per day is used to identify the two groups. As it is already mentioned in the previous chapter, data on available food for consumption, from purchase and /or stock, for the last week to the households, were converted to kilocalorie and then divided to household's AE. After that, this level of energy was compared with the minimum subsistence energy requirement per AE per day, 2100 kcal. Following this procedure, 66 sample households were found to be unable to meet the minimum subsistence requirement and only 32 households were found to meet their energy requirement. In other words, 67.3 percent and 32.7 percent of the sample households were food insecure and food secure, respectively.

The reason for use of this measure was that it produces a crude estimate of the number of calorie available for consumption in the household. For the purpose of this study, the concept of food security is defined as the extent to which a total household expenditure per AE meets its subsistence requirement. Total household expenditure in this study is defined as total expenditure incurred by the household or any of its members and includes expenditure on consumption as well as non-consumption items. More specifically, total expenditure consists of expenditures on

food including own produce, stimulants, clothing and footwear, household equipment, social obligation and various services.

the reason why the total household expenditure/AE employed in this study is justified by the fact that in survey of this kind, the income statistics reported by the households usually tends to under estimate the actual income level of households due to various reasons. Since the income of the household is not known with certainty, household expenditure is usually taken as a proxy of income (CSA,2009). Other study further indicates that total household expenditure reflects purchasing power of the household and has been employed as proxy of total household income. Accordingly, evaluating the extent to which the household income covers the minimum level of expense needed for subsistence can assess the extent to which the sample households are food secure or insecure.

4.2 Description of Socioeconomic Characteristics of the Sample Households

4.2.1 Age and sex Composition of the Sample Respondent

The total size of sample household members was 314 out of this sample household members 151 (48%) and 163 (52%) were male and female, respectively. The sample household members less than 15 years of age in the sample accounted for 44.4 percent. The age 15-25 covers 24 percent of the sample household members The economically active age members, 26-64 years, constituted 28.8percent. Thus, the remaining around 3 percent of sample household members were age of above 65 years. The children (0-14 years) and youth (15-25) constituted 68.4 percent of the total sample household members. This generally indicated that the majority of the sample household members were under 26 years of age.

Moreover, the ratio between percent of the young age group (0-14) and the old age group (15-64) indicates the dependency ratio. The young dependency ratio, i.e., the proportion of persons between 0-14 year to 15-64 years and the old dependency ratio, the proportion of persons above 64 years to that of the active age group (15-64) members of the sample.

Table-5 Distribution of sample household members by age and sex

Age group	Male		Female		Total	
Age	Number	%	Number	%	Number	%

≤ 7	32	21.2	26	16	58	18.6
8-14	45	30	35	21.5	80	25.8
15-25	29	19.2	47	28.8	76	24
26-64	41	27	50	30.6	91	28.8
≥ 65	4	2.6	5	3.1	9	2.8
Total	151	100	163	100	314	100

Source survey result

4.2.2 Family Size

Family size was considered as one of the potential variables that would have due contribution for food insecurity. The proportion of sample households becoming food insecure increased as the family size increases. Distribution of sample households by family size in number.

About 25 percent of the 32 food secure and 6.1 percent of the 66 food insecure sample households were found to have family size less than or equal to 3. While only the food insecure households had family size over 7, which constituted 12.5 percent food secure and 36 percent of the insecure of total sample households, respectively.

The survey result also revealed that there was significant difference at 1% probability level in the mean family size between food secure and food insecure sample groups. In that the mean was found to be 5.1 and 6.3 for food secure and food insecure households, respectively. While the overall mean family size of the sample household was 5.9. This was above the national average of 5 persons (CSA). This result is in agreement with the prior expectation. The largest family size of the sample households was 10 and the smallest was 2.

Table-6 sample household by family size in number (source survey result)

Family size	Food secure		Food insecure		total	
	Number	%	No	%	no	%
≤ 3	8	25	4	6.1	12	16
4-7	20	62.5	38	57.9	56	60

8-10	4	12.5	24	36	28	24
Total	32	100	66			
Mean	5.09		6.29			5.9
Sd	2.04		2.05			2.1
T-value	2.7					

Significant at less than 1% probability level $P < 0.01$

4.2.3 Dependency Ratio and Age of Household Heads

Dependency Ratio: With respect to the specific characteristics of food insecure and food secure dependency ratio was positively or directly related with food insecurity. So, households with large dependency ratio tend to be food insecure than those with small ratio. Accordingly, the statistical analysis showed that there is significant difference at less than 1 percent probability level in the mean dependency ratio between food secure and insecure households, which is 2.27 for food secure and 1.56 for the food insecure households.

Table-7 distribution sample household members by dependency ratio

Dep ratio	Food secure		Food insecure		total	
	No	%	No	%	total	%
≤1	16	50	20	30.3	36	40.15
2-3	14	43.7	32	48.5	46	46.1
≥ 3	2	6.3	14	21.2	16	13.75
Total	32	100	66	100		
Mean	1.56		2.27		2.04	
Sd	1.01		1.3		1.25	
t-value	-2.7					

*** Significant at less than 1% probability level

Source survey result

Age of Household Head:

The mean age of sample household heads was found to be 36.6 with standard deviation of 10.3. The statistical analysis revealed that there was no significant difference in the mean age of the household head between food secured and food insecure household heads. Where, the mean age of food secure households was 38.3 years, that of the food insecure households was 35.7 years. This finding was turned out to be right to the prior expectation, which argued as the age of the household head increases since they can acquire more knowledge and experience they would be less prone to be food insecure. Less number of household heads was concentrated at the two extreme age groups (≤ 25 , and ≥ 46), i.e., only 26.1 percent whereas about 73.9 percent of the total household heads were concentrated in the age bracket of 26-45.

