



**ADDIS ABABA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**  
**CENTRE FOR REGIONAL AND LOCAL DEVELOPMENT STUDIES**

**DIMENSIONS OF FOOD SECURITY AND LIVELIHOOD**  
**STRATEGIES AMONG RURAL HOUSEHOLDS:**  
**THE CASE OF JARSO WORADA OF EASTERN HARARGHE ZONE;**  
**OROMIA REGIONAL STATE**

**BY**  
**MUKEREM TAHA SEID**

**JUNE 2011**  
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**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF**  
**ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE**  
**REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN**  
**REGIONAL AND LOCAL DEVELOPMENT STUDIES**

**By**

**MUKEREM TAHA SEID**

**Advisor**

**DEGEFA TOLOSSA (PhD)**

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**MUKEREM TAHA SEID**

**APPROVED BY BOARD OF EXAMINERS**

**SIGNATURE**

Woldeab Teshome (PhD)

**CHAIRMAN, GRADUATE COMMITTEE**

Degefa Tolossa (PhD)

**ADVISOR**

Bamlaku Alamirew (PhD)

**EXAMINER**




**JUNE 2011**  
**ADDIS ABABA**

## Acknowledgements

First and foremost praise be to Allah (S.W) the Beneficent...the Merciful God, who enable me to complete my work.

I would like to express my heartfelt gratitude to my advisor Dr. Degefa Tolossa for his valuable comments and constant encouragements throughout the study. Had it not been his critical comments and unreserved guidance, this thesis would have not been shaped in the present form. I would also like to warmly acknowledge my examiner Dr. Bamlaku Alamirew for his valuable comments and constructive suggestions.

My Special appreciation also goes to My Mother Ade Makiya Siraj and my brothers Ato Fuado Mohammed, Siraj Taha and Muayado Mohamed, Eliyas Abdi, Abduselam Muse and his beloved wife Roza Ahmed, for their encouragements & morale support and, I fail short of word to express my heart-felt gratitude to my wife Fatiya Mohamed and all of my family members for their encouragements and sincere wishes for the success of this work.

I would also like to warmly acknowledge Ato Abdulkarim Mohamed, vice head and leader of extension team of the *Jarso wareda* rural development office and Ato Haji Sani, the head of the woreda animal and marketing desk for their logistical support and assistance during community level discussions and for facilitating access to relevant information at the woreda level and hospitality and also Ato Nega for willing to give documents and information regarding health aspects.

I also greatly acknowledge the dedication and enthusiasm of Abraham G/sellassie for editing this final report; special thanks is due to the my research enumerators, *kebele* officials and the community in the study area for their willingness to share the necessary information for the study and above all for their warm reception

Last but not least Addis Ababa University, school of graduate studies must be acknowledged for funding the research.

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## Abbreviations and Acronyms

<b>AE</b>	Adult Equivalent
<b>ADLI</b>	Agriculture Development-Led Industrialization
<b>ANOVA</b>	Analysis of Variance
<b>ARDW</b>	Agricultural and Rural Development office of Woreda
<b>CSA</b>	Central statistical agency
<b>DFID</b>	Department for international development
<b>DRC</b>	Democratic Republic of Congo
<b>DPPA</b>	Disaster prevention and preparedness Agency
<b>CFSPE</b>	Coalition for food security programme Ethiopia
<b>EEA</b>	Ethiopia Economic association
<b>EHNRI</b>	Ethiopian Health and Nutrition Research Institute
<b>FANTA</b>	Food and Nutrition Technical assistance
<b>FAO</b>	Food and Agricultural Organization
<b>FDRE</b>	Federal Democratic Republic of Ethiopia
<b>FGT</b>	Foster, Greer and Thorebecke
<b>FGD</b>	Focus Group Discussion
<b>FSP</b>	Food Security Programme'
<b>GDP</b>	Gross Domestic Product
<b>HFIAS</b>	Household Food Insecurity Access Scale
<b>HDI</b>	Human Development Index
<b>IDS</b>	Institute of Development Studies
<b>IFAD</b>	International Fund for Agricultural Development

<b>KII</b>	Key Informant Interview
<b>K cal</b>	Kilo Calorie
<b>Masl</b>	Meter above sea level
<b>NGOs</b>	Non-Governmental Organizations
<b>MRA</b>	Minimum Recommended Allowance
<b>ODA</b>	Oromia Development Association
<b>PSNP</b>	Productive Safety Net Programme'
<b>PAs</b>	Peasant Associations
<b>SDPRP</b>	Sustainable Development and Poverty Reduction Programme
<b>TLU</b>	Tropical Livestock's Unit
<b>UN</b>	United Nations
<b>UNDP</b>	United Nation Development Programme
<b>WFP</b>	World Food Programme
<b>WHO</b>	World Health Organization

## **Abstract**

*The matter of dimension of food security in rural areas is of immense nature and needs to be investigated. A number of factors are responsible for the situation. This paper examines the determinants of three aspects of food security in rural areas of Jarso Woreda, i.e. food availability, accessibility and absorption.*

*In light of this, examination of the socio-economic characteristics of the food secure and insecure; identification of factors influencing food security; estimation of the extent of food insecurity; and assessment of livelihood strategies and coping mechanisms of the rural households were undertaken in the study.*

*Two stage stratified random sampling procedure was used to select 3 rural kebeles and 122 sample respondents from a total of 19 rural kebeles. For the purpose, survey questionnaire, FGD and KII were used to collect the primary data from the sample households.*

*To analyze the data, descriptive statistics like mean, standard deviation, percentage, and frequency distribution, household food balance model and Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access were used to describe the socio-economic characteristics of the sample households. In addition attempts were also made to look in to the specific characteristics of the food secure and food insecure groups using univariate analysis (T-test and chi-square ( $\chi^2$ ) tests of significance), with respect to the explanatory variables.*

*The results of the study revealed that the rural households in the study area were food insecure. It was checked by using recommended minimum calorie requirement (i.e., 2100 kcal). Based on the results about 60.7% of the rural households were food insecure*

*A multivariate regression model was used to identify the determinants of food insecurity. A total of twelve explanatory variables, 6 continuous and 6 discrete, were included in the empirical model. Out of these, 6 were found to be statistically significant. These variables include family size, type of household head, and status of education, cultivated land size, livestock ownership and agro-ecology.*

*To estimate the extent of food insecurity FGT index was used. Accordingly, the incidence of food insecurity, food insecurity gap and severity of food insecurity were found to be 60.7 percent, 14 percent and 228 percent, respectively, when we see the household food insecurity access prevalence (HFIAP), it classifies the sample households in to food secure and mild, moderately and severely food insecure. Accordingly result shows only 13.1% of the population was categorized under food secure, while 17.2%, 45.1%, and 24.1% of the population was classified as mildly, moderately and severely food insecure respectively. The livelihood strategies of the rural households were also found to be diversification and integration of activities.*

*Therefore, consideration of dimensions and determinants of food security; and the livelihood and coping mechanisms' of the rural households is important because it provides information that would enable to undertake effective measures with the aim of improving rural livelihoods in general and food security in particular.*

**Key Words:** *food availability, access & utilization; Livelihood strategies and coping mechanism*

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background of the Study

It is now widely accepted that poverty is the principal root cause of food insecurity at the level of households. From the global context, it is obvious that, where there is chronic poverty, there is also prevalence of food-insecurity. As clearly outlined by Degafa (2005), Poverty and food insecurity are the highly interwoven issues that reciprocally reinforce one another. *“Poverty is a driving force for household food insecurity, and food insecurity, in turn, impoverishes a household”* (Degafa, 2005) and World Bank (1986) also explains that food insecurity is directly linked to absolute poverty and lack of purchasing power.

On the other hand, availability and access to resources and the ability and use of resources determine the level of poverty and the status of food insecurity in a given part of the world (Dereje, 2010). This is influenced by bio-physical, socio-economic, institutional and political attributes of those areas. Currently, rural poverty is declining due to various reasons. According to World Development Report (2008) the recent decline in the \$1-a-day poverty rate in developing countries from 28 percent in 1993 to 22 percent in 2002 has been mainly the result of falling rural poverty (from 37% to 29 %). More than 80 percent of the decline in rural poverty is attributable to better conditions in rural areas rather than to out-migration of the poor.

Today, the world has more than enough food to feed every one, which means that, it is generally food self sufficient, producing enough to meet the dietary needs of today’s global population, although future global food security should not be taken for granted because of uncertainties from growing resource scarcity and climate change (World Bank, 2008). Yet, more than 1 billion are food insecure according to current report of WFP (2010), FAO (2010) and IFAD (2010). It has been estimated that, of these population, almost two-third are contributed by seven countries: India, China, DRC, Bangladesh, Indonesia, Pakistan and Ethiopia (FAO, 2008).

Most of the food insecure people live in rural areas of developing countries where food is produced. Yet, they are net food buyers rather than sellers. According to the UN Hunger task force, about half of the hungry are smallholders, 20% are landless, and 10% are agro-pastoralist, fisher folk, and forest users. The remaining 20% live in urban areas (World Bank, 2008).

Consequently, the highest incidence of undernourishment is found in SSA, where one in every three persons suffers from chronic hunger. In fact the greatest number of undernourished people are in South Asia (299 million), closely followed by East Asia (225 million) (World Bank, 2008) Ethiopia is one of the poorest countries in SSA which is known for food insecurity, hunger and famine. As a result, sizable proportion of the country's population has been surviving on imported food through aid and relief support over many decades (Devereux, 2000)

Some five to seven million Ethiopians are chronically food insecure and require support each year. Annual food aid deliveries have averaged 700,000 tons during the last 10 years (IFAD, 2009). According to Human Development Report (UNDP, 2009) its rank is 171<sup>th</sup> out of 182 countries with a Human development index (HDI) value of 0.414.

Even by African standards, Ethiopia's economy is dominated by smallholder agriculture, which employed 85% of the labour force and contributed 46% of national GDP and 90% of export; and 90 % of the poor depend on the sector for their livelihoods (World Bank, 2008). Rural Ethiopia is also unusually undifferentiated: small farmers account for over 90% of total crop area and agricultural output (Bollinger *et al.* 1999, cited in Devereux, 2000). Food production in Ethiopia is highly variable and unpredictable, due mainly to erratic weather, which has triggered famines for centuries.

Ethiopian economy being predominantly agricultural and is unable to cover the food requirement of the country. Because of these and other motives, smallholders are diversifying their economic ventures to non-farm and off-farm activities in order to insulate themselves from shocks. There is variation in such factors as season, sex, age, and wealth status, and food condition in the households' involvement in livelihood diversification. It is also stated by literature (Such as Devereux, 2000 and Degafa, 2005) as there are many motives that lead Ethiopian rural communities to diversify their livelihood portfolios. These factors include food shortage, land scarcity and low food production and opportunity of non-agricultural income.

## 1.2. Statement of the Problem

Poverty, inequality and food insecurity are the most crucial and persistent problems facing humanity. As the scale of human activities expands, the capacity of eco-systems to regenerate the natural resource base becomes an increasingly binding constraint to further growth and development. With respect to agriculture, the combined effect of population growth on developing countries, (of increase per capita income of changes in dietary pattern linked inter alia to growing urbanization) will bring about sustainable increases in demand for food and other agricultural products (Kostas *et al.*, 2001 cited in Abebaw, 2003).

It should also be noted that the types of activities practiced and strategies followed by households may lead to sustainability of the livelihoods (Scoones, 1998 and Degafa, 2005), which one of the outcomes are food security. Since this study is about dimension of food insecurity and livelihood strategies of rural households to respond to food insecurity, the condition needs to be assessed from the household level. According to Degafa (2005) a household that leads a sustainable livelihood often feels food secure throughout the year by realigning crop cultivation and livestock rising or through running own non-farm ventures or working with somebody else. As he further explains, a household is food insecure when it is incapable of sufficiently feed its household members from its own production or purchase from the market in return to own cash, which may be earned from the exchange of self-endowment.

Since Ethiopia is the nation of great diversity, with regard to its bio-physical environment, socio-cultural, economic and livelihoods activities of the people, the occurrence of famine has differed both spatially and temporally in the country. According to Mesfin (1984) cited in Adane (2008), there are two famine-prone belts in Ethiopia. The first includes some part of the north shoa, south Wollo and north Wollo zone, and some parts of Tigray. The second famine prone belts are the range based pastoral economy of lowland Ethiopia, which runs from Wollo in the north through Hararghe and Bale to Sidamo and Gamagofa in the south.

Studies have also shown that there are diverse causes for household food insecurity in Ethiopia, including recurrent drought, limited sources of alternative income, population pressure, limitation in technology, lack of product diversification and market integration, limited capacity in planning and implementation, environmental degradation, limited access to credit and lack of access to information are the main once (CFSPE, 2003; EEA, 2003/04; Canali and Slaviero, 2010).

East Hararghe zone is one of the food deficit zones of Oromia regional state, which is found in the second drought prone belt. According to Getachew (1995) and Tesfaye (2003) cited in Adane (2008) in Hararghe, there have been very few years without famine relief distribution since the 1970s, even during moderately dry or non-drought years. In this zone (out of 16 *woredas*), nine are drought-prone and food insecure (Angèle, 2007). In the zone in general and study area in particular drought and famine have been reinforcing each other and occurring frequently in less than five years interval, which mainly emanated from demographic, socio-economic and environmental problems.

Overall the agriculture in *Jarso Woreda* is rudimentary and low in productivity. It suffers from high variability of production: there is a large dominance of small-scale subsistence farming affected by low use of modern inputs, technology and recurrent drought. The high and increasing density of rural population and the consequent pressure on land cause disintegration of the land tenure systems, with fragmentation of farm holdings, environmental degradation and decline of land fertility are the cumulative causes of food insecurity (Angèle, 2007). In spite of various attempts by the government and Non-governmental Organizations (NGOs) to ensure rural household food security (e.g. by credit provision and small-scale irrigation schemes), most farm households in the area face food shortages just few months after harvest. As a result, major livelihood assets of the rural households that belong to the study area are significantly depleted, which makes it one of safety net beneficiary *woreda* in the region.

This research was proposed mainly due to the following three reasons: First the study area is one of the hot spot areas in the country in relation to recurrent famine, and malnutrition prevalence since the 1970s. Second, most food security studies so far more focused in the north-eastern parts of the country, whilst the eastern parts of the country in general and the low-land parts in particular have been marginalized in food security research agendas. Third, by their nature, the dimension of food security and livelihood strategies of rural household are complex and varied from place to place according to the livelihood activities, asset possession, and coping strategies of the area. Thus, the livelihood of the eastern and the northeast may differ.

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

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

The overall objective of the study is to assess the dimension of food security and livelihood strategies and coping mechanisms of rural households in *Jarso Woreda*.

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

The specific objectives of the study include the following:

1. To study the socio-economic characteristics of the food in/secure rural households;
2. To identify the determinants and dimension of food security among the rural household;
3. To estimate the food insecurity gap and its severity among rural households;
4. To examine the livelihood strategies of rural households.

### **1.4. Research Questions**

1. What are the characteristics of food secure and insecure households?
2. What are the aspects and determinants of food security in the area?
3. What are the livelihood strategies that are used as survive mechanism in the area?
4. What are factors generally affecting the food security level in study *Woreda*?

