

**STUDIES ON DETERMINANTS AND STATUS OF FOOD INSECURITY
AMONG RURAL HOUSEHOLDS: THE CASE OF DILLA ZURIA
WOREDA IN GEDEO ZONE, SNNPR, ETHIOPIA**

A Thesis

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Education, Department of Rural Development, in Partial Fulfillment of the
Requirements for the Degree of Master's of Arts in Rural Development
(M.A(RD))**

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DECLARATION

I hereby declare that the dissertation entitled:- **Studies on Determinants and Status of Food Insecurity Among Rural Households: The Case of Dilla Zuria Wereda in Gedeo Zone, SNNPR, Ethiopia**, submitted by me for the partial fulfillment of the M.A in Rural Development (M.A(RD)) degree to Indra Gandhi National Open University, (IGNOU)New Delhi is my own original work and has not been submitted earlier either to IGNOU or to any other institution for the fulfillment of the requirement for any course of study. I also declare that no chapter of this manuscript in whole or in part is lifted and incorporated in this report from any earlier work done by me or others.

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CERTIFICATION

This is to certify that Mr Demssew Mekonnen Wake student of M.A. (RD) from Indra Gandhi National Open University, New Delhi was working under my supervision and guidance for his project work for the course MRDP-001. His project work entitled:- **Studies on Determinants and Status of Food Insecurity Among Rural Households: The Case of Dilla Zuria Wereda in Gedeo Zone, SNNPR, Ethiopia**, which he is submitting, is his genuine and original work.

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List of Abbreviations and Acronyms

AE	- Adult Equivalent
ATUAI	- Access to and Utilization of Agricultural Information
CLU	- Cultivated Land Size
CPI	- Customer Price Index
DEPNDRTO	-Dependency Ratio
DYINCPAE	-Daily Income per Adult Equivalent
EC	- Ethiopian Calendar
EDUSTHH	- Education Status of Household Head
FAO	-Food and Agricultural Organization
FDRE	- Federal Democratic Republic of Ethiopia
FGT	- Foster Greer Thorbeck
GO	- Governmental Organization
Ha	- Hectare
HFINS	- Households Food Insecurity
HGTCRDT	- Household Access to credit
HHSX	- Sex of Household Head
HRD	- Humanitarian Requirement Document
HSAVACC	- Saving Account
HSZE	- Household Size
LANDCULT	- Cultivated land size
LPM	- Linear Probability Model
MARD	-Master of Arts in Rural Development
Masl	- Meter Above Sea Level

MDG	- Millennium Development Goal
MOARD	- Ministry of agriculture and Rural Development
MOFED	- Ministry of Finance and Economic Development
NGO	- Non Governmental Organization
OLS	- Ordinary Least Square
PRPNFDEX	- Proportion of Food Expenditure
PSNP	- productive Safety net Programme
SNNPR	- Southern Nations, Nationalities and Peoples Region
SSA	- Sub-Saharan Africa
TLU	- Livestock Holding
UNDP	- United Nations Development Programme
UNICEF	- United Nations Children's Fund
VIF	- Variance Inflation Factor
WFP	-World Food Programme

ABSTRACT

The study was conducted with the specific objective of examining food insecurity situation, estimating the food insecurity gap and severity and identifying the determinants of food insecurity at household level in Dilla Zuria wereda. The research objectives were realized through conducting household survey in four kebeles of the study area. Household demographics, educational status, income, expenditure and other data deemed to be relevant were collected, organized, analyzed and interpreted to come with possible results. The analysis employed both descriptive statistics and econometric methods. Descriptive statistics were employed to describe household characteristics with food security status. Binary logistic model was specified and estimated to identify determinants of food insecurity. FGT indices were used for the computation of incidence and severity of food insecurity among sample households.

The sample households were classified into food secure and food insecure groups based on kcal actually consumed by the households. Total amount of food consumed by each household was converted into equivalent daily kcal per AE and then compared with recommended daily kcal per adult equivalent. Total daily food energy per adult equivalent of less than 2100 kcal was considered as food insecure and food secure otherwise. The descriptive statistics showed the existence of a significant mean difference in daily income per AE and daily food expenditure per AE between food secure and insecure households. The T - test for household size and adult equivalent showed a mean difference between the two groups at less than 5 and 1 percent probability level respectively whereas at less than 10 and 5 percent significance level for number of income sources and cultivated land, respectively. Binary logit econometric model was employed to estimate determinants of the probability of being food insecure as a function of various household characteristics among sampled households of Dilla zuria wereda. Eight out of twelve variables namely household size, sex of household head, education of household head, daily income per adult equivalent, land cultivated, proportion of food expenditure, access to credit and total livestock were found to be statistically significant with the hypothesized sign as determinants of household food insecurity in the study area. Household size and daily income per AE were significant

and are related with the dependent variable positively for the first and inversely for the latter. Household head education and sex of household head were significant and the remaining four, namely, total land cultivated proportion of food expenditure, access to credit and total livestock were found to be at less than 10 percent significance level. The head count ratio revealed that 57 percent of sampled households are found to be food insecure. The gap and severity of food insecurity were estimated to be 13 and 5.9 percent, respectively. Considering the daily recommended 2100 kcal per adult equivalent, a resource needed to bring all households to daily subsistence requirement amounted to 26,586,651 kcal. This shows daily requirements estimate of 71.86 quintals of cereal per day which is equivalent to 26,078.9 quintals per year.

1. INTRODUCTION

1.1. Background of the Study

Ethiopia has a total surface area of about 1.13 million square kilo-meters, and lies between 30N and 50N latitude, and 330E and 480E longitude. The altitude of the country ranges from below 0m.a.s.l. to about 4,600m above sea level. The amount and intensity of annual rainfall varies depending on the altitude, where the highlands receive a mean of 1,400 mm -to- 2,200 mm. In the mid-highland areas, annual rainfall ranges from 1,000 mm to 1800 mm. The mean annual rainfall in lowlands ranges between 200 mm to 500 mm (Ahmed, 2008).

Total land area of the country is about 111.5 million hectares of which about 66% (73.6 million hectares) is estimated to be potentially suitable for agricultural production. Out of the total land area suitable for agriculture, 11.6 million hectares is estimated to be under cultivation for the production of annual and perennial crops (Tesfahun, 2003). The per capita cultivated land holding is around 0.7 hectares which is even substantially less in some densely populated highland areas (MOARD, 2007).

Ethiopia has a long history of famine emergencies and it is closely monitored by international humanitarian agencies. Some 31 million people live below poverty line and between 6 and 13 million people are at risk of starvation each year (MOFED, 2005).

Ethiopia remains one of the world's least developed countries, ranked 174 out of 187 in the 2011 UNDP Human Development Index. Rain-fed agriculture is the foundation of the economy, employing 80 percent of the country's 82 million people. Thus household food security is largely determined by factors such as rainfall patterns, land degradation, climate change, population density, low level of rural investment and the global market (WFP,2012).

According to the humanitarian requirements document (HRD) of the Government of Ethiopia around 3.2 million people will continue to require food assistance across the country until June 2012(USAID's, WFP's and FEWS's Ethiopia food security outlook update joint report, 2012 (www.fews.net/ethiopia)). The Humanitarian Requirements Document issued by the government

and humanitarian partners in September 2012 estimates that 3.76 million people require relief food assistance from August to December 2012 (WFP,2012).

However, the government's Productive Safety Net Program (PSNP), which provides cash in return for labor on community projects, or food for those unable to work has been assisting in reducing the number of victims. Both emergency food aid and the PSNP are substantially funded by international donors. Despite these support mechanisms, UNICEF reports that 38% of children under the age five were underweight in 2008, still far above the MDG target for 2015 (UNICEF, 2009).

Most arable regions in Ethiopia anticipate two cropping seasons; the longer *meher*(June to September) rains are complemented by the shorter *belg* (March to May) season. This profile varies, both within and between regions.

The primary cause of food insecurity is the structural failure of the rural economy to withstand the highly erratic patterns of rainfall that frequently disrupt this seasonal pattern. Almost 65% of rural households are living with farm plots of less than one hectare, with primitive tools and negligible access to capital. Although families enjoy lifetime tenure, there is no right to buy or sell land in Ethiopia, diminishing incentives for prudent management of soil and water resources. For example, poorly maintained hillside plots are particularly prone to erosion by intense rainfall. Pastoral farming, undertaken by 12%-15% of the population, is also limited by extreme poverty in its capacity to cope with the increasing aridity of grazing lands. This sector is also threatened by pressure to convert land to other uses. With 85% of the population dependent on livelihoods linked to this volatile agriculture sector, vulnerability to food insecurity is inevitable (FEWS, 2011).

And these structural weaknesses are aggravated by the relatively high population growth rate of 2.6% per annum. Over the past decade, cereal production has more than doubled – to nearly 15 million tons – mainly as a result of the expansion of the cropped area to more marginal lands. This has led to severe land degradation (FAO, 2009).

In recent years, a very different volatility – global food prices – has imposed a new dimension of risk. Currently, the prices for staple foods are seasonally declining, particularly in the central and western surplus-producing areas. In December 2012, the consumer price index (CPI) shows

general consumer inflation moving down to under 13 percent from nearly 16 percent in November. In December, Food price inflation declined to 12 percent from 13 percent in November. However, December food prices were still much higher than the five-year average and appear to be remaining at their elevated level even during the Meher harvest. Typically, after the Meher harvest, prices decline significantly. This year, they appear to have merely stabilized at their current high levels (FEWS and WFP, 2013).

Projected cereal production in Ethiopia for 2011 was much the same as the average over the last five years. The country continues to be dependent on imports and exposed to the latest round of unstable prices. Reports suggest that food price inflation exceeded 40% for the year ending May 2011, causing serious hardship for poor families in both rural and urban areas (FEWS,2011).

1.2. Statement of the Problem

Even though developing countries have achieved relatively faster agricultural growth during the last four decades, the progress has been dominated by significant gains in Asia (World Bank, 2008). Agricultural growth in Sub-Saharan Africa averaged nearly 3 percent over the past 25 years. This is partly attributed to their agro-climatic potential, poor infrastructure and the dismantling of public agricultural institutions for research, extension, credit and marketing (Denning G, et al., 2009).

To counter these years of neglect and out of concern for global food security, the United Nations, heads of State and Government and international and regional organizations, called for urgent action (Anonymous, 2009). A number of initiatives have emerged or are emerging to address this important challenge (Negin J, et al., 2009). Such initiatives include the Alliance for an African Green Revolution and a proposed Global Fund for Smallholder Agriculture (Sanchez A, et al.2009). The reason for such initiatives includes ensuring sustainability of agricultural growth in countries experiencing food insecurity. Despite the above efforts, deepening food crises in several developing countries, especially those in Sub-Saharan Africa, (SSA) is still the concern of many researchers, planners, donors and international development agencies, who have given high priority to the study of food systems and the problem of food security (Gezahegn, 1995).

Despite the availability of resources and the efforts made by the governments in most of these countries, food insecurity and declining food production per capita remained among the most crucial issues. The attainment of an increase in food grain production above the population growth is still a challenge for most SSA countries (Kidane W, et al., 2006). With a population projected to reach 80 million in 2010 and about 45 percent living below the poverty line and most vulnerable to food insecurity, ensuring food security remains a key issue for the Government of Ethiopia (MoFED, 2002). According to FAO “in 2013 the population of Ethiopia projected to reach 88.35 million (FAOSTAT,2013).

In order to combat threats of famine and pervasive poverty and thereby ensure food security for its population, the government strategy has rested on increasing the availability of food grains through significant investments in agricultural technologies (high yielding varieties of seeds and fertilizer), services (extension, credit, inputs), and rural infrastructure (roads, markets) (Addisu, 2011).

The impacts of these policies, however, have been shadowed as there are still millions of people who experience extreme hunger in the country. Food security is dependent on agricultural production, food imports and donations, employment opportunities and income earnings, intra-household decision-making and resource allocation, health care utilization and caring practices (Maxwell and Frankenberger, 1992).

It is a multi-dimensional development issue that needs cross-sectoral integrated approaches. However, because there are concerns that such approaches can be too costly, too complicated or take too long to show results, institutions may not invest their scarce resources in implementing them.

Moreover, household food security issues cannot be seen in isolation from broader factors such as physical, policy and social environment (Hoddinott J, 2001). The physical factors play a large role in determining the type of activities that can be undertaken by rural households.

Households in rural areas of Dilla Zuria *Woreda* are facing unrelenting food shortages. On top of ever decreasing land holding size and increasing population, recurrent drought and natural resources (water, forest, and rangeland) degradation in the study area have made the food security situation worse. Realizing this issue, many governmental and non-governmental organizations are intervening at least to reduce the adverse effects of the food problem, but there is yet little success. Cognizant of these facts, this study is designed to identify location specific factors that contributed to household food insecurity, and through that make recommendations to improve the effectiveness of intervention. Therefore, this study is envisaged to narrow the existing information gap and capitalize on the existing ones so that proper policies could be designed.

1.3 Significance of the study

A study of dimensions and determinants of food insecurity is vital because it provides with 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. It will also enable development practitioners and policy makers to have better knowledge as to where and how to intervene in rural areas to bring food security or minimize the severity of food insecurity. Moreover the empirical analysis carried out in this study is also expected to contribute towards better food gap estimation. Furthermore, little work has been done about rural livelihood strategies in the study area. Hence, this study besides its narrowing potential of the wide gap of knowledge about livelihood strategies, it is also expected to equip the different organizations and policy makers with the more pertinent information of livelihood strategies adopted by the rural households of the area.

1.4 Objectives of the study

- The general objective of the study was to identify the determinants and status of food insecurity among rural households.

This study was envisaged in the study area with the following specific objectives:

- To identify the determinants of food insecurity among the rural households;
- . To estimate the food insecurity gap and its severity among rural households;
- . To examine the coping mechanism to mitigate the food insecurity.

1.5 Scope and Limitation of the Study

The study specifically focused on identifying major determinants of food insecurity at household level by comparing calorie consumption per adult equivalent with the minimum requirement by classifying sample households as food secure and insecure and then assess the extent of food insecurity in Dilla Zuria district. Due to financial resources and time constraints, the researcher did not venture to investigate the wider social and environmental dimensions of food insecurity. Only dimensions of food insecurity in terms of incidence and severity has been investigated. And also it is difficult to delve in to variations among households in terms of variables reflecting quality differences.

1.6. Chapter Organization

The study has five main chapters. Following to the introduction, statement of the problem, objective of the study, definition of important terms and hypothesis, and universe of the study are also presented in this chapter. Literature is reviewed in chapter two. Concepts and definitions of food security, measurements and indicators of food security/insecurity, the situation of food insecurity in Ethiopia, and the coping mechanisms are explained under the second chapter. Chapter three, research methodology, contains tools and procedures of data collection, the methodology employed for data processing and analyses, description of the study area, and sampling. Main findings of the study are presented and discussed in chapter four. Finally, chapter five presents the summary and recommendations based on the results of the study.

2. REVIEW OF RELATED LITERATURE

2.1. The Concepts of Food Security and Food Insecurity

The concepts and definitions of food security and insecurity have been discussed for a long period of time. There is much literature on the concepts and definitions of food security. Since its inception it is defined in different ways by international organizations and researchers. According to Hoddinot (1999), there are close to 200 definitions and 450 indicators of food security. In the early periods the question was whether a nation or a region could grasp enough food to meet the cumulative requirements of its people. Food security is the condition in which all have access to sufficient food to live healthy and productive lives (World Bank, 1986). This means that special attention was given to fluctuations in aggregate food supply. Food security interventions were also primarily concerned with providing effective shock absorber mechanisms against such fluctuations. Such conceptions could be clear from the definition of the World Food Conference of 1974.

According to the World Food Conference of 1974, food security was defined as:

‘availability at all times of adequate world food supplies of basic foodstuffs...to sustain a steady expansion of food consumption...and to offset fluctuations in production and prices’ (United Nations, 1974).

However, it was soon realized that this definition gave a very limited view of the food security problem. It is so because a large number of a population could be living in hunger even if the country had sufficient food in the aggregate during normal times. It is also a paradox that global food security exists alongside individual food insecurity. It is known that the world produces enough food to feed every one.

However, there are countries in the world, regions within countries, villages within regions, households within villages and individuals within households that are not able to meet their food needs. This means that adequacy at the national level does not necessarily ensure adequacy at the household or individual level. As a result, food security had advanced from emphasizing the supply side through the individual and household level (demand side) for improved access to food in the 1980s (FAO, 1983). In the 1990s, improved access was redefined by taking into

account livelihood and subjective considerations. It emphasizes a broader framework of individual behavior in the face of uncertainty, irreversibility, and binding constraints on choice (Osmani 2001, and Maxwell 1996).

The most widely used definition of food security is the one forwarded by World Food Summit in 1996 and broadly set as '*Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life*' (FAO, 1996). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food.

To sum up, it is known that food security concepts and definitions have been developed over the past thirty years. Hence, the current concept emphasizes the role of multiple factors that affect the household's or individual's ability to acquire enough food all the times (Maxwell, 1996). Consistence with these definitions of food security can be defined with the main emphasis on food availability, access, and utilization.

The other concept that is worth mentioning here is that the issue of food insecurity. It is believed that people who frequently do not have enough to eat according to accepted cultural norms created a crisis. For this reason, the phrase 'Food Insecurity' was used to describe the instability of national or regional food supplies over time. It was then expanded to include lack of secure provisions at the household and individual level.

Food insecurity concern may be due to either inadequate physical availability of food supplies, poor access among the population, or inadequate utilization of food (Habicht et al., 2004). Food insecurity classified as chronic or transitory. Some other literature also include a third kind of food insecurity; i.e., cyclical type of food insecurity. Chronic food insecurity occurs when a household is persistently unable to meet the food requirements of its members over a long period of time. It, therefore, afflicts households that persistently lack the ability to either buy food or produce their own. Structural factors contributing to chronic food insecurity include poverty (as both cause and consequence), the fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2002).

On the other hand, transitory food insecurity refers to a temporary decline in a household's access to enough food. It results from a temporary decline in household access to food due to crop failure, seasonal scarcities, temporary illness or unemployment, instability in food prices, production, household income or combination of these factors. But, the main triggers of transitory food insecurity in Ethiopia are drought and war. Finally, the cyclical type of food insecurity is caused by seasonality (Osmani, 2001; and FAO, 2006).

In general, a household can be said to be food secure only if it has protection against all kinds of insecurity. The average access to food over the long term should be nutritionally adequate, and a household should be able to cope with short-term vicissitudes (changes) without sacrificing the nutritional needs of any of its members. Finally the concept and definition of food security were developed and clearly explained based on the growing hunger, food insecurity and malnutrition situations in developing countries. From the above definitions of food security, slight variations were observed.

However, the overall basic principles and definitions of food security, that is, “availability, access and utilization” were stressed in the definitions cited above. Therefore, for the purpose of this study, the definition put forward by World Food Summit (1996) is taken as a working definition of food security and the household level is considered as the key unit of food security analysis.

2.2 Food Security: Determinants and Measurement

Measures of household food security are needed for different applications in situations where households are chronically vulnerable due to deepening poverty, environmental and climatic shocks, rapid economic change, and conflict. Indicators may be used to predict crises (early warning), to understand shortfalls in access to adequate food (assessment), to allocate resources (targeting) or to track the impact of interventions (monitoring and evaluation). Humanitarian relief and development organizations increasingly need to measure household food security to monitor and evaluate the impact of programs and make planning and targeting decisions. Existing measures of regional or even local food availability often are inadequate for project-level decision-making, since availability is only one component of household food security. Other components, such as access to food and certainty of the food supply, are also important

(Wolfe and Frongillo, 2001). How best to measure household food insecurity is the subject of much debate. The collection of data for a complete analysis of food security can virtually be impossible task in a situation where a household composition is variable and a “household” itself is subject to varying interpretation.