Table- 8 sample household head by age

Age	Food secure		Food insecure		total	
	No	%	No	%	No	%
18-25	2	6.2	8	12		9.1
26-45	22	68.8	52	79		73.9
Gre 46	8	25	6	9		17
Total	32	100	66	100		100
Mean	38.3		35.74		36.6	
Sd	11.8		9.5		10.3	
t-value	-1.16					

Source survey result

4.2.4 Sex of Household Head

Dummy variable taking value 0 if the household head is male, 1 otherwise. Male headed and female headed household in the overall sample households were 80 and 20 percent, respectively. There was also almost similar proportion of male to female headed households were male headed and the remaining 21.2 percent were female headed. Likewise, 81.2 percent and 18.8 percent of the food secure households were male and female headed, respectively. Though in this research it was hypothesized that male headed households are less likely to be food insecure than female

headed ones, the survey result revealed that there is no the systematic relationship between food insecurity and sex of household head is very weak

Table-9 sample household by sex of household head

Sex of Hhh	Food secure		Food insecure		total	
	no	per	no	per	tot	per
Male 0	26	81.2	52	78.8	78	80
Female 1	6	18.8	14	21.2	20	20
Total	32	100	66	100		

Source survey result

4.2.5 Education

It was hypothesized that literate household heads are more productive than the illiterate. The survey result indicated that nearly 43.8 percent of the food secure and only 18.2 percent of the food insecure were literate. The difference between the two sample groups with regard to education was found to be statistically significant with less than 1 percent probability level. On average the proportion of literate food secure household heads were larger than the proportion of literate food insecure household heads

Table-10 sample household by status of education

Status of education	Food secure		Food insecure		Total	
	no	per	Ni	Per	No	per

Literate 1	18	43.8	12	18.2	30	31
Illiterate 0	14	56.2	54	81.8	68	69
Overall	32	100	66	100		
t-value	-2.7					

Source survey result

4.2.6 Land Holding Per Household and Per Capita in the study area, as witnessed by the survey result there was significant difference in the mean cultivated land size between the food secure and food insecure households. The mean farm size of food secure and food insecure households was found to be 1.4 ha and 0.9 ha, respectively. The overall mean farm size was 1.1 ha about 31 percent and 48.5 percent of the total food secure and food insecure household groups had farm size in a range of 0.60-1.50 ha, respectively. percentage of sample households in the other extreme holding for instance, only 18.8 percent of the food secure had farm size less than 0.50 hectare, but about 33.3 percent of the food insecure ones had this level of farm size. Further, analyzing cultivated land size per capita showed the importance of land holding as a factor in identifying the two sample groups.

Table-11 sample household by farm size

Farm size (ha)	Food secure		Food insecur		total	
	No.	%	No.	%	No.	%
0-0.5	6	18.8	22	33.3	28	26.05
0.6-1	10	31	32	48.5	42	39.75
1.11-1.5	6	18.8	8	12.1	14	15.45
1.5-2	8	25	4	6	12	15.5
> 2	2	6.3	....	....	2	3.15
Total	32	100				100
Mean	1.4		0.9		1.1	
Sd	1.05		0.6		0.78	
t-value	-2.2					

source survey result

4.2.7 Livestock Holding

Livestock production plays an important role both in the crop producing and pastoral areas of study area. Livestock provide milk, meat, and transport. Livestock that are owned by the sample households include cattle, sheep and goat, equine and poultry. The total livestock population owned by the sample respondents was 1005 in number. Out of this, 24.3 percent, 34.4 percent, 2.5 percent, 39 percent were cattle, shoat, equine and chicken, respectively. The percent share of Chicken and Shoat is larger than any of the other types of livestock. among the sample households. ruminant production in the study area, both as a store of wealth and as check or control of food shortage during time of stress.

Table-12 number of livestock and their respective share among sample households

Livestock type	no	per
Cattle	245	24.3
Shoat	343	34.4
Equine	25	2.5
Chicken	392	39
Total	1005	100

Source survey result

Table below shows the distribution of sample household groups by livestock holding in TLU. It is apparent that the sample households in the study area on average own 4.08 TLU. Around 46 percent of total household owns livestock less or equal to 3 TLU. And it is only 37.5 percent and 54.5 percent of food secure and food insecure household groups. own more than 7.50 TLU. It was hypothesized that livestock ownership in TLU is an important economic determinant in that a person who owns more TLU is more likely to be food secured than the one who has less.

Table-13 Distribution of sample household by livestock holding in TLU

Livestock Holding in TLU	food secure		food insecure		total	
	N0	%	No	%	No	%
<3	12	37.5	36	54.5	24	46
4-7	11	34.4	23	35	17	34.7
8-10	6	18.75	7	10.6	11.5	14.7
>11	3	9.4	...	...	1.5	4.7
Total	32	100	66	100	98	100
Mean	5.5		3.4		4.08	
Sd	3.3		2.1		2.07	
t-value	-3.8					

Source survey result

4.2.8 Ox Ownership

Livestock is an integral part of crop production activities in the study area. It provides substantial non-human labor and manure to the soil. With regard to the contribution of labor, oxen ownership is an important variable. As the information obtained from sample respondents most of them, about 47.3 percent, do not use oxen or use one oxen only for farming operation. The remaining ones cultivate their land using oxen either by contributing labor or by coupling. Moreover, the result revealed that there is significant difference between the two groups at less than 1 percent ($p < 0.01$) level. with regard to ox ownership. This variability between the two

groups is correlated with the cost of maintaining an ox and its importance for farm operation in the study area

Table-14 sample household by ox ownership

No. of oxen	Food secure		Food insecure		Total	
	No	%	No	%	No	%
0-1	8	25	46	69.7	54	47.3
2-4	22	68.8	20	30.3	42	49.5
≥4	2	6.2	....		2	3.1
Total	32	100	66	100		100
Mean	2.22		1.26		1.57	
Sd	1.2		.75		1.02	
t-value	-4.8					

Source survey result

4.2.9 Credit

Credit for the purpose of consumption or purchase of agricultural inputs like improved seed, chemical fertilizer, etc. improves the food security status of households. In the study area different organizations provide credit to bring food security. Most of the food insecure households, more than 51 percent, received credit less than or equal to Br. 1000 whereas only 43.7 percent of the food secure households received the same amount. However, around 25 percent of the food secure households received Br. 1000-2500. Whereas only 21.2 percent of the food insecure received the same amount. Moreover, there was insignificant difference in the mean amount of credit received by the two sample household groups. households receiving more

credit have a less chance to be food insecure than those households receiving less amount of credit.