### **1.5. Justification and 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 future researchers 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.

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), is also expected to equip the different organizations with more detailed and pertinent information about livelihood strategies adopted by the rural households of the area. It would also help them design ways so as to build their intervention mechanisms.

## **1.6. Scope and Limitations of the Study**

The study was conducted to identify the determinants of food security at the household level and to assess the severity of the problem at this level. The study covered only 3 of the 19 *Kebeles* of the *Jarso Woreda*. Moreover, the study deals with a limited number of households and focused on the dimensions and determinants of food security. The data were collected at one time period and during the time of harvest where food shortage faced by the households in the study area is expected to be low.

A comprehensive analysis of food security involves a range of activities. It requires understanding the resource base of a particular area in relation to a particular group of people. It also involves establishing a clearer picture of the intervening social, economic and political factors that affect the food security status of households. This means that food security analysis demands understanding of the link between the micro-and meso- and macro-level factors that affect all dimensions of food security/insecurity. Besides, rural livelihood is so dynamic and therefore food security analysis should be an ongoing and iterative process. Therefore, to build up a characteristically realistic picture of the situation and for reasons associated with time and resources, the scope of this study should be limited, since it is practically difficult to capture a comprehensive picture of all the dynamics involved in a thesis research like this one. Also, no information on the nutritional status of members of the rural households is collected in the survey for this study. Therefore, the utilization dimension of food security was estimated indirectly through the access and provision of certain infrastructures like health, safe drinking water and sanitation situation.

This study therefore, does not claim to be comprehensive. Rather it focuses on a micro-level investigation of the nature and types of the existing and recently emerged (contemporary) rural households' food security and livelihood strategies and the underlying social, economic and demographic factors that influence the food security and the choice of certain strategies by individual households.

## **1.7. Organization of the Thesis**

The thesis is classified into seven chapters. The first chapter is an introductory part which incorporates background and statement of the problem, objectives, justification and significance of the study, limitations of the study. The second chapter is devoted to literature review and formulation of analytical framework of the study. In this chapter, theoretical explanations of food security/insecurity and other empirical reviews related to dimensions of household food security are presented. Based on the theoretical explanations and empirical reviews, analytical framework of the study is also established under this chapter. The research methodology is explained under the third chapter where data set of the study, methods of analysis, and variables to be analyzed are explained. Chapter four presents the general background of the study area and the socio-economic characteristics of the sample households. Chapter five discusses the results of the study on the issues related to households' food security status and factors influencing household food security and its determinants. Chapter six also continues on the discussion of the results of the study related to the magnitude, extent and intensity of food security, livelihood strategies. The final section is devoted to summary of the study, conclusion, and recommendations.

## CHAPTER TWO

### LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

#### 2.1. Concepts of Food Security

A clear understanding of the concept of food security is an essential element to better explore the underlying causes and dimensions of food security. Food security is a concept that can generally be addressed at global, regional, national, sub-national, community, household and individual levels (Kifle and Yosef, 1999; as cited in Degafa, 2002). Since the world food conference of 1974, the concept of “food security” has evolved, developed, multiplied, and diversified. At the last count, there were close to two hundred definitions of the term (Smith *et al*, 1992; Cited in Maxwell, 1996).

The conceptual framework of food security has progressively developed and expanded based particularly along with the growing incidence of hunger, famine and malnutrition in developing countries. The concept of food security attained wider attention in the early 1980s after the debate on ‘access’ to food and the focus of unit of analysis shifted from national and global level to household and individual levels (Debebe, 1995). The history of thinking about food security since the World Food Conference can be conceptualized as consisting of three important and overlapping paradigm shifts. The three shifts are: from the global and the national to the household and the individual, from a food first perspective to a livelihood perspective, and from objective indicators to subjective perceptions (Maxwell, 1996).

As summarized by Getachew (1995) and Sen (1984), started to argue that ‘the mere presence of food in the economy, or in the market, does not necessitate a person to consume it’ and thus starvation can set in without any obvious aggregate availability fall. To make it very clear available evidences indicate that during the last two decades, there has been an increasing trend in per capita food output in the world. In contrast, a significant proportion of the populations, particularly, in the developing world, have been suffering from hunger and malnutrition. In 1990, for example, the calorie supply at the global level was more than 110 percent compared to the total requirement. However, during the same period, more than 100 million people were affected by famine and more than a quarter of the world population were short of enough food (Debebe, 1995). These facts indicate that availability at global level does not guarantee acquisition of food at national or household levels.

Conventionally, the broader concept of food security is reflected in the World Food Summit definition: *food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'*. Access to the needed food is necessary, but not a sufficient condition for a healthy life. A number of other factors, such as the health and sanitation environment and household and public capacity to care for vulnerable members of society, also come into play (Von Broun *et al* 1992; cited in Abebaw, 2003 pp.12).

According to Kifle and Yoseph (1999) availability is basically a household's capacity to produce the food it needs. The second component relates to people's ability to get economic access to this food. Economic access is typically constrained by income. If households cannot generate sufficient income to purchase food, they lack an entitlement to the food. The third component concerns an individual's ability to use food consumed for growth, nutrition, and health. In an environment lacking clean water, sanitation, child care, and health facilities, the ability to use food to promote health and nutrition will be impaired (Haddad, 1997 cited in Abebaw, 2003).

Considering its span of duration, World Bank (1986), Tesfaye and Debebe (1995), made a distinction between chronic and transitory food insecurity, which are closely intertwined to each other. A constant failure to food 'access' is distinguished as 'chronic', while a temporary decline is considered as 'transitory' food insecurity. Chronic food insecurity is a continuously inadequate diet caused by the inability to acquire food. It affects households that persistently lack the ability either to buy enough food or to produce their own. Transitory food insecurity, on the other hand, is a temporary decline in a household's access to enough food. It results from instability in food prices, food production, or household income-and in its worst form it produces famine (World Bank, 1986).

Transitory food insecurity can be further divided into cyclical and temporary food insecurity (CIDA, 1989, cited in Maxwell and Frankenberger, 1992). Temporary food insecurity occurs for a limited time because of unforeseen and unpredictable circumstances; cyclical or seasonal food insecurity when there is a regular pattern in the periodicity of inadequate access to food. This may be due to logistical difficulties or prohibitive costs in storing food or borrowing.

### **2.1.1. Indicators of Food Security**

Assessment of food insecurity is a difficult issue as there are no universally established indicators which serve as measuring tools. Food security requires a multi-dimensional consideration since it is influenced by different interrelated socio-economic, environmental and political factors. Because of this problem, assessing, analyzing and monitoring food insecurity follow diversified approaches; ranging from a mere quantitative to a combination of both quantitative and qualitative measurement (Debebe, 1995)

Along with the development of the concept of food security, a number of indicators have been identified, these include food supply indicators (rain fall, area planted, yield forecasts and estimate of production); social-stress indicators (market prices, availability of produce in the market, labour patterns, wages and migration) and individual stress (which indicate nutritional status, diseases and mortality). The different types of indicators, however, can be classified into two main categories': process and outcome indicators. The former provides an estimate of food supply and food access situation and while latter serves as proxies for food consumption (Debebe, 1995).

Outcome indicators are also classified into direct and indirect indicators. The former includes, household budget and consumption survey, household perception of food security, food frequency assessment while the latter includes; storage estimate, subsistence potential ratio, nutritional status assessment (Maxwell and Frankenberger, 1992)

The most important issues related to food access indicators is the diversified coping strategies developed by household and the sequential responses through which people used to pass at times of decline in food availability. As the bellow table demonstrates, the responses vary from commitment of low domestic resources to distress migration depending on the intensity of crisis.

**Table 2.1: Indicators of Household Food Security**

<b>A. Supply Indicators</b> -Meteorological data -Information on natural resources -Agricultural production data -Marketing information	-Agro ecological models -Food balance sheets -Information on pest damage -Regional conflicts
<b>B. Food Access Indicators</b> -Land use practice -Dietary change -Diversification of income sources -Livestock sales -Sale of productive assets	-Diversification of livestock -Change of food source -Access to loan/credit -Seasonal migration -Distress migration
<b>C. Outcome Indicators</b> -Household budget and expenditure -Food consumption frequency -Subsistence potential -Nutritional status	-Household perception of food security -Storage elements

**Source:** Frankenberger (1992)

It should be understood that each type of household food security indicators have their own strength and shortcomings. As a result, a number of criteria can be used in the selection of indicators for use in monitoring household food security. These include resource availability, relevance, accuracy and timeliness (Frankenberger, 1992).

### **2.1.2. Dimensions of Food-Insecurity**

Increasing understanding of the various dimensions of food security has led to multiple theoretical formulations and reformulations of the causes and how they should be identified and analyzed. There is a broadening of the scope of the term food security beyond the conventional thesis of world and regional food-supply adequacy to individual and household levels with a focus on access (Sen 1981), to issues of sustainability (Scoones 1998) and vulnerability (Chambers, 1989). The issue of food security/insecurity is directly linked to the socioeconomic development of the geographical area concerned.

Although food security is a multivariate interaction with various dimensions, those like availability, access and utilization are known to be the principal one, some literature add stability of access as a fourth dimension (IFAD/FAO/WFP, 2000)

**Availability Dimension:** the various dimension of food security are represented by a number of indicators that are in most of the situation specific to the country in case. The availability dimension of food could be represented by deficit in food production. This aspect of food availability could be captured through a simple ratio of consumption requirement per capita to production of cereals. The ratio at any particular cross-section of time, however, may not be representative of the food availability situation. Because any particular year considered for analysis might be a normal year or a surplus crop or crop failure. It would therefore be important to take an average of the crop data over more than one year for working out the ratio of consumption to production (WFP, 2005).

**Access Dimension:** the availability of food is necessary condition of food security but not sufficient in itself. Food may be available in sufficient quantity but the population may not have the purchasing power to buy the food. The purchasing power, on the other hand, is linked to the income and livelihood access as also the assets capability of the households. These indicators are further linked to education and employment of the members in the households, especially that of the head of the household. Due to the inter-linkages, the poor households, for example, would have less education, little scope to get employment or get engaged in low paid employment activities, which in turn would earn them no or very low income (WFP, 2005).

**Utilization Dimension:** this represents the food assimilation into the body and the nutritional implications of food security thereof. While the availability and access are necessary and sufficient conditions of food security, proper utilization of food is the most cognitive assumption of food security. The utilization of food would be considered good only if the food consumed is a balanced diet with all the essential nutrients and micro-nutrients assimilating into the body in right proportion. This is the essential condition for development of healthy, lengthy and productive life. This factor in turn governed by knowledge on good nutrition and dietary practices. Besides, availability of safe drinking water, environmental sanitation and hygiene are also important factors that have a strong bearing on the nutritional outcomes (WFP, 2005).

**Stability of access:** are individuals at high risk of losing their access to food? An example of this situation would be a landless, agricultural laborer who was almost wholly dependent on agricultural wages in a region of erratic rainfall. Such a person is at high risk of not being able to find work in a situation of general crop failure and thus going hungry, i.e. is vulnerable (FAO/TCAS, 1996).

There was a tendency to underplay the importance of the fourth dimension, stability of access, in the past. It is, however, crucial, because it is required for understanding the concept of vulnerability. A person can be vulnerable to hunger even if he or she is not actually hungry at a given point in time. In general, the ability to call upon resources in emergencies reduces vulnerability (IFAD/FAO/WFP, 2000).

### **2.1.3. Measuring Food Security Outcomes**

Recent research on the multi-factorial nature of food security has provided a wealth of analytical insight, but measurement problems remain as a major challenge, not only for research, but particularly for targeting, program management, monitoring and evaluation (Maxwell, *et al*, 1999 cited in Abebaw, 2003). However the search for viable indicators is driven by the lack of a 'gold standard' measure for food security. Measures of consumption, poverty and malnutrition are all used as proxy measures, indicators of assets and income are used as more distant determining factors (Maxwell and Frankenberger, 1992).

As further reviewed in Maxwell, *et al* (1999) the most common indicators of food security revolve around measures of food consumption. A good measure of consumption requires data on household food consumption, household size, age and sex of individuals, as well as physical size and activity levels. Even if average size and activity levels are presumed, consumption measures capture only the physiological sufficiency elements of food security.

Many studies have found that process indicators are insufficient to characterize food security outcomes (Hoddinot, 2001). Accordingly, he outlined four measures of household food security outcomes: individual intakes, household calorie acquisition, dietary diversity, and indices of household coping strategies.

## 2.2. Empirical Review

Per capita food production in SSA including Ethiopia has been declining in the last three decades (Mohamed, 1995). Production growth rates during these decades declined around -0.6 percent between 1980 and 83 and gradually declined to -6.2 percent in 1990 (FAO, 1990). On the other hand, with a rapid population growth, the demand for food has been increasing at the rate of 2.9 percent per annum since 1979 (Yaker, 1993, cited in Abebaw, 2003) resulting in food imports and international aid.

Despite the available resources and the efforts made by governments in SSA, food insecurity remains one of the most crucial issues. For instance at the beginning of the 1980s consumption of basic staple food exceeded production by about 8 million metric tons (Braun and Paulino, 1990, cited Abebaw, 2003).

Ethiopia having considerable agricultural potential has been self sufficient in staple food and was classified as a net exporter of food grains till the let 1950s. It was reported that the annual export of grain to world market amounted to 150,000 tons in 1947/48 (Alemayehu 1988; cited in Tesfaye and Debebe 1995). However since 1960s, domestic food supply failed to meet the food requirements of the people. Even though sufficient amount of food has been produced in most of the good years, the average food production during the last decade remained almost stagnant.

Nevertheless, since the beginning of the mid 1980s, food production has exhibited very low level of growth. Total domestic food production between 1979/80-1993/94 increased by only 0.5 percent per annum. The level of per capita food production in the same period drastically dropped by 2.5 percent owing to the rapid population growth. The food self sufficiency ratio as measured by the extent of food demand met by domestic food production, has also declined following the decreased trend in food production (Tefaye and Debebe, 1995).

Food availability in Ethiopia is to a great extent determined by domestic staple food production by subsistence agriculture. Even though there is a marked variation among various regions, cereals including teff, sorghum, maize and wheat are predominantly produced and consumed in the country. There is growing evidence conforming that even in the normal years, Ethiopia has failed to domestically produce enough food to meet the subsistence needs of its population (Ayalneh, 2002).

For instance, according to the current report of FAO/WFP crop and food security assessment mission, the cereal import requirement of the country in 2010 is estimated at nearly 1.16 million tones. With commercial imports forecast at 520 000 tones and food aid in pipeline and pledges currently amounting to about 30 000 tones, there is an uncovered gap of about 610 000 tones (FAO, 2010).

Regardless of substantial resources invested each year by the Government and its partners to reduce food insecurity, both chronic and transitory food insecurity problems continue at the household level in Ethiopia. The major factor contributing to food insecurity remains to be consecutive below normal rainfall seasons. Other factors contributing to household food insecurity include the food prices increases both nationally and globally; markets functionality in some rural areas; access to credit for agricultural inputs; lack of pasture and water for livestock; and inadequate water for human consumption especially in the lowland and pastoral areas; low livestock productivity that has not recovered from subsequent droughts; inadequate veterinary and health services; and population growth that is not matching the agricultural production (FAO, 2010).