Assessment of food security is a difficult issue as there are no universally established indicators that serve as measuring tools (Debebe, 1995). Food security requires multidimensional considerations since it is influenced by different socioeconomic, environment and political factors. Due to these problems, assessing, analyzing, and monitoring food insecurity follow diversified approach. Latham (1997) described some of the indicators of food security at the household level. He mentioned some of the key indicators of food security related to food supply and mainly to household access to food. Those indicators that are related to food supply include: measurements of agricultural production (similar to those collected for food balance sheet); inputs that influence agricultural production in the area (such as credit, irrigation, fertilizers and pesticides); climatic data (especially the amount of rainfall compared with that usually expected and the timing of rainfall, but also temperature and other meteorological data); market factors including food sales and prices; security (whether there are areas of conflict or parts of the country where movement of people and food is restricted or limited); and data on crop diseases and agricultural pests. When he continued to describe the types of indicators that are related to household access to food he mentioned as follows: food consumption data; clinical assessment related to symptoms of nutrition deficiencies; assessment of food stores; selling of assets including livestock and household goods; greater consumption of low-status foods (a move from rice to cassava consumption, for example); migration from rural to urban areas; and data suggesting frequent perceptions of food insecurity or food crises by households.

2.2.1 Food Availability and Its Determinants

Food availability refers to the physical presence of food at various levels from household to national level; such food can be supplied through household production, other domestic output, commercial imports, or food assistance. It will be achieved when sufficient quantities of food are consistently available at the regional or national/country level (Lovendal and Knowelis 2005; and USAID, 1999) as well as it determined by each of these factors at the regional or

national level. The domestic food production and food import contribute to national food availability, whereas increasing domestic food production reduces dependence on food import. In general, food availability may be constrained by inappropriate agricultural knowledge, technology, policies, inadequate agricultural inputs, family size, etc. (Yared, 2001; and Hoddinott, 1995).

2.2.2 Food Access and Its Determinants

Food access refers to the ability of a household and its members to acquire enough food through production, exchange or transfer. Access ensured when households and all individuals within them have adequate resources that used to meet the households access to food. Once the basic sources of food have been identified, it is necessary to investigate the often-complex interaction of agro-physical and socio-economic processes that limit a household's ability to obtain sufficient quantities of food from each source (USAID, 1999).

It is clear that the sources of food for a household are different, households typically whether: (a) grow it and consume from their own stocks; (b) purchase it in the marketplace; (c) receive it as a transfer from relatives, members of the community, the government, or foreign donors; or (d) gather it in the wild. Understanding these basic patterns and how they vary across locations, population groups, and over time will provide a particularly important starting point for understanding the general nature of the food security problem (Ibid).

Amarthya Sen first developed the entitlements approach in 1981, replacing earlier theories that stressed shortages in food availability as causes of food insecurity. In contrast, Sen's approach focuses on household access to food, or 'entitlements'. The entitlement of a person stands for the set of different alternatives that the person can acquire through the use of various legal channels. According to Sen, people are usually starved mainly because of lack of the ability to access food rather than because of its availability. In a sense, income or purchasing power is the most limiting factor for food security.

He recommended food security should aim at increasing people's ability to acquire food through the 'legal means available in the society' i.e., production, trade or exchange, inheritance and transfer. Analysis has also changed from macro (national) to micro (household and individual) levels (Maxwell 1994; Reutlinger, 1987). The majority of the poor people in developing country

are engaged in subsistence farming. They also depend on agriculture both for their incomes and food entitlements. So agriculture production is the main determinant of food security of the household and that the role of agriculture is crucial to the eradication of poverty and food insecurity in the rural households.

The leading determinant of food insecurity in the Horn of Africa is low levels of per capita food production. Food insecurity can be tackled most effectively through policies that promote agricultural productivity, rural incomes and food production (FAO, 2001). The crucial assets for farming households are the productive ones such as land, labor, and traction-power (animal power). Lack of farm resource and household asset are the important indicator of poverty in the farming system. Farmland, labor and livestock and fertility of soil have important implication on households' food security status and poverty level. Production based entitlements will also be affected by household access to agricultural inputs such as fertilizers and seeds. This will be influenced by price and availability of these inputs that, in turn, may be affected by liberalization of economic policies.

In rural economy men and women face different constraints in accessing to different resources and adopting new technologies. It is so because they work within different sets of time constraints, work burden, responsibility and roles. Thus, the female-headed can find it more difficult than their men counterparts to gain access to valuable resources. Land, credit, agricultural inputs, technology, extension services, education, training, participation in off-farm activities and other services could be mentioned in this regard. These and other female problems have negative influence on food security (Aredo, 1994). On the other hand, except for households that are entirely self-sufficient in all their food needs access to food through the market is an important component of household food security. The main factor affecting trade-based entitlements is the level and variability of the price of food relative to whatever individuals are able to exchange for it. Retail food prices at a point in time and their variability over time will, in turn, depend on by the total supply and demand of food, market integration and transport cost.

Moreover, some of the basic sources that determine the possibility of increasing entitlement to food are cash, labor, markets and public services, and other income gain from remittance and aid (Dercon, 2001, Osmanis, 2000, and Steven et al., 2000). Both the level and the location of

employment opportunities will also influence labor based entitlements. In addition it is affected by the labor power, technical knowledge and skills embodied in different individuals and households, which will be affected by the provision of health and education, and by nutrition and food security. All will be influenced by the rate of population growth. When the entitlement is transferred, it differs from other entitlement categories because they are not produced or earned directly by the individual but are donated by others. Formal transfers come from the state, aid donors or NGOs, while informal transfers come from relatives and friends. Formal transfers will clearly depend on government policies: the existence and extent of transfers of cash or food will affect transfer-based entitlements. The existence and strength of social networks, including kinship networks, is an important determinant of informal transfers, as it is the extent to which risks are correlated across kinship networks (Steven et al., 2000).

In general access indicators measure that food access become apparent when governments and development agencies realize existence of household food insecurity and famine conditions are occurring despite the availability of food. In recent years, access indicators have been as relatively more valuable in development planning, implementation and monitoring of food security interventions. Likewise, food access indicators are relatively effective because they show various strategies used by the household to get food from diversified sources, i.e., from own farm production, non-farm income, remittance etc. (Habtewold, 1995 and Frankenberger, 1992).

2.2.3 Food Acquisition and Its Determinants

It refers to a proper biological use of food to obtain an appropriate energy and nutritious diet, potable water, and adequate sanitation. Biological utilization relates to individual level food security and is the ability of the human body to effectively convert food into energy. A household that has the capacity to *acquire* all the food it needs may not always have the ability to *utilize* that capacity to the fullest. Food utilization, which is typically reflected in the nutritional status of an individual, is determined by the quantity and quality of dietary intake, general childcare and feeding practices, along with health status and its determinants. Effective food utilization depends in large measure on knowledge within the household of food storage

and processing techniques, basic principles of nutrition and proper mother child care and feeding practices, and illness management.

Poor infant care and feeding practices, inadequate access to, or the poor quality of, health services are also major determinants of poor health and nutrition. While important for its own sake, as it directly influences human well-being, improved food utilization also has feedback effects, through its impact on the health and nutrition of a household members, and therefore, on labor productivity and household income-earning potential (Hoddinott, 1995).

2.2.4 Measurements of food security

Measuring the required food for an active and healthy life and the degree of food security attained is a question to be addressed in a food security study. However there is no single indicator for measuring it. For this purpose different indicators are needed to acquire the various dimensions at the country, household and individual levels. At the national or regional level, food security can be measured in terms of food demand (requirements) and supply indicators.

The supply of food may be from current production and stocks and from previous production whereas the need has to be determined on the basis of biological or nutritional requirement of a given society for a certain period of time usually a year or a day (Hoddinot, 1999).

The most commonly used indicators which used to measure household food securities are availability, food access and utilization indicators. These indicators embrace meteorological data, information on natural resources, agricultural production data, marketing information, food balance sheet, sales of productive assets, diversification of income sources and household budget expenditure security. Thus, it is possible to say that there are no single and one best food security measure that is universally accepted. It is up to the researcher to select an indicator or a combination of indicators that suits the objective of the study, the level of aggregation and specific circumstances of the study and the study area. Therefore, in this study the expenditure for the household used as a benchmark to differentiate food secure and insecure household among the total sampled households and to identify their determinants (Frankenberger, 1992).

2.3 Coping Mechanisms

Farm households respond to the problems caused by seasonal and disaster related food insecurity in different ways. Food availability can be affected by climatic fluctuations, depletion of soil fertility, or the loss of household productive assets or some other related problems. In that case farmers try to reduce this problem by taking actions that result in trade-offs between current and future consumption. The range of coping and adaptive strategies is large and differs according to the particular conditions. It includes expansion of production and improving productivity, food grain purchase through sales of livestock and institutional and societal income transfer systems such as gift and relief food distribution. Asset ownership ensures household consumption when incomes are insufficient. Households acquire assets that can be sold to compensate shortfalls in consumption and income. Livestock are a classic indicator of assets and they are more likely to be marketed regularly or more readily.

According to some literature most of the time households didn't sell livestock unless food insecurity is severe (Maxwell and Frankenberger, 1992). In general asset and changes in the value of an asset index are a good indication of household vulnerability to more severe food insecurity. Especially during drought years, livestock, a major asset that can be easily liquidated, is more important in terms of implying better access to food. Moreover, in drought periods, households may shift their labor resources from crop production to non-farm wage employment to ensure continued income (USAID, 2003; Yared, 2001).

Non agricultural income earning plays an important role in providing additional income to rural households. It enhances household economy and food security by giving additional income and decrease food deficit when agricultural production falls short and it also avoids grain sales. When shock occurred households might also adjust their consumption patterns, by reducing their dietary intake to conserve food and relying more on loans or transfers and less on current crop production and market purchases to meet their immediate food needs (Shiptone, 1990).

Coping mechanisms used by farm households in rural Ethiopia include livestock sales, agricultural employment, and certain types of off-farm employment and migration to other areas, requesting grain loans, sale of wood or charcoal, small scale trading, selling cow dung (in central Ethiopia) and crop residues, reduction of food consumption, consumption of meat from

their livestock, consumption of wild plants, relying on relief assistance, relying on remittance from relatives, selling of clothes, and dismantling of parts of their houses for sale. Some of them are likely to be implemented only after the possibilities of certain other options have been pursued. In addition, households who have diversified source of income are often able to cope with crisis than others (FFP, 2003; Yared, 1999 and Dessalegn, 1991).

Households that spend a high portion of their income on food (i.e., more than 70 percent) are very likely to be food insecure. Thus, the percent of total household expenditure spent on food is used to show household vulnerability. To the extent that households rely on market purchases as an important source of food, cash incomes (or expenditure levels) are likely to be more or less important indicator of their food security status (USAID, 2003 and Smith 2002).

Food aid, today, is mainly considered as an instrument in addressing for both transitory and chronic types of food insecurity in low-income country. It is noted that the humanitarian agencies, or donors, implement food aid programs in these countries in order to give immediate response to the needy people, to increase income sustainability, to improve agricultural productivity, and to improve the health and nutrition among the residents. Moreover it leads to improvement in the availability of food supplies at the national or regional level, or to increase access to food at household levels through higher home production of food crops, market purchase and/or other means or to make more effective utilization of food at the individual level to meet human biological needs (USAID, 1999).

According to some literature (Habtewold, 2001; WFP, 1991) food aid can be classified based on its target or purpose. Even if there is no clear difference in the definition between the different types of food aid, however, it is traditionally classified into three broad types. These are emergency food aid, project food aid, and program food aid. The emergency food aid is a response to sudden natural and man-made disasters while the second type; i.e. project food aid, is aiming at transferring income to the poor or satisfying their nutritional requirements in normal years through development oriented works. The third type; i.e. program food aid, is providing to the government for balance of payment and budgetary support (Ibid). In general, food aid is an important development resource, supporting programs with a wide range of development objectives.

For example, investments in soil and water conservation efforts supported by food-for-work programs have potential long-term implications for increased agricultural productivity and crop income, while school feeding programs are typically intended to improve student attendance and performance, factors which ultimately lead to enhanced labor productivity and higher wage earnings. Improved health and nutrition achieved through food-assisted maternal and child health programs or food-for-work efforts at improved water and sanitation have immediate implications for individual health and well-being and also promote productivity and income-earning potential over the long-term.

As it is mentioned above, it is believed that food aid has tremendous contribution in improving food security of individuals, households, and regions of the developing countries. On the other hand, numerous researchers (Barrett, 2006; Barrett and Maxwell, 2005, Barrett and Hoddinott, 2005; Barrett, 2002 and Maxwell, 1991) have constructed a list of disincentive scenarios of food aid that could be mentioned as follows:

- **Household-Level Effects of Food Aid (both cash and kind):** According to some research it discourages them from working something to generate income. Moreover, food for work programs are relatively more attractive than work on own farms/businesses either because it pays immediately or because the household considers the payoffs to be higher than the returns from own labor. In addition, poor timing and FFW wages that are above prevailing market rates can cause negative dependency by diverting labor from local private uses.

- *In addition* food aid can discourage household-level production. It is so because if food aid lowers local food prices, that may decrease the relative payoffs to investing in one's own production. In this case, both recipients of food aid and non-recipients of food aid are discouraged from own production.

- *Changed Consumption Patterns:* The rationale for food aid partly has long been export promotion that entails some efforts to change consumers' preferences to introduce them to new foods and thereby endogenously stimulate demand for foods with which they were previously unfamiliar or which had formerly represented only a minor share of their diet. In general, when it is seen the last 30 years there is no year passes without receiving food aid from donors. With this, all amount of continuous food aid from the donors, in this time has become a debating

agenda and NGOs and others do numerous evaluation studies on the impact of food aid on food security program. There is a debate about incentive and disincentive effect of food aid as labor disincentive production, change consumption pattern, natural resource over exploitation, price effect, community level moral hazard, disrupting international market, real exchange rate, and discourage policy reform.

2.4 Empirical studies on Determinants of food insecurity

Causes of food insecurity facing farm households in various developing regions, particularly Africa, Latin America and Asia, have been documented in some literature. The productivity of Ethiopian agriculture is among the lowest in the world - around 1.2 tons per hectare (World Bank, 1999). Although higher yields are possible through agricultural intensification, the evidence suggests that “average landholdings would be insufficient to feed a family of five even if production could be successfully increased three times with the use of improved technology” (Masefield, 2000).

The study in Nigeria using Tobit model found that sex of head, educational level, dependency ratio, network, farm size, input usage, extent of commercialization, being a member of cooperative, food expenditure, remittance have negative influence on food security, whereas age of head, and household size positively influence the problem and all the variables are significant.

Study done by Alarcon et al., (1993) for smallholder farm households in west highland of Guatemala found that lack of access to credit and cash crop production displace food crops and household consumption of own production is reduced. Thus, the household’s vulnerability to food insecurity tends to increase. However, another study in Malawi by Diagne (1998) found that formal credit has marginally beneficial effects on household annual income. However, these effects are very small and do not cause any significant difference between the per capita incomes, food security, and nutritional status of credit program members and non-current members.

Ramakrishna and Assefa (2002) undertook an empirical study in the Amhara regional state of Ethiopia, in the case of North Wollo. The data analysis based on food balance sheet and aggregate food security index reveal that the North Wollo Zone is highly food insecure area and

the majority of the sampled households depend on famine relief assistance. In addition they tried to find the cause of food insecurity using logit model and found that cereal production, education, fertilizer consumption, livestock, and land size, reduce the probability that household food insecure while, family size increases the probability of insecurity.

Similarly, in Ethiopia in the case of Oromia region using the data carried out by Centre for Studies of African Economies (2003) in collaboration with Addis Ababa University, also used logit model regression to identify the determinants of food security in the selected area. The empirical evidence revealed that farmers' access to fertilizer or educational level of household heads or farmers' access to land or farmers' access to family planning improve the probability of food security in the study area.

Barret and Clay (2003) also find that in rural Ethiopia food aid may change in a consumption pattern and shift the production pattern of agricultural system. In community study on resource access and food security in North Wello the most frequently mentioned income sources were food for work, migrant labor and daily wage labor. Moreover the sales of fuel wood and charcoal, grain trading and handicraft were found to be more important non-farm activity for women (Yared et al., 2000).

The Consortium for Southern Africa Food Security Emergency and the World Food Program have jointly implemented a food and livelihood security monitoring system in six countries in the Southern Africa region since 2002. Based on three round surveys the monitoring system that covered more than 12,000 households, the organizations conclude that food aid can have a positive impact on beneficiary households in several ways. The first is to provide a short-term safety net and a source of calories to individuals so that they can remain productive enough to endure the food security crisis. Food aid can also help households differ spending, avoid selling assets, and avoid invoking other negative coping behaviors. Evidence from the community household clearly shows that food aid has contributed to declining use of coping strategies to meet food needs in beneficiary populations (WFP, 2005).

A study conducted in Uganda on the main cause of seasonal food insecurity revealed a data associated with weather related problems (little or too much rain) followed by pests and disease. Factors that contribute to such insecurity were inadequate labor, inadequate land, not growing

enough food during the seasons and soil infertility, poor health, lack of planting materials, lack of oxen for ploughing and so on. The farmers coping strategies include donations from relatives and neighbors, reducing the number of meals or ration, sale of livestock and exchange of labor for food.

The study also shows that female headed households were more food insecure than male-headed households (Bahiigwa 1999). Off-farm employment opportunities in rural Ethiopia are limited in both availability and income-generating potential. Only 44% of rural households surveyed by the Ministry of Labor in 1996 reported any non agricultural sources of income, and these contributed only for 10% to household income (Befekadu and Berhanu, 2000).

2.5 Conceptual framework of the Study

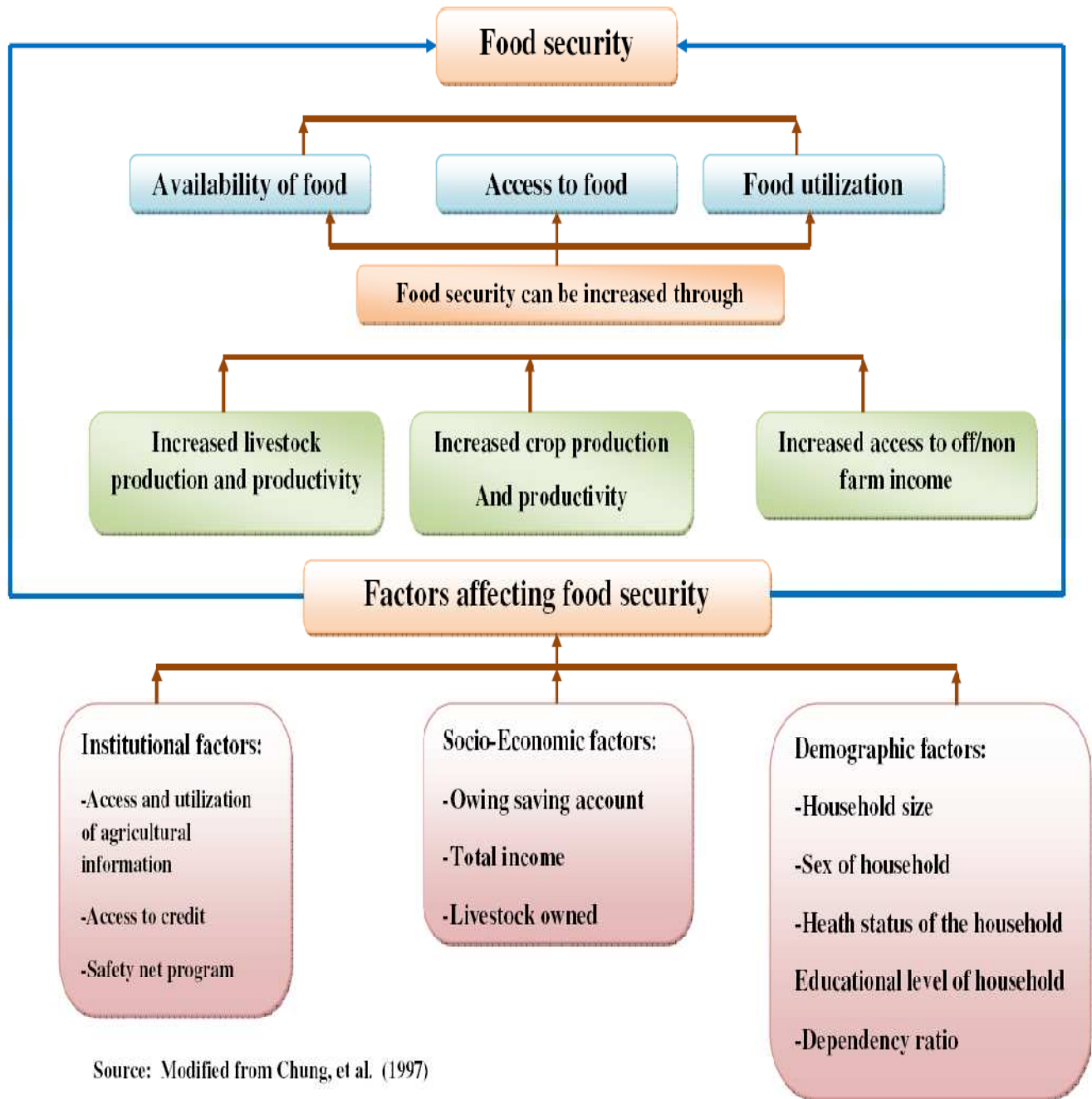
The conceptual framework of this study (Figure 1) is based on the assumption that the food security situation of the household is influenced by demographic, institutional, and socio-economic factors. In socio-economic variables include owning saving account, daily income, proportion of household food expenditure, and livestock owned.