Table-15 Distribution of sample households by amount of credit received (Birr)

credit	Food secure		food insecure			total
	No	%	No	%	No	
1000	14	43.7	34	51.5	24	47.6
1000-2500	8	25	14	21.2	11	23.1
2600-3500	4	12.5	12	18.2	8	15.35
3600-5000	6	18.8	6	9.1	6	13.95
Total	32	100	66	100		100
Mean	2246.88		1827.27		1964.29	
Sd	1432.56		1078.25		1214.11	
t-value	-1.6					

Source survey result

4.2.10 Use of Agricultural Input

The table shows the distribution of sample households by status of use of services. In the survey it was observed that 54.7%, 72% and 8.9% of the overall sample households are users of improved seed, fertilizer and irrigation respectively. To compare the two sample groups, 62.5%, 90%, and 10.3% of the food secure households were users of improved seed, fertilizer and irrigation respectively. Whereas the corresponding food insecure households who were users of improved seed, fertilizer and irrigation were 47%, 54% and 7.6%, respectively.

Table-16 Distribution of sample household by status of use of service

Service	food secure		food insecure			total
	use	Non use	Use	Non used	Use	Non used
Improved seed	62.5	37.5	47	53	54.75	45.2
Fertilizer	90	10	54	46	72	28
irrigation	10.3	89.7	92.4	92.4	8.95	91

Source result
survey

4.3 Household Income

Household income in the study area not only depends on the agricultural potential and the relative price obtained by the farmers for agricultural produce and livestock and livestock products, but also on the time of sale and the type of off farm activities a household performs. In the study area, as it is observed from the survey results the relative share of income from cereal to the total annual household income is the largest. Hence, cereal production is the most important source of income in the study area. It is followed by livestock production, off-farm activity and vegetable production, respectively.

The group statistics also showed that there is insignificant difference in income of household/AE between the food secure and food insecure household groups. Where household income/AE in the food secure group is 1321.88Birr, However, the mean income of food insecure households is 1124.24Birr per AE. More than 94

Table-17 Distribution of sample households by amount of annual income per AE in Birr

Annual income	food secure		food insecure		total	
	No	%	No	%	No	%
≤ 500	6	18.75	16	24.2	11	21.5
501-1000	15	46.9	23	34.8	19	40.85
1001-1500	4	12.5	16	24.2	10	18.35

≥1500	7	21.9	11	16.8	9	19.35
Mean	1321.88		1124.24		1188.78	
Sd	1364.3		574.9		908.3	
t-value	-1					
Min	350		400		350	
Max	8000		2500		8000	

Source survey result

Income from shoat: Livestock, especially sheep and goat, production in the study area is important in a way that it serves as a buffer stock and lessens the vulnerability of farm households to food insecurity. As it is already mentioned earlier, second to crop production livestock production is the major source of income for the rural households in the study area. Income from the sale of live animals, mainly shoat, and livestock products like milk and egg, constitute to the total annual income of the sample households.

As it is shown in the Table, 60.6 percent of sample households earn on average annual income less than Br. 2800 from the sale of shoat and nearly 7percent of the households earn more than 4500 ETB from the same source. There is also significant difference in the mean annual income earned from shoat between the two sample household groups. Therefore, this result indicates that since food secure households are in a better position with respect to income from shoat, they acquired better purchasing power and managed the possible food shortage after 5-6 months of harvest and hence escaped from becoming food insecure.

Table-18 Distribution of sample households by income from shoat

Income from shoat	food secure		food insecure		total	
	No	%	No	%	No	%
<2800	16	50	47	71.2	31.5	60.6
2800-4500	13	40.6	16	24.2	14.5	32.4
>4500	3	9.4	3	4.54	3	6.97
Total	32	100	66	100		100
Mean	3162.50		2578.03		2768.88	

Sd	1090.2	901.5	1000.2
t-value	-2.8		

Source: - Survey result

Income from Off-farm: Households in the study area perform various off farm activities like livestock trading, grain, vegetable and small trading etc. The income from such activities greatly improves the households' entitlement potential in the study area especially during time of stress. The survey result showed that about 23.65 percent of the sample households earn less than or equal to Br. 1000 from these source in the study area. But when we further look the results with in the sample groups 9.4 percent of the food secure and 37.9 percent of the food insecure households earn This amount from off farm activity. However, going further one step to the higher income level the food secured sample groups are in a better off. 50 percent of the food secured sample groups earn more than Br. 1000 whereas only 19 percent of food insecure households earn the same amount. Moreover, the survey result also revealed that there is significant difference in the mean annual income from off farm activity between the two sample groups

Table-19 Distribution of sample households by off farm income in Birr

Off farm Income	food secure		food insecure		total	
	No	%	No	%	No	%
≤1000	3	9.4	25	37.9	14	23.65
1001-2000	16	50	19	28.8	17.5	39.4
2001-3000	11	34.4	19	28.8	15	31.6
≥3000	2	6.25	3	4.5	2.5	5.4
Overall	32	100	66	100		100
Mean	2331.25		1420.45		1717.86	
Sd	1274		735.1		1032.3	
Tvalue	4.48					

Source: - Survey result

4.4 Biophysical Characteristics

4.4.1 Major Agricultural Problems

Different reasons were given concerning the declining trend in production. The responses of sample farmers on major reasons for the declining trend of crop production are shown in Table 5. 20 Infertility of land or soil infertility problem was ranked as a very serious problem of farming. Out of total respondents who cited the various problems, about 49% of them mentioned soil infertility problem. Soil fertility problem is one of the physical factors affecting crop production. The relationship between problem of soil fertility and state of food security indicate that soil fertility problem has negative impact on crop production performance, and causes a deterioration of food security status of the household.