A number of studies confirmed that there is severe food insecurity in Ethiopia covering a wide range of areas and affecting a large number of people. Over 40 percent of the estimated food insecure people in SSA are found in Ethiopia, Nigeria and Zaire (Andeson 1989; cited in Tesfaye and Debebe, 1995). Moreover, according to MOFED (2002) based on the national food poverty line stood at Birr 649.81, the proportion of people in Ethiopia who are absolutely poor during the year 1999/00 was 44.2 percent. Furthermore, based on the evaluation of 14 important socio-economic indicators (such as level of inputs and credit uses, oxen ownership, nutritional status, infant mortality, etc), five regions including the main cash crop producing areas (Wello, Gamo Gofa, Illubabure, Hararghe and Sidamo) were identified as the most deprived areas (Tefaye and Debebe, 1995).

The case studies conducted in rural Dire Dawa reported that among the sample households only 28 % were found to meet their energy requirement. In other words 76 percent of the sample households were found to be food insecure (Abebaw, 2003). In the same way the study conducted in west Hararghe of Daro Labu Wareda, 68.9% of the households categorized themselves food insecure when asked whether they feel food secure or not based on their own perception (Adane, 2008).

### **2.2.1. Determinants of Household Food Security**

Food security is generally affected by two major determinants: Availability of food and accessibility to it (Andersen, 1997 cited in Abebaw, 2003). Same source also showed that human resource development, non-food factors, including education, health care, and clean water; population growth, urbanization and displacement of people greatly influence food insecurity and human nutrition. This source further stipulated that natural resource and agricultural inputs are critical determinants of food security.

Food insecurity is due to a variety of reasons, and the FAO/UNDP (1987) cited in Getachew (1995) suggested, i) the relatively high density of human and livestock populations and the resulting squeeze of land resources; ii) the inability of agricultural practices to sustain the required productivity levels of land; iii) insufficient level of adoption of modern farm technology; iv) extensive and often irreversible levels of land degradation; v) the value placed on livestock, specially cattle, in the social economic system and the accomplishing desire to maintain large livestock holdings.

A case study of resource and food security (likewise food insecurity) of Wobera District of East Hararghe Zone (Getachew, 1991) showed that sufficient conditions exist for chronic and transitory food insecurity among the households. These conditions are: first, land, one of the most important resources for food production, is scarce among the study households. Second, other household resources such as livestock have fallen dramatically. Third, due to climatic hardship, even cereal major producing areas remain deficit, leaving both cereal and cash crop dependent households in a disadvantaged food supply position. Fourth, the administrative apparatus of Ethiopia (both past and present) neglected the rural sector with no or realistic development strategies to reduce risks of food insecurity.

The same source further showed that agro-ecological induced variation of holding size and plot distribution and ox-ownership, as an important factor in determining household resource endowment and the ability to perform agricultural activities, came out to be factors which determine the food security situation among the sample households.

Moreover, other factors that were given due attention in the study were labor, land-to-man ratio, ability of the area to offer cash crop and off-farm income, grazing land, household indebtedness, cash block (off farm employment income, cash crop income, livestock income and borrowing), market price, household expenditure (obligation to the state, rural institution, the household itself and other households).

In a case study of Social and Demographic Characteristics *Habro woreda*, using logistic regression model, Getachew (1993) showed that there is a statistically significant relationship between resources held by a household and its level of food security. It was confirmed that those households which hold land less than three Timad, do not own any oxen, have a small household adult equivalent size and earn non-farm income of less than Birr 500 (or nothing at all) are those most at risk of food insecurity among the sample population. Consequently, the researcher showed that the levels of income and farm size are the most important resources determining food security when other factors such as favorable climatic conditions and low pest outbreak are satisfied. In other words, a larger land size and high income increase the chances of maintaining food security.

Poor target groups often lack access to institutions and services which could help them in improving their subsistence production and income (SLE, 1999; cited in Ayalneh 2002). Moreover, it is a combination of availability, access and the chance of receiving external assistance that determines the households' food security.

### **2.3. Livelihood Strategies**

Livelihood strategies are the range and combination of activities and choices that people make in order to achieve their livelihood goals. On the basis of their personal goals, their resource base and their understanding of the option available, different categories of households-poor and less poor-developed and pursue different livelihood strategies. These strategies include short term consideration such as ways of earnings a living, coping with shocks and managing risks, as well as long term aspirations for children's future and old age (Ellis, 2000).

Livelihood strategies are composed of activities that generate the means of household survival (Ellis, 2000). The livelihood strategies that households develop to ensure their livelihoods depend on how they can combine their livelihood assets, take into account the vulnerability context in which they live, and the policies, institutions and processes that affect them. The livelihood outcomes that households achieve with their strategies can depend on any or all these elements (Messer and Townsley, 2003, cited in Mulu, 2008).

The purpose of inventing strategies is to seek patterns that can be acted up on in order to improve the livelihood prospects of the poor. This is about discovering alternatives and increasing options. One way of ensuring a broad view is to think about people's underlying livelihood strategies, what they are trying to achieve rather than what they may be doing at any point in time. Hence, consideration has to be given to issues such as: the way in which people use their assets (to maximize income or minimize vulnerability); which assets they choose to invest in and which they choose to run down, (DFID, 1999).

At village or community level, a single livelihood strategy could not apply, since different households will adapt different strategies according to their particular asset and asset status (Ellis, 2000). Swift and Hamilton (2001) have indicated that households may construct four main categories of livelihood strategies in a rural context: *Livelihood intensification*, where the value of output per hectare of land or per animal is increased by the application of more labor, capital and technology; *Livelihood extensification*, where more land or animal are brought into production at the same level of labor, capital and technology; *Livelihood diversification*, where households diversify their economic activities away from reliance on the primary enterprise (livestock or cropping), typically seeking a wider range of on – and off – farm sources of income; *Migration*, where people move away from their initial source of livelihood, and seek a living in another livelihood system.

Although conceptually the above helps to distinguish these strategies from each other, typically households pursue a combination of strategies together or sequentially. Different individuals or social groups may use similar strategies for different reasons. Households may use particular strategies to meet minimum consumption needs in the present, or to achieve ongoing accumulation, corresponding to a distinction between subsistence strategies and livelihood strategies (Davis, 1996 as cited in Mulu, 2008).

The more choice and flexibility that people have in their livelihood strategies, the greater their ability to withstand-or adapt to-the shocks and stresses of the vulnerability context (Kostas et al., 2001 as cited in Abebaw, 2003).

## **2.4. The Sustainable Livelihoods Framework**

Different agencies involved in livelihood operations adopt different approaches of livelihoods. However, there is some communality among them. The common thread that unites all the agencies is that, the most adopt Chambers and Conway definition of livelihoods (or some slight variant on this). This definition holds that: *'a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihood at the local and global levels and in the long and short term'* (Chambers and Conway, 1992).

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

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

### **2.4.1. Sustainable Livelihood Framework and the Analysis of Food Security**

The analysis of food security through sustainable livelihood framework has become popular because it provides a practical tool kit for linking the analysis with multi-dimensional and people centered analysis of poverty looking beyond income and consumption levels to include an assessment of people's strategies', assets and capabilities (Devereux, 2004).

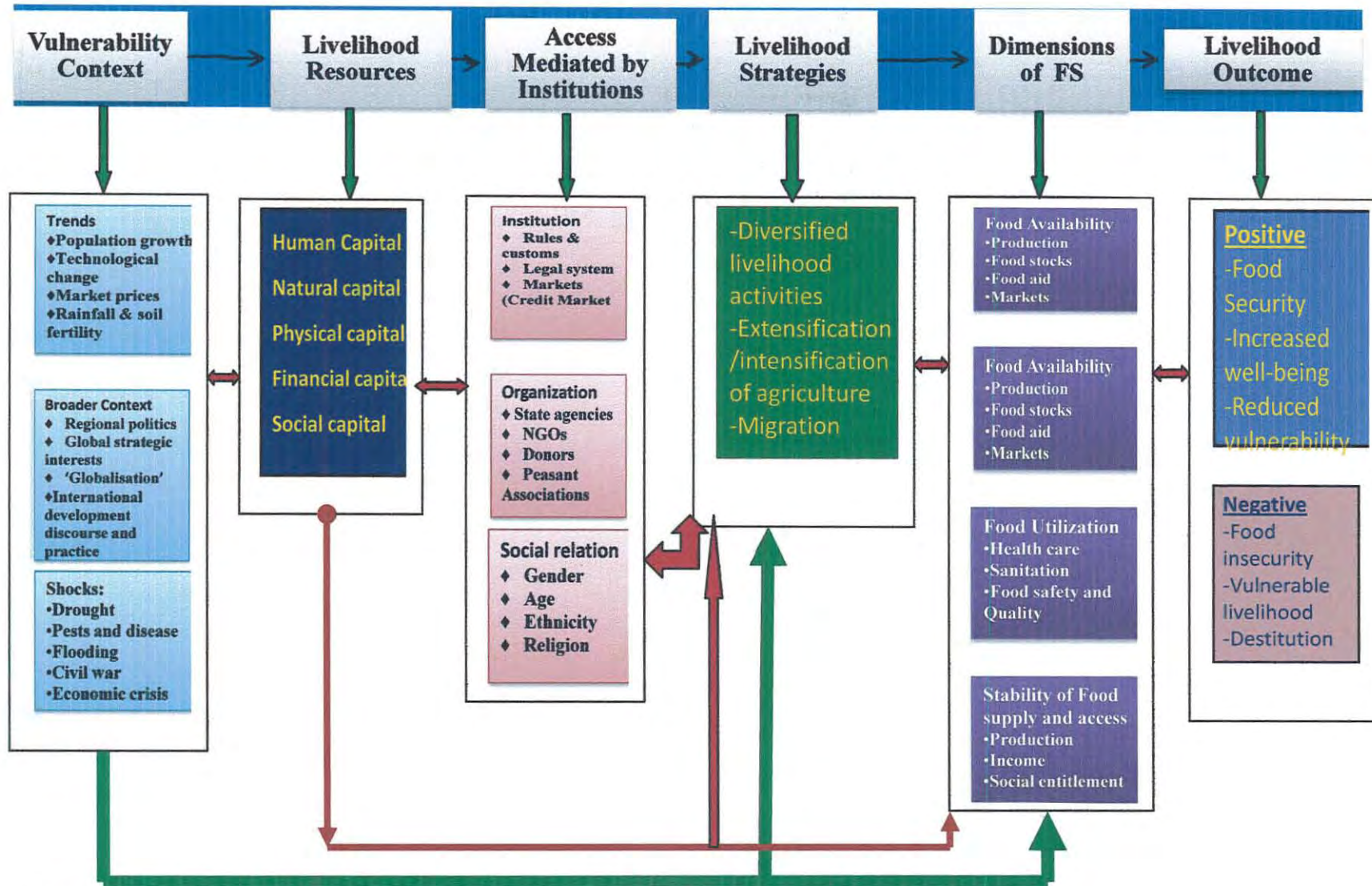
The sustainable livelihood framework incorporates the following five elements: vulnerability context, livelihood assets, transforming structures and process, livelihood strategies; and livelihood outcomes (DFID, 2000). From these elements vulnerability context and livelihood assets are the main components of households' food insecurity.

The sustainable livelihood approach emerged from a critique of earlier attempts to understand crisis in household provisioning and food security. The most influential of these was the entitlement approach proposed by Sen (1981) as a way to understand famine.

A sustainable livelihood approach shows that food security is not just an issue of productivity, or even the sustainability of production, or of entitlements, but depends on how people, especially poor people gain access to production and exchange capabilities and to food. This is also true of an entitlement approach, but a sustainable livelihood approach takes a more nuanced view of institutions, how they work and are used by different categories of people, and how they develop over time (Swift and Hamilton, 2000).

The same source indicates that, a Sustainable Livelihood Approach has many advantages because it is a people focused, multi-sectoral, and considers multiple factors. Livelihood approach has recognized the significance of assets in determining the food security status of households.

Figure 2.1: Sustainable Livelihoods Framework



Source: Adapted from Scoones, (1998), Devereux, (2000) and Degefa, (2005)

## 2.5. Definitions of Variables and Working Hypothesis

Review of literatures, past research findings, experts and author's knowledge of the food insecurity situation of the study area were used to identify the potential determinants of household food insecurity.

**Household Food Per Capita Availability (FOPATY):** is continuous dependent variable in the model and its cut point 2100 kcal, if calorie per capita is  $\geq 2100$  the household is food secure and if less than cut point it assumed to be food insecure. The information, which identifies the food secured from the food insecured, is obtained by comparing the total food calorie available for consumption in the household per AE to the minimum level of subsistence requirement per AE (2100 kcal) using Food balance model. Household beyond this threshold is said to be food secured, otherwise not.

**Family Size in Number (FASZ):** It is an important variable, which determines the household food insecurity status in the study area. As the family size increases, the number of mouths to be fed obviously decreases which shares the available food in the household. Hence, it is hypothesized that family size and food insecurity in the study area are positively related

**Age of the Household Head (AGE):** Rural households mostly devote their live time or base their livelihoods on agriculture. The older the household head, the more experience he has in farming and weather forecasting. Moreover, older persons are more risk averters, and mostly they intensify and diversify their production activities. As a result, the chance for such household to be food insecured is less. In light of this, It is hypothesized that Age of the household head and food insecurity are negatively correlated in the study area.

**Dependency Ratio (DPR):** In a household where adults or productive age groups are higher than the non productive age groups, the probability of the household to be in shortage of food would be less. The reverse is also true in that the higher the number of the nonproductive age groups, individuals whose ages are less than 15 years and greater than 65 years, in relation to the number of productive age groups of individual that the household has, the higher the probability of the household to be food insecured. Most individuals share what the few productive age groups produce. Therefore, it is expected for dependency ratio to be directly related with food insecurity.

**Education (EDUC):** Education equips individuals with the necessary knowledge of how to make living. As agriculture is a dynamic occupation the conservation practices and agricultural production technologies are always coming up with better knowledge. So if the household head is literate, he/she will be very keen to accept extension services and soil and water conservation practices including any other income generating activities. Hence, in the study area different activities are undergoing and it is perceived that households who have had at least primary education or informal education are the ones more likely to participate than the others and their chance to be food secured will be higher. As a result it is expected that education to have negative impact on food insecurity.

**Cultivated Land Size (CLSZ):** As the cultivated land size increases, provided other associated production factors remain normal, the likelihood that the holder gets more output is high. So that households who have large cultivated land size can have a better option to diversify production and to increase its production so such a household will be in a better position in its food security status. Consequently it was hypothesized that the larger the cultivated land the less will be the chance to be food insecure.

**Irrigation (IRGN):** If the climatic condition in a given area is not promising, then it would be far better to be supplemented with irrigation so that increased production output could be attained. However, in the study area the high evapo-transpiration coupled with less and erratic precipitation curtails the production output per hectare and destines the study area as one of the food deficit regions of the country. Therefore, irrigation is the key technology to boost the production of the households. With this justification it is hypothesized that irrigation and food insecurity are negatively related in the study area.