All variables mentioned i.e. demographic, socio-economic, and institutional variables affect the food security situation of the study area in one or the other way. Socio-economic variables affect food security situation in that having more income will make a person more food secure than not having more income. Household having more saving account will be more food secured than households which have saving habit. The household which spent high proportion of income for food expenditure will be more food insecure than household which spent less income. Demographic variables like a household having more dependency ratio will be food insecure than a household which have low dependency ratio. A household which is healthy could work hard and become food secured than a household which is sick for long period of time. Institutional variables like access to and utilization of information, access to credit received when having positive sign will have positive effect to the food security situation of a household.

Government policies may also have an impact on the price of inputs through subsidies and price controls (Devereux 2000; Maxwell and Frankenberger 1992; Sen, 1986). Technology, institutions, and availability of knowledge and infrastructure will have impact upon the level of production and thus production-based entitlements. Again, overall budgetary considerations, for example structural adjustment policies, may influence the provision of research and extension. Food access is also a function of the physical environment, social environment and policy environment that determine how effectively households are able to utilize their resources to meet their food security objectives (USAID, 1999).

Thus, according to many researchers the determinants of food insecurity are also classified in to three groups within the framework of the general definition of food security, that is, food availability, access, and utilization (Hoddinott, 1995; USAID, 1995; Maxwell and Frankenberger, 1992; Weber et al., 1988) while some other researchers gave more attention only on access and utilization of food and the determinant of food security can be seen as a combination of two distinct problems (Osmani, 2001; Sen, 1981). In more precise way, figure 1 is provided below, highlighting the three dimensions of food security that are availability, access, and utilization, and the nature of their relationship to one another.

Figure: 3. Conceptual Framework



Source: Modified from Chung, et al. (1997)

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Dilla Zuria Woreda is one of the six districts in Gedeo zone of SNNPR. The total area of the district is about 248 km² and is located in the direction of South of Addis Ababa and is subdivided into 17 peasant associations and one urban dweller associations. Dilla Zuria district is located at a distance of 368 km away from Addis Ababa to south, on the highway to Moyle. It shares a boundary with Dilla in the north and northwest, Bule in the east, bordering with Oromiya Region, Gelana Abaya Woreda to the south and southwest (Dilla Zuria Woreda Administration Office, 2012).

The 2007 census indicates that Dilla Zuria Woreda has a total population of 117,630 of which 58,522 (49.75) are males and 59,108 (50.25%) are females. The population density of the Woreda is 702 persons per km² at a national growth rate of 1.07 percent. Seventy four percent of the population in the Woreda is the Gedeo people (Dilla Zuria Woreda Administration Office, 2012).

According to the woreda Agriculture and Rural Development Office data, agricultural sector is the dominant means of livelihood for the majority of the people in the district. Out of the total of 24,790 hectares of land in the Woreda, 22,871 hectares are known to have potential for agriculture. Annual crops cover 5.03 percent; perennial crops 84.77 percent, uncultivable land 0.65 percent and others are 3.52 percent. It has three main agro-climatic zones with the topography ranging from wide flat valley bottoms to steep mountain slopes. The rainfall distribution of the study area is bimodal. The main rainy season is from June to September ('Kiremt' or Mahar') and the short rainy season is from February to April ('Belg'). The average annual rainfall is 1077.20 mm and, the annual average temperature of the Woreda is 20°C (Dilla Zuria Woreda Agriculture and Rural Development Office, 2012).

3.2 Data Type and Data Sources

Both primary and secondary data sources were used for this study. The primary data were collected from sample households. Secondary information from both published and unpublished was collected from relevant institutions and individuals. Bureau of Agricultural and Rural Development, South National Regional State Finance and Economic Development, and other related bureaus, offices, officials and development agents were consulted for secondary information.

3.3 Method of data collection

Primary data was collected from sampled rural households through structured interview scheduling. In this study, two stage sampling procedure were used. At the first stage, 18 PAs were divided into two groups on the basis of distance: those residing nearby and those living farther out, by using cluster sampling. From the clustered 18PAs, 2PAs from long distance location and 2PAs from nearby area were selected using random sampling.

In the second stage, probability proportional to size sampling technique was employed to draw sample households from the selected sample four Pas. A total of 150 households were selected. A structured survey interview schedule was pre-tested to collect the data. For the purpose, enumerators who have completed grade ten and able to understand the local language were recruited and trained before the pretest.

3.4. Method of Data Analysis

Food security at household level is best measured by the direct survey of dietary intake (in comparison with appropriate adequacy norms). The level of, and changes in, socio economic and demographic variables can be properly analyzed, and can serve as proxies to indicate the status of and changes in food security (Von Braun *et al*, 1992).

Food security at the household level is measured by direct survey of income, expenditure, and consumption and comparing it with the minimum subsistence requirement. In this regard, income and expenses are used to compute the status of food security. The minimum level of income, which is required per adult equivalent, was calculated on the basis of amount of food required by an adult person. The government of Ethiopia has set the minimum acceptable weighted average food requirement per person per day at 2100 kilo calorie (FDRE, 1996; cited in Ayalneh, 2009), which is estimated to be 225 kg of food (grain equivalent) per person per year. Consequently, a threshold level was set by computing the value of this amount of cereal by the existing local market price of grain. Thus, those households beyond this thresholds level were deemed to be food secured otherwise not food secured. This study used total household expenditure per adult equivalent to compute proxy indicator of food security. This indicator is chosen because of the fact that consumers normally minimize their incomes than their total expenditure. It includes the sum of own produce consumed, purchased (crops and livestock products) for consumption, expenses on clothing, education, medical care, taxes, social obligation, household utensils, transport costs and other expenses. The actual expenditure per adult equivalent per annum was computed by summing up all the required expenditure components of the household and dividing it by the total adult equivalent of the household for each household.

On the other side, subsistence level of household expenditure or minimum level of income which meets at least the needs of adult person was calculated based on the amount of food required. For this study, the minimum level of income was taken as livelihood protection threshold. The **livelihoods protection threshold** represents the total income required to sustain local livelihoods. This is the line below which an intervention is required to maintain existing livelihood assets and strategies. In practice, this means a) enough income to ensure basic survival, b) maintain access to basic services (e.g. routine medical and schooling expenses), c) sustain livelihoods in the medium to longer term (e.g. regular purchases of seeds, fertilizer, veterinary drugs, etc.), and d) achieve a minimum locally acceptable standard of living (e.g. purchase of sugar, coffee/tea, pepper etc.).

Having identified the food insecure and food secured groups of households, the next step was to identify the socio economic characteristics that were correlated with the food insecurity. In light of this, it is hypothesized that there are some household characteristics like household size, income, household head educational level, etc that will have relative importance in determining whether the households are food secured or not. To estimate food insecurity gap and its severity Foster Greer Thorbecke (FGT) model was used:-

$$P(\alpha) = \left(\frac{1}{n}\right) \sum_{i=1}^q \left[\frac{Z - Y_i}{Z}\right]^\alpha$$

Where, α is greater than or equal to zero.

n : is the number of sample households

y_i : is the measure of poverty (measure of average per capita food calorie in take/US\$1)

for the i^{th} household;

Z : is the cut point between poor and non-poor

q : is the number of poor households; and

α : is the weight attached to the severity of poverty

In order to test the hypothesis a probabilistic model was specified with food security as a function of series of household characteristics as explanatory variables. The dependent variable in this case is dummy variable, which takes a value of zero or one depending on whether or not a household is food insecure. Thus, the main purpose of a qualitative choice model was to determine the probability that an individual with a given set of attribute will fall in one choice.

Regression models in which the dependent is dichotomous could be estimated by linear probability model (LPM), logit or probit models. Although linear probability model is the simplest method, it is not logically attractive model in that it assumes that the conditional probability increases linearly with the value of explanatory variables. Unlike linear probability model, logit model guarantees that the estimated probabilities increase but never steps outside

the 0 – 1 interval and the relationship between probability (P_i) and explanatory variable (X_i) is nonlinear (Gujarati, 1995).

Usually a choice has to be made between logit and probit models, but as Amemiya (1981) has pointed out, the statistical similarities between the two models make such a choice difficult. However, Maddala (1983) and Kmenta (1986) indicated that many authors tend to agree in that the logistic and cumulative normal functions are very close in the mid range, but the logistic function has slightly heavier tails than the cumulative normal distributions.

Gujarati (1995) Pindyek and Rubinfeld (1981) also illustrated that the logistic and probit formulations are quite comparable, the main difference being that the former has slightly flatter tails, that is, the normal curve approaches the axis more quickly than the logistic curve. Therefore, the choice between the two is one of convenience and ready availability of computer programmers'. Hosmer and Lemeshew (1989) pointed out that a logistic distribution has got advantage over the others in the analysis of dichotomous outcome variable in that it is extremely flexible and easily used model from mathematical point of view and results in meaningful interpretation.

Thus, a logistic model was specified to identify the determinants of food insecurity and to assess their relative importance in determining the probability of being in a food insecure situation at household level. The analysis of the logistic regression model will show that changing an independent variable alters the probability that a given individual becomes food secure, and will help to predict the probability of achieving food security.

Following Gujarati (1995), the functional form of logit model is specified as follows:

$$P_i = E(y=1 / x_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_i)}}$$

For ease of exposition, we write

$$P_i = \frac{1}{1+e^{-Z_i}} \quad (2)$$

The probability that a given household is food insecure is expressed by (2) while, the probability for not food insecure is:-

$$1-P_i = \frac{1}{1+e^{Z_i}} \quad (3)$$

Therefore we can write:-

$$\frac{P_i}{1-P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} \quad (4)$$

Now $(P_i/1-P_i)$ is simply the odds ratio in favor of food insecurity. The ratio of the probability that a household will be food insecure to the probability of that it will not be food insecure.

Finally, taking the natural log of equation (4) we obtain:-

$$L_i = \ln \left[\frac{P_i}{1-P_i} \right] = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (5)$$

Where P_i = is a probability of being food insecure ranges from 0 to 1

Z_i = is a function of n explanatory variables (x) which is also expressed as:-

$$Z_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_n X_{ni}$$

6

β_0 is an intercept

$\beta_1, \beta_2, \dots, \beta_n$ are slopes of the equation in the model

L_i = is log of the odds ratio, which is not only linear in X_i but also linear in the parameters.

X_i = is vector of relevant household characteristics

If the disturbance term (U_i) is introduced, the logit model becomes

$$Z_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_n X_{ni} + U_i$$

7

The logit model cannot be estimated by the usual ordinary least square (OLS) method because to apply OLS we must know the value of the dependent variable $\ln(P_i / 1 - P_i)$, which obviously not known and moreover the methods of OLS doesn't make any assumptions about the probabilistic nature of the disturbance term. If there is data on individual observations the method of maximum likelihood can be used to estimate the coefficients of the equation (Gujarati, 1999).

It needs to be clarified that prior to the estimation of the logistic regression model, the explanatory variables are checked for the existence of multicollinearity. In this study among the

other methods Variance Inflation Factor (VIF) is used to measure the degree of linear relationships among the continuous explanatory variables. Where each continuous explanatory variable is regressed on all the other continuous explanatory variables and coefficient of determination for each axillaries or subsidiary regression will be computed.

Following Gujarati (1995), VIF is defined as:

$$VIF (X_j) = \left(\frac{1}{1 - R_j^2} \right)$$

8

Where:

X_j = the j^{th} quantitative explanatory variable regressed on the other quantitative explanatory variables.

R_j^2 = the coefficient of determination when the variable X_j regressed on the remaining explanatory variables.

As a rule of thumb, if the VIF of a variable exceeds 10 that variable is said to be highly collinear and it can be concluded that multi colinarity is a problem (Gujarati, 1995).

It is also evident that there might be interaction among qualitative variables, which could lead to the problem of multicollinearity. To detect this problem, contingency coefficients are computed for each pair of qualitative variables.

The contingency coefficients are computed as follows:

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}}$$

9

Where, C= coefficient of contingency, χ^2 = a Chi-square random variable and n = total sample size.

3.5 Definition of Variables and Hypothesis

The literature on the determinants of household food insecurity makes it clear that the choice of dependent and independent variables have been identified by different researchers, international and national development organizations. This section describes the variables used in the econometric analysis. Dietary intake is used as a proxy to measure household food security status. Households consume a variety of food, mainly from purchase that are converted in to their calories using ENHRI food composition table for use in Ethiopia (1998).

Household food insecurity (HFINS): It is a dichotomous dependent variable in the model taking value of 1 if a household is food insecure and 0 otherwise. Food security status of a household is identified by comparing total kilocalorie consumed in a household per adult equivalent per day with daily minimum requirement of 2100 kcal and those getting 2100kcal and above is food secure and food insecure otherwise.

Independent variables: Household socio-economic characteristics such as household size, sex of household head, marital status of head, educational status of household head, dependency ratio, and access to credit, ownership of saving account, daily income per adult equivalent, and proportion of food expenditure are selected variables for the model analysis.

Demographic variables

Household size (HSZEAE): An increase in household size implies more mouth to be fed from the limited resources and especially in male dominant household the situation becomes more than this due to high possibility of accustoming to bad habits. As a result in this study, the household size and status of food insecurity was expected to be related positively.

Sex of household head (HHSX): HHSX is a dummy variable taking a value of 1 if male and 0 otherwise. Household head is a person who economically supports or manages the household or for some reason of age or respect is considered as head by other members of the household It could be male or a female. There is no generally accepted relationship between sex of household head and level of food security. In the study area where females are actively engaged in various activities as compared to males, it was hypothesized that households with female head and food insecurity were related negatively.

Education level of household head (EDUSTHH): Education level is important for gauging income earning potential of a household which has significant influence on consumption behavior of the household. Education is a dummy variable taking a value of 1 if household head is literate and 0 otherwise. Educational level of household head and food insecurity were expected to be related negatively.

Dependency ratio (DEPNDRTO): Household members aged below 15 and above 64 are considered as dependent and dividing it by household members whose age is between 15 – 64 resulted in dependency ratio. These groups are economically inactive and burden to the other

member of the household. It was hypothesized that dependency ratio and food insecurity were positively related.

Cultivated land size (CLU): farm land owned by the household plays a great role in determining food security positively. This variable is a continuous variable measured in hectare. It is one of the livelihood assets that are used for the production of food for consumption and ensuring household entitlement to food. Households with relatively higher size of cultivated land can better access to food. Therefore, it was hypothesized that the larger the size of land the household owns the less the chance to be food insecure.

Institutional variables

Access to and utilization of agricultural information (ATUAI): Frequently getting agricultural information well and utilizing it will create good condition for the decision of the farmer in order to be food secured. Information is a good tool to boost production. Therefore, this variable was expected to influence the food security situation of the study area positively.

Access to credit (HGTCRDT): It is a dummy variable taking a value of 1 if household received credit and 0 otherwise. Credit serves as a means to be involved in income generating activities and to reap derived benefit based on the amount and purpose of credit. It also normalizes consumption at hard time. Thus, access and getting credit was negatively related with food insecurity.

Safety net program (SFP): This variable refers to households who will get service or support from safety net program. Safety net program is one of the most important services which is given

by the government for the households who are vulnerable to food insecurity. Therefore it was hypothesized that household safety net program enhance the probability of being food secured.

Socio-economic variables

Owning saving account (HSAVACC): It is a dummy variable taking a value of 1 if a household has bank account or maintains credit and saving association and 0 otherwise. Owning saving account or maintaining credit and saving association was hypothesized to be negatively related to food insecurity.

Daily income (DYINC): One of the major determinants of household food insecurity is income of a household. Total amount of daily income in Birr from different source is computed and the higher the level the lesser the likelihood of household become food insecure. Income was hypothesized to be negatively related with food insecurity status of the household.

Livestock owned (LO): This variable refers to the total number of livestock owned by the household. Livestock have got multiple benefit providing draft power, manure, income from sale of milk, butter, and sale of live animals in times of risk to buy necessities. As reported by Escobal (2001), the ownership of assets like cattle increase the share of own farm income in total household income. A household which has more number of livestock can be easily food secured than the one which haven't. This variable was expected to influence the food security situation positively.

4. RESULTS AND DISCUSSION

Study results are presented in two categories as a descriptive and econometric model analysis of the survey data. Descriptive statistics such as mean, standard deviation, percentage and frequency distribution were employed and binary logistic, econometric model was used to identify determinants of food insecurity at household level. Dimensions of household food insecurity, in terms of extent and severity, were computed by using an FGT index.

4.1 Measuring the food-insecurity status of the households

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 (Appendix 2 & 3).

Data on available food for consumption, from purchase and /or stock, for the last seven days 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, 86 sample households were found to be unable to meet the minimum subsistence requirement and only 64 households were found to meet their energy requirement. In other words 57.3 percent and 42.7 percent of the sample households were food insecure and food secure, respectively.

4.2. Demographic and Socio-Economic Characteristics

Socio -economic characteristics of sample households by age, sex, household size, and education level were summarized in relation to the food security status at household level. Possible explanations on factors supposed to have contribution on household food insecurity are also presented from analyses of model output.

4.2.1. Age and sex composition

The summary of basic household characteristics for the 150 sample households indicated a total size of household members of 988 people where females accounted for about 543 (55%). Percentage of male and female in each category followed similar pattern where age group of 15 – 25 are found to be the largest. Age group of the sample household showed children aged 0 – 14 consisted 23 percent, age group 15 – 64, 74 percent and old age above 64 years of age amounted to 3 percent. Over all dependency ratio, defined as the ratio of people aged 0 – 14 and above 64 divided by those people aged 15 – 64, was 0.35 (Table 1).

Table 1. Characteristics of household by age and sex

Age Group	Male (N= 445)	Female (N= 543)	Total (N = 988)
	Percent	Percent	Percent
0 – 7	6.5	9.21	8
8 – 14	18.2	12.52	15.1
15 – 25	34.8	35.73	35.3
26 – 45	27	28.36	27.7
46 – 64	0.6	11.05	10.8
Above 64	2.9	3.13	3
Total	100	100	100

Source: Survey result 2011

4.2.2. Characteristics of household by headship

Female as household head comprise 30 percent of sample households while, the majority that is 70 percent, were male - headed households. Mean number of household size, age of household head in years and number of adult equivalent of sample households were found to be 4.94, 45.94, and 4.09, respectively. Mean family size and adult equivalent were found to be higher in male-headed households whereas mean household head age and dependency ratio were higher in female- headed sample households. Fifty three percent of male-headed households had household size number below seven, while 25 percent of female- headed households had the same size of households. Seventeen percent of male - headed households had more than six members, whereas only 5 percent of female - headed households had family size of more than six. Male- headed households in each group had greater percentage of family size (Table 2).