The combination of small size of land and large lack of rain were found to be the second and third important problems as mentioned by 23.4% and 17.4% of the farmers respectively. Other problems mentioned were Lack of agricultural input and Large family size. The major problems for the declining trend of food security status in the study area are shown in the table

Table -20 Proportion of Farmers with Major Reasons for the Decline in Crop Production

Major reasons	Number	%of who cited the problem
Infertility of land soil	48	48.9
Small size of land	23	23.4
Lack of agricultural input	3	3.1
Large family size	7	7.1
Lack of rain	17	17.4
Over all	98	100

Source: - Survey result

Moreover, the respondents indicated that they faced many agricultural problems among which inadequate rainfall is the most frequently cited (by 77.6% farmers) agricultural problem. The

study also found that about 59.3% and 50.8% of the respondents faced a serious problem of insect and pest's infestation and poor quality of land. With regard to the proportion of farmers who respond on the major causes of food insecurity problems (Table 21), relatively small numbers of the food secure farmers reported to have these problem as compare to that food insecure group. For instance, 70% and 85.2% of food secure and food insecure farmers were cited absence of rainfall, while, 45.1% and 73.5% respond on insect and pest infestation as major causes of food insecurity problem respectively (see Table 21). In general, the poor performance of traditional farming practice that has greatly affected the sustainability of production and productivity coupled with the inadequate and erratic rainfall has made district's rural farm households more vulnerable and food insecure.

Insect and Pest infestation (INSPST) are important biological factors limiting crop production and causes of food deficit in the study area. As a result, it was assumed that farmers with problem of pest infestation is more likely to be food insecure than those who don't have the problem. In light of this, the chi-square analysis showed that the absence of rain falls, pest incidence and poor health situation of the farmers were systematically associated with the state of food security at probability level of 1% and 10%. The proportion of farmers with the problem of pest incidence is higher among the food insecure groups than the food secure groups of farmers. An agro-ecologic condition (AGROZ) of an area determines the type and level of production. The study area is broadly classified into mid-altitude and lowland zones. The low land area is usually characterized by low amount and erratic distribution of rainfall and is thus vulnerable to drought. Furthermore, the lowland part has usually one cropping season as opposed to midhighland. As a result, it is hypothesized that farmers in the low land zone are more likely to be food insecure than those in mid altitude. However, the chi-square analysis showed there is no systematic association between food security status and agro ecological zone.

Table 21: The proportion of farmers with Major Causes of food Insecurity (in %)

Types of response	Food secure	Food insecure	All cases	χ^2 -
	N =32	N =66	N =98	
Absence of rainfall	70.0	85.2	77.6	8.9

Insects and pests	45.1	73.5	59.3	9.87	
Shortage of land	48.0	53.6	50.8	0.32	
Poor quality of soil	47.6	57.3	52.5	1.65	
Too much rain	3.2	2.9	3.05	0.26	
Animal diseases	17.6	21.3	13	0.36	
Poor health situation	7.8	16.4	12.1	2.97	
Absence of farm input	11.0	13.8	12.4	1.63	Source: Survey Result

4.5 Summary of Mean Differences and Household Scores

Table-22: show summary statistics and household scores of sample household groups on the variables included in the model. According to the survey result depicted in the Table, food insecure and food secure household groups revealed significant difference with respect to some socio-economic variables like family size (FASZ), dependency ratio, education, land holding, livestock holding, ox ownership, income from shoat, and off-farm income

Table-22: Summary Statistics of continuous variables included in the model

Variable	Food secure(N =32)		Food insecure (N= 66)		t-value
	Mean	SD	Mean	SD	
FASZ	5.09	2.02	6.29	2.05	2.7****
AGE	38.3	11.8	35.74	9.5	-1.16
DPR	1.56	1.01	2.27	1.3	2.7****
CLSZ	1.4	1.05	0.9	0.6	-2.2****

TLU	5.5	3.3	3.4	2.1	-3.8***
NUOXEN	2.22	1.2	1.26	0.75	-4.8***
CREDIT	2246.88	1432.56	1827.27	1078.25	-1.6*
ANUAINC	1321.88	1364.3	1124.24	574.9	-1
SHOAT	3162.50	1090.2	2578.03	901.5	-2.8***
OFFINC	2331.25	1274	1420.45	735.1	4.48***

Source survey result

***, **, * represents significant at 1%, 5%, and 10% probability levels

Table-23: Summary Statistics of Discrete Variables Included in The Model

variable	Food secure			Food insecure		χ^2
	score	Number	%	Number	%	
HHLD	0	26	81.2	52	78.8	0.14
	1	6	18.8	14	21.2	
EDU	0	14	43.8	12	18.2	1.34
	1	18	56.2	54	81.8	
IRGN	0		89.7		92.4	2.7
	1		10.3		7.6	

*Significant at 1% probability level.