**Access to Credit (ACRDT):** Those households who received the credit they wanted have better possibility to spend on activities they want. The possible explanation is that, in the study area, those households who were willing to participate in credit scheme and managed to get access to it became capable to improve their income position through performing different activities and succeeded to secure better access to food than those who were not. Hence it was expected that credit will have a negative impact on food insecurity.

**Total Livestock Owned (TLU):** Livestock are source of income for farming households. Households who have better possession of livestock are expected to be less vulnerable to food insecurity. This is so because livestock directly (meat, milk and egg) or indirectly (draft power, manure and income from sales of livestock and livestock products) contribute to house hold food security. Therefore, it is expected that livestock holding have a negative impact on food insecurity.

**Non-Farm Income Generating Activities (NFIGA):** Crop production and income earned from sales of Livestock and livestock products is inadequate in the farming households of the study area. They often look for other income source other than agriculture to push themselves to the threshold of securing access to food security. As a result it is expected that households who managed to get involved non-farm income generating activities are less likely to be food insecure. i.e., participation in non-farm income generating activities is expected to have a negative impact on food insecurity.

**Sex of Household Head (HHH):** Labor factor plays a great roll in the rural area. Hence, male headed households are in a better position to pull labor force than the female headed ones. Moreover, with regard to farming experience males are better than the female farmers. So sex of the household head is an important determinant of food insecurity in the study area. Therefore, it is hypothesized that male headed households are less likely to be food insecure.

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

**Agro- Ecology (AECOL):** there is also difference in the food security status of household in relation to their agro-ecology. This difference might be emanated from differences in accessing livelihood assets and vulnerability to bio-physical hazards. Hence, households in the highland agro-ecology are believed relatively to be better off in terms of their food security status when compared to households residing in the midland and lowland agro-ecologies. Likewise midland residences are also believed to be better off than lowland residences. Because: The amount of rainfall and its distribution is by far better than midland and the *lowland*; which enhances both livestock and crop productivity. They also practiced fattening because both pasture and water are available due to relatively favorable rainfall. As a result it is hypothesized that agro-ecology will have positive or negative impact on food insecurity of the households.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1. Data Source and Sampling**

##### **3.1.1 Sample size and Sampling Procedure**

In this study a multistage sampling, a combination of purposive, stratified and simple random sampling procedures was followed to select the study Woreda, PA and the sample household respectively.

Firstly, the Woreda was picked purposively, because it is one of the drought prone and food insecure area in the East Hararghe zone. As a result it is the beneficiary of safety net and humanitarian assistance. In addition to this since the researcher is well acquainted to the Woreda and was be able to generate a plenty of information.

Secondly, by stratifying the Kebele's in to three clusters based on its agro-ecological zone; that is *Dega*, *Woinadega* and *Kola* which constitutes 28%, 55% and 17% of the area of the Woreda respectively, totally three kebeles were selected from the District, one Kebele from each agro ecological zone randomly.

Finally, the list of the household was obtained from the leader of the respective kebele administration which was used as a sample frame. Then sample frame was stratified again into male headed household and female headed household, finally sample household was drawn randomly from the sample frames.

These criteria assume more or less households living in the same agro-ecological zone are similar, so households living in the same agro-ecology zone are implicitly assumed to be homogeneous. This was made to maintain the representativeness of the district. Lastly From 125 households, the survey questionnaire was administered to 122 household heads, because the remaining 3 households either they were not present during the survey date or they did not volunteer to participate in the survey. Thus, the non-response rate was 2.4%. The non-response rate refers to the proportion of sample households who did not participate in the survey.

### **3.1.2. Data Types and Sources**

To achieve the objective of this study, data was collected from both primary and secondary sources. Secondary data was gathered from literature review such as journals, books, statistical abstracts, and administrative documents, NGOs report and others to explain the general issues related with household dimensions of food insecurity and their coping strategies. While the Primary data was collected from household survey, key informant interviewees and focus group discussion.

### **3.1.3. Method of Data Collection**

**A) Structured Household Survey:** Primary data on household assets, activities, income, and demographic information was collected from sampled households using structured interview schedule. To collect the data structured and semi-structured questionnaires was prepared and pre-tested before the actual survey was commenced to check the compatibility of the questionnaires with local realities. Then after some adjustment of questionnaires, the real survey was conducted. For the purpose of survey, 3 enumerators who have completed two years college training and working in the rural area as Development Agent were recruited and trained before the data collection process begin.

**B) Participatory Qualitative Data Collection Methods:** these methods of data collection were employed by the researcher, which include key informant interview, focus group discussion, etc.

**I. Focus Group Discussion (FGD):** In addition to household survey focus group discussions were held in each agro-ecological zone: one with adult males, one with adult females. To initiate the discussion semi-structured questionnaires was prepared and forwarded one by one to the participants. The subject of the discussion was what the community do and experience daily to capture the social and institutional aspects of livelihood construction in the area such as, their daily activities and their food security situation.

#### **II. Key Informant Interview**

The in-depth interview was held with key informants, some individuals from each agro-ecological zone were selected based on their age, experience and official positions. In this session elderly people, officials and experts from agriculture and rural development, health offices was contacted to get their previous and current impressions on food security situation of the Woreda.

**Table 3.1: Summary of Methods of Data Collection, Sample Kebeles & Size and Number of Groups and Individuals**

KEBELE	HH survey	Qualitative tools and numbers of individuals/ group discussion					
	Sample size	FGD	Elderly int.	DA int.	Health exten.	Health officer	Woreda Agri. officers
Afgug	42	1 M and 1 F group	1	1	1	1	1 vice head of woreda agri. office
Malkajabdu	41	1 M and 1 F group	1	1	-		1 Agri. extension officer
Burkamite	39	1 M group	1	1	-		

**Source:** Field survey, December 2010

### 3.1.4. Method of Data Analysis

The analysis of food insecurity is a complex work because it is the cumulative effects of different reinforcing factors that have direct and indirect influences. As a result various techniques of analysis were employed to address the objectives of this study.

The data generated from key informant interviewees and FGD was analyzed by using qualitative techniques, such as summarization, categorization, re-stating etc. Concerning quantitative data, household sample survey data were coded and entered into a computer for analysis, using the computer software SPSS (Statistical Package for Social Science). The other specific methods of data analysis such as tabulation and cross-tabulation were also used. Computation of descriptive statistic such as frequency, percentage, mean, standard deviation and coefficient of variation was carried out. Further, inferential statistics such as simple correlation and multiple regression models were employed to examine and establish statistical relationship between food per capita availability (as dependent variable) and various independent variables. The household food balance model was utilized to quantify food availability at the household level and also Household Food Insecurity Access Scale (HFIAS) for Measurement of Food access was used.

To aggregate the data, some units of measurement have been standardized. As a result, some conversion factors for tropical livestock unit (TLU), adult equivalent (AE) has been employed. As well as food consumption data have been standardized using food comparison table for use in Ethiopia (EHNRI,1997) as adopted in Ayalneh (2002) and elsewhere in the world (Hoddinott, 2001).

## **3.2. Empirical Model and Data Analysis**

### **3.2.1. Determinants**

Food security at the household level is best measured by direct survey of income, expenditure, and consumption and compared it with the minimum subsistence requirement (Von Braunetal, 1992). The government of Ethiopia has set the minimum acceptable weighted average food requirement per person per day at 2100kcal (FDRE, 1996; cited in Kifle1999). Hence, for this Study 2100 kcal per adult equivalent (AE) per day is employed as a cut off between food secured and food insecured households.

For the purpose of this study, household's food Balance Model was used to measure calorie per capita available for consumption per AE per day is used to identify the two groups. Accordingly, data on available food for consumption for the last 12 months o the households, which were obtained through recall by the household, were converted to kilocalorie. Thus those households who have energy per AE beyond the minimum subsistence requirement (2100kcal) are deemed to be food secured, otherwise food insecured.

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

A variety of statistical models can be used to establish the relationship between the household characteristics and food insecurity. That is to say, food insecurity is a function of a series of household characteristics. Conventionally, linear regression analysis is widely used in most economic and social investigation. Moreover, it is easy to interpret, and there is a widespread believes that it is a reasonable procedure even if some of the assumptions underlying it are not met in the data (Aldrich and Nelson, 1984; cited in Getachew, 1995).

### **3.2.2. Multiple Regression Model**

Multivariate analysis encompasses a variety of statistical methods used to analyze measurements on two or more variables. Regression analysis is subset of multivariate analysis that predicts the effects of many independent variables on a certain dependent variable.

The general formula of the multiple regression model is given by:

$$Y_i = B_0 + B_1 X_{1i} + B_2 X_{2i} + \dots + B_K X_{ki} + e \dots \dots \dots 1$$

Where K =No. predictor variable and i= No. of the sample population denotes the number of predictor variables (factors explaining the dependent variables) and i denotes the number of the sample population. The corresponding estimated model pertaining to a particular sample from the population is:

$$Y_i = b_0 + b_1 x_i + b_2 x_2 + \dots + b_k x_{ki} + e \dots \dots \dots 2$$

**Variables Definition**

*The variables that were used in the model are:*

**Dependent Variable(Y)** = the per-capita food available for each household estimated by household food balance model for the past 12 months (December 2009 to December 2010)

*Independent Variables included in the model*

- (HHH) = Sex of household head (1=male and 0=female)
- (EDUC) = Educational attainment of HHH (1=literate and 0=illiterate)
- (AGE) = Age of household head in years
- (FASZ) = Family size of the HH
- (NFIGA) = Participation in non-farm income generating activities (1=yes and 0=No)
- (NUOXEN) = Owner ship of oxen by the households in number
- Access to Credit = Access to credit by the households in the last 12 months (1=yes and 0=No)
- (TLU) = Ownership of livestock capital by the households converted in to TLU
- (CLSZ) = The cultivated land (in hectares) owned by the HHs
- (AECOL) = Agro ecology (1=highland, 2=mid-midland and 3=low land)
- (DPR) = Dependency ration
- (IRGN) = Use of irrigation (1=yes and 0=No)

### 3.2.3. Household Food Balance Model

Modified form of the regional food balance model which was used by Degefa (1996, and 2002) was used to calculate the amount of food available for households in the last year. The household food balance was calculated as:

$$N_{ij} = (P_{ij} + B_{ij} + F_{ij} + R_{ij}) - (H_{ij} + S_{ij} + M_{ij}) \dots\dots\dots 3$$

*Where: N<sub>ij</sub> is net food available for household i in year j*

*P<sub>ij</sub> is total grain produced by the household i in year j*

*B<sub>ij</sub> is the total grain purchased by the households i in year j*

*F<sub>ij</sub> is total grain obtained through food for work by household i in year j*

*R<sub>ij</sub> is total relief food received by household i in year j*

*H<sub>ij</sub> is post-harvest losses to household i in year j*

*S<sub>ij</sub> is total crop utilized for seed from the home by household i in year j*

*M<sub>ij</sub> is the total marketed output by household i in year j*

All the data needed for the model, with the exception of post-harvest losses were obtained through household survey. The 2009/10 crop harvests were used as production data as applied by Degefa (2002), post harvest crop loss is an average value estimated at 10% of the total harvest for each crop. The data for other variables were based on the inventory for the twelve months, between December 2009 up to December 2010. The model enables us to estimate adult equivalent per capita daily kilo calorie available for home consumption. In order to convert grain available in kilograms into equivalent kilocalories, conversion factors were used for crops grown at home as well as for those acquired through other means like, purchasing, FFW etc.

### 3.2.4. Intensity of Food Insecurity

With the increased awareness and availability of data, various measures of poverty have been developed overtime, among which the Foster, Greer and Thorbeck (FGT) class of poverty index is the most commonly applied (Ayalneh 2002). This index was initially suggested by Foster, Greer and Thorebecke (1984) and has several desirable properties that have enhanced recently by IFPRI for the purpose of food insecurity analysis (Hoddinott, 2002). Therefore, this Study employs the FGT index in order to estimate the food insecurity gap and its severity among the rural households.

The FGT index can be specified as follows:

$$P(\alpha) = \frac{1}{N} \sum_{i=1}^q \left[ \frac{(z-y_i)}{z} \right]^\alpha \dots\dots\dots 4$$

Where N is the number of sample households;

$Y_i$  is the measure of per adult equivalent food calorie intake of the  $i^{th}$  household;

Z represents the cutoff between food security and insecurity (expressed here in terms of caloric requirements);

q is the number of food-insecure households; and

$\alpha$  is the weight attached to the severity of food insecurity.

In equation (7),  $z-y_i = 0$  if  $y_i > Z$ .

Hoddinott (2001) further explained that giving no weight to the severity of food-insecurity is equivalent to assuming that  $\alpha = 0$ , then, the formula collapses to  $P(0) = q/N$  this is called the head count ratio. The head count ratio measures the incidence of food insecurity and shows the proportion of households below the already assumed subsistence level of energy (2100 kcal). It does not indicate the depth of food insecurity. It does not also tell us whether the food insecure households are only slightly below the subsistence requirement level or whether their consumption falls substantial short of subsistence level.

Giving equal weight to severity of food insecurity among all the food insecure households is equivalent to assuming that  $\alpha = 1$ . Summing the numerator gives the food insecurity gap; dividing this by z expresses this figure as a ratio. This index ( $P_1$ ) will provide the possibility to estimate resources required to eliminate food insecurity through proper targeting. That is, the product ( $N \times Z \times P_1$ ) gives the total calorie commitment required to bring the food insecured households to the given daily calorie requirement level.

Furthermore, giving weight to the severity of food insecurity among the most food insecured households is equivalent to assuming that  $\alpha > 1$ . The most common approach in poverty literature is to set  $\alpha = 2$ . This index gives greater attention to the most food insecure households by weighting each food insecure household by the square of its proportionate shortfall below the subsistence requirement level. In addition to regression model and FGT index, some descriptive statistics were also used.