Table 2. Descriptive characteristics of households by headship

Characteristics	All households	Male- headed household	Female- headed household
Mean household size	4.94	5.10	4.55
Mean age of head	45.94	45.72	46.43
Dependency ratio	0.35	0.34	0.37
Adult equivalent	4.09	4.25	3.72
HH size group			

1 – 2 persons	17 (11)	9 (6)	8 (5)
3 – 4 persons	51 (34)	34 (23)	16 (11)
5 - 6 persons	50 (33)	36 (24)	14 (9.3)
7 – 8 persons	25 (17)	20 (13)	5 (3.3)
More than 8	7 (5)	6(4)	2 (1.3)
<hr/>			
Total	150 (100)	105 (70)	45(30)
<hr/>			

Figures in bracket are percentage

Source: Survey result 2011

4.2.3. Family size

It is hypothesized that family size has positive relationship with food insecurity status of a household. The survey result revealed that 33.3 percent of food secure households have family size of 1 – 3 persons whereas only 15.1 percent of food insecure households have the same family size. About 26.8 percent of food insecure and 18.4 percent of food secure households have family size of more than six persons. Households with larger family size were more likely to be at risk of becoming food insecure. The survey result indicated that there is a significant difference in mean family size at less than 5 percent probability level between food secure and food insecure sample households. The mean household size for food insecure and food secure

households was found to be 5.43 and 4.55 respectively. The minimum and maximum family size of sample households is 1 and 12 persons (Table 3).

Table 3. Household food security status and family size

Family size	food security (N=64)	food insecurity (N=86)	Total (150)
<u>group</u>	<u>percent</u>	<u>percent</u>	<u>percent</u>
1-3	33.3	15.1	25.5
4-6	48.8	58.1	52.5
7-9	17.0	-22.1	19.5
>10	0.9	4.7	2.5
<u>Total</u>	<u>100</u>	<u>100</u>	<u>100</u>
Mean	4.55	5.43	4.94
SD	1.98	2.24	2.12
Minimum			1
<u>Maximum</u>			<u>12</u>
<u>t-value</u>	<u>2.933**</u>		

**significant at less than 5 percent probability level

Source: survey result 2011

Family size in terms of adult equivalent (AE) and food insecurity are related positively. The number of adult equivalent within the household does not necessarily imply job opportunity or access to income and the same was reflected on the survey result. Households having less than 3.51 adult equivalents constituted 54.4 percent of food secure and 29 percent of food insecure households. Similarly 55.8 percent of food insecure and 34.2 percent of food secure households have AE within a range of 3.51 – 6 (Table 4).

A significant mean difference of adult equivalent was revealed from survey result between the two groups at probability level of less than one percent. Though, adult equivalent and family size explain similar household characteristics, difference of significance level was observed due to

family composition in terms of age and sex. The mean household adult equivalent for food insecure and food secure households were 4.51 and 3.77 respectively (Table 7). This implies that unless households with higher AE are supported by better income levels, the vulnerability to food insecurity becomes more serious.

Table4. Household food security status and adult equivalent

AE group	food secured (N=64) percent	food insecured (N=86) percent	Total (150) percent
≤3.50	54.4	29.0	43.5
3.51-6.00	34.2	55.8	43.5
6.01-8.50	11.4	10.5	11.0
>8.50	0	4.7	2
Total	100	100	100
Mean	3.77	4.51	4.09
SD	1.68	1.89	1.81
Minimum			0.75
Maximum			10.3
t-value	2.832***		

***significant at less than 1 percent probability level

Source: survey result 2011

4.2.4. Sex of household head

Sex of household head was hypothesized to be one of the variables that make a difference on the level of food security. Female- headed households accounted for about 30 percent of the sample households. The survey result indicated that 30.2 percent of food- insecured households were female- headed whereas, the corresponding figure for male- headed households was 69.8 percent. Male headed households comprise 70.2 percent of food- secured and the remaining 29.8

percent food secure are female headed households. The survey result showed no significant difference ($p > 0.10$) on food security status of household in terms of sex of the household head. Female- headed households had 4.55 mean household sizes and 5.10 for male headed households (Table 5).

Table 5 Food security status by sex of household

Household Head	Food-secured (N=64)	Food- insecure (N=86)	Total (150)	χ^2
	Percent	Percent	Percent	
Male	70.2	69.8	70	0.004
Female	29.8	30.2	30	
Total	100	100	100	

Source: survey result 2011

4.3 Education level of household head

Since education equips individuals with the necessary knowledge of how to make a living, education promotes awareness about the possible advantage of modernizing agriculture and diversifying household income sources. On this basis, it was expected that educated household heads are unlikely to be food insecure. As the finding of the research indicates, 80.2% of the sample households were illiterate and 10.2% were able to read and write. This clearly shows that the educational status of the farming households in the study area was very low. About 9% of food- insecure and 11.5% food- secured households had formal education, i.e., from grade 1 up to 7. The Chi-square test result of the study showed that educational status of household heads in the study area has no significant influence on food security status of the households (Table 6).

Table 6. Educational status of sample households

Education level	Food- insecure		Food- secured		Total		χ^2	p-value
	No.	%	No.	%	No.	%		
Illiterate	68	79	52	81.3	120	80.2	5.705	0.222
Reading and writing	12	14	4	6.3	16	10.2		
1-4 grades	2	2.3	4	6.3	6	4.3		
5-6 grades	4	4.7	2	3.1	6	3.9		
> or = 7 grades	0	0	2	3.1	2	1.6		

Source: survey result 2011

4.4 Cultivated land size

Crop production requires primarily the availability of suitable cultivable land. The total cultivated land size of sample households ranged from 0.25 to 3.50 ha. The average land size of the respondents was 1.32 ha with standard deviation of 0.56 ha. This average cultivated land size is below the national average of 1.53 ha, which is said to be sufficient to produce household food requirement. As indicated in the Table 7, 71.1% of the respondents have a farm size of less than 1.53 ha. The mean comparison of two groups in terms of mean cultivated land size revealed that there is significant difference between food- secured and insecure households, which was 1.47 ha for food- secured and 1.24 ha for food- insecure households (Table7). Their mean difference was 0.23 ha and is significant at less than 5% probability level. This result supports the hypothesis that farmers who have larger cultivated land area are more likely to be food- secured than those with smaller land area due to the fact that there is high possibility to produce more food.

Table7. Distribution of sample farmers by cultivated land size

Land size in ha	food- secured (N=64)		food- insecured (N=86)		Total (150)	
	No	%	No	%	No	%
0.25-1.00	17	26.6	31	36.0	48	31.3
1.01-1.50	24	37.5	36	42.0	60	39.8
1.51-2.00	11	13.0	26	18.2	37	15.6
2.01-3.50	8	12.5	8	9.0	16	10.6
Mean	1.236		1.465		1.318	
SD	0.544		0.564		0.56	
Minimum					0.25	
Maximum					3.50	
Sum					184.59	
t-value					- 2.357**	

**significant at less than 5 percent probability level

Source: survey result 2011

4.5 Access to various services

Proximity to the different social services such as schools, human and livestock clinics, agricultural extension services, flourmills, all weather roads and drinking water has significant effect on food- security. Therefore, it was hypothesized that the nearer to the various services the better probability of being food- secured. The overall average distance of different social services was 36.17 km, with standard deviation of 11.59 km (Table 8). The mean difference between food- secured and food- insecured households was 1.54km, which was not statistically significant.

Table 8: Distribution of households by distance to different services (in km)

Distance in km	food- secured (N=64)		food- insecure (N=86)		Total (150)	
	No	%	No	%	No	%
18.24 – 27.35	15	23	24	28	39	25.5
27.36 – 33.29	16	25	18	20	34	22.4
33.30 – 42.94	19	30	23	26.8	42	28.4
42.95 – 63.80	14	22	21	24.2	35	23.1
Mean	36.73		35.19		36.17	
SD	12.26		10.29		11.59	
MD	1.54					
Minimum					18	
Maximum					63.80	
t-value	0.752					

Source: survey result 2011

4.6. Credit

Credit service improves food security status of households through purchase of agricultural inputs like improved seed and chemical fertilizers. In the study area, credit services were available for production purposes. However, 85.5 percent of the respondents were not participating in the credit service. Many farmers were reluctant to use credit for purchase of fertilizers, as it was very expensive and may lead to indebtedness. The mean amount of formal credit received by the two groups of households was too small to have a noticeable effect on food security. It was hypothesized that households who are willing to participate in credit service can improve their income status through performing different activities with the loan acquired and hence improve their food security condition. The result revealed that there was no

statistically significant difference in the mean amount of credit received by the two sample household groups (Table 9).

Table 9: Distribution of sample households by amount of credit received in Birr

Amount of credit In Birr	food- secured (N=64)		food- insecure (N=86)		Total (150)	
	No	%	No	%	No	%
0	51	80	78	91	- 129	85.50
10-139	9	14	2	2.0	11	3.00
140-350	0	0	5	5.9	5	2.95
351-840	4	6	-1	1.1	5	3.55
Mean	23.71		34.01		27.30	
SD	105.36		89.39		99.75	
MD	10.30					
Minimum					0	
Maximum					840	
Sum					3834	
t-value	-0.584					

Source: survey result 2011

4.7 Remittance, Gift and Safety net

In this study, remittance refers not only to economic support from relatives at the time of hardship but also to the blessing and strengthening the family tie. On the other side, productive safety- net programme provides financial assistance, sometimes when households run out of their own produce and further more creating opportunity. Currently the aid is supplied either in the form of cash or kind through participation in the productive activities, named, productive safety net, after realizing the link between remittance and dependency syndrome, until they assure their

food security status. According to this survey, 70 of the sample households (26 food- secured and 44 food- insecure) received from Birr 150- 850. Out of the total sample households, 46 (21 food- secured and 25 food- insecure) respondents have received more than Birr 850.00; the remaining 41 sample households did not earn any income on remittances, gifts and aids. Of the food- secured categories 26 sample households received Birr 150-850 and 21 sample households received greater than Birr 850.00. On the other side, 44 and 25 food- insecure sample households had received the above mentioned amount of Birr, respectively. The majority of households were with consumption deficit, GO/NGO and productive safety net has been the only source for these households to depend upon (Table 10).

Table 10: Distribution of sample households by remittances, gifts and aids earned

Money earned in Birr	food- secured (N=64)		food- insecure (N=86)		Total (150)	
	No	%	No	%	No	%
<150	17	26.56	17	19.76	34	22.66
150-850	26	40.62	44	51.16	70	46.66
>850	21	32.81	25	29.06	46	30.66
Mean	854.69		830.23		840.67	
SD	767.12		718.99		740.01	
Minimum					0	
Maximum					3000	
t-value	0.852					

Source: survey result 2011

4.8 Household income sources and level

For the purpose of this study, income sources of sampled households include agriculture, alcohol trade, monthly salary, livestock trade, pensions, daily wage, gift and remittance and other sources. The monthly income of sampled households have -revealed that the share of income comprises, agriculture (38.7), livestock trade (30.84%), gift and remittance (22.36%), pensions

(2.10%), monthly salary (2.04%), alcohol trade (0.17%), and other sources (1.24%). The mean income level of sampled households was found to be Birr 1654.98 with standard deviation of 2680.19. The minimum and maximum monthly income of respondents was Birr 20.00 and 26,250.00 respectively (Table 11).

Table11: Household income sources and level of revenues of sample respondents

Source of income	Total monthly income(Birr)	Percent
Agriculture	128,116	38.7
Alcohol trade	564	0.17
Monthly salary	6735	2.04
Livestock trade	102090	30.84
Pension	6935	2.1
Daily wage	8410	2.54
Gift and remittance	74,026	22.36
Others	4120	1.24
Total	330,996	100
Mean	1654.98	
SD	2,680.19	

Source: Survey result, 2011

4.8.1. Household food security status by number of income source

The sampled households reported that 64% of them were engaged in one to two income generating activities. Diversifying income sources are important to reduce risk in rural economic environment especially for low income groups. The average number of income generating activities or sources per household for the whole sample respondents was 2.3. The corresponding figure for food- secured and food- insecure was 2.16 and 2.5, respectively. The reasons for higher mean of income sources for food- insecure households might be associated with type of activity households had been engaged and insufficiency of income to cover households food and non- food expenditure.

Table12: Households food- security status by number of income source

Number of income	food- secured (N=64)	food- insecure (N=86)	Total (150)
<u>Sources</u>			
Sources	percent	percent	percent
1-2	71.0	54.7	64
3-4	24.6	-37.2	30
5-6	-4.4	- 8.1	6
Total	-100	-100	100
Mean	2.16	2.50	4.09
SD	1.27	1.22	1.57
t-value	2.096*		

*significant at less than 10 percent probability level

Source: survey result, 2011

It was hypothesized that number of income sources and food insecurity were related negatively. Households with income source of 1 – 2, 3 – 4, and 5 – 6, accounted for about 54.7, 37.2 and 8.1 percent of the food insecure groups, whereas, 71 percent of food secure households earn their income from one to two sources. Within food insecure group, the higher the number of income sources, the lower the percentage of food insecure households. The number of income source exhibited a significant mean difference at less than 10 percent probability level between the two groups (Table 12).

4.8.2. Household food security and daily income per adult equivalent

Daily income per adult equivalent (AE) was hypothesized to have negative relationship with household food insecurity. Households with daily income per AE of less than or equal to Birr 4, 4.01 – 8, 8.01 – 12, 12.01 – 16, 16.01 – 20 and above 20 comprised 25.5, 23, 21, 9, 6.5 and 15

percent, respectively. However, 15.8 percent of food- secured and 38.4 percent of food- insecure households were earning a daily income per adult equivalent of Birr 4 or less. Hence, as daily income per AE increases, the percentage of food- insecure households exhibits a declining tendency. The mean daily income per adult equivalent of food- secured and food- insecure household were Birr 16.73 and 6.93, respectively. The survey result depicted a significant mean difference in daily income per adult equivalent at probability level of less than one percent between food- secured and food- insecure household group (Table 13).

Table 13: Household food security status by daily income per adult equivalent

Daily income per Adult equivalent	food- secured (N=64) Percent	food- insecure (N=86) Percent	Total Percent
≤ 4.00	15.79	38.37	25.5
4.01-8	18.42	29.07	23.0
8.01-12	21.93	19.77	21.0
12.01-16	11.40	5.81	9.0
16.01-20	7.89	4.65	6.5
≥20	24.56	2.33	15.0
Total	100	100	100
Mean	16.73	6.93	12.51
SD	18.80	6.30	15.54
t-value	5.188***		

*** Significant at less than one percent probability level

Source: survey result 2011

4.8.3. Household Food Security and Expenditure

Households usually allocate their income to meet food needs of their family. The sample households were asked on the quantity and value of food consumed and then annual food expenditure was computed.

Table14: Annual food expenditure of households

Expenditure type	Total annual Expenditure(in kg)	Percent
Cereals	222,918.72	19.08
Vegetables	152,553.00	13.06
Pulse	41,284.20	2.40
Enset	28,036.80	3.53
Prepared food	211,952.52	18.14
livestock products	294,508.20	25.21
Other food items	216,828.96	18.56
Total	1,168,082.40	100
Mean	7,787.20	

Source: Survey result, 2011

The average annual household expenditure on food expenditure for sampled households was Birr 7787.20, with a total of 1716.75 Birr per AE. The minimum and maximum annual food expenditure was Birr 270 and 32,549.04, respectively, whereas for non – food expenditure the minimum was Birr 118.20 and the maximum was Birr 53,832.00 (Table 14).

The mean food budget share of sample households had indicated that cereals, vegetables, pulses, enset, prepared food, livestock and other accounts for about 19, 13, 3.53, 2.4, 18.14, 25 and 18.56 percent of food expenditure, respectively. Non - food expenditure of sample household consist outlays on clothings (6.36%), agricultural input (22.8%), water and energy and regular

expenditure (16.4%), medical care and education (9.64%), communication and transportation (17.29%), and annual and occasional expenditure (27.77%).

4.8.4. Daily food expenditure per adult equivalent

The mean daily food expenditure per AE of the whole sample respondents was Birr 4.04 and for food- secured and food- insecure households the figure was 5.12 and 2.60, respectively. Households with daily food expenditure per AE of less than Birr 4.51 comprised 88.4 percent of food- insecure and 47.4 percent for food- secured households. On the other hand, among food- insecure, who had spent more than eight Birr, constituted only 1.16 percent while the corresponding figure was 12.28 percent for food- secured households. As the amount of daily food expenditure per AE increases significant level of difference was observed between the two groups. The result of the survey suggested a significant mean difference in daily food expenditure per AE at less than one percent significant level ($p < 0.01$) between the two groups (Table 15).

Table15: Household food security status by daily food expenditure

Daily food expenditure	food security (N=64)	food insecurity (N=86)	Total (150)
	Percent	Percent	Percent
≤ 4.50	47.37	88.37	65.0
4.51-8.00	40.35	10.47	27.5
8.01-11.50	8.77	1.16	5.5
11.51-15.00	2.63	0.00	1.5
≥ 15.01	0.88	0.00	0.5
Total	100	100	100
Mean	5.12	2.60	4.04
SD	2.61	1.53	2.54
t-value	-8.538***		

*** Significant at less than one percent probability level

Source: survey result 2011

4.8.5. Household food consumption

This study measured household food security in terms of adequacy of daily kcal consumption per adult equivalent. Sampled households reported that over 22 food items were used for consumption and for the purpose of this paper they are categorized in to seven food types just to indicate the contribution of each group to total kcal consumption. The most commonly consumed foods were barely, sorghum, wheat, livestock products, vegetables, sugar and others.

In general the sampled households derive their calorie intake from cereals (44.11%), vegetables (7.07%), prepared food (15.87%), pulses (5.6%), fruit (1.1%), livestock product (4.86%) and others which includes sugar, salt, oil and others (21.38%).

4.9. Extent and Incidence of Food Insecurity

The quantitative measures of poverty index developed by FGT and recently employed by Hoddinot (2001) and others in food security study are head count ratio, food insecurity gap and severity of food insecurity. The three measures vary with the weight attached to severity of food insecurity. Based on food energy intake at household level, head count ratio or incidence of food insecurity indicates the percentage of households who fall below the predetermined kcal amount. Though head count ratio is simple to compute and interpret, it is insensitive to differences in depth of food insecurity.

The second index, food insecurity gap, measures the aggregate food insecurity deficit of the food insecure population relative to the recommended caloric requirement i.e. it reflects total kcal deficit of all household below the subsistence energy requirement level. It can also be interpreted as a potential indicator of eliminating food insecurity by transferring required resources to food-insecure individuals. The drawback of this measure is that it doesn't capture the difference in

severity of food insecurity among the poor. The last index that measures the mean of squared proportional shortfalls from the cut off points is known as severity of food insecurity. The problem with this measure is that it is not easy to interpret.

4.9.1. Extent and severity of food insecurity in the study area

The results of the survey had revealed that the head count ratio or incidence of food insecurity are 0.57 which implies 57 percent of the sampled households cannot meet the daily recommended caloric requirement.

To determine how far the food insecure households are below the recommended daily caloric requirement, food insecurity gap was calculated. Food insecurity gap provides the possibility to estimate resources required to eliminate food insecurity through proper targeting. The calculated value for food insecurity gap was found to be 0.13. This indicates that if the woreda mobilizes and distributes resources that can meet 13 percent of caloric need of every food insecure households and distribute to each household to bring up to the recommended daily caloric requirement level, then theoretically food insecurity can be eliminated. It means that assuming sampled households are representative there were about 23,811 households with 97,387 adult equivalents. Considering the daily recommended 2100 kcal per adult equivalent, a resource needed to push all households to daily subsistence requirement is estimated to be 26,586,651 kcal per day. Taking a Kg of cereal produce 3700 kcal, total amount of cereals needed per day becomes 71.86 quintals. This shows a requirement of 26,078.9 quintals of cereal or equivalent amount of money to purchase 26,078.9 quintals of grain to bring all households to obtain daily subsistence caloric energy in a year.

Finally, to approach the most food insecure sample households, severity of food insecurity was calculated by assigning a higher weight, $\alpha = 2$. Thus, the survey result indicated that the severity of food insecurity becomes 0.059.

4.9.2. Incidence of food insecurity and household characteristics

The incidences of the food insecurity with some household characteristics are depicted on Table 16. Food insecurity is more than three times less prevalent with households of less than or equal to three members as compared to those households with more than nine members. On the other hand, households with family size ranging from 7 to 9 have almost twice more incidence of food insecurity as compared to those having less or equal to three family members.

The prevalence of food insecurity decreases as household head education status improved i.e. literate household head has 51.3 percent prevalence of food insecurity and is higher for illiterates. Households with higher daily income per adult equivalent have much lower incidence of food insecurity than lower daily income per adult equivalent households. As indicated in Table 20 the incidence of food insecurity is four times lower for households who earned Birr 16.01 and above of daily income per adult equivalent than those with less than Birr 4.01.