Source: survey result

4.6 Analysis of Determinants of Food Insecurity

As it is already discussed, logit model was selected to identify the determinants of food insecurity in the study area. However, before fitting the logit model, it was important to check whether serious problem of multicollinearity and association exists among and between the variables of the model estimation, respectively. For this purpose, variance inflation factor (VIF) was used for the problem of multicollinearity was not serious among the variables. Value of VIF greater than or equal to 10 is an indicator for the existence of serious problem of multicollinearity. The next Table presents the value of VIF for each of the continuous variables. As it is shown in the Table, the VIF of all the variables were found to be smaller than 10. Hence, the problem of multicollinearity was not serious among the variables. As a result, all the hypothesized 10 continuous explanatory variables were included in the model estimation.

Table-24 Variance inflation factor for continuous variables

Variables	R ²	VIF
FASZ	0.206	1.26
AGE	0.47	1.9
DPR	0.37	1.59
CLSZ	0.69	3.26
TLU	0.41	1.7
NUOXEN	0.45	1.81
CRE	0.55	2.22
ANUAINC	0.34	1.53
SHOAT	0.65	2.9
OFFINC	0.6	2.53

The variable food insecurity (FODINS) was used as dependent variable, indicating the probability of being food insecure 0, 1 otherwise. In order to identify the most important factors from the hypothesized potential variables to influence food insecurity, binary logit model was estimated from the survey data. For the purpose, Statistical Package for Social Science (SPSS) was employed. measure of goodness of fit used in logistic regression analysis is the count R2, which indicates the number of sample observations correctly predicted by the model. The count R2 is based on the principle that if the estimated probability of the event is less than 0.5, the event will not occur and if it is greater than 0.5 the event will occur (Maddala). The observation is grouped as a food insecure if the computed probability is greater than or equal to 0.5, and as a food secure otherwise. The model results show the logistic regression model correctly predicted 84 of 98, or 85.7 percent of the sample households. The correctly predicted food insecure and the correctly predicted food secure of the logit model are 90.9 percent and 75 percent, respectively. Thus, the model predicts both groups accurately.

4.7 Incidences and Extents of Food Insecurity

Table below shows the way in which some household factors affect food insecurity by comparing the incidence of food insecurity among household groups sharing similar characteristics. The prevalence of food insecurity among households with four to seven members is found to be two-times more than that of households with three or less members. In that the two variables have positive relationship.

the incidence of food insecurity also increases as the proportion of children and elders increase in the family. This is also shown in the Table where incidence of food insecurity in households with dependency ratio greater than or equal to 3 is found to be 1.57 times higher than that of households with dependency ration less than or equal to 1. Is 2 times higher in illiterate household heads than that of literate ones. Hence, the risk of incidence of food insecurity decreases with education, i.e., to say when the households turned from illiterate to literate status the incidence for the households to become food insecure decreased. With regard to farm size Likewise prevalence of food insecurity declines as farm size of the household increases.

Table-25 Incidence of food insecurity by household groups

Household factor	Grouping criteria	HH member	Number of food insecure HHs	Incidence of food insecurity
HH size	≤3	12	4	33.3
	4-7	58	38	65.5
	8-10	28	24	85.7
	Overall	98	66	67.3
Dependency ratio	≤1	36	20	55.6
	2-3	46	32	69.6
	≥ 3	16	14	87.5
	Overall	98	66	67.3
Education	Literate	30	12	40
	Illiterate	68	54	79.4

	Overall	98		67.3
Sex of HH head	Male	78	52	66.7
	Female	20	14	70
	Overall	98		67.3
No of oxen	0-1	54	46	85.2
	2-4	42	20	47.6
	4	2	....	.....
	Total	98	66	67.3
Farm size	0-0.5	28	22	78.6
	0.6-1	42	32	76.2
	1.11-1.5	14	8	57.1
	1.5-2	12	4	33.3
	≥ 2	2	....	...
	Total	98	66	67.3

Source: Survey result

4.8 Livelihood Strategies of the Study Area

agriculture is the primary source of livelihood with mainly teff, wheat and maize grown as staple food crops, vegetables predominantly tomato and onion, and chat are some perennial cash crops. However, even though all these crops are grown in the area, the livelihood of the farm households heavily depend on the success and failure of staple crop production.

The other important livelihood activity, which plays an indispensable role in the mixed farming operation, is livestock and poultry production. Of the different livestock and poultry species in the production system holders pay greater emphasis to the small ruminants, sheep and goat, production. Because their capacity to generate income in a shorter period is very high. Moreover, that animals in addition to their contribution to the nutritional requirement of the household and their gravity to increase household income.

As there are uncertainties and risks involved around crop and livestock production, and inadequate returns from the sector, to maintain the household for the entire year, many rural households are performing different off farm activities to boost their income. These activities include participation in employment generation scheme, livestock trading, grain, vegetable

trading. These activities in some households of the sample performed only for 5-6 months while other households still perform throughout the year. The scale of these activities reaches to its climax during the dry period. Having these means of livelihoods, households of the area follow different strategies to achieve increased income and food security there by sustain their livelihood.

The most important and leading livelihood strategy adopted in the study area is diversification of activities. This came into being because increasing household income through extensification, increasing farm size, became impossible. Diversification was also made possible between farming and off farm activities. Some of the household members, in order to smoothen their income and meet their food requirement throughout the year, engaged themselves in off farm activities while other active household members are making themselves busy on crop and livestock production. Most of the time active female household members are engaged through purchase and resale activities.

In the study area households also use different institutions as a beneficial strategy for their livelihood. Of the different institutions Equb is the one most frequently all the households are involved in. Equb is a voluntary money pooling association rotating the sum among the members either weekly, biweekly or monthly (Ayalneh, 2013). However, it is only traders or those involved in off farm activities are practicing this Equb in monetary terms. Moreover, households of the area mostly face severe and repeated challenges related with rain shortage and crop production failure. Under such situation, households try to cope with food shortage through different coping strategies like reduction, smoothening and escaping of meals, sale of productive assets, relief aid, borrowing from neighbors and relatives, and performing different off farm activities.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The result of this study, as discussed in the foregoing parts of this paper underlines that the determinants of household food insecurity are complex and interrelated, requiring a multifaceted and all round interventions for improving the severity and ultimately alleviating the problem. Therefore, this study undoubtedly accepts that food insecurity could be eliminated by broad-based and multi-pronged efforts against poverty, which is through development programs in all sectors.