## CHAPTER FOUR

### DESCRIPTION OF THE STUDY AREA AND SAMPLE HOUSEHOLD CHARACTERISTICS

#### 4.1. Location and Topography

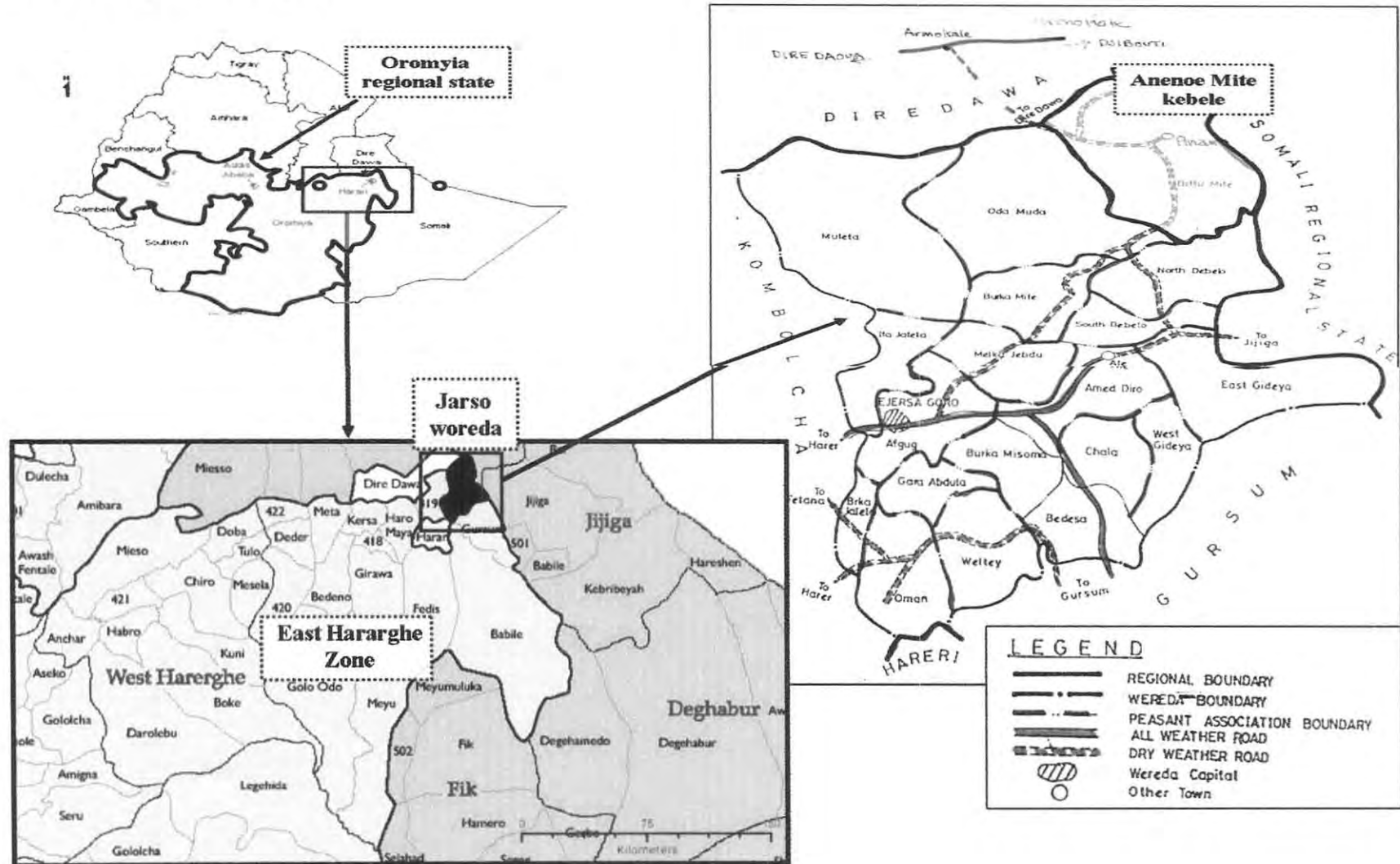
Jarso district is located in East Hararghe zone of Oromia Regional State at about 600 km East of Addis Ababa. Jarso district lies between 9°24' and 9°44' N; latitude and 42°09' and 42°26'E longitude to the north east of Harar town. It is bordered by Somali Regional state of the north and northeast, Gursum district to the south, Harari Regional state to the south and Kombolcha district to the west directions. Its capital city Ejersa Goro town is located at a distance of 36Kms From Harar town to the north direction. The district has 19 farmers Administration and one urban *Kebele* dwellers. Based on topography the Woreda land mass can be classified as mountainous, sloppy and plains which account 40%, 50% and 10% respectively.

The study district classified in to *dega*, *woinadega* and *kolla* agro-climatic zones covering about 28%, 55% and 17% of the total area of the district respectively. *Daga* agro-climatic zone (2300-3026 m.a.s.l.) is characterized by average annual rainfall and temperature varying between 1200 and 2000mm and 10<sup>0</sup>c and 15<sup>0</sup>c. Similarly, *woinadega* agro-climatic zone (1500-2300m.a.s.l.) is explained by average annual rainfall and temperature varying between 600 and 2000mm and 15<sup>0</sup>c and 20<sup>0</sup>c, while *kola* agro-climatic zone (1050-1500m.a.s.l), is explained by average annual rainfall and temperature ranging between 410mm and 820 mm and 20.0c and 25.0c respectively.

#### 4.2 Climate

The climate of the study area is characterized mainly by warm and dry climate with relatively low precipitation. It receives a bimodal rainfall of small rains in spring and big rain in summer with April as a peak for the small rains and July for the big rain. Having June as a dry month, the rainy season extends from February to May and from July to September and the dry season stretches from October to January. Generally, the study area is a semi-arid area with an average annual rainfall exceeds half the potential evapo-transpiration. In addition, the spatial and temporal distribution of rainfall in the study area is unreliable to support rain fed agriculture. Generally, altitude and rainfall distribution are positively correlate. Accordingly, the mean annual rainfall in the study area varies from 950mm in the North West up lands to not more than 650 mm in the low land areas (ARDW, 2003).

Figure 4.1: Map of the Study Area



Source: Angella (2007)

### **4.3. Agro-Ecological Zone**

Based on the altitude, moisture and physiography, the study area can be categorized into three broad agro-ecological zones, *Kola, Woinadega and Dega*. The Kola agro-ecological zone with an altitude of less than 1500masl is found in the eastern and northwestern part of the study area. It accounts for about 17 percent of the total area of the Woreda .The mean annual rainfall ranges between 500 and 650mm (ARDW, 2003).

The Woinadega agro-ecological zone with an altitude of above 1500masl is found in the north east part of the region where there are mountain ranges and hills. This area accounts for about 55 percent of the area. The mean annual rainfall ranges between 650 and 850mm. Due to its higher altitude, this agro-ecological zone experiences lower temperature and potential evapotranspiration. While the Dega agro-ecological zone with an altitude of above 2300 masl and is characterized by average annual rainfall and temperature varying between 1200 and 2000mm and 10<sup>0</sup>c and 15<sup>0</sup>c (ARDW, 2003).

### **4.4. Soils and Land Utilization**

The major soil types of the region exhibit a general relationship with altitudes and slopes. Shallow and infertile soils being the characteristics of mountains and hills, on the other hand, deep and fertile soils are the major properties of the valley bottoms, river terraces and flat plains. Generally, the soil of the valley is developed on recent alluvial sediments derived from the adjacent mountain ranges. In the study area in general and in the lowland flat plains, valley bottoms and river terraces, in particular, the soil types mainly comprise of fluvial soils (medium textured soils) and some verti soils (black heavy clays oils).Texturally, these two types of soils are sandy loams and sandy clay loams. Shallow lepti soils are the dominant type of soils found in the mountain and hills of the region. The fertility status of the soil in the region in general and over the southern highlands in particular is low (Agella, 2007).

## **4.5. Population**

According to the 2007 Population and housing census of Ethiopia, the total population of Jarso Woreda in the year 2007 was estimated to reach 119,368. Out of the total population 60,514 (50.7%) are males and 58,854 (49.3%) are females. On the other hand, 4.02 and 95.98% of the total population live in urban and rural areas, respectively. Regarding the sex composition of the population in the urban areas, 47.88% are females and 52.12% are males, whereas in the rural areas 49.36% are females and 50.64% are males (CSA, 2008).

The spatial distribution of rural population in the study areas shows that 83 percent of the rural people live in the mountainous, sloppy, undulated and highly degraded fragile lands, which account for more than 80% percent of the total land area. The ever increasing human and livestock population in the uplands combined with land degradation has resulted in almost a total lack of land available for the expansion of crop cultivation. The average land holding per household for the majority of the rural households is less than 0.5 hectare (ARDW, 2003)

## **4.6. Agriculture**

Agriculture is the main stay of the economy of Ethiopia both from the point of its contribution to the GDP, foreign exchange earnings and employment opportunities. This is partially true for the rural part of the study area. The agricultural system in the study area is of traditional subsistence type or small scale peasant farming. It is practiced in small scale fragmented holdings of peasant farmers. The major type of farming system in the region is subsistence mixed farming which is practiced by more than 90% of the total farm households while the rest followed by crop production and livestock rearing of the total rural households (ARDW, 2003). According to the same source, both rain fed and irrigated agriculture is practiced in the Woreda.

### **4.6.1. Crop Husbandry**

The potential land area for rain fed agriculture is 8171 ha, whereas the land area under small scale irrigation is about 4919 ha. In the woreda from the total land area which is 63300 hectares, 13090 hectares of land is used for farming out of which 12106 ha is used for the production of annual crops and the remaining 984 hectares for perennial crops mainly chat and coffee. The average land holding is estimated to be 0.65 hectare per household (ARDW, 2003).

Sorghum, wheat, maize and barely are the most important annual crop grown in the region. They account, on average, for 95% of annual cereal production. The total area cultivated and amount of production by crop types are indicated in Table 3.

**Table 4.1: Total Area Cultivated and Production of Different Crops in Jarso Woreda in 2002 (2009/10) Production Year**

Crop Type	High Land		Mid-Land		Low Land		Total	
	Area (hac)	Product (qtl)	Area (hac)	Product (qtl)	Area (hac)	Product (qtl)	Area (hac)	Product (qtl)
<b>Cereals</b>								
maize	1226	49634	2697	24520	980	29800	4903	103944
sorghum	224	5746	420	10876	1561	39936	2205	56558
wheat	1249	35759	622	27990	258	9030	2127	72779
barely	326	7302					326	7302
Oats	111	1598					111	1598
Total	3136	100039	3739	63386	2799	78766	9672	242181
<b>Pulses</b>								
Horse bean	60	798					60	798
Field pea	47	592					47	592
Lentils	55	550					55	550
Har/bean		1620		2431	973.5	1461	3674.5	5512
Total	162	3560		2431	973.5	1461	3836	7452
<b>Oil Crops</b>								
Ground nut					102	1142	102	1142
Sesame					20	120	20	120
Total					122	1262	122	1262
fenuigreek	20	128	10	64	10	64	40	256
<b>Vegetables</b>								
Potato	866	93528	288	31104	178	19224	1332	143856
Sweet potato	203	-	272	-	70	-	559	--
Total	1069	93528	560	31104	248	19224	1891	143856
Pepper /berbere		98260	640	34796	278	21044	2078	154100
Grand total							17639	549107

Source: ARD Office of Woreda (2003)

Even though the area coverage is relatively small, perennial crops such as coffee and chat (Cata edulies) are produced in the study area; chat, coffee and potato are the most important cash crops. Moreover, though the Woreda has suitable climate for such cash crop production, the current level of production does not commensurate with its potential. The major reasons being shortage of land, inadequate irrigation development, lack of agronomic know how on irrigation crops and absence of well organized marketing infrastructure. A farming system, that mainly relies on mono cropping, with little rotation, intercropping, and other improved cultural practices, has resulted in low productivity of crops.

#### 4.6.2. Livestock Resource and Rangeland

Livestock production forms an integral part of almost all farming systems in crop producing areas of the Woreda. It is also the major occupation for pastoralists living in the lowlands. Livestock that are found in the study area include cattle, camels, sheep, goats, donkey and poultry. The Woreda has also high potential for beekeeping. According to Agricultural office of the Woreda, the total livestock population of the area was estimated to be 187174. Out of this, 29.2% are cattle, 35.2% shoat (goat and sheep), poultry 28.22% and 6.29%, 1.08% are donkey, camel respectively.

The performance of livestock in the study area is low mainly due to insufficient quantity and quality of feed sources throughout the year. Feed shortages are particularly critical during the dry season. There is a declining trend of grazing land, both in quality and quantity, in the mixed farming system of the study area. This is largely caused by the increasing human and livestock population. The increase in human population associated with increase in demand for food has resulted in the expansion of cropping area into grazing areas. The current estimated area of the grazing and browsing range land in the Woreda is only about 1175 ha. The range lands are characterized by sparse shrub land and bushy grassland dominated by *Acacia Commiphora* species (ARDW, 2003)

#### 4.7. Infrastructure and Services

**Water Supply:** According to key informants the existing water system in the rural areas of the woreda consists of protected springs, shallow and hand wells, and bore holes. Springs are the major sources for domestic water supply in the rural areas. Other sources include rivers, ponds and wells. These water sources are not reliable during the dry season as their yield decreases considerably. In fact, in some of the cases the water sources dry up completely.

**Roads:** The rural areas are mostly inaccessible during the rainy seasons because the roads are muddy and washed away by the floods at this season. In the South west the Woreda center town is connected to *Kombolcha and Harar* by all weather graveled road, in East to *Gursum* by same kind of roads. Within the study area, all roads that are connecting the rural area to the center town are seasonal roads that are only gives services during dry seasons.

**Education and Health:** According to the educational and health office the woreda, Jarso has 1 secondary school and 35 primary schools. Out of the primary schools, 1-4 grades (first cycle primary schools) are found in each rural Kebele. Based on the same source, the number of students enrolled in secondary and primary schools in the Woreda in 2003 were 802 and 28,342 respectively. Concerning the population size of the students engaged in the secondary education, of the total number the share of female students was 174 which indicate the gender gap in participation of secondary schools between male and female students. Similarly, the sum of students attending primary education is 28,342. Of this 16,487 and 11,855 are male and female students, respectively (Woreda Education Bureau, 2010).

With regard to health and related services in the study area, there are 4 health centers, 19 health posts while there is no any Hospital and higher clinics in the woreda (Woreda health office, 2010). The same source further indicates that the family planning coverage and health delivery coverage are 36% and 25% respectively. Concerning the extent of malnutrition in the woreda there were 173 severe, 385 moderate and 25910 cases were reported in the last years.

**Marketing Facilities:** Although the major market center for the woreda is the Ejersa Goro town, smaller local markets are located also in some rural villages. Both crop and livestock products are the main goods supplied by the farmers to the market centers. 'Chat', coffee, sweet potato, tomato, live animals, milk, hens, eggs, etc., are supplied to market. In return, the farmers take home consumable goods such as food, oil, salt, kerosene, soap, etc.

#### **4.8. Demographic and Socio- Economic Characteristics of the Sample Households**

Here it is not needed to mention that household's productivity and escaping from food insecurity are determined by various household attributes. Of these attributes, demographic and socio economic characteristics are the ones. Thus before discussing the interrelationship between household demographic characteristics, productive assets and biophysical situation, basic demographic characteristics of sample household heads are presented below. This sub-topic presentation is based on data depicted in Table 4.2.

## Educational Level

The field survey result revealed that 47.5% and 52.5% of the household heads are illiterate and literate respectively. Among literate household heads, 27.9% of them can read and write and 18.9% of them have attended elementary education. The proportion of household head who attended secondary education is about 5.7%.