The negative relations of food insecurity and access to credit revealed higher incidence for households who didn't get credit and had no saving account. The prevalence of food insecurity of households who had no saving account and didn't have access to credit was 73.6 and 58.5 percent, respectively.

Table16: Incidence of food insecurity

Characteristics	Household Grouping	Number of food insecure	Total household	Food insecurity incidence
Family size	1 – 3	13	38	34.2
	4 – 6	50	79	63.3
	7 – 9	19	29	65.5
	≥ 10	4	4	100
	Overall	86	150	57.3
				Education
	Illiterate	27	35	77.1
	Literate	59	115	51.3
	Overall	86	150	57.3
Owning saving account	No	53	72	73.6
	Yes	33	78	42.3
	Overall	86	150	57.3
Daily income per AE	≤ 4	33	38	86.8
	4.01 - 8.00	25	35	71.4
	8.01 - 12.00	17	32	53.1

	12.01 - 16.00	5	14	35.7
	≥ 16.01	6	31	19.3
	Overall	86	150	57.3
<hr/>				
Credit No	75	128	58.5	
	Yes	11	22	50.0
	Overall	86	150	57.3

Source: Survey

result

4.10. Household Coping Strategies

As indicated in various parts of the thesis so far, farmers in Dilla zuria wereda district have been affected by various biophysical and socio-economic problems which cause tremendous decline in crop yield, poor assets possession and population induced food insecurity. In the face of such adverse conditions, farmers in a vulnerable area, like Dilla zuria wereda, engage themselves in several activities in order to avoid food insecurity or used various local coping strategies to survive severe food crisis. Farmers were asked how they managed to minimize food supply shortages or how they can cope with food insecurity. The result of the interview and the responses of the farmers on actual activities and the local coping strategies practiced during food crisis by groups of sample farmers in Dilla zuria wereda has been outlined in Table 17.

The principal strategy used by significant number of sample farmers in Dilla zuria wereda district to reduce food supply shortfall includes, production diversification by allocating resources to crops of different production cycles (annual and perennials) and livestock rearing. This diversification has different objectives including production of various crop varieties, such as sweet potato, barely, maize, haricot been and potato during short rainy season to meet their subsistence needs.

Changing cropping system and cropping pattern enables farmers to produce food over several months of the year due to the different length of maturity time of various crops, while cash crops, such as coffee, chat and ground nut are grown for households cash need. The most commonly practiced coping strategies at household level that are sequentially used during the severe food crisis period, according to the responses of the farmers, consisted of giving more emphasis and increased shift of household activities to off-farm and non-farm jobs.

Accordingly, 66% of all respondent households were involved in wage employment. Even though, there is limited access to employment opportunity in the district, resource poor farmers work for wage in kind or cash. Livestock, besides their complimentary relationship with crop production, provide sound hedging against risk of food insecurity. To this effect, when food produced is fully consumed and or no cash reserve is available to purchase more of it, animal products and live animals were sold to purchase food for the household. Accordingly, among the sample households, 36% of all cases, 46.9% of food- secured and 27.90% of food- insecure households, were involved in sales of animals to acquire food whenever there is a shortfall in food supply. This mechanism is ranked as the second most important coping practice, followed by receiving relief food aid. The proportion of food- secured and food- insecure households who had received relief food aid during food supply shortage were 42.1% and 30.23%, respectively.

The survey results further revealed that households in the study area practice sale of household assets; migrating to other places and purchasing of less preferred and cheap crops. Among the sample households, 34.7% of all cases, 51.6% of food- secured and 22.1% of food- insecure households, practice sale of household assets; 32.7% of all cases, 21.9% of food- secured and 40.71% of food- insecure households were involved in purchasing less preferred and cheap crops.

The analyses of the coping strategies of the respondents have shown that, coping strategies have distinct patterns. All farmers were not equally vulnerable to food insecurity, they responded in different ways. Some households implement some coping strategies after all other options have been pursued and exhausted, while other households (especially those who are easily vulnerable) often collapse immediately and thus engaged in unusual activities. For instance, among the

sample households a few of them were found to have been practicing such critical coping mechanisms of vulnerable households. Only; 10% all cases respond to cope serious food crisis by eating wild crops. About 7.13% were receiving relief food aid assistance from the locally operating office. While 16% and 11.3% were involved in borrowing of grain or cash from others and sale of firewood in search of food and /or cash, respectively, almost every year. On the other hand the relatively better-off farmers did not use these strategies immediately after a crisis.

With respect to the period of severe food shortage, the largest proportion of farmers was reported to have severe food shortage during certain months of the year. About 40% of total farmers reported that they face serious food shortage during June to September, while 26.4% and 20.% of the total farmers reported that they face this problem during June to August and May to August respectively. Few farmers (4%) said that months between April to September are tough time for them in terms of food shortage. The remaining sample farmers mentioned one to two months as a period when food shortage reaches its highest peak. This implies that there is high seasonal variation with respect to the food supply shortage.

Finally, the local coping pattern and strategies practiced in the study areas suggests how most of the district's farmers were vulnerable and how food insecurity was serious. In this context, the factors like poor marketing infrastructure, lack of off-farm job opportunities, lack of irrigation support and lack of credit facilities aggravated food insecurity and made households more vulnerable. With increased vulnerability, farmers shift to the consumption of the cheapest, and less quality food items such as sweet potato, which is commonly used during risk of food insecurity, although, it is the poorest source of minimum nutrient intake. Accordingly, farmers who meet the minimum subsistence requirement, as per the basic definition of food security had better access to food and were not subject to the extreme adjustment mechanisms mentioned above.

Table 17: Types of Coping Strategies and proportion of farmers practicing them (%)

Strategies Practiced by Farmers	Food secure (N=64)		Food insecure (N=86)		Total (N=150)	
	number	Percent	Number	Percent	Number	percent
wage employment	50	78.12	49	57.00	99	66
sale of livestock	30	46.9	24	27.90	54	36
Received relief food aid	27	42.1	26	30.23	53	35.3
sale of fire wood	9	14.06	8	9.30	17	11.3
eating wild crops	6	9.37	9	10.5	15	10
migrating to other places	14	21.9	35	40.71	49	32.7
sale of household assets	33	51.6	19	22.1	52	34.7
borrowing of grain or cash from others	13	20.31	11	12.8	24	16
purchasing of less preferred and cheap crops	17	26.6	23	26.74	40	26.7
Reduce number and size of meals per day	4	6.25	7	8.13	11	7.33

Source: Survey result, 2011

4.11. Determinants of Food Insecurity

An econometric model, logistic regression, was employed to identify the determinants of household food insecurity. The variables included in the model were tested for the existence of multi collinearity, if any. Contingency coefficient and variance inflation factor (VIF) were used for multi collinearity test of dummy and continuous variables, respectively (Appendix 4 & 5).

Table18: Contingency coefficient value for dummy variables

Variables	HHSX	EDUSTHH	HGTCRDT	HSAVACC	ATUAI	SAFETYNET
HHSX	1					
EDUSTHH	0.367	1				
HGETCRDT	0.151	0.179	1			
HSAVACC	0.197	0.167	0.273	1		
ATUAI	0.037	0.094	0.071	0.006	1	
SAFETYNET	0.05	0	0.098	0.098	0.227	1

Source: Own computation

Contingency coefficient value ranges between 0 and 1, and as a rule of thumb variable with contingency coefficient below 0.75 shows weak association and value above it indicates strong association of variables.

The contingency coefficient for the dummy variables included in the model was less than 0.75 that didn't suggest multicollinearity to be a serious concern as depicted on Table 18.

As a rule of thumb continuous variable having variance inflation factor of less than 10 are believed to have no multicollinearity and those with VIF of above 10 are subjected to the problem and should be excluded from the model. The computational results of the variance inflation factor on Table 19 confirmed the non-existence of association between the variables and were included in the model.

Table19: Variance inflation factor of continuous variables

Variable	R ²	VIF
HSZE	0.003	1.00
DAYINCPAE	0.116	1.13
DEPNDRTO	0.055	1.05
PRPNFDEXPH	0.076	1.08
LANDCULT	0.564	1.77
TLU	0.537	2.16

Source: Own computation

In total, twelve independent variables were used for estimation. To identify determinants of food insecurity among hypothesized explanatory variables that are supposed to have influence on Dilla zuria wereda rural households, binary logit model was estimated using a statistical package known as SPSS version 11. Types, codes and definition of the variables and estimates of the logit model are presented on Table 20 and Table 21, respectively.

Table20: Types, codes and definition of variables in the model

Types	Codes	Definition
Dummy	HHSX	1, if household head is male; 0 otherwise
Dummy	EDUSTHH	1, if household head is literate; 0 otherwise
Dummy	HGTCRDT	1, if household got credit; 0 otherwise
Dummy	ATUAI	1, if household got agri. information; 0 otherwise
Dummy	HSAVACC	1, if household has saving account; 0 otherwise
Dummy	SAFETYNET	1, if household is a member; 0 otherwise
Continuous	HSZE	Household size in number
Continuous	DENPDRTO	Dependency ratio
Continuous	LANDCULT	Total cultivated land size
Continuous	DYINCPAE	Daily income per adult equivalent
Continuous	PRPNFDEX	Proportion of food expenditure
Continuous	TLU	Total Livestock holding in TLU

Table 21: The maximum likelihood estimates of the logit model

Variables	Coefficient	Wald - statistics	Odds ratio
HSZE	0.413	15.528***	1.512
HHSX	1.797	4.572**	6.033
EDUSTHH	-1.161	5.992**	0.313
DYINCPAE	-0.147	18.625***	0.863
LANDCULT	-1.472	3.327*	0.229
PRPNFDEX	-0.008	3.276*	0.992
HGTCRDT	-0.862	3.248*	0.422
TLU	-0.488	3.103*	0.614
ATUAI	-0.411	0.624	0.663
HSAVACC	-0.296	0.527	0.744
SAFTEYNET	-0.011	0.266	0.989
DEPNDRTO	-0.156	0.262	0.855
Constant	0.563		
Pearson Chi-square		66.673***	
-2 Log likelihood		206.653	
Sensitivity		69.8	

Specificity	78.9
Percent correctly predicted (Count R ²)	75
Sample size	150

*** significant at less than 1% probability level

** significant at less than 5% probability level

* significant at less than 10% probability level

Source: Model output

The likelihood ratio has a chi – square distribution and it is used for assessing the significance of logistic regression. Model chi – square provides the usual significance test for a logistic model i.e. it tests the null hypothesis that none of the independents are linearly related to the log odds of the dependent. It is an overall model test which doesn't assure every independent is significant. The result is significant at less than one percent probability level revealing that the null hypothesis that none of the independents are linearly related to the log odds of the dependent is rejected. Additionally, goodness of fit in logistic regression analysis is measured by count R² which works on the principle that if the predicted probability of the event is greater than 0.50 the event will occur otherwise the event will not occur. The model result show the correctly predicted percent of sample household is 75 percent which is greater than 0.50. The sensitivity, correctly predicted food insecure is 69.8 percent and that of specificity, correctly predicted food secure is 78.9 percent. This indicates that the model has estimated the food insecure and food secure correctly.

4.11.1. Explanation of significant independent variables

Twelve independent variables that are hypothesized to have influence on household food insecurity in the study area were included in the model, of which eight were found to be statistically significant even though the level of statistical significance for the independent variables included in the model was different for individual variable and the sign of the significant parameters were as expected. The model output revealed that household size (HSZE)

and daily income per adult equivalent (DYINCPAE) were significant at less than one percent probability level. Educational status (EDUSTHH) and sex of household head (HHSX) were found to be significant at less than 5 percent probability level and the rest three variables namely, household access to credit (HGTCRDT) and proportion of food expenditure (PRPNFDEX) were significant at less than ten percent probability level. The remaining two variables, namely overall dependency ratio (DEPNDRTO) and owning of saving account (HSAVACC) were not statistically significant.

In light of the above summarized model results possible explanation for each significant independent variable are given consecutively as follows:

Household size (HSZE): Given the strong positive relationship between household size and food insecurity already noted in the descriptive part, it is not surprising that the estimated parameters are positive and highly significant. This positive relationship shows that the odds ratio in favor of the probability of being food insecure increase with increase in household size. Other things remaining equal, the odds ratio in favor of food insecurity increases by a factor of 1.512 as household size increases by one. The possible reason is that with existing high rate of unemployment and less employment opportunity coupled with low rate of payment, an additional household member shares the limited resources that lead the household to become food insecure.

Sex of household head (HHSX): Sex of household head is significant at less than 5 percent probability level and positively related with household food insecurity. The result is in line with apriority expectations. Other things being equal, the odds ratio in favor of food insecurity increases by a factor of 6.033 as the household head becomes male. Possible reason is that female household head is more responsible and give due attention to their family and having a woman as head of household impacts higher caloric availability reflecting differences in spending priority between male and female headed households.

Educational status of household head (EDUSTHH): Although, educational status of other income earner household members have great importance, that of head plays a significant role in shaping household members by being exemplary and willing to invest on education. Holding other variables constant, negative relation of educational status of household head and the

dependent variable brought the odds ratio in favor of food insecurity to reduce by a factor of 0.313 as head of the household becomes literate. It is explained in terms of contribution of education on working efficiency, competency, diversify income, adopting technologies and becoming visionary in creating conducive environment to educate dependants with long term target to ensure better living condition than illiterate ones. Thus, being literate reduces the chance of becoming food insecure in the sample households.

Daily income per adult equivalent (DYINCPAE): The survey result showed a negative relation between daily income per adult equivalent and food insecurity and the coefficient is highly significant at less than one percent probability level. The odds ratio in favor of food insecurity, holding other variables constant, decreases by a factor of 0.863 as daily income per adult equivalent increases by one Birr. The result corresponds with the prior expectation and the possible explanation is that income determines purchasing power of the household with the prevailing price so that those households having higher daily income per adult equivalent are less likely to become food insecure than low income households.

Cultivated land size (LANDCULT): This variable has a negative influence on the probability of being food insecure in the study area. Land size owned by a household was found to have significantly affecting positively at a probability level of less than 10 percent. This implies that the probability of households being food secure increases as the size of cultivated land owned by the household increases. This agrees with the hypothesis that the larger the size of land the household owned, the less would be the chance of being food insecure than those households who own relatively lower size of farm land. This is due to the fact that those households who have large farm size can produce more crops which increases the probability of the HH being food secure. The interpretation of the result showed that if other things held constant, the odds ratio in favor of the probability of food insecurity decreases by a factor of 0.229 as the cultivated land size increases by one hectare.

Proportion of food expenditure (PRPNFDEX): Proportion of food expenditure spent by the household is significant at less than 10 percent probability level and related negatively with food insecurity. Under *ceterius paribus* condition, the odds ratio in favor of food insecurity decreases by a factor of 0.992 as proportion of food expenditure increases by one. As proportion of expenditure on food increases, access to food by household also increases to the amount needed

for household consumption. In situation where some covariant shocks for instance rise in price of food commodity happens increasing proportion on food expenditure helps to overcome the change and keep households in accessing needed food and it also leads to the consumption of better quality food.

Household access to credit (HGTCRDT): The results of the survey revealed that the variable under consideration is negatively related and significant at less than 10 percent probability level with food insecurity. Holding other things constant, the odds ratio in favor of food insecurity decreases by a factor of 0.422 as a household has access to credit. The possible explanation is that credit gives the household an opportunity to be involved in income generating activities so that derived revenue increases financial capacity and purchasing power of the household to escape from risk of food insecurity. Access to credit also smoothen consumption when household faces with hard time.

Livestock holding (TLU): The survey result showed a negative relation between livestock holding and food insecurity and the coefficient is highly significant at less than ten percent probability level. The odds ratio in favor of food insecurity, holding other variables constant, decreases by a factor of 0.614 as household's livestock holding in TLU increases by one. The result corresponds with the prior expectation and the possible explanation is that food insecurity is more severe among those rural households with little or no livestock. Generally speaking, the result corroborates the findings of many other authors who claim that livestock are important source of hedge against food insecurity. This is because the shock absorbing capacity of households is directly related to their livestock holding.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

In examining the food insecurity situation, at Dilla Zuria wereda some valuable information was obtained by identifying the determinants of food insecurity at household level.

The study at Dilla Zuria had indicated that, eight out of twelve variables, namely, household size, sex of household head, education of household head, daily income per adult equivalent, land cultivated, proportion of food expenditure, access to credit and total livestock holding were found to be determinants of household food insecurity.

The head count ratio had revealed that more than half of sampled households were food-insecure. Considering the daily recommended 2100 kcal per adult equivalent, an additional food resource is needed to bring all households to daily subsistence requirement.

This study has attempted to figure out the determinants of food insecurity as outlined above. However, in order to provide basic information on the patterns and determinants of rural food insecurity, the social, political and environmental dimensions, descriptive data on purchasing patterns of food insecure, specific characteristics that make rural poor more vulnerable to food insecurity demands future researchers' attention.

5.2. Recommendations

Possible policy recommendations that emanate from the results of the research study are presented as follows:

- Household size was found to be directly related with household food insecurity. The slow down of the Dilla zuria wereda business condition coupled with poor investment

performance has contributed to the deterioration of income generation capacity of food insecure households. With these scenario, having more household size aggravate the problem of meeting food, leave alone education, health and other non – food demands of household that will bring future return. So, action based awareness creation on the impacts of population growth at the family, community and national level should be strongly advocated that lead to reduction in fertility and lengthen birth spacing resulted in smaller household size. Moreover, development actors involved on population issue should encourage households having acceptable number of children through provision of special offer such as covering schooling cost, giving training and other related incentives.

- As income and food insecurity are negatively related on the model results, searching and providing productive technical skill that make trainees competitive on the current market and generate income should be sought and promoted. Additionally, budget allocated for food security programme are in use mostly for solving short term difficulties. So this budget should also be allocated and utilized for employment generation scheme in the area.

- Access to credit can create an opportunity to be involved in economic activity that generates revenue to households. Recently established small and micro- business agency in the region has started activity of organizing and training of every business community who are interested. Provision of startup capital in the form of loan is effected through micro- finance institution. Development partners operating in the study area should implement provision of credit to eligible households using targeting criterion that reflects actual characteristics of food insecure households. The other pressing issue related to provision of credit is the requirement of collateral and group lending procedure, which discourages so many households. People are afraid of holding accountability for others so individual lending should be considered as another option and collateral requirement should be avoided if there is a need to lift food insecure households from their current situation. Borrowers should be encouraged to save or contribute as matching fund to reach the limited resources over large number of needy people.

- The effect of education on household food security confirms the significant role of the variable in consideration for betterment of living condition. The more household head educated, the higher will be the probability of educating family member and familiar with modern technology, which the twenty first century so badly demands. So, strengthening both formal and informal education and vocational or skill training should be promoted to reduce food insecurity in Dilla zuria wereda.
- Access and entitlement to scarce cultivated land holding have negatively strained the food insecure households. This confirms the hypothesis that food insecurity in the study area is due to declining access to land. The existing land holding size is far below the optimum size to sustain the livelihoods of farm households with the prevailing technology and farm practices. Hence, the following short term and long term policy measures need to be taken.

There is a need to look forward to reduce the increasing labor force in agriculture through designing policies that promote the establishment and operation of off-farm and non-farm income generation opportunities.

Production oriented policies (agricultural intensification), such as technological innovation and commercialization in agriculture, has to be strengthened to alleviate poverty and improve food insecurity. As this will allow maximizing earnings from limited holdings. However, this measure must be implemented with care as commercialization of agriculture might also induce household food insecurity.

- Livestock holding variables appears to have negative impact on household food insecurity. This implies as livestock sector plays a great role in improving food security. Hence due emphasis should be given to improve production and productivity of this sector. Livestock production is impeded by various constraints including feed supply, disease, and, institutional and policy factors. Livestock feed shortage is a major constraints to livestock production. To increase feed availability and quality, in addition to the existing natural pasture and crop residues, some packages activities are need to be

introduced. New feed technologies which could be suitable need to be introduced. Developing ways of introducing forage legumes is very important. In addition to this, introducing and familiarizing the technology of fodder banks through hay and other forms of feed conservation is so essential, particularly during the dry season.