Other area of interventions should focus at improving households' income and employment opportunities. This will have greater impact in improving the state of food security in Merti

district, where expansion of agriculture has no more hope and coping possibilities are very limited and affected by recurrent drought. Therefore, intervention areas such as promoting credit access and creating diversified off-and non-farm activities would serve in reinforcing the existing local coping strategies and absorb those who are resource poor households. In this regard, government and NGOs operating in the district and surrounding areas should closely be relating their financial services to household food security by diversifying their credit schemes in to off farm income generating activities.

The current rate of population growth in such a drought stricken district is frustrating phenomenon. As already discussed in the foregoing part of this paper, households with large (dependent or inactive) number of family member will most likely face food insecurity problem because of high dependency burden. Thus, the government and NGOs, particularly operating at the local levels should design sound implementation program to put the already endorsed and existed population policy in to effect. To this end, a focus on family planning and integrated health service and education provisions must catch the attention of decision-making bodies.

One area of intervention hypothesized to improve the state of food security at household level is promoting the production of cash crops (chat and coffee). This implies that efforts have to be made to improve income from cash crops production to ensure food security through promoting and developing small scale and traditional irrigation programs which intern reduce rainfall dependability and enhance the level of household food security.

The low farm productivity, the lack of household assets, the very low-income levels and a dramatic shortage of caloric availability in the study areas do reflect partly as a lack of adequate investment in rural development. In Merti there must be concerted efforts in addressing the rural development programs, particularly, these efforts among other things will have substantial effect on households' food security. It can facilitate growth in the rural area and create employment opportunity for the households. Developing market infrastructure, improving transport and communication system can offer also possibilities of increasing access to availability cheaper food (or means of livelihood) for the resource poor households in the district.

Lastly, the livelihood of many households in the district was and is seriously affected by drought. Thus, although food assistance may not be long-term solution to the underlining causes of household food security, it seems imperative to continue the relief handout for some time to

keep alive those who have no access either to produce or buy food. But, the link with the employment generating system would help both in reducing dependency syndrome and contributing to local development.

5.2. RECOMMENDATIONS

1. As family size and food insecurity are positively related serious attention has to be given to limit the increasing population in the study area. This can be achieved by creating sufficient awareness to effect family planning in the households. Even though every individual has a natural right to multiply himself with his willing partner. the ever-shrinking productive resources in the study area coupled with increasing population would hamper any development intervention from achieving its objectives. So, along with creation of effective family planning through effective extension services some methods of incentives, such as material reward for those households accepting a given number of children by the end of reproductive age, to limit the family size should be considered.

2. Productive resources especially land is very limiting and highly binding resource in the study area. And hence, even if the model result showed farm size and food insecurity have a relationship, tackling the problem of food insecurity through increasing farm size would not bring any sustainable improvement. So a medium and longer-term food insecurity strategy through increased food production must be introduced.

3. Moreover, improving production and productivity of agriculture has strong tie with research, extension and education. fertilizer use, improved seed and management practices should be implemented.

4. households in the study area have very limited room for generation of income. Hence, for these households to enhance their welfare in general and food security in particular, they must have diversified access to income alternatives. In the face of this, provision of credit must be taken as a measure, though not the only one, to build the capacity of farmers to invest in the agricultural sector, such as purchase of fertilizer, pesticides, improved seed, live and productive animals. Moreover, development strategies should be able to identify income alternatives other than agriculture. In light of this, non-governmental organizations that are focusing only on agriculture should also channel their scarce resources to creation of income generating activities,

trading, crafting, etc. which would greatly help in strengthening off-farm activities which would enable the households to secure their food through purchase.

5. Households in the study area have very limited room for generation of income. Hence, for these households to enhance their welfare in general and food security in particular, they must have diversified access to income alternatives. In the face of this, provision of credit can be taken as a measure.

6. REFERENCES

- Abassa, J.V., Bouis, H., Kumar, S., and Pandiya- Lorch, 2016. Improving Food Security of the Poor: Concept, Policy and Programmes. IFPRI, Washington D.C
- Abebaw Shimeles, 2003. Dimensions and Determinants of Food Security Among Rural Households in Dire Dawa, Eastern Ethiopia.
- Alemneh Dejene 2008. Land degradation in Tanzania: Perception from the village. World Bank Technical Paper, No.370. Washington, D.C: 1-17
- Amamia (2018). Applied Logistic Regression. A Wiley- Inter- Science Publication, New York.
- Aseres 2005. Awasa Agricultural Research Center. 2005. Determinant of Food Security in Southern Ethiopia at Micro Level. (Unpublished Document). Awasa, Ethiopia.