**Table: 4.2: Demographic Characteristics of the Respondents**

Socio-Demographic characters	Socio-Demographic Category	Frequency	Percentage
Educational status of household head	Illiterate	58	47.5
	Literate	64	52.5
Ethnicity	Oromo	117	95.9
	Others	4	3.3
Marital status	Married	106	86.9
	Divorced	2	1.6
	Widowed	14	11.5
Sex of household head	Female headed	19	15.6
	Male headed	103	84.4
Age of household head	<30	26	21.3
	30-45	56	45.9
	46-65	33	27.0
	>65	7	5.7
Family size	1-3	7	5.7
	4-6	49	40.2
	7-9	65	53.3
	10+	1	0.8
Dependency ratio	0	1	0.8
	1-2	33	27.0
	3-4	45	36.9
	5-6	41	33.6
	7+	2	1.6

Source: Field survey, December 2010

## Age of Head of the Household

Most of the household heads are found in the age category of 30-45 which is 45.9%; while the number of respondents at the two extreme age groups i.e. less than 30 was 21.3%. Those who are found at the age group above 65 were 5.7%, which is the reflection of third world population pyramid. The mean age of sample household heads was found to be 43.07 with 118.60 Standard deviation.

### **Sex of Head of the Household**

Among the sample household heads covered in the household survey, 84.4% of them were male and the remaining 15.6% of them are female. The number of female headed household was too small even though we tried to increase their number in the sampling process through deliberate inclusion.

### **Marital Status**

Regarding marital status of the household head, 86.9% of them were in marital union during the survey and furthermore, 11.5%, and 1.6% them have been widowed, and divorced respectively.

### **Ethnic Group**

The largest proportions of respondents belong to the Oromo ethnic group (95.9%). Although not included in the table, the second largest ethnic group included in the survey was Somali, which accounts 3.3 % of the total respondents with the other groups.

### **Household Size**

Household size is mentioned in most literatures as one of the main predicting variables for food security status of the household. In this particular study, the data depicted that more than half of the household (53.3%), have 7-9 households size and 40.2% of them have 4-6 household size; while those who have 1-3 and above 9 household size were 5.7% and 0.8 respectively. The average household size is 5.97.

### **Dependency Ratio**

It was believed that, households with large dependency ratio tend to be food insecure than those with small ratio. As shown in the Table 4, 36.9% of the sampled households have 3-4 dependency ratio, whereas 33.6 % have 5-6, followed with those who have 1-2 dependency ratio that accounts for 27% of the sample. The remaining households which accounts for 1.6% have 7 or more than dependency ratio.

## CHAPTER FIVE

### HOUSEHOLD FOOD SECURITY STATUS AND ITS DETERMINANTS

This chapter presents the mechanisms of distinguish between the food secure households from food insecure ones, and presents the findings from the descriptive, Food balance model and econometric analysis made in this study. The descriptive analysis made use of tools such as mean, percentage, standard deviation and frequency distribution. Inferential statistics were also employed to compare the food secure and food insecure household groups in respect of some explanatory variables. Econometric analysis was used to identify the determinants of food security.

#### 5.1. Measuring the Food Security Status of the Households

Food security at the household level can be measured through different methods. In this study both quantitative measurement of food security indicators and a self-reporting method for examining household food security was carried out. Households' Food Balance Model was used to quantify the amount of food available for households in the last 12 months or calorie acquisition per AE per day was used to identify the two groups. The reason for use of this measure was that it produces a crude estimate of the number of calorie available for the consumption in the household (see annex 1, for conversion factors). Moreover, it is not obvious to respondents how they could manipulate their answers. Because the questions are retrospective, rather than prospective, the possibility that individuals or households will change their behavior as a consequence of being observed is lessened (Hoddlnott, 2001).

**Table 5.1: Distribution of Households' Status across Different Agro-Ecology**

Status of Households	Agro-ecology						Total (N=122)	
	Highland (N=42)		Midland (N=41)		Low-Land (N=39)			
	F	%	F	%	F	%	F	%
Food insecure	16	38.1	26	63.4	32	82.1	74	60.7
Food secure	26	61.9	15	36.6	7	17.9	48	39.3
Total	42	34.4	41	33.6	39	32.0	122	100.0

**Source:** Field survey, December 2010

As it is already mentioned in chapter 3, data on available food for consumption, from production, purchase and/or stock, for the last 12 months 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 which is 2100 kcal. Following this procedure, as depicted in Table 5.1, 74 sample households were found to be unable to meet the minimum subsistence requirement and only 48 households were found to meet their energy requirement. In other words, 60.7 % and 39.3 % of the sample households were food insecure and food secure, respectively.

### Self-Reported Household Food Security Status

The researcher also tried to crosscheck household food security status results from objective food security indicator with that of subjective indicator. For this, households in the study area were also asked whether they consider their family as food secure or not, based on their own perception. Accordingly as indicated in Table 5.2, from the sampled households, more than half of the sampled population (53.7%) of the households categorized themselves as food insecure and 23.1% perceived as their food security status varies from year to years. Whereas only the remaining 23.1% reported to be food secure.

**Table 5.2: Self-Assessment by Households of Food Security Status and Available Calories**

Perception Households Food Security Status	Frequency and percentage	Available Calories		Total
		< 2100 cal / food insecure	≥2100 cal / food secure	
Food Secure	F	10	18	28
	%	35.7	64.3	23.1
Food insecure	F	46	19	65
	%	70.8	29.2	53.7
Varies from year to year	F	17	11	28
	%	60.7	39.3	23.1
Total	F	73	48	121
	%	60.3	39.7	100.0

**Source:** Field survey, December 2010

When we compare the results of Tables 5.1 and 5.2, i.e. the results from objective indicators (measured through calorie per capita) with subjective indicators (measured through perception of respondents). From those perceived to be food secure, 64.3% are from those who have per capita calories food availability  $\geq 2100$ . This indicates that more than 60% self-report was classified their status exactly. Whereas, more than 70% of the perceived food insecure found to be food insecure in calorie per capita food availability.

From the remaining 28 households, who were categorized under the third division (i.e. status varies from year to years), 60.7% have less than minimum requirement allowance, while the rest have more than or equals to 2100 calorie per capita food availability. Most of the households, 54.1% of the sample mentioned shortage of land as the main reasons for being food insecure. Whereas the remaining mentioned drought (9.8%), population growth (1.8%), lack of non-farm job opportunity (0.8%), Varies problems (9.84%) as the reasons in addition to shortage of land.

## **5.2. Livelihood Assets and Households Food Security Status**

In order to sustain their livelihood rural households integrate five different forms of capital natural, human, physical, financial and social capitals. Thus, the argument is lack of access to these critical assets directly or indirectly affects household food security. Therefore, under this sub-topic the opportunity of households to access these critical assets is examined.

### **I. Natural Capital and Status of Households**

Natural resources such as land, water, soil type, forests etc. were the main natural capital that plays a crucial role for the households in the study area. Access or constraints to the above natural capital has a significant impact on the livelihood pursued by the households and the food security of the households. From the natural capital of the households of study area, due emphasis was given only to the land and water (irrigation), and fertility of the land due to the fact that, the presence of the above three factors, i.e. land, soil fertility and water (irrigation) would determine the food security situation and livelihood activities pursued by the households.

#### **Land Holding**

Land holding size is one of the natural capitals of the households that determine the food availability (security) of the households. Under subsistence agriculture, land holding size is expected to play a significant role in influencing farm households' food security (Degefa, 2005). From any other productive resources land is by far the most important resource in agriculture. The fertility status, location and other attributes of land in association with its size made it a binding resource in agriculture. In the study area, as witnessed by the survey result there was significant difference in the mean cultivated land size between the food secure and food insecure households at less than 1% probability level ( $p < 0.00$ ).

The mean farm size of food secure and food insecure households was found to be 0.73 ha and 0.34 ha, respectively. The overall mean farm size was 0.49 ha. As indicated in the Table 7, about 34.02 % and almost 66 % of the total food secure and food insecure household groups had farm size in a range of 0 - 0.50 ha, respectively. This difference might be insensible statistically. But, percentage of sample households in the other extreme holding brackets differs sensibly. For instance, only 6.8 % of the food insecure had farm size between 0.50 -0.75 hectare, but about 14.6 % of the food secure one had this level of farm size. In the contrary, it was the larger proportion of food secure households and less proportion of food insecure households hold larger land size in the area. This can be observed from the same Table 5.3, where about 75 % and only 25 % of the food secure households and food insecure households had farm size above 0.76 hectare.

**Table 5.3: Distribution of Sample Households by Farm Size per Household (In Hectare)**

Land holding size		Status of house holds		Total
		Food insecure	Food secure	
Landless	F (%)	3 (4.1)	2 (4.2)	5 (4.1)
0-0.25	F (%)	34 (45.9)	16 (33.3)	50 (41.0)
0.26-0.5	F (%)	30 (40.5)	17 (35.4)	47 (38.5)
0.6-0.75	F (%)	5 (6.8)	7 (14.6)	12 (9.8)
0.76-1.0	F (%)	1 (1.4)	5 (10.4)	6 (4.9)
>1.01	F (%)	1 (1.4)	1 (2.1)	2 (1.6)
Total	F (%)	74 (100)	48 (100)	122 (100.0)

**Source:** Field survey, December 2010

Further, analyzing cultivated land size per capita showed the importance of land holding as a factor in identifying the two sample groups. Even if there was no significant difference in land holding per house hold, the survey result exhibited there was significant difference in the mean farm size per capita between the two sample groups at less than 5 % probability level ( $p < 0.05$ ). As it is shown in Table 5.4, the overall mean farm size per capita is 0.0954 hectare; and that of food insecure and food secure households is 0.0562 ha and 0.156 ha, respectively. In general, each individual in the study area has to live on average of 0.0954 ha of farm size.

**Table 5.4: Mean Per Capita Size of Land Holding of Two Households Groups (In Hectare)**

Status of Households	Mean	N	Std. Dev.	Minimum	Maximum	Variance	% of Total N
Food insecure	.0562	74	.03695	.00	.17	.001	60.7
Food secure	.1560	48	.07902	.00	.34	.006	39.3
Total	.0954	122	.07514	.00	.34	.006	100.0
t							8.834
Df.							120
Sig.							.000

**Source:** Field survey, December 2010

## Fertility of the Land

Having large land size by itself does not guarantee the households to be food secure, because the impacts of soil fertility and relief on agricultural production as well as its influences through various features of soil is also a well-recognized causes of food shortage. Expansion of cultivation into marginal and sloppy areas has facilitated soil erosion and depletion of basic soil nutrients of the land. In order to understand the perception of households, the sample populations were asked about their lands productivity in the last ten Years. Accordingly, as shown in the Table 5.5, 50.4% of the respondents believe that as the productivity was increased. While the remaining 46.2% were perceive as it decreased. The other 3.4 % responded as there was no change in the productivity of their land.

**Table 5.5: Distribution of Households' Perception on Their Productivity of Land**

Productivity of land in the last 10 years	Agro-ecology						Total (N=117)	
	Highland(N=42)		Midland(N=41)		Low-Land(N=39)		F	%
	F	%	F	%	F	%		
Increased	24	57.14	24	58.5	11	28.2	59	50.4
Decreased	17	40.5	12	29.3	25	64.1	54	46.2
No change	0	.0	1	2.4	3	7.7	4	3.4
Total	41	97.64	37	90.2	39	100	117	100

**Source:** Field survey, December 2010

## Access to Water (Irrigation)

Needless to mention in areas where agriculture is the prime mover of the livelihoods of the society, moisture is very crucial. If the climatic condition in a given area is promising, then it would be far better to be supplemented with irrigation so that increased production output could be attained. However, in the study area the high evapo-transpiration coupled with less and erratic precipitation curtails the production output per hectare and destines the study area as one of the food deficit regions of the country. Therefore, since irrigation is the key technology to boost the production of the households, many agencies are trying to upgrade the existing traditional irrigation technology. As a result, many households keep on improving their production. The relation clearly depicted in Table 5.6.

**Table 5.6: Households Status by Access to Irrigation**

Do you have access to irrigation	Status of households				Total (N=117)		
	Food insecure (N=71)		Food secure (N=46)		F	%	
	F	%	F	%			
YES	40	56.3	38	82.6	78	66.7	
NO	31	43.7	8	17.4	39	33.3	
<b>Total</b>	<b>71</b>	<b>100</b>	<b>46</b>	<b>100</b>	<b>117</b>	<b>100</b>	
X <sup>2</sup>						8.669	
Df						1	
Sig.						.003	

**Source:** Field survey, December 2010

From the two groups, households which belong to the food secure group have a better advantage to access irrigation with respective proportion of 82.6%. Where as the proportion of the food insecure with access to irrigation is 56.3%. As we observed from the chi-square test, the association between access to irrigation and the status of households is statistically significant with ( $P < 0.01$ ).

## II. Human Capital and Status of Households

Regarding human capital, data was collected on educational status of household head and health status of household members. As education, health, and availability of human labour in the households have direct linkages to household livelihoods and food security.

### Education

It was hypothesized that literate household heads are more productive than the illiterate counterpart. The survey result indicated that nearly 79.2 % of the foods secure and only 35.1 % of the foods insecure were literate. The difference between the two sample groups with regard to education was found to be statistically significant with less than 1% probability level of chi-square value. On average the proportion of literate food secure household heads were larger than the proportion of literate food insecure household heads. Therefore, the Chi-square test showed as systematic association between food insecurity and education.

**Table 5.7: Distribution of households by status of education**

Educational status of household head	Status of households				Total (N=122)		
	Food insecure (N=74)		Food secure (N=46)		F	%	
	F	%	F	%			
Illiterate	48	64.9	10	20.8	58	47.5	
Literate	26	35.1	38	79.2	64	52.5	
<b>Total</b>	<b>74</b>	<b>100</b>	<b>48</b>	<b>100</b>	<b>122</b>	<b>100</b>	
X <sup>2</sup>						22.634a	
Df						1	
Sig.						.000	

Source: Field survey, December 2010

### Health Status of Households' Family Members

During the survey, households were asked to evaluate the health status of their household member. Based on their evaluation, the food secure group 72.9%, 22.9% and 4.2% replied that the health status of their family improved; did not show any change; and deteriorated respectively. While the food insecure counterpart replied that the health status of their family improved; did not show any change; and deteriorated with 69.4%, 26.4% and 1.4% respectively. As the causes of health deterioration, lack of income for treatment, lack of health facility near the village and high treatment costs were mentioned by focus group discussants'. Thus, access to education and health services is very low, which contribute as a negative synergy for household food security achievement directly or indirectly.

### III. Physical Capital and Status of Households

Under physical capital, data were collected on livestock number; respondents distance from market center and main roads, as well as farm implements .i.e. oxen ownership. Physical capital comprises the basic infrastructure such as transport, shelter and irrigation works, as well as the production equipment which enable people to pursue their livelihoods (Scoones 1998).

#### Livestock Holding

Livestock production plays an important role both in the crop producing of the study area. Livestock provide milk, meat, traction power and transport. Livestock that are owned by the sample households include cattle, sheep and goat, and poultry. The total livestock population owned by the sample respondents was 931 in number. Out of this, 35.77 %, 35.55% and 25.35 % were cattle, shoat, and chicken respectively.

The percentage share of cattle and shoats is larger than any of the other types of livestock among the sample households. This signifies the importance of small ruminant and cattle production in the study area, both as a store of wealth and as check or control of food shortage during time of stress or so. Almost, all households in the sample own livestock with different combination. Table 5.8, shows mean livestock holdings of households in TLU. Food insecure households on average relatively own less number of livestock's (12.37) than food secure ones (15.76). Likewise, the food secure households found in a better position in the holding of livestock than the food insecure households. So this survey result demonstrated that though the difference between the two sample household groups regarding to livestock holding is insignificant there is still some gap between them.