The research result indicates that some of the coping strategies used by some farmers have negative effect on the livelihood of the farmer. Among these coping mechanisms, decreasing food intake per day, renting out land and borrowing of crops/cash (which will be paid by doubling the amount in the coming harvest season) are either costly or damaging the individual. This increases the vulnerability of the household to food insecurity in the future. Therefore, it is urgent that these households should be protected from using such coping strategies, i.e., the food gap should be filled by other means not to make them vulnerable to food insecurity.

6. ANNEXURES

Annexes I- REFERENCES

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Annexes II- Questionnaire (Appendices)

INDIRA GANDHI NATIONAL OPEN UNIVERSITY

SCHOOL OF CONTINUING EDUCATION

Master's Programme in Rural Development

M.A.(RD)

Interview schedule developed for the “studies on Determinants and Status of Food insecurity among Rural Households,” the case of Dilla Zuria Woreda, SNNPRS, Ethiopia

(By: Demssew Mekonnen)

PART I: GENERAL INFORMATION

1.1 Kebele: _____

1.2 Name of the household head _____

1.3 Name of the enumerator _____

1.4 Date of interview _____ Signature _____

PART II: DEMOGRAPHIC, ECONOMIC AND SOCIAL CHARACTERISTICS OF THE HOUSEHOLD.

2.1: Table:1. Household characteristics

01	02	03	04	05	06
No	Name of the household members	Marital status	Sex	Age(year)	Education level
1					
2					
3					
4					

5			
6			

3.3 If your answer to question No. 3.1 is no, why?

1. Land is small
2. My holding is not convenient for livestock production.
3. others, (please specify)

3.4 Do you have oxen for your farm operation? 1. Yes 2. No

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

3.6 If you don't have enough oxen, how do you get additional oxen you need?

1. Hire from someone
2. Coupling with other farmer
3. Borrow from friends
4. By contributing labor to a person who has oxen
5. Others (specify)

3.7 What are the critical problems in livestock production and productivity?

1. Shortage of Feed
2. Shortage of Water
3. Shortage of disease
4. Shortage of breed type
5. Others, specify

3.8 If there is a problem of feed or water, what were the causes? (It is possible to give more than one answer)

1. Expansion of cultivating land to increase farm land.
2. Drought
3. Competition of farm land has reduced pasture land due to population pressure, etc.
4. Others, please specify

3.9 What are the sources of feed for the livestock?

1. Common grazing land
2. private grazing land
3. Crop residue
4. Others, specify

Part IV LAND POSSESSION AND CROP PRODUCTION AND PRODUCTIVITY

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

4.2 . If your answer to question no.4.1 is yes, what is the total size of your land?

_____ in Timad or _____ Hectare

4.3 What was the total area of land you cultivated last year? _____ timad. or _____ ha

4.4 If no land, the source of land for cultivation is _____

1. Owned in _____
2. Share cropped _____
3. Rented in _____
4. Received as a gift _____
5. Others (specify) _____

4.5 Do you think your land holding is sufficient enough to support your family?

(Yes / No).

4.6 If no state the reason (multiple answers possible).

1. Soil fertility problem
2. Lack of agricultural input
3. Small size of land
4. Large family size
- 5 Others (specify)

4.7 Are your farm soil fertility land has problem? 1. Yes 2. No

4.8 If yes what proportion of your farm Land is in problem? _____ Hectare

4.9 What proportion of your cultivated land is allotted to the following in hectare?

1. Annual crop
2. Perennials

4.10: Table 3. List the type of crops you cultivated and their average production for year 2002.

Type of Crop	Cultivated crops in 2002		
	Area(hectare) or in local unit	Total production unit(Qt)	Value in Birr
Annual crops			
1			
2			

3			
4			
5			
Perennial crops			
1			
2			
3			

Part V: SOURCES OF HOUSEHOLD FOOD

5.1 How did you get access to food to your household during last production year (in 2002)? (Own production / by purchasing from market / inter household transfer / relatives / food aid / exchange of labor, others, specify)

5.2 : Table 4. From sources you have identified above can you tell us the amount of food you collected during last year (2002)

Month of the year	Food aid received in kg			Productive safety net			Amount purchased in kg					
	Grain /wheat	Edible Oil	Others (specify)	grain	Edible Oil	Others	Teff	Sorg	maize	Bar	Pul	Others (specify)

- 5.3 If the source of food is market purchase, how do the households obtain the cash income? (Sale of livestock / sale of vegetables and apicultural produce / off or non farm income / others, specify)
- 5.4 If the source of HH food was food aid, for how long and since when have you been using food aid? Since 19--- for ----- years.
- 5.5 Were you receiving food aids year after year? (Yes / no).
- 5.6 For how many period of the year you usually receive food aid? For ----- months, from ----- to ----- month.
- 5.7 Is there an equal allocation of food to all household members in your family? (Yes / No)

Part VI. CREDIT SERVICE AND MARKETING

- 6.1 Did you sold any part of the harvested food crops during last year? (yes / no)
- 6.2 If the answer to question number 8 is yes, where did you sell your products? ----- markets.
- 6.3 How much is the distance to the main market to your village? ----- Km or ----- hours of walk.
- 6.4 At what particular part of the year do you sell most part of your produce? During - ----- to ----- months.
- 6.5 Did you get reasonable price for your produce at that particular time? (yes /no)
- 6.6 Did you receive any kind of credit in the last two years? (yes / no)
- 6.7 If the answer to the above question is yes, for what purposes? (A number of answers can be possible) (purchase of seeds / purchase of fertilizers / purchase of oxen / to buy farm implements / for food consumption / others, please specify).
- 6.8 What were the sources of credit? Put in order of importance. (Service cooperatives / friends and relatives / NGOs / Local money lenders / others specify

6.9 If you have not received any type of credit, why? (Multiple answers possible).
 (No one to give credit / No need for credit / fear of ability to pay / No asset for collateral)

Part VII. EXTENSION SERVICE AND AGRICULTURAL INPUT

7.1 Has your household received any type of extension service from government or NGOs in 2002 production year? (yes / no)

7.2 If your answer to question no.7.2 is no, what was the reason behind? (lack of knowledge / lack of support from government / I don't want / others)

7.3 Did you use the following modern farm inputs like chemical fertilizer, improved seeds, herbicides, pesticides, improved farm tools, etc? (yes / no)

7.4 : Table 5. If the answer to the above question is yes, which inputs in what amount have you used in 2002 production year?

Serial No	Input types	Sources and amount of inputs (in Kg)						
		Own purchase	Credit Micro finance institution	Credit (Gov't)	Credit (NGO)	Credit (friends)	Donation (NGO)	Donation (GO)

7.5 If your answer to question number 7.4 is no, what was the reason that you have not used? (the price is high / the inputs were not available / lack of credit / no information about them / I don't want / others(specify))

Part VIII. COPING MECHANISMS TO DEAL WITH FOOD SHORTAGES

8.1 :Table 6. What were the coping strategies that the household use to have enough food?

	wage employment
	sale of livestock
	reduce number of meals per day
	reduce size of meals
	sale of charcoal
	sale of fire wood
	eating wild crops
	migrating to other places
	rent out land
	sale of household assets
	borrowing of grain or cash from others
	purchasing of less preferred and cheap crops
	Received relief food aid
	Children discontinued school
	Others specify_____

8.2 How often did the household face food shortage during the last 10 years?

Part IX. OFF FARM AND NON FARM INCOME

9.1 Did you or any member of your family have off-farm job? (Yes / no)

9.2 :Table 7. If you or your family member earned off-farm income, indicate the type of job and the amount of income earned during last production year.

Name of the family member	Type of job	Amount earned during the year(in birr)

* The type of job can be pottery, metal work, wood work, petty trade, sale of local drinks, livestock trade, employment paid on monthly basis, milling, sale of fire wood or charcoal, weaving, others (specify).

9.3 Did your household receive any other non-farm income such as gifts, remittance, food aid or other transfer? (yes/ no)

9.4 If the answer to the above question was yes, mention the amount you received during the last production year.

Part X. HOUSEHOLD EXPENDITURES

10.1: Table 8. Would you please indicate the type and amount of expenditures of your family for the year 2002 using the following table?

Types of food	Amount in kg	Amount in birr	Remark (indicate whether it is own produce or not)
1.expenses for food crops			
- cereals			
- pulses			
- oil crops			
- vegetables			

- others(specify)			
2. expenses on livestock and its Products			
- slaughtered animals			
- honey			
- milk			
-			
- others (specify)			
3. expenses for others like:			
- seeds			
- fertilizers			
- farm implements			
- medical expenses			
- expenses for clothes			
- education expenses			
- others (specify)			
4. different taxes			
5. social obligations			
6. HH utensils			
7. labor cost			

8. rents			
9. fuel and transport expenses			
10.transferred to others			

PART XI SAFETY NET PROGRAM

11.1 Is there safety net program in the woreda? (yes/no)

11.2 If your answer in no. 11.1 is yes, what kinds of services have you getting from the program?

Check lists interviewed for key informants

1. Since when the woreda has recognized as food insecure?
2. Why was the district recognized as food insecure?
3. How is the level of food insecurity in the woreda?
4. In which agro-ecology is food insecurity more sever?
5. What are the root causes of food insecurity?
6. How was the extent of food insecurity during the previous production year (in 2009 or 2001/2002 Ethiopian production year)?
7. What coping mechanisms does the population of the district utilize to deal with food shortages?
8. What are the means of generating income other than agriculture? In other words, what are the off farm & nonfarm activities that are utilized by the rural households of the woreda?
9. What are the policies and strategies that the government is attempting to overcome food insecurity?
10. How is the credit arranged for food insecure rural households?
11. Other things that you would like to say related to food security/insecurity?

The key informants interviewed were:

Woreda Agriculture and Rural Development Office

Woreda Administration

Office of Food Security in the Woreda

Woreda Cooperative Office

Finance and Plan Office

Zonal BoARD

Zonal Food Security Agency And others

Appendix2. Table 1: Calorie value of food items consumed by sample households

Food item	Unit	Kcal
Teff	Kg	3589
Wheat	Kg	3623
Sorghum	Kg	3805
Maize	Kg	3751
Barley	Kg	3723
Sweet potato	Kg	1360
Coffee	Kg	1103

Source: EHNRI, 2000

Appendix3. Table 1: Conversion factor used to calculate adult equivalent

Age category (Years)	Female	Male
Less than 10 years	0.60	0.60
10 – 13	0.80	0.90
14 – 16	0.75	1.00

17 – 50	0.75	1.00
Greater than 50	0.75	1.00

Source: Institute Pan African Pour le Development (1981); cited in Strock et al. 1991

Appendix4.Table1: Contingency coefficient value for dummy variables

Variables	HHSX	EDUSTHH	HGTCRDT	HSAVACC	ATUAI	SAFETYNET
HHSX	1					
EDUSTHH	0.367	1				
HGETCRDT	0.151	0.179	1			
HSAVACC	0.197	0.167	0.273	1		
ATUAI	0.037	0.094	0.071	0.006	1	
SAFETYNET	0.05	0	0.098	0.098	0.227	1

Source: Own computation

Appendix5.Table1: Variance inflation factor of continuous variables

Variable	R ²	VIF
HSZE	0.003	1.00
DAYINCPAE	0.116	1.13
DEPNDRTO	0.055	1.05
PRPNFDEXPH	0.076	1.08
LANDCULT	0.564	1.77
TLU	0.537	2.16

Source: Own computation

Annexes III- Project Proposal

PROFORMA FOR SUBMISION OF M.A (RD) PROPOSAL FOR APPROVAL

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Title of the Project:- Studies On Determinants Of Food Insecurity Among Rural Households: The Case Of Dilla Zuria Woreda In Gedeo Zone, SNNPR, Ethiopia

Signature of the Student:- _____

Approved/ Not Approved:- _____

**STUDIES ON DETERMINANTS AND STATUS OF FOOD INSECURITY
AMONG RURAL HOUSEHOLDS: THE CASE OF DILLA ZURIA
WOREDA IN GEDEO ZONE, SNNPR, ETHIOPIA**

A Proposal

**Submitted to the Indira Gandhi National Open University, School of
Continuing Education, Department of Rural Development, in Partial
Fulfillment of the Requirements for the Degree of Master's of Arts in Rural
Development (M.A(RD))**

By:

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August, 2014

Addis Ababa, Ethiopia

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Acronyms

1. INTRODUCTION

1.1. Background of the Study

Ethiopia has a total surface area of about 1.13 million square kilo-meters, and lies between 30N and 50N latitude, and 330E and 480E longitude. The altitude of the country ranges from below 0m.a.s.l. to about 4,600m above sea level. The amount and intensity of annual rainfall varies depending on the altitude, where the highlands receive a mean of 1,400 mm - to- 2,200 mm. In the mid-highland areas, annual rainfall ranges from 1,000 mm to 1800 mm. The mean annual rainfall in lowlands ranges between 200 mm to 500 mm (Ahmed, 2008).

Total land area of the country is about 111.5 million hectares of which about 66% (73.6 million hectares) is estimated to be potentially suitable for agricultural production. Out of the total land area suitable for agriculture, 11.6 million hectares is estimated to be under cultivation for the production of annual and perennial crops (Tsfahun, 2003). The per capita cultivated land holding is around 0.7 hectares which is even substantially less in some densely populated highland areas (MOARD, 2007).

Ethiopia has a long history of famine emergencies and it is closely monitored by international humanitarian agencies. Some 31 million people live below poverty line and between 6 and 13 million people are at risk of starvation each year (MOFED, 2005).

Ethiopia remains one of the world's least developed countries, ranked 174 out of 187 in the 2011 UNDP Human Development Index. Rain-fed agriculture is the foundation of the economy, employing 80 percent of the country's 82 million people. Thus household food security is largely determined by factors such as rainfall patterns, land degradation, climate change, population density, low level of rural investment and the global market (WFP,2012).

According to the humanitarian requirements document (HRD) of the Government of Ethiopia around 3.2 million people will continue to require food assistance across the country until June 2012(USAID's, WFP's and FEWS's Ethiopia food security outlook

update joint report, 2012 (www.fews.net/ethiopia). The Humanitarian Requirements Document issued by the government and humanitarian partners in September 2012 estimates that 3.76 million people require relief food assistance from August to December 2012 (WFP,2012).

However, the government's Productive Safety Net Program (PSNP), which provides cash in return for labor on community projects, or food for those unable to work has been assisting in reducing the number of victims. Both emergency food aid and the PSNP are substantially funded by international donors. Despite these support mechanisms, UNICEF reports that 38% of children under the age five were underweight in 2008, still far above the MDG target for 2015 (UNICEF, 2009).

Most arable regions in Ethiopia anticipate two cropping seasons; the longer *meher* (June to September) rains are complemented by the shorter *belg* (March to May) season. This profile varies, both within and between regions.

The primary cause of food insecurity is the structural failure of the rural economy to withstand the highly erratic patterns of rainfall that frequently disrupt this seasonal pattern. Almost 65% of rural households are living with farm plots of less than one hectare, with primitive tools and negligible access to capital. Although families enjoy lifetime tenure, there is no right to buy or sell land in Ethiopia, diminishing incentives for prudent management of soil and water resources. For example, poorly maintained hillside plots are particularly prone to erosion by intense rainfall. Pastoral farming, undertaken by 12%-15% of the population, is also limited by extreme poverty in its capacity to cope with the increasing aridity of grazing lands. This sector is also threatened by pressure to convert land to other uses. With 85% of the population dependent on livelihoods linked to this volatile agriculture sector, vulnerability to food insecurity is inevitable (FEWS, 2011).

And these structural weaknesses are aggravated by the relatively high population growth rate of 2.6% per annum. Over the past decade, cereal production has more than doubled – to nearly 15 million tons – mainly as a result of the expansion of the cropped area to more marginal lands. This has led to severe land degradation (FAO, 2009).

In recent years, a very different volatility – global food prices – has imposed a new dimension of risk. Currently, the prices for staple foods are seasonally declining, particularly in the central and western surplus-producing areas. In December 2012, the consumer price index (CPI) shows general consumer inflation moving down to under 13 percent from nearly 16 percent in November. In December, Food price inflation declined to 12 percent from 13 percent in November. However, December food prices were still much higher than the five-year average and appear to be remaining at their elevated level even during the Meher harvest. Typically, after the Meher harvest, prices decline significantly. This year, they appear to have merely stabilized at their current high levels (FEWS and WFP, 2013).

Projected cereal production in Ethiopia for 2011 was much the same as the average over the last five years. The country continues to be dependent on imports and exposed to the latest round of unstable prices. Reports suggest that food price inflation exceeded 40% for the year ending May 2011, causing serious hardship for poor families in both rural and urban areas (FEWS,2011).

1.2. Statement of the Problem

Even though developing countries have achieved relatively faster agricultural growth during the last four decades, the progress has been dominated by significant gains in Asia (World Bank, 2008). Agricultural growth in Sub-Saharan Africa averaged nearly 3 percent over the past 25 years. This is partly attributed to their agro-climatic potential, poor infrastructure and the dismantling of public agricultural institutions for research, extension, credit and marketing (Denning G, et al., 2009).

To counter these years of neglect and out of concern for global food security, the United Nations, heads of State and Government and international and regional organizations, called for urgent action (Anonymous, 2009). A number of initiatives have emerged or are emerging to address this important challenge (Negin J, et al., 2009). Such initiatives include the Alliance for an African Green Revolution and a proposed Global Fund for Smallholder Agriculture (Sanchez A, et al.2009). The reason for such initiatives includes ensuring sustainability of agricultural growth in countries experiencing food insecurity. Despite the above efforts, deepening food crises in several developing countries, especially those in

Sub-Saharan Africa, (SSA) is still the concern of many researchers, planners, donors and international development agencies, who have given high priority to the study of food systems and the problem of food security (Gezahegn, 1995).

Despite the availability of resources and the efforts made by the governments in most of these countries, food insecurity and declining food production per capita remained among the most crucial issues. The attainment of an increase in food grain production above the population growth is still a challenge for most SSA countries (Kidane W, et al., 2006). With a population projected to reach 80 million in 2010 and about 45 percent living below the poverty line and most vulnerable to food insecurity, ensuring food security remains a key issue for the Government of Ethiopia (MoFED, 2002). According to FAO “in 2013 the population of Ethiopia projected to reach 88.35 million (FAOSTAT,2013).

In order to combat threats of famine and pervasive poverty and thereby ensure food security for its population, the government strategy has rested on increasing the availability of food grains through significant investments in agricultural technologies (high yielding varieties of seeds and fertilizer), services (extension, credit, inputs), and rural infrastructure (roads, markets) (Addisu, 2011).

The impacts of these policies, however, have been shadowed as there are still millions of people who experience extreme hunger in the country. Food security is dependent on agricultural production, food imports and donations, employment opportunities and income earnings, intra-household decision-making and resource allocation, health care utilization and caring practices (Maxwell and Frankenberger, 1992).

It is a multi-dimensional development issue that needs cross-sectoral integrated approaches. However, because there are concerns that such approaches can be too costly, too complicated or take too long to show results, institutions may not invest their scarce resources in implementing them.

Moreover, household food security issues cannot be seen in isolation from broader factors such as physical, policy and social environment (Hoddinott J, 2001). The physical factors

play a large role in determining the type of activities that can be undertaken by rural households.

Households in rural areas of Dilla Zuria *Woreda* are facing unrelenting food shortages. On top of ever decreasing land holding size and increasing population, recurrent drought and natural resources (water, forest, and rangeland) degradation in the study area have made the food security situation worse. Realizing this issue, many governmental and non-governmental organizations are intervening at least to reduce the adverse effects of the food problem, but there is yet little success. Cognizant of these facts, this study is designed to identify location specific factors that contributed to household food insecurity, and through that make recommendations to improve the effectiveness of intervention. Therefore, this study is envisaged to narrow the existing information gap and capitalize on the existing ones so that proper policies could be designed.

1.3 Objectives of the study

The general objective of the study is to identify the determinants of food insecurity among rural households.

This study has the following specific objectives:

- ❖ To identify the determinants of food insecurity among the rural households;
- ❖ To estimate the food insecurity gap and its severity among rural households;
- ❖ To examine the coping mechanism to mitigate the food insecurity.