- Ayalneh Bogale, 2017. Land degradation, impoverishment and livelihood strategies of rural households in Ethiopia: Farmers' perceptions and policy implications.
- Ayalneh. 2013. Food Security and Food Assistance Programs. Handbook of Agricultural Economics (Volume 2). Elsevier Science, Amsterdam
- Bezabih.G . 2018An Assessment of the Food Security Situation in Ethiopia. M.Sc. Thesis.
- Broun, J.V., Bouis, H., Kumar, S., and Pandiya- Lorch, R. 2012. Improving Food Security of the BSF/UNICEF. 2000. Improvement of Household Food Security and Woreda Integrated Basic Service Programme: oke Woreda of Oromiya Region, Ethiopia. Technical Document for The Belgium Survival Fund. (Unpublished Document). Addis Ababa, Ethiopia.
- Chabers, R. and G. Canway 2012. The Underlying Causes of Household Food Security and Coping Strategies: The Case of Legambo Wereda, South Wollo Zone, Amhara Region, North Eastern Ethiopia. M.sc. Thesis,
- Chung, K., Haddad, L., Rama Krishna, J. and Riely, F. 2017. Identifying The Food Insecure: The Application of Mixed-Method Approach. IFRPI, Washington D.C.
- CSA (Central Statistical Agency), 2004. The 2004 Population and Housing Census of Ethiopia: Results for Southern Nations, Nationalities and Peoples' Region. Volume 1, part 1, Addis Ababa.
- CSA. 1992. Basic Report on National Nutritional Surveillance: Module Nutritional Survey of Rural Areas. Addis Ababa.
- CSA (Central Statistical Agency), 2001. Report on the 1999/2000 Household Income, Consumption and Expenditure Survey: Statistical Bulletin 258. Ethiopia, Addis Ababa. CSA (Central Statistical Agency), 2006. Statistical Abstract 2005. Ethiopia, Addis Ababa.
- Debebe, H.,2017. Food Security: A Brief Review of Concepts and Indicators. Pp. 2-9. In: Mulat, D. and "et al." (eds.). Food Security, Nutrition and Poverty Alleviation in Ethiopia: Problems and Prospects, Agricultural Economics Society of Ethiopia, Addis Ababa.

- ENI, (Ethiopian Nutrition Institute).1968. Food Composition Table for Use in Ethiopia, Addis Abeba
- FAO (Food and Agricultural Organization), Ethiopian Highland Reclamation Study, Rome, Italy.
- FAO (Food and Agricultural Organization), 2001.Two essays on socio- economic aspects of soil degradation. FAO Economic and Social Development Paper. No 149. Rome: 1-11.
- FAO (Food and Agricultural Organization), 2001. Soil fertility management in support of food security in Sub-Saharan Africa. Rome. 6-12
- FDRE, (The Federal Democratic Republic of Ethiopia). 1996. Food Security Strategy. Prepared for the Consultative Group Meeting of Dec., 1996, Addis Ababa.
- Federal Democratic Republic of Ethiopia (FDRE). (2001). Regional Conservation Strategy. The Resource Base, Its Utilization and Planning for Sustainability. Vol. 1. Dire Dawa, Ethiopia.
- Federal Democratic Republic of Ethiopia (FDRE). (2001). Regional Conservation Strategy. The Resource Base, Its Utilization and Planning for Sustainability. Vol. 1. Dire Dawa, Ethiopia.
- Foster, P.,2017 Poverty and Hunger: Issues and Options for Food Security in Developing Countries.
- Frankenberger, T. R. and D. M. Goldestein. (2012). Food Security, Coping Strategies and Environmental Degradation. Arid Lands Newsletter. Vol. 30 Office of Arid Lands Studies. University of Arizona. PP 21-27.
- Getachew D. (2009). A Case Study of Adama Boset: Resource and Food Security. Rural Ethiopia. Addis Ababa, Ethiopia.
- Getachew 2009. Food Security, Nutrition and\ Poverty Alleviation in Ethiopia: Problems and Prospects. Proceedings of Inaugural and First Annual Conference of the Agricultural Economics Society of Ethiopia.

- Gezahegn, f. (2015). Agricultural Marketing Policies and Food Security in Ethiopia. In: Mulat, D.
- Gujarati, D. N., 1995. Econometrics, 3rd ed. McGraw-Hill, Inc., New York.
- Gujarati, D. N., 1998. Essential of Econometrics, 2nd ed. The McGraw-Hill, Inc., Singapore.
- Gujarati, D. N., 2003. Basic Econometrics, 4th ed. The McGraw-Hill, Inc., New York.
- Haddad (ed.). 2017 Achieving Food Security in South Africa New Challenges, New Opportunities, IFPRI. Washington D. C.
- Hoddinot (2011). Economy at the Crossroads: Famine and Food Security in Rural Ethiopia. CARE International in Ethiopia. Addis Ababa, Ethiopia.
- Holden, S. and B. Demiss, 2004. Land degradation, drought and food security in a less favored area in the Ethiopian highlands: A bio-economic model with market imperfections. *Agricultural Economics*, 30: 31-49.
- IFPRI (International Food Policy Research Institute), 2001. Sustainable food security for all by 2020. Pp. 107-113. Proceedings of an international conference. Bonn, Germany, 4-6 September 2001, IFPRI. Johnston, J., 1984. *Econometric Methods*, 3rd ed. McGraw-Hill publishing Company, New York.
- Kifle and Yoseph D 2016. Food Security: Concepts, Policy and Planning Issues with Particular Reference to Ethiopia. A Paper Prepared for the Workshop on “Regional Development Planning and Policy Issues”
- kostas., Ehui S., s, and S. Meijer, 2001. Food Security in Sub-Saharan Africa Socio-economics and Policy Research Working Paper, Nairobi, Kenya.
- Kostas G.S., 20011. Food, Agriculture and Rural Development Current and Emerging Issues for Economic Analysis and Policy research. FAO, Rome
- Maxwell. S., and Smith, 2012. Household Food Security: Concepts, Indicators and Measurements. A Technical Review. UNICEF
- Mequannet, 2015. Food Security, Population and Environment, Population and Development review. 19 No.1:1-32.

Mesfin. 2012 Poverty, Household Food Security, and Nutrition in Rural

Ethiopia.

Ministry of Planning and Economic Development MOFED. (2002). Ethiopia: (Sustainable Development and Poverty Reduction). (Draft). Addis Ababa, Ethiopia

Mulugeta Tefera, 2016. Determinants of household food security in Eastern Oromiya: Planning and Economic Development Office of Dire Dawa (PEDO). (2001). Base Line Surveyu. Dire Dawa, Ethiopia

Ostas, 2018. Resource Management for Poverty Reduction Approches & Technologies. Selected Contribution to Ethio-forum. The Regal Press Kenya Ltd., Addis Abeba, Ethiopia

Tesfaye Berhanu, 2003. Influence of land size on household food security. An MSc Thesis Presented to the School of Graduate Studies of Alemaya University: 107-108.