**Table 5.8: Distribution of Sample Households by Livestock Holding In TLU**

Livestock's in (TLU)	Status of households				Total (N=122)	
	Food insecure (N=74)		Food secure (N=48)		F	%
	F	%	F	%		
1-5	2	2.7	1	2.1	3	2.5
6-10	37	50.0	13	27.1	50	41.0
11-15	18	24.3	17	35.4	35	28.7
16-20	10	13.5	8	16.7	18	14.8
21-25	2	2.7	4	8.3	6	4.9
26+	5	6.8	5	10.4	10	8.2
Total	74	100	48	100	122	100
Mean	12.37		15.76		13.7	

**Source:** Field survey, December 2010

It is apparent that the sample households in the study area on average own 13.7 TLU, with 4.04 TLU and 68.48 TLU minimum and maximum holding respectively, among the sample households. Moreover, more than half of food insecure group owns livestock  $\leq 10$  TLU, while the food secure groups in this range are only 27.1%. And also more than 50% of food secure own between 11-20 and where as only 37.8 % of food insecure household groups found in this range of TLU. It was hypothesized that livestock ownership in TLU is an important economic determinant in that a person who owns more TLU is more likely to be food secured than the one who has less likewise the survey result showed that there is significance difference in TLU between the two groups at less than ( $P < 0.01$ ) probability.

## Oxen Ownership

Livestock is an integral part of crop production activities in the study area. It provides substantial non human labor and manure to the soil. With regard to the contribution of labor, oxen ownership is an important variable. In the study area, as witnessed by the survey result no household owns more than three oxen. Otherwise the households are ox-less or own only one or two. As it is shown in Table 5.9, 39 % of sample households are oxen less and only 4.9 % of the sample owns three oxen.

**Table 5.9: Distribution of Sample Households by Oxen Ownership**

Number of oxen	Status of households		Total
	Food insecure	Food secure	
Having no oxen	43 (58.1%)	5 (10.4%)	48 (39.3%)
1 Ox	14 (18.9%)	7 (14.6%)	21 (17.2%)
2 Oxen	15 (20.3%)	32 (66.7%)	47 (38.5%)
3 Oxen	2 (2.7%)	4 (8.3%)	6 (4.9%)
Total	74 (100.0%)	48 (100.0%)	122 (100.0)

**Source:** Field survey, December 2010

As the information obtained from sample respondents most of them, about 50 %, do not use oxen for farming operation. The remaining cultivates their land using oxen either by contributing labor or by coupling. Moreover, the result revealed that there is significant difference between the two groups with regard to ox ownership at 10 % probability level.

## Distance from Market Center

According to the estimation of the sample households, about 7.4% of the respondents travel less than 30 minutes walking distance to reach to the nearest market center (when we see within the status of households, the food secure group who found within this range are 12.5% while the food insecure was only 4.1%): 28.9% of them traveled 30-60 minutes walking distance to reach to the nearest market center (with 35.4% and 24.7% for food secure and food insecure groups). The remaining 18.2% and 45.5% of them travel 61-90 minutes and >90 minutes of walking distance to reach the nearest market center respectively. The result of chi-square test shows as there is positive association between distance from market center and food security of the households, at less than 5% probability level. Because, as the distance from the market center increase it is more likely that the household being food insecure while the probability of household food security is increasing with decreasing of distances from the market center.

**Table 5.10: Percentage Distribution of Households by Distance from Market Centers**

Distance from markets center (In minute)	Status of households				Total (N=122)		
	Food insecure(N=74)		Food secure(N=48)		F	%	
	F	%	F	%			
< 30	3	4.1	6	12.5	9	7.4	
30-60	18	24.7	17	35.4	35	28.9	
61-90	18	24.7	4	8.3	22	18.2	
>90	34	46.6	21	43.8	55	45.5	
<b>Total</b>	73	100	48	100	122	100	
X <sup>2</sup>						8.195	
Df.						3	
Sig.						.042	

Source: Field survey, December 2010

### Access to Road

Similar to the case of market centre, sample households were asked to estimate their distance from the main road. Accordingly, 40.5% and 45.5% of the respondents travel 30 minutes walking distance and 30-60 minutes walking distance to reach the main road respectively. However, 14% of them walk for more than an hour to reach the main road walking distance. As other rural parts of the country, road networks are limited and do not reach many villages in the study areas. Hence, farmers do not get faire prices for their products. These discourage farmers from adopting new technologies to increase yields of their crops or livestock. It is also difficult to transport heavy items like seeds and fertilizers especially during the rainy season. However this relation was not statistically significant as probability level was more than 5% ( $P>0.09$ ). Nevertheless, the cross-tabulation results in Table 5.11, indicate that, there is differential access to roads between the two groups because, the food secure that are walking less than 30 minutes to reach the weather roads were about 50% whereas only 34.2% of food insecure households were within this range.

**Table 5.11: Percentage Distribution of Households by Distance from All Weather Roads**

Distance from main roads (In minute)	Status of households				Total (N=122)		
	Food insecure(N=74)		Food secure(N=48)		F	%	
	F	%	F	%			
< 30	25	34.2	24	50.0	49	40.5	
30-60	35	47.9	20	41.7	55	45.5	
61-90	13	17.8	3	6.2	16	13.2	
>90	0	0	1	2.1	1	0.8	
<b>Total</b>	73	100	48	100	122	100	
X <sup>2</sup>						6.472	
Df.						3	
Sig.						.091	

Source: Field survey, December 2010

#### IV. Access to Financial Capital and status of Households

Under financial capital data were collected on access to credit and remittance of households.

##### Access to Credit

Credit for the purpose of consumption or purchase of agricultural inputs like improved seed, chemical fertilizer, etc improves the food security status of households. Therefore good credit service could enable peasants to invest on the most constrained assets. But in Ethiopian context in general and the study area in particular, access to credit is limited. From all respondents only 15.7% of them have access to credit. The main reasons for low credit access, mentioned by 45.5%, 18.8% and 2% respondents, were lack of lending institutions (both informal and formal), lack of interest among farmers due to high interest rate and short grace period respectively. From those who have access to credit service, most of them (79%) borrowed from relatives and friends, while 21% of them borrowed from micro-finance and non-governmental organization that are working on the area.

**Table 5.12: Percentage Distribution of Respondents by Access to Credit**

Access to credit in the last 12 months	Status of households		Total
	Food insecure	Food secure	
Yes	15 (20.5%)	4 (8.3%)	19 (15.7%)
No	58 (79.5%)	44 (91.7%)	102(84.3%)
<b>Total</b>	<b>73 (100.0%)</b>	<b>48 (100.0%)</b>	<b>121(100.0)</b>

Source: Field survey, December 2010

##### Receiving Remittance

From the sample household who were participated in this study, only 26.9% were received remittance (25.4% of food insecure and 29.2% of food secure), which is not that much significant. Hence, households' opportunity to receive remittance was limited and its contribution for household food security was insignificant with ( $P>0.5$ ).

**Table 5.13: Percentage Distribution of Respondents by Access to Remittance**

Access to remittance in the last 12 months	Status of households				Total (N=119)		
	Food insecure (N=71)		Food secure (N=48)		F	%	
	F	%	F	%			
yes	18	25.4	14	29.2	32	26.9	
No	53	74.6	34	70.8	87	73.1	
<b>Total</b>	<b>71</b>	<b>100</b>	<b>48</b>	<b>100</b>	<b>119</b>	<b>100</b>	
X <sup>2</sup>						.212	
Df.						1	
Sig.						.645	

Source: Field survey, December 2010

## **V. Social Capital and Status of Households**

Social capital refers to social resources involving networks, social claims, social relations, affiliations, and associations upon which people draw in pursuit of livelihoods (Degefa, 2005). The common social capital practices that observed in the study area were like *guza (dabo)*, *gumata* and *Equb*. These social relationships were based on either being membership of that area or having kinship relation with the local community was the most observed features in the study area. People in the study area have the traditions of helping each other when any member of the community was faces a problem such as health related problem, shortage of labor and shortage of food. All of the respondents unanimously confirm as they participate in one or the other social support activities in one or the other way. '*Guza*' (labor exchange arrangement) is the type of labor support on which the households requires the assistances of other households in a particular day to plough (work) his farm. *Gumata* is the type of support that is existed during the wedding ceremony. If someone in the area get married, his relatives/friends invites the members of the community and they are expected to come up with some amount of money. '*Equb*' is a voluntary money pooling association, rotating the sum among the members either weekly or monthly.

### **5.2.1. Use of farm Technologies and Status of Households**

The effort of subsistence farmers is always to increase their agricultural productivity to satisfy their household consumption. From many other inputs, fertilizer and improved seeds, and participation in extension packages to adopt new farm technologies are used to boost agricultural productivity. Hence, in this sub-topic effort has been made to examine use of fertilizer and participation in extension packages.

#### **Use of Chemical Fertilizer**

The proportions of households who apply chemical fertilizer to augment their crop production were 61.5%, as can be seen clearly from the Table 5.14, of this 54.9 % and 71.7% of the food insecure and food secure are using the chemical fertilizer, respectively. This indicated that there is a difference between the two groups in using production increasing practices, although its statistical significance was less than 10%. The main bottlenecks to apply fertilizer, mentioned by most respondents, were lack of financial capital, high fertilizer price and lack of rural credit services.

**Table 5.14: Percentage Distribution of Respondents by Usage of Chemical Fertilizers**

Use of Chemical fertilizers		Status of households		Total
		Food insecure	Food secure	
Yes	F	39	33	72
	%	54.9	71.7	61.5
No	F	32	13	45
	%	45.1	28.3	38.5
Total	F	71	46	117
	%	100.0	100.0	100.0

Source: Field survey, December 2010

### Access to and Participations in Extension Services

Regarding to extension communication and social services about 63.9% of the respondent has reported that they had access to extension service while 35.3 % reported that they did not have any contact with the development agents. Agro-ecological wise, 81% of farmers in the highland and 73.7% of farmers in the midland responded that they had access to extension service, whereas only 36% of the lowlanders had reported to participate in extension package.

The diffusion of the technology is more difficult to achieve in the study area. This is mainly because of fragile soils, highly varied microclimates and the typically much weaker institutional and physical infrastructures. Thus, advances of the technologies are likely to be effective only in limited geographical zones. Moreover, resource poor farmers frequently reject or only partially adopt improved technology. For instance, when we were under take field work we came across and witnessed similar issue in which the poor farmers was decline to take the improved Mango seedlings, which has been promoted by local NGO known as ODA (Oromia Development Association) in the midland sample kebele (Melka Jabdu) on long term credit bases. This happened despite the technology's demonstrated higher levels of productivity in experimental plots, its calculated economic profitability for the farmer and its beneficial contribution to the larger society.

**Table 5.15: Percentage Distribution of Respondents by Participation in Extension Package**

Participate in extension package		Status of households		Total
		Food insecure	Food secure	
Yes	F	47	29	76
	%	64.4	63.0	63.9
No	F	25	17	42
	%	34.2	37.0	35.3
Total	F	73	46	119
	%	100.0	100.0	100.0

Source: Field survey, December 2010

### 5.2.2. Participation in Non-farm Income Generating Activities

In areas like *Jarso Woreda* where drought-induced food insecurity is widespread i.e. in high risk and unfavorable environments, the promotion of crop specialization, both in terms of type and variety does not meet the needs of farming households. Obviously, under such circumstance, non-farm activities are bound to be the most appropriate alternative to improve the living condition in general, and that of food security in particular. In the study area non-farm income sources are generally limited. However, such income occupy an importance greater than the amount of income that household derive from them because they help households in meeting critical cash and food deficits that agriculture cannot fulfill and also enable them to avoid or reduce grain or livestock sales thereby preventing undesirable leakages in household resources.

According to the survey results, in the study area, there is a difference in extent of participation in non-farm income generating activities across the agro-ecology as shown in the Table 5.16. When more than 80.8% of the food secure households are participating in highland area, only 75% of the food insecure households of same area were involved in these activities, this might be due to the proximity of the sample area to the woreda market center. Whereas in the midland 73.3% and 48 % of food secure and food insecure were participating in some kind of non-farm income generating activities respectively, the rest were subsisting on a single venture i.e. agriculture. Likewise in the lowland when all of the food secured households were driving some part of their income from these businesses, only 78% of those food insecure were involved. Generally, from the sampled population, more than 70% were reported to be engaged in some kind of non-farm income generating activities, while the remaining 28.7% are reported to subsist on agricultural activities.

**Table 5.16: Distribution of Respondents by Participation in Non-Farm Income Generating Activities**

Agro-ecology			Status of households		Total
			Food insecure	Food secure	
Highland	Yes	F	12	21	33
		%	75.0	80.8	78.6
	No	N	4	5	9
		%	25.0	19.2	21.4
Mid-land	Yes	F	12	11	23
		%	48.0	73.3	57.5
	No	F	13	4	17
		%	52.0	26.7	42.5
Lowland	Yes	F	25	6	31
		%	78.1	100.0	81.6
	No	F	7	0	7
		%	21.9	.0	18.4

Source: Field survey, December 2010

Therefore, it is possible to say that those households driving income from multiple sources are in a better position to likely secure the consumption need of their family. However, the association between food security status of the households and participation in non-farm income generating activities are statistically insignificant with ( $P>0.1$ ).

### 5.3. Summary of Mean Difference and Household Scores

Table 5.17 and 5.18, shows summary statistics and household scores of sample household groups on the hypothesized continuous and discrete variables included in the model. E.g Table 5.17, Shows the 6 hypothesized categorical variables, status of education of the household head (EDUC), irrigation (IRGN) and sex of household head (HHH), NAIGA, Credit access, Chem-fertilizer. Among these, the two sample groups were differentiated with respect to status of education (EDUC) and in using of irrigation which are significant at 1% probability level.

**Table 5.17: Summary Statistics of Discrete Variables Included in the Model**

Variable	score	Food insecure		Food secure		X <sup>2</sup>
		N	%	N	%	
NAIGA	1	49	66.2	38	79.2	2.387
	0	25	33.8	10	20.8	
Credit access	1	15	20.3	4	8.3	3.155***
	0	59	79.7	44	91.7	
Chem. fertilizer	1	39	52.7	33	68.8	3.100***
	0	35	47.3	15	31.2	
IRGN	1	40	54.1	38	79.2	7.963*
	0	34	45.9	10	20.8	
HH head	1	63	85.1	40	83.3	0.072
	0	11	14.9	8	16.7	
EDUC	1	26	35.1	38	79.2	22.634*
	0	48	64.9	10	20.8	

**Source:** Field survey, December 2010, \*, \*\*, \*\*\* Significant at 1 %, 5 % and 10 % probability level.

According to the survey result depicted in Table 5.18, food insecure and secure household groups revealed significant difference with respect to some socio-economic variables like family size (FASZ), dependency ratio (DPR), cultivated land size and Number of farm oxen (NUOXEN) at probability level of less than 1%. When the age of household head (AGE) is not statistically significant, live stocks ownership in TLU is significant at less than 10 % probability level.