1.4. Important Terms (Definition of Variables) and Hypothesis

The literature on the determinants of household food insecurity makes it clear that the choice of dependent and independent variables have been identified by different researchers, international and national development organizations. This section describes the variables used in the econometric analysis. Dietary intake is used as a proxy to measure household food security status. Households consume a variety of food, mainly from purchase that are

converted into their calories using ENHRI food composition table for use in Ethiopia (1998).

Household food insecurity (HFINS): It is a dichotomous dependent variable in the model taking value of 1 if a household is food insecure and 0 otherwise. Food security status of a household is identified by comparing total kilocalorie consumed in a household per adult equivalent per day with daily minimum requirement of 2100 kcal and those getting 2100kcal and above are food secure and food insecure otherwise.

Independent variables: Household socio-economic characteristics such as household size, sex of household head, marital status of head, educational status of household head, dependency ratio, and access to credit, ownership of saving account, daily income per adult equivalent, and proportion of food expenditure are selected variables for the model analysis.

Demographic variables

Household size (HSZEAE): An increase in household size implies more mouth to be fed from the limited resources and especially in male dominant household the situation becomes more than this due to high possibility of accustoming to bad habits. As a result in this study, the household size and status of food insecurity are expected to be related positively.

Sex of household head (HHSX): HHSX is a dummy variable taking a value of 1 if male and 0 otherwise. Household head is a person who economically supports or manages the household or for some reason of age or respect is considered as head by other members of the household. It can be male or a female. There is no generally accepted relationship between sex of household head and level of food security. In the study area where females are actively engaged in various activities as compared to males, it is hypothesized that households with female head and food insecurity are related negatively.

Education level of household head (EDUSTHH): Education level is important for gauging income earning potential of a household which has significant influence on consumption pattern of the household. Education is a dummy variable taking a value of 1 if household

head is literate and 0 otherwise. Educational level of household head and food insecurity were expected to be related negatively.

Dependency ratio (DEPNDRTO): Household members aged below 15 and above 64 are considered as dependent and dividing it by household members whose age is between 15 – 64 resulted in dependency ratio. These groups are economically inactive and burden to the other member of the household. It is hypothesized that dependency ratio and food insecurity are positively related.

Cultivated land size (CLU): farm land owned by the household plays a great role in determining food security positively. This variable is a continuous variable measured in hectare. It is one of the livelihood assets that are used for the production of food for consumption and ensuring household entitlement to food. Households with relatively higher size of cultivated land can better access to food. Therefore, it is hypothesized that the larger the size of land the household owns the less the chance to be food insecure.

Institutional variables

Access to and utilization of agricultural information (ATUAI): Frequently getting agricultural information and well utilization of it will create good condition for the decision of the farmer in order to be food secured. Information is a good tool to boost production. Therefore, this variable is expected to influence the food security situation of the study area positively.

Access to credit (HGTCRDT): It is a dummy variable taking a value of 1 if household received credit and 0 otherwise. Credit serves as a means to be involved in income generating activities and to reap derived benefit based on the amount and purpose of credit. It also normalizes consumption at hard time. Thus, access and getting credit was negatively related with food insecurity.

Safety net program (SFP): This variable refers to households who get service or support from safety net program. Safety net program is one of the most important services which is given by the government for the households who are vulnerable to food in security.

Therefore it is hypothesized that households safety net program enhance the probability of being food secured.

Socio-economic variables

Owning saving account (HSAVACC): It is a dummy variable taking a value of 1 if a household has bank account or maintains credit and saving association and 0 otherwise. Owning saving account or maintaining credit and saving association is hypothesized to be negatively related to food insecurity.

Daily income (DYINC): One of the major determinants of household food insecurity is income of a household. Total amount of daily income in Eth.Birr (equivalent to the name Rs of India (but not in value)) from different source is computed and the higher the level the lesser the likelihood of household become food insecure. Income is hypothesized to be negatively related with food insecurity status of the household.

Livestock owned (LO): This variable refers to the total number of livestock owned by the household. Livestock have got multiple benefit providing draft power, manure, income from sale of milk, butter, and sale of live animals in times of risk to buy necessities. As reported by Escobal (2001), the ownership of assets like cattle increase the share of own farm income in total household income. A household which has larger number of livestock can be easily food secured than the ones which haven't. This variable is expected to influence the food security situation positively.

1.5 Scope (Universe) and Limitation of the Study

The study will specifically focus on identifying major determinants of food insecurity at household level by comparing calorie consumption per adult equivalent with the minimum requirement by classifying sample households as food secure and insecure and then assess the extent of food insecurity in Dilla Zuria district. Due to financial resources and time constraints, the researcher will not venture to investigate the wider social and environmental dimensions of food insecurity. Only dimensions of food insecurity in terms of incidence and severity will be investigated. And also it is difficult to delve in to variations among households in terms of variables reflecting quality differences.

1.6. Chapter Organization

The study has five main chapters. Following to the introduction, statement of the problem, objective of the study, definition of important terms and hypothesis, and universe of the study are also presented in this chapter. Literature is reviewed in chapter two. Concepts and definitions of food security, measurements and indicators of food security/insecurity, the situation of food insecurity in Ethiopia, and the coping mechanisms are explained under the second chapter. Chapter three, research methodology, contains tools and procedures of data collection, the methodology employed for data processing and analyses, description of the study area, and sampling. Main findings of the study are presented and discussed in chapter four. Finally, chapter five presents the summary and recommendations based on the results of the study.

2. REVIEW OF RELATED LITERATURE

2.1. The Concepts of Food Security and Food Insecurity

The concepts and definitions of food security and insecurity have been discussed for a long period of time. There is much literature on the concepts and definitions of food security. Since its inception it is defined in different ways by international organizations and researchers. According to Hoddinot (1999), there are close to 200 definitions and 450 indicators of food security. In the early periods the question was whether a nation or a region could grasp enough food to meet the cumulative requirements of its people. Food security is the condition in which all have access to sufficient food to live healthy and productive lives (World Bank, 1986). This means that special attention was given to fluctuations in aggregate food supply. Food security interventions were also primarily concerned with providing effective shock absorber mechanisms against such fluctuations. Such conceptions could be clear from the definition of the World Food Conference of 1974.

According to the World Food Conference of 1974, food security was defined as:

‘availability at all times of adequate world food supplies of basic foodstuffs...to sustain a steady expansion of food consumption...and to offset fluctuations in production and prices’ (United Nations, 1974).

However, it was soon realized that this definition gave a very limited view of the food security problem. It is so because a large number of a population could be living in hunger even if the country had sufficient food in the aggregate during normal times. It is also a paradox that global food security exists alongside individual food insecurity. It is known that the world produces enough food to feed every one.

However, there are countries in the world, regions within countries, villages within regions, households within villages and individuals within households that are not able to meet their food needs. This means that adequacy at the national level does not necessarily ensure adequacy at the household or individual level. As a result, food security had advanced from emphasizing the supply side through the individual and household level (demand side) for

improved access to food in the 1980s (FAO, 1983). In the 1990s, improved access was redefined by taking into account livelihood and subjective considerations. It emphasizes a broader framework of individual behavior in the face of uncertainty, irreversibility, and binding constraints on choice (Osmani 2001, and Maxwell 1996).

The most widely used definition of food security is the one forwarded by World Food Summit in 1996 and broadly set as '*Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life*' (FAO, 1996). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food.

To sum up, it is known that food security concepts and definitions have been developed over the past thirty years. Hence, the current concept emphasizes the role of multiple factors that affect the household's or individual's ability to acquire enough food all the times (Maxwell, 1996). Consistence with these definitions of food security can be defined with the main emphasis on food availability, access, and utilization.

The other concept that is worth mentioning here is that the issue of food insecurity. It is believed that people who frequently do not have enough to eat according to accepted cultural norms created a crisis. For this reason, the phrase 'Food Insecurity' was used to describe the instability of national or regional food supplies over time. It was then expanded to include lack of secure provisions at the household and individual level.

Food insecurity concern may be due to either inadequate physical availability of food supplies, poor access among the population, or inadequate utilization of food (Habicht et al., 2004). Food insecurity classified as chronic or transitory. Some other literature also include a third kind of food insecurity; i.e., cyclical type of food insecurity. Chronic food insecurity occurs when a household is persistently unable to meet the food requirements of its members over a long period of time. It, therefore, afflicts households that persistently lack the ability to either buy food or produce their own. Structural factors contributing to chronic food insecurity include poverty (as both cause and consequence), the fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. It is argued that

chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2002).

On the other hand, transitory food insecurity refers to a temporary decline in a household's access to enough food. It results from a temporary decline in household access to food due to crop failure, seasonal scarcities, temporary illness or unemployment, instability in food prices, production, household income or combination of these factors. But, the main triggers of transitory food insecurity in Ethiopia are drought and war. Finally, the cyclical type of food insecurity is caused by seasonality (Osmani, 2001; and FAO, 2006).

In general, a household can be said to be food secure only if it has protection against all kinds of insecurity. The average access to food over the long term should be nutritionally adequate, and a household should be able to cope with short-term vicissitudes (changes) without sacrificing the nutritional needs of any of its members. Finally the concept and definition of food security were developed and clearly explained based on the growing hunger, food insecurity and malnutrition situations in developing countries. From the above definitions of food security, slight variations were observed.

However, the overall basic principles and definitions of food security, that is, “availability, access and utilization” were stressed in the definitions cited above. Therefore, for the purpose of this study, the definition put forward by World Food Summit (1996) is taken as a working definition of food security and the household level is considered as the key unit of food security analysis.

2.2 Food Security: Determinants and Measurement

Measures of household food security are needed for different applications in situations where households are chronically vulnerable due to deepening poverty, environmental and climatic shocks, rapid economic change, and conflict. Indicators may be used to predict crises (early warning), to understand shortfalls in access to adequate food (assessment), to allocate resources (targeting) or to track the impact of interventions (monitoring and evaluation). Humanitarian relief and development organizations increasingly need to measure household food security to monitor and evaluate the impact of programs and make planning and targeting decisions. Existing measures of regional or even local food

availability often are inadequate for project-level decision-making, since availability is only one component of household food security. Other components, such as access to food and certainty of the food supply, are also important (Wolfe and Frongillo, 2001). How best to measure household food insecurity is the subject of much debate. The collection of data for a complete analysis of food security can virtually be impossible task in a situation where a household composition is variable and a “household” itself is subject to varying interpretation.

Assessment of food security is a difficult issue as there are no universally established indicators that serve as measuring tools (Debebe, 1995). Food security requires multidimensional considerations since it is influenced by different socioeconomic, environment and political factors. Due to these problems, assessing, analyzing, and monitoring food insecurity follow diversified approach. Latham (1997) described some of the indicators of food security at the household level. He mentioned some of the key indicators of food security related to food supply and mainly to household access to food. Those indicators that are related to food supply include: measurements of agricultural production (similar to those collected for food balance sheet); inputs that influence agricultural production in the area (such as credit, irrigation, fertilizers and pesticides); climatic data (especially the amount of rainfall compared with that usually expected and the timing of rainfall, but also temperature and other meteorological data); market factors including food sales and prices; security (whether there are areas of conflict or parts of the country where movement of people and food is restricted or limited); and data on crop diseases and agricultural pests. When he continued to describe the types of indicators that are related to household access to food he mentioned as follows: food consumption data; clinical assessment related to symptoms of nutrition deficiencies; assessment of food stores; selling of assets including livestock and household goods; greater consumption of low-status foods (a move from rice to cassava consumption, for example); migration from rural to urban areas; and data suggesting frequent perceptions of food insecurity or food crises by households.

2.2.1 Food Availability and Its Determinants

Food availability refers to the physical presence of food at various levels from household to national level; such food can be supplied through household production, other domestic output, commercial imports, or food assistance. It will be achieved when sufficient quantities of food are consistently available at the regional or national/country level (Lovendal and Knowelis 2005; and USAID, 1999) as well as it determined by each of these factors at the regional or national level. The domestic food production and food import contribute to national food availability, whereas increasing domestic food production reduces dependence on food import. In general, food availability may be constrained by inappropriate agricultural knowledge, technology, policies, inadequate agricultural inputs, family size, etc. (Yared, 2001; and Hodinott, 1995).

2.2.2 Food Access and Its Determinants

Food access refers to the ability of a household and its members to acquire enough food through production, exchange or transfer. Access ensured when households and all individuals within them have adequate resources that used to meet the households access to food. Once the basic sources of food have been identified, it is necessary to investigate the often-complex interaction of agro-physical and socio-economic processes that limit a household's ability to obtain sufficient quantities of food from each source (USAID, 1999).

It is clear that the sources of food for a household are different, households typically whether: (a) grow it and consume from their own stocks; (b) purchase it in the marketplace; (c) receive it as a transfer from relatives, members of the community, the government, or foreign donors; or (d) gather it in the wild. Understanding these basic patterns and how they vary across locations, population groups, and over time will provide a particularly important starting point for understanding the general nature of the food security problem (Ibid).

Amarthya Sen first developed the entitlements approach in 1981, replacing earlier theories that stressed shortages in food availability as causes of food insecurity. In contrast, Sen's approach focuses on household access to food, or 'entitlements' .The entitlement of a person stands for the set of different alternatives that the person can acquire through the use

of various legal channels. According to Sen, people are usually starved mainly because of lack of the ability to access food rather than because of its availability. In a sense, income or purchasing power is the most limiting factor for food security.

He recommended food security should aim at increasing people's ability to acquire food through the 'legal means available in the society' i.e., production, trade or exchange, inheritance and transfer. Analysis has also changed from macro (national) to micro (household and individual) levels (Maxwell 1994; Reutlinger, 1987). The majority of the poor people in developing country are engaged in subsistence farming. They also depend on agriculture both for their incomes and food entitlements. So agriculture production is the main determinant of food security of the household and that the role of agriculture is crucial to the eradication of poverty and food insecurity in the rural households.

The leading determinant of food insecurity in the Horn of Africa is low levels of per capita food production. Food insecurity can be tackled most effectively through policies that promote agricultural productivity, rural incomes and food production (FAO, 2001). The crucial assets for farming households are the productive ones such as land, labor, and traction-power (animal power). Lack of farm resource and household asset are the important indicator of poverty in the farming system. Farmland, labor and livestock and fertility of soil have important implication on households' food security status and poverty level. Production based entitlements will also be affected by household access to agricultural inputs such as fertilizers and seeds. This will be influenced by price and availability of these inputs that, in turn, may be affected by liberalization of economic policies.

In rural economy men and women face different constraints in accessing to different resources and adopting new technologies. It is so because they work within different sets of time constraints, work burden, responsibility and roles. Thus, the female-headed can find it more difficult than their men counterparts to gain access to valuable resources. Land, credit, agricultural inputs, technology, extension services, education, training, participation in off-farm activities and other services could be mentioned in this regard. These and other female problems have negative influence on food security (Aredo, 1994). On the other hand, except for households that are entirely self-sufficient in all their food needs access to food through the market is an important component of household food security. The main factor affecting

trade-based entitlements is the level and variability of the price of food relative to whatever individuals are able to exchange for it. Retail food prices at a point in time and their variability over time will, in turn, depend on by the total supply and demand of food, market integration and transport cost.

Moreover, some of the basic sources that determine the possibility of increasing entitlement to food are cash, labor, markets and public services, and other income gain from remittance and aid (Dercon, 2001, Osmanis, 2000, and Steven et al., 2000). Both the level and the location of employment opportunities will also influence labor based entitlements. In addition it is affected by the labor power, technical knowledge and skills embodied in different individuals and households, which will be affected by the provision of health and education, and by nutrition and food security. All will be influenced by the rate of population growth. When the entitlement is transferred, it differs from other entitlement categories because they are not produced or earned directly by the individual but are donated by others. Formal transfers come from the state, aid donors or NGOs, while informal transfers come from relatives and friends. Formal transfers will clearly depend on government policies: the existence and extent of transfers of cash or food will affect transfer-based entitlements. The existence and strength of social networks, including kinship networks, is an important determinant of informal transfers, as it is the extent to which risks are correlated across kinship networks (Steven et al., 2000).

In general access indicators measure that food access become apparent when governments and development agencies realize existence of household food insecurity and famine conditions are occurring despite the availability of food. In recent years, access indicators have been as relatively more valuable in development planning, implementation and monitoring of food security interventions. Likewise, food access indicators are relatively effective because they show various strategies used by the household to get food from diversified sources, i.e., from own farm production, non-farm income, remittance etc. (Habtewold, 1995 and Frankenberger, 1992).

2.2.3 Food Acquisition and Its Determinants

It refers to a proper biological use of food to obtain an appropriate energy and nutritious diet, potable water, and adequate sanitation. Biological utilization relates to individual level food security and is the ability of the human body to effectively convert food into energy. A household that has the capacity to *acquire* all the food it needs may not always have the ability to *utilize* that capacity to the fullest. Food utilization, which is typically reflected in the nutritional status of an individual, is determined by the quantity and quality of dietary intake, general childcare and feeding practices, along with health status and its determinants. Effective food utilization depends in large measure on knowledge within the household of food storage and processing techniques, basic principles of nutrition and proper mother child care and feeding practices, and illness management.

Poor infant care and feeding practices, inadequate access to, or the poor quality of, health services are also major determinants of poor health and nutrition. While important for its own sake, as it directly influences human well-being, improved food utilization also has feedback effects, through its impact on the health and nutrition of a household members, and therefore, on labor productivity and household income-earning potential (Hoddinott, 1995).

2.2.4 Measurements of food security

Measuring the required food for an active and healthy life and the degree of food security attained is a question to be addressed in a food security study. However there is no single indicator for measuring it. For this purpose different indicators are needed to acquire the various dimensions at the country, household and individual levels. At the national or regional level, food security can be measured in terms of food demand (requirements) and supply indicators.

The supply of food may be from current production and stocks and from previous production whereas the need has to be determined on the basis of biological or nutritional requirement of a given society for a certain period of time usually a year or a day (Hoddinot, 1999).

The most commonly used indicators which used to measure household food securities are availability, food access and utilization indicators. These indicators embrace meteorological data, information on natural resources, agricultural production data, marketing information, food balance sheet, sales of productive assets, diversification of income sources and household budget expenditure security. Thus, it is possible to say that there are no single and one best food security measure that is universally accepted. It is up to the researcher to select an indicator or a combination of indicators that suits the objective of the study, the level of aggregation and specific circumstances of the study and the study area. Therefore, in this study the expenditure for the household used as a benchmark to differentiate food secure and insecure household among the total sampled households and to identify their determinants (Frankenberger, 1992).

2.3 Coping Mechanisms

Farm households respond to the problems caused by seasonal and disaster related food insecurity in different ways. Food availability can be affected by climatic fluctuations, depletion of soil fertility, or the loss of household productive assets or some other related problems. In that case farmers try to reduce this problem by taking actions that result in trade-offs between current and future consumption. The range of coping and adaptive strategies is large and differs according to the particular conditions. It includes expansion of production and improving productivity, food grain purchase through sales of livestock and institutional and societal income transfer systems such as gift and relief food distribution. Asset ownership ensures household consumption when incomes are insufficient. Households acquire assets that can be sold to compensate shortfalls in consumption and income. Livestock are a classic indicator of assets and they are more likely to be marketed regularly or more readily.

According to some literature most of the time households didn't sell livestock unless food insecurity is severe (Maxwell and Frankenberger, 1992). In general asset and changes in the value of an asset index are a good indication of household vulnerability to more severe food insecurity. Especially during drought years, livestock, a major asset that can be easily liquidated, is more important in terms of implying better access to food. Moreover, in

drought periods, households may shift their labor resources from crop production to non-farm wage employment to ensure continued income (USAID, 2003; Yared, 2001).

Non agricultural income earning plays an important role in providing additional income to rural households. It enhances household economy and food security by giving additional income and decrease food deficit when agricultural production falls short and it also avoids grain sales. When shock occurred households might also adjust their consumption patterns, by reducing their dietary intake to conserve food and relying more on loans or transfers and less on current crop production and market purchases to meet their immediate food needs (Shiptone, 1990).

Coping mechanisms used by farm households in rural Ethiopia include livestock sales, agricultural employment, and certain types of off-farm employment and migration to other areas, requesting grain loans, sale of wood or charcoal, small scale trading, selling cow dung (in central Ethiopia) and crop residues, reduction of food consumption, consumption of meat from their livestock, consumption of wild plants, relying on relief assistance, relying on remittance from relatives, selling of clothes, and dismantling of parts of their houses for sale. Some of them are likely to be implemented only after the possibilities of certain other options have been pursued. In addition, households who have diversified source of income are often able to cope with crisis than others (FFP, 2003; Yared, 1999 and Dessalegn, 1991).