Webb and von Braun (2014). Poverty and Hanger: Issues and Options in Developing Countries. A World Bank Policy Study, Washington, D.C.

Wolday, A.; Enui, S. And Tesfaye, Z. (ed.): Food Security, Nutrition and Poverty

Alleviation in Ethiopia: Problems and Prospects. Proceedings of the Inaugural and First

World Bank, 2012. Poverty and Hunger: Issues and Options for Food Security in Developing Countries. World Bank, Washington, DC.

World Bank, 2016. World Development Indicators. World Bank, Washington, DC, USA.

World Bank. 2018. Ethiopia: Food Security Study, A World Bank Report, Washington D.C.

Yared, A. (2013). Household Resources, Strategies and Food Security in Ethiopia: A Study of Amhara Household in Wagda, North Shewa. The Department of Sociology and Social Administration and Addis Ababa University Press, Ethiopia

APPENDICES

Appendix A. Summary of The Survey Questionnaire

General Information

Date of Interview, Code No, Peasant Association Village, Signature

PART I

HOUSEHOLD DEMOGRAPHICS, HOUSEHOLD ASSETS AND NON AGRICULTURAL INCOME

SECTION 1: HOUSEHOLD ASSETS

1. Does anyone in this household currently own any of the following items?

- | | |
|---------------------|--------------------------------|
| A) Tools/ equipment | c) valuables |
| B) Household goods | d) Stored agricultural produce |

2. Have you sold any of items in the last 2 years? If yes,
Number of Sold, amount sold in Birr, Reason for sale

SECTION 2. CREDIT

1. During the last two years have you taken out a loan of any amount, in cash or in Kind? Yes =1 no = 2.
2. If yes, what are the sources of credit?
3. Why did you want to obtain a loan?
5. In which year/month was it borrowed?
6. Is there any part of the loan not paid back?
7. In the last 2 years have you ever given a loan of any amount in kind or in cash to another household?
8. If yes, amount in Birr _____ Amount in kind/birr _____
9. Is there any part outstanding?

SECTION 3. OFF FARM INCOME, BUSINESS ACTIVITIES AND REMITTANCES

1. Do you or any member of your family have off-farm job? (Yes = 1 No = 0)
2. If yes to question 1. Indicate the type of work and annual income.
3. Has the household received any other income (such as remittances, gifts, aid other transfers) in the last 2 years? (Yes, = 1 No = 2)

If yes, complete the following table

Type of receipts	Person who receive the income	Amount receive in birr total
------------------	-------------------------------	------------------------------

*If in kind, covert to birr at prices prevailing at the transfer

PART II AGRICULTURE

SECTION 1 LAND RESOURCE

1. Do you have your own land? (Yes =1 No = 2)
- 2.If yes to question No 1, what is the total size of your land holding?

3. What is the total area of land you cultivated last year? _____ timad
4. Do you think that your piece of land is enough to support your family?
5. If no to question No 4. State your reasons
6. What proportion of your cultivated land is allotted to:
 - a) Annual crops _____ timad
 - b) Perennials _____ timad

SECTION 2. CROP OUTPUT AND SALES

1. List the type of crops you cultivated and their average production (including garden crops) for the last two years.
2. Is that you produce last year enough for year family? (Yes = 1, No = 0)
3. If yes to question 2, what amount of grain stock was transferred to this year _____ Qt.
4. Have you sold any part of the last year harvest? (Yes = 1, No = 2)
5. If yes where do you sell your farm products?
6. When (at what particular time of the year) do you sell most part of your produce? During _____ month(s)
- 7) If no to question No 8 how long does it last? _____ Months
8. Do you get reasonable price for your produce at this particular time? (Yes = 1 No = 2).
9. If no to question No 10, what are the reasons?
- 10) Why do you sell at that particular time of lower (unreasonable) price?
11. What do you think are the main causes of food deficit?
12. During which months is food shortage severe? During _____ month(s)
13. Do you use any irrigation scheme? Yes = 1 No = 2
14. If yes to question 19 what type of it?
15. If yes to questions 19 what types of crops did you produce using irrigation?

Types of crops 2011 2010

Area	production	Area	production
------	------------	------	------------

SECTION 3: USE OF MODERN AGRICULTURAL INPUTS

1. Do you use chemical fertilizers? Yes = 1, No=2
2. If yes to question no. 1 for how many years have you been using fertilizer?

3. Have you been using fertilizer every year? Yes = 1 No = 2

4.If no to question No 3 why?

5.If yes to question No 1, indicate the amount of fertilizer used in the last 2 years

Types of crops	2011	2010
Fertilizer used area	Fertilizer used area	

6. Do you use improved seed on your farm? Yes = 1 No = 2

SECTION 4. LIVESTOCK OWNERSHIP

1.Do you own livestock? Yes = 1, No = 2

2. If yes, give details

3. Do you use oxen for your farm operation? (Yes = 1, No = 0)

4. If yes to question No 3. Are your oxen enough for your farm operations? (Yes = 1, No = 0)

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

6.Is animal disease a problem to you? (Yes=1, No=2)

7. If yes to question No 8, do you get enough drugs to treat your animals (yes = 1, No = 0)

SECTION 5. AGRICULTURAL EXTENSION SERVICES

1. Has your household received any type of extension from any government and/or nongovernment organizations? (Yes = 1, No = 0)

2. Have you participated in the agricultural extension package program? (Yes = 1, No = 0)

3. If yes to question No 2, for how long? ____ Years.