Households that spend a high portion of their income on food (i.e., more than 70 percent) are very likely to be food insecure. Thus, the percent of total household expenditure spent on food is used to show household vulnerability. To the extent that households rely on market purchases as an important source of food, cash incomes (or expenditure levels) are likely to be more or less important indicator of their food security status (USAID, 2003 and Smith 2002).

Food aid, today, is mainly considered as an instrument in addressing for both transitory and chronic types of food insecurity in low-income country. It is noted that the humanitarian agencies, or donors, implement food aid programs in these countries in order to give immediate response to the needy people, to increase income sustainability, to improve agricultural productivity, and to improve the health and nutrition among the residents.

Moreover it leads to improvement in the availability of food supplies at the national or regional level, or to increase access to food at household levels through higher home production of food crops, market purchase and/or other means or to make more effective utilization of food at the individual level to meet human biological needs (USAID, 1999).

According to some literature (Habtewold, 2001; WFP, 1991) food aid can be classified based on its target or purpose. Even if there is no clear difference in the definition between the different types of food aid, however, it is traditionally classified into three broad types. These are emergency food aid, project food aid, and program food aid. The emergency food aid is a response to sudden natural and man-made disasters while the second type; i.e. project food aid, is aiming at transferring income to the poor or satisfying their nutritional requirements in normal years through development oriented works. The third type; i.e. program food aid, is providing to the government for balance of payment and budgetary support (Ibid). In general, food aid is an important development resource, supporting programs with a wide range of development objectives.

For example, investments in soil and water conservation efforts supported by food-for-work programs have potential long-term implications for increased agricultural productivity and crop income, while school feeding programs are typically intended to improve student attendance and performance, factors which ultimately lead to enhanced labor productivity and higher wage earnings. Improved health and nutrition achieved through food-assisted maternal and child health programs or food-for-work efforts at improved water and sanitation have immediate implications for individual health and well-being and also promote productivity and income-earning potential over the long-term.

As it is mentioned above, it is believed that food aid has tremendous contribution in improving food security of individuals, households, and regions of the developing countries. On the other hand, numerous researchers (Barrett, 2006; Barrett and Maxwell, 2005, Barrett and Hoddinott, 2005; Barrett, 2002 and Maxwell, 1991) have constructed a list of disincentive scenarios of food aid that could be mentioned as follows:

- Household-Level Effects of Food Aid (both cash and kind): According to some research it discourages them from working something to generate income. Moreover, food for work

programs are relatively more attractive than work on own farms/businesses either because it pays immediately or because the household considers the payoffs to be higher than the returns from own labor. In addition, poor timing and FFW wages that are above prevailing market rates can cause negative dependency by diverting labor from local private uses.

- *In addition* food aid can discourage household-level production. It is so because if food aid lowers local food prices, that may decrease the relative payoffs to investing in one's own production. In this case, both recipients of food aid and non-recipients of food aid are discouraged from own production.

- *Changed Consumption Patterns:* The rationale for food aid partly has long been export promotion that entails some efforts to change consumers' preferences to introduce them to new foods and thereby endogenously stimulate demand for foods with which they were previously unfamiliar or which had formerly represented only a minor share of their diet. In general, when it is seen the last 30 years there is no year passes without receiving food aid from donors. With this, all amount of continuous food aid from the donors, in this time has become a debating agenda and NGOs and others do numerous evaluation studies on the impact of food aid on food security program. There is a debate about incentive and disincentive effect of food aid as labor disincentive production, change consumption pattern, natural resource over exploitation, price effect, community level moral hazard, disrupting international market, real exchange rate, and discourage policy reform.

2.4 Empirical studies on Determinants of food insecurity

Causes of food insecurity facing farm households in various developing regions, particularly Africa, Latin America and Asia, have been documented in some literature. The productivity of Ethiopian agriculture is among the lowest in the world - around 1.2 tons per hectare (World Bank, 1999). Although higher yields are possible through agricultural intensification, the evidence suggests that "average landholdings would be insufficient to feed a family of five even if production could be successfully increased three times with the use of improved technology" (Masefield, 2000).

The study in Nigeria using Tobit model found that sex of head, educational level, dependency ratio, network, farm size, input usage, extent of commercialization, being a

member of cooperative, food expenditure, remittance have negative influence on food security, whereas age of head, and household size positively influence the problem and all the variables are significant.

Study done by Alarcon et al., (1993) for smallholder farm households in west highland of Guatemala found that lack of access to credit and cash crop production displace food crops and household consumption of own production is reduced. Thus, the household's vulnerability to food insecurity tends to increase. However, another study in Malawi by Diagne (1998) found that formal credit has marginally beneficial effects on household annual income. However, these effects are very small and do not cause any significant difference between the per capita incomes, food security, and nutritional status of credit program members and non-current members.

Ramakrishna and Assefa (2002) undertook an empirical study in the Amhara regional state of Ethiopia, in the case of North Wollo. The data analysis based on food balance sheet and aggregate food security index reveal that the North Wollo Zone is highly food insecure area and the majority of the sampled households depend on famine relief assistance. In addition they tried to find the cause of food insecurity using logit model and found that cereal production, education, fertilizer consumption, livestock, and land size, reduce the probability that household food insecure while, family size increases the probability of insecurity.

Similarly, in Ethiopia in the case of Oromia region using the data carried out by Centre for Studies of African Economies (2003) in collaboration with Addis Ababa University, also used logit model regression to identify the determinants of food security in the selected area. The empirical evidence revealed that farmers' access to fertilizer or educational level of household heads or farmers' access to land or farmers' access to family planning improve the probability of food security in the study area.

Barret and Clay (2003) also find that in rural Ethiopia food aid may change in a consumption pattern and shift the production pattern of agricultural system. In community study on resource access and food security in North Wollo the most frequently mentioned income sources were food for work, migrant labor and daily wage labor. Moreover the sales

of fuel wood and charcoal, grain trading and handicraft were found to be more important non-farm activity for women (Yared et al., 2000).

The Consortium for Southern Africa Food Security Emergency and the World Food Program have jointly implemented a food and livelihood security monitoring system in six countries in the Southern Africa region since 2002. Based on three round surveys the monitoring system that covered more than 12,000 households, the organizations conclude that food aid can have a positive impact on beneficiary households in several ways. The first is to provide a short-term safety net and a source of calories to individuals so that they can remain productive enough to endure the food security crisis. Food aid can also help households differ spending, avoid selling assets, and avoid invoking other negative coping behaviors. Evidence from the community household clearly shows that food aid has contributed to declining use of coping strategies to meet food needs in beneficiary populations (WFP, 2005).

A study conducted in Uganda on the main cause of seasonal food insecurity revealed a data associated with weather related problems (little or too much rain) followed by pests and disease. Factors that contribute to such insecurity were inadequate labor, inadequate land, not growing enough food during the seasons and soil infertility, poor health, lack of planting materials, lack of oxen for ploughing and so on. The farmers coping strategies include donations from relatives and neighbors, reducing the number of meals or ration, sale of livestock and exchange of labor for food.

The study also shows that female headed households were more food insecure than male-headed households (Bahigwa 1999). Off-farm employment opportunities in rural Ethiopia are limited in both availability and income-generating potential. Only 44% of rural households surveyed by the Ministry of Labor in 1996 reported any non agricultural sources of income, and these contributed only for 10% to household income (Befekadu and Berhanu, 2000).

3. RESEARCH METHODOLOGY

3.1. Data Collection: Tools and Procedures

For this study, both primary and secondary data will be used. Primary data will be collected from sampled rural households using structured questionnaire through interview. The questionnaire will be administered by trained enumerators. The enumerators will be selected based on the criterion of 10th - grade completion and above, and also ability to communicate in Gede'uffaa, common language in the area, and have good motivation to work. They will be trained on the methods of data collection and on how to gain farmers' cooperation.

The Secondary data, from both published and unpublished sources, will be collected from relevant institutions and individuals, Bureau of Agricultural and Rural Development, Southern National Regional State Finance and Economic Development bureau, and other related bureaus, offices, officials and also development agents will be consulted for secondary information.

3.2. Data Processing and Analysis

Food security at household level is best measured by the direct survey of dietary intake (in comparison with appropriate adequacy norms). The level of, and changes in, socio economic and demographic variables can be properly analyzed, and can serve as proxies to indicate the status of and changes in food security (Von Braun *et al*, 1992).

Food security at the household level is measured by direct survey of income, expenditure, and consumption and comparing it with the minimum subsistence requirement. In this regard, income and expenses are used to compute the status of food security. The minimum level of income, which is required per adult equivalent, will be calculated on the basis of amount of food required by an adult person. The government of Ethiopia has set the minimum acceptable weighted average food requirement per person per day at 2100 kilo

calorie (FDRE, 1996; cited in Ayalneh, 2009), which is estimated to be 225 kg of food (grain equivalent) per person per year. Consequently, a threshold level will be set by computing the value of this amount of cereal by the existing local market price of grain. Thus, those households beyond this thresholds level will be deemed to be food secured otherwise not food secured. This study will use the total household expenditure per adult equivalent to compute proxy indicator of food security. This indicator is chosen because of the fact that consumers normally minimize their incomes than their total expenditure. It includes the sum of own produce consumed, purchased (crops and livestock products) for consumption, expenses on clothing, education, medical care, taxes, social obligation, household utensils, transport costs and other expenses. The actual expenditure per adult equivalent per annum will be computed by summing up all the required expenditure components of the household and dividing it by the total adult equivalent of the household for each household.

On the other side, subsistence level of household expenditure or minimum level of income which meets at least the needs of adult person will be calculated based on the amount of food required. For this study, the minimum level of income will be taken as livelihood protection threshold. The **livelihoods protection threshold** represents the total income required to sustain local livelihoods. This is the line below which an intervention is required to maintain existing livelihood assets and strategies. In practice, this means a) enough income to ensure basic survival, b) maintain access to basic services (e.g. routine medical and schooling expenses), c) sustain livelihoods in the medium to longer term (e.g. regular purchases of seeds, fertilizer, veterinary drugs, etc.), and d) achieve a minimum locally acceptable standard of living (e.g. purchase of sugar, coffee/tea, pepper etc.).

Having identified the food insecure and food secured groups of households, the next step will be to identify the socio economic characteristics that will be correlated with the food insecurity. In light of this, it is hypothesized that there are some household characteristics like household size, income, household head educational level, etc that will have relative importance in determining whether the households are food secured or not. To estimate food insecurity gap and its severity Foster Greer Thorbecke (FGT) formula will be used.

$$P(\alpha) = \left(\frac{1}{n}\right) \sum_{i=1}^q \left[\frac{Z - Y_i}{Z}\right]^\alpha$$

Where, α is greater than or equal to zero.

n : is the number of sample of household

y_i : is the measure of poverty (measure of average per capita food calorie intake/US\$1)

for the i^{th} household;

Z : is the cut point between poor and non-poor

q : is the number of poor households; and

α : is the weight attached to the severity of poverty

In order to test the hypothesis, a probabilistic model will be specified with food security as a function of series of household characteristics as explanatory variables. The dependent variable in this case is dummy variable, which takes a value of zero or one depending on whether or not a household is food insecure. Thus, the main purpose of a qualitative choice model is to determine the probability that an individual with a given set of attribute will fall in one choice.

Regression models in which the dependent is dichotomous could be estimated by linear probability model (LPM), logit or probit models. Although linear probability model is the simplest method, it is not logically attractive model in that it assumes that the conditional probability increases linearly with the value of explanatory variables. Unlike linear probability model, logit model guarantees that the estimated probabilities increase but never steps outside the 0 – 1 interval and the relationship between probability (P_i) and explanatory variable (X_i) is nonlinear (Gujarati, 1995).

Usually a choice has to be made between logit and probit models, but as Amemiya (1981) has pointed out, the statistical similarities between the two models make such a choice difficult. However, Maddala (1983) and Kmenta (1986) indicated that many authors tend to agree in that the logistic and cumulative normal functions are very close in the mid range, but the logistic function has slightly heavier tails than the cumulative normal distributions.

Gujarati (1995) Pindyek and Rubinfeld (1981) also illustrated that the logistic and probit formulations are quite comparable, the main difference being that the former has slightly flatter tails, that is, the normal curve approaches the axis more quickly than the logistic curve. Therefore, the choice between the two is one of convenience and ready availability of computer programmers. Hosmer and Lemeshew (1989) pointed out that a logistic distribution has got advantage over the others in the analysis of dichotomous outcome variable in that it is extremely flexible and easily used model from mathematical point of view and results in meaningful interpretation.

Thus, a logistic model will be specified to identify the determinants of food insecurity and to assess their relative importance in determining the probability of being in a food insecure situation at household level. The analysis of the logistic regression model will show that changing an independent variable alters the probability that a given individual becomes food secure, and will help to predict the probability of achieving food security.

Following Gujarati (1995), the functional form of logit model is specified as follows:

$$P_i = E(y=1 / x_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_i)}} \quad 1$$

For ease of exposition, we write

$$P_i = \frac{1}{1 + e^{-Z_i}} \quad 2$$

The probability that a given household is food insecure is expressed by (2) while, the probability for not food insecure is:-

$$1 - P_i = \frac{1}{1 + e^{Z_i}} \quad 3$$

Therefore we can write:-

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} \quad 4$$

Now $(P_i/1-P_i)$ is simply the odds ratio in favor of food insecurity. The ratio of the probability that a household will be food insecure to the probability of that it will not be food insecure.

Finally, taking the natural log of equation (4) we obtain:-

$$L_i = \ln \left[\frac{P_i}{1 - P_i} \right] = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad 5$$

Where P_i = is a probability of being food insecure ranges from 0 to 1

Z_i = is a function of n explanatory variables (x) which is also expressed as:-

$$Z_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_n X_{in}$$

6

β_0 is an intercept

$\beta_1, \beta_2, \dots, \beta_n$ are slopes of the equation in the model

Z_i is log of the odds ratio, which is not only linear in X_i but also linear in the parameters.

X_i is vector of relevant household characteristics

If the disturbance term (U_i) is introduced, the logit model becomes

$$Z_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_n X_{in} + U_i$$

7

The logit model cannot be estimated by the usual ordinary least square method because to apply OLS we must know the value of the dependent variable $\ln(P_i / 1 - P_i)$, which obviously not known and moreover the methods of OLS doesn't make any assumptions about the probabilistic nature of the disturbance term. If there is data on individual observations the method of maximum likelihood can be used to estimate the coefficients of the equation (Gujarati, 1999).

It needs to be clarified that prior to the estimation of the logistic regression model, the explanatory variables are checked for the existence of multi colinearity. In this study among the other methods Variance Inflation Factor (VIF) will be used to measure the degree of linear relationships among the continuous explanatory variables. Where each continuous explanatory variable is regressed on all the other continuous explanatory variables and coefficient of determination for each axillaries or subsidiary regression will be computed.

Following Gujarati (1995), VIF is defined as:

$$VIF (X_j) = \left(\frac{1}{1 - R_j^2} \right)$$

8

Where:

X_j = the j^{th} quantitative explanatory variable regressed on the other quantitative explanatory variables.

R_j^2 = the coefficient of determination when the variable X_j regressed on the remaining explanatory variables.

As a rule of thumb, if the VIF of a variable exceeds 10 that variable is said to be highly collinear and it can be concluded that multi co linearity is a problem (Gujarati, 1995).

It is also evident that there might be interaction among qualitative variables, which could lead to the problem of multi co linearity. To detect this problem, contingency coefficients are computed for each pair of qualitative variables.

The contingency coefficients are computed as follows:

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}}$$

9

Where, C = coefficient of contingency, χ^2 = a Chi-square random variable and n = total sample Size.

3.3. Description of the Study Area

Dilla Zuria Woreda is one of the six districts in Gedeo zone of SNNPR. The total area of the district is about 248 km² and is located in the direction of South of Addis Ababa and is sub-divided into 17 peasant associations and one urban dweller associations. Dilla Zuria district is located at a distance of 368 km away from Addis Ababa to south, on the highway to Moyle. It shares a boundary with Dilla in the north and northwest, Bule in the east, bordering with Oromiya Region, Gelana Abaya Woreda to the south and southwest (Dilla Zuria Woreda Administration Office, 2012).

The 2007 census indicates that Dilla Zuria Woreda has a total population of 117,630 of which 58,522 (49.75) are males and 59,108 (50.25%) are females. The population density of the Woreda is 702 persons per km² at a national growth rate of 1.07 percent. Seventy four percent of the population in the Woreda is the Gedeo people (Dilla Zuria Woreda Administration Office, 2012).

According to the woreda Agriculture and Rural Development Office data, agricultural sector is the dominant means of livelihood for the majority of the people in the district. Out of the total of 24,790 hectares of land in the Woreda, 22,871 hectares are known to have potential for agriculture. Annual crops cover 5.03 percent; perennial crops 84.77 percent, uncultivable land 0.65 percent and others are 3.52 percent. It has three main agro-climatic zones with the topography ranging from wide flat valley bottoms to steep mountain slopes. The rainfall distribution of the study area is bimodal. The main rainy season is from June to September ('Kiremt' or Mahar') and the short rainy season is from February to April ('Belg'). The average annual rainfall is 1077.20 mm and, the annual average temperature of the Woreda is 20°C (Dilla Zuria Woreda Agriculture and Rural Development Office, 2012).

3.4. Sampling

Primary data will be collected from sampled rural households through structured interview scheduling. In this study, two stage sampling procedure will be used. At the first stage, 18 PAs were divided into nearest distance and farther distance using cluster sampling. From the clustered 18PAs, 2PAs from far away and 2PAs from the closer distance will be selected using random sampling.

In the second stage, probability proportional to size sampling technique will be employed to draw sample households from the selected sample four Pas. A total of 150 households will be selected. A structured survey interview schedule will be pre-tested to collect the data. For this purpose, enumerators who have completed grade ten and able to understand the local language will be recruited and trained before the pretest.

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Appendices

Annexes IV-CV of The Supervisor

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Personal Data:

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Educational Background

Ph.D. - University of Nebraska, USA, 1972
M.Sc. - University of Minnesota, USA, 1966
B.Sc. - Haile Selassie I University, Ethiopia, 1963

Administrative Experience

May, 2010 - Dean, St.Mary's University College
April, 2006-2009 - Ambassador Extraordinary and Plenipotentiary of
The Federal Democratic Republic of Ethiopia to the
Hellenic Republic

2002 – 2006	Ambassador Extraordinary and Plenipotentiary of the Federal Democratic Republic of Ethiopia to Italy
1998 – 2001	Minister, Minister of Agriculture
1993 – 1998	Academic Vice President, Alemaya University of Agriculture
1988 – 1993	Head, Crop Protection Program, Debre Zeit Agricultural Research Center
1981 – 1985	Dean, College of Agriculture, Addis Ababa University
1978 – 1981	Assistant Dean for Academic Affairs, College of Agriculture, Addis Ababa University

Professional Experience

1993	Associate Professor
1988 – 1993	Assistant Professor, Senior Research Scientist, Debre Zeit Agricultural Research Center, Alemaya University of Agriculture
1986 – 1987	Sabbatical leave in USA, Texas, A & M University and Bonn University
1981 – 1985	Dean, College of Agriculture, Addis Ababa University
1978 – 1981	Assistant Dean for Academic Affairs, College of Agriculture, Addis Ababa University, Alemaya, Ethiopia
1972 – 1978	Assistant Professor, Department of Plant Sciences, Addis Ababa University, and Head of Crop Protection

Post-graduate Thesis Research Advisorship: 30 Students

Scientific Journal Articles (Peer Reviewed): 17

Awards and Grants

1994	Grant by the University of Haifa (Institute of Evolution, Israel, in cooperation with GIFRID Project 157, INT 60 – 94)
1991	FAO Research Grant (Project No. ETH / 88/010)
1986	Fulbright visiting scholar award, Texas A & M University
1969	Rockefeller Foundation Fellowship, University of Minnesota, USA
1964	US AID Scholarship, University of Minnesota, USA