**Table 5.18: Summary Statistics of Continuous Variables Included in the Model**

Variable	Food in secure		Food secure		t-Value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Agehhh	42.7	12.12	43.7	11.01321	-.451	.653
FSiZe	6.59	1.703	5.00	1.444	5.355*	.000
DPR	1.8784	0.69245	1.4271	0.78694	3.332*	.001
Nuoxen	0.68	0.893	1.73	0.765	-6.727*	.000
TLU	12.3702	8.70124	15.7691	12.61950	-1.761***	.081
ClSz	0.3412	0.23229	0.7305	0.24603	-8.834*	.000

Source: Field survey, December 2010, \*, \*\* and \*\*\* is significant at 1%, 5% and 10% probability level

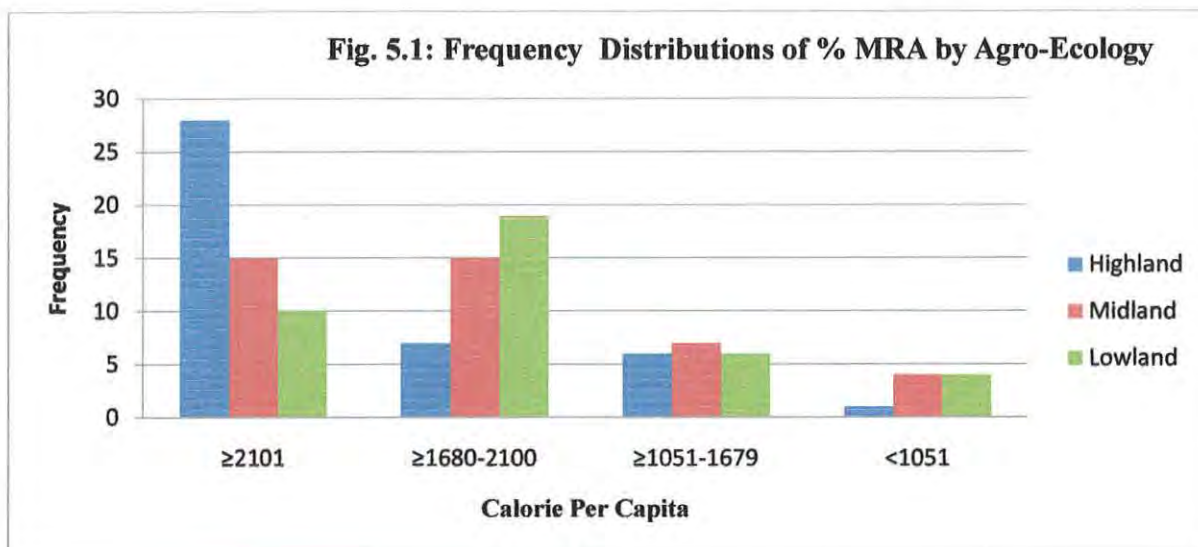
#### 5.4. Analysis of Determinants of Food Security

The household data generated during survey was quantified the food that was available for households from different sources by using household food balance model. Then we first examine the kind of relationship that exist between per capita food availability in calorie and the various socio-economic factors that influencing the food availability at the household level. In what follows we will see calorie per capita availability across different agro-ecology.

##### Per capita food availability above MRA, over 80% of MRA and over 50% by agro ecology

As shown in Figure 5.1, the disparity among the agro-ecology in covering MRA is appearing significant. The finding show in the highland (i.e. Afgug kebele) is in a better position relatively than the other two *Kebeles*, in terms of food available for consumption. In highland 66.7% of the sampled households on average had attained more than MRA per capita food availability for the year under study. But only 36.6 % and 25.6 % of midland and lowland sampled households attained this level respectively. In other ways while 36.6% and 48.7% of midland and low land are able to cover more than 80% MRA respectively, only 16.7% of the highlanders found in this range. The highland Kebele has the least number of households with average food availability of less than 50% of the MRA, it account for 0.8% of the sampled households, unlike this the midland and lowland together are account for 6.6% households in this category.

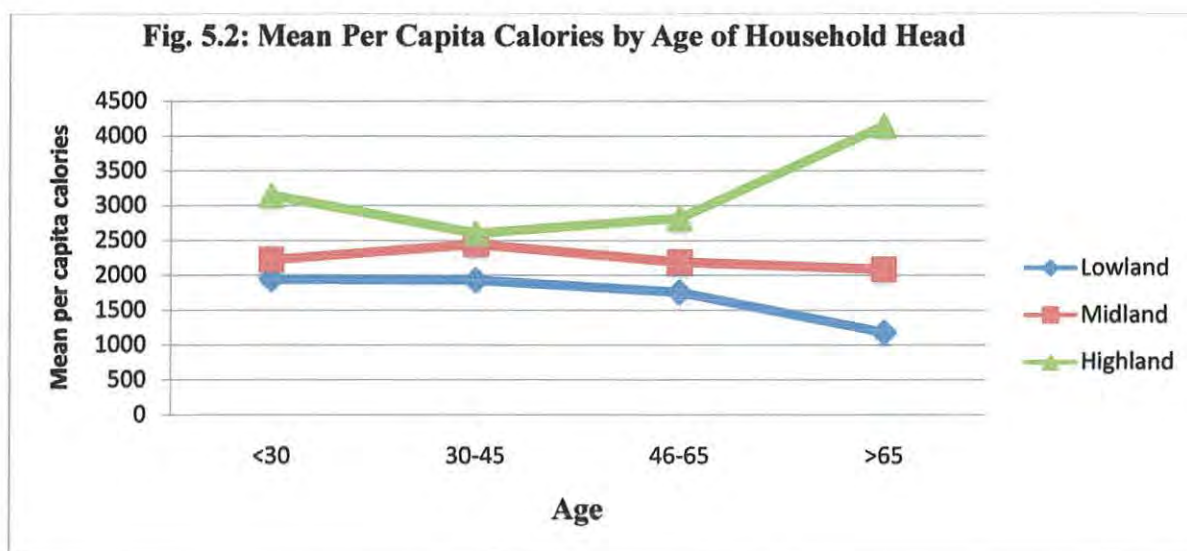
**Fig. 5.1: Frequency Distributions of % MRA by Agro-Ecology**



### Mean Daily Per Capita, by Age of Household Head

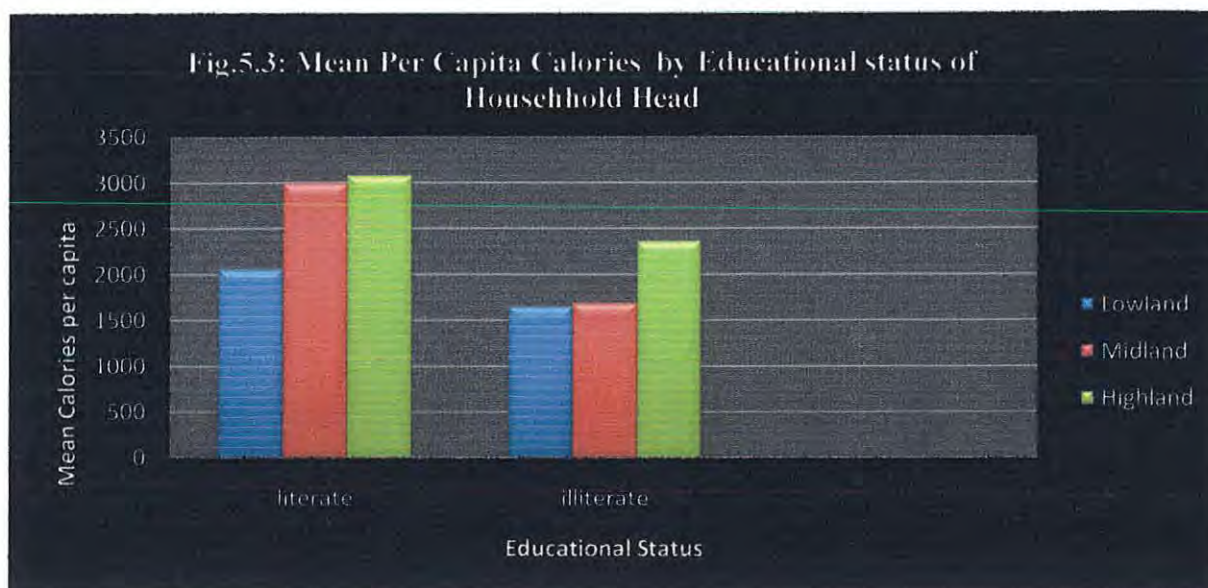
The age of the household head was the demographic variables that were tested for any association with food availability. It was assumed that, the higher the age of the household head, the better the food security situation of the households. However the result was mixed, for instance in the lowland the mean food availability per capita decreasing with age increases, where as that of midland first increased then started to decline with age of the households. While that of highlands shows high per capita at the two extreme point and increasing trends at a decreasing rate as you can see from the figure 5.2.

**Fig. 5.2: Mean Per Capita Calories by Age of Household Head**



### Mean Daily Per Capita Calories, by Educational Status of Household Head

Mean per capita availability also compared with the educational status of the household head. The basic assumption here was that farmers that are educated adopt new technology and farm practices faster than illiterate, which in turn enhances agricultural productivity. The results in the figure 5.3, shows that the amount of food consumption was higher for literate heads when compared to their illiterate counterparts. This result was in agreement with our prior expectation.



**Table 5.19: Mean Daily Per Capita Calories, by Number of Livestock Owned in TLU**

Live stocks in TLU holding category	Agro ecology			Total
	Lowland	Midland	Highland	
1-5	2091	3046	1728.90	2288.63
6-10	1698.79	2268.89	2570.92	2124.74
11-15	2086.15	2411.78	2346.31	2266.51
16-20	1800	1888.43	3064.71	2326.22
21-25	-	2357	3879.33	3118.17
26+	1671	2929	3587	3072.20
Total	1846.92	2292.90	2802.26	2325.69

**Source:** Field survey, December 2010

The livestock ownership in TLU is an important economic determinant in that a person who owns more TLU is more likely to be food secured than the one who has less, thus it was attempted to see the prevailing difference brought about by the number of livestock's to household food availability per capita.

As can be seen from Table 5.19, the result is different from one area to another. For example while calorie per capita availability is decreasing with increasing the number of livestock's holding in the low land area, unlikely it was increasing with an increase in the number of livestock's possession of households in the highland area.

**Table 5.20: Mean Daily Per Capita Calories, by Family Size**

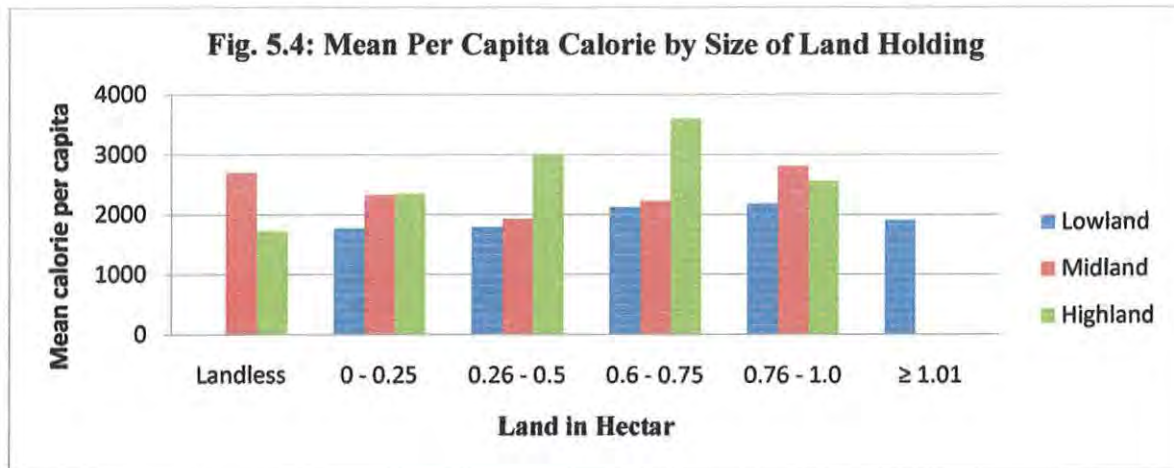
Family size	Agro ecology			Total
	Lowland	Midland	Highland	
1-3	---	2852.60	4133.50	3218.57
4-6	1979.07	2577.13	3212.27	2627.36
7-9	1809.74	1925.60	2345.77	2026.82
10+	720.0	-	-	720.0
Total	1846.92	2292.90	2802.26	2325.68

**Source:** Field survey, December 2010

The association of per capita food availability of house hold with the family size was also examined as shown in the Table 5. 20, this was examined with the prior expectation that the food per capita availability declines with an increase in number of family size. According to some researchers this was why rapid population growth is blamed and calls for solution to keep the rate under control. The result of cross tabulation clearly indicated what was expected, for instance those households whose family member is  $\geq 10$  can only meet 34.3 % of MRA.

#### **Mean Daily Per Capita Calories, by Size of Land Holding**

The possible assumption in this regard is that farm households who had larger farm size had better chance to produce more, to diversify the crop they produce and to get larger volume of crop residues. So far we have seen that average land holding in the study area was not more than 0.5 hectare, however the households' food per capita availability and land size have strong positive relationship as depicted in figure 5.4.



#### 5.4.1. Econometric Model for Household Food Security Status

So far, the association of the food security status of the households with some of the major demographic, socio-economic, technological and environmental factors have been examined descriptively. The statistical significance of the association also is stated though not demonstrated and tabulated in the body.

However, when several factors are influencing the outcome, its associations with the determining factor obtained from separate analysis may fail from demonstrating the strength of the association. This is because the interaction of the variable with other variables may make its association with the dependent variable to be underestimated or overestimated.

In other words, it is not possible to identify distinctly the variables that contribute significantly. So, to get rid of making invalid conclusions, a systematic method of analyzing the combined effect of all the major variables has to be employed.

In this part, therefore, the significance of their influences on food security status of the households will be measured and verified statistically. To this end, multiple linear regression model function is estimated to further analyze the significance of the effects of the factors. Several factors are identified as explanatory variables determining the food security status of the rural households.

The major explanatory variables can be classified, as indicated above, socio-economic factors (such as sex, educational status, age of head of households, family size, dependency ratio); households' farm resource endowments (total land size, number of oxen, livestock in TLU without oxen); agricultural institutions (extension services in fertilizer application and soil and water conservation, credit in all or either of the previous consecutive years); farm management with long-term effect; agro-ecological factors (soil infertility/high gradient of the land called marginal lands, rainfall shortage as causes of food shortages); involvement in non-farm income generating activities; etc are included.

#### **5.4.2 Discussion of the Results of the Model**

There are two sets of variables included in the multivariate analysis: the dependent variables (per capita food availability in calories) and the independent variable (i.e. variables explaining the response variable). The multivariate analysis, using multiple regressions, identified about six variables explaining the variations in the status of household food security in the study area.

The value of  $R^2$  which shows the proportion of variability in the dependent variable explained by predictors was 0.584. Therefore, as depicted in the Table 5.21, the twelve predictors explained about 58.4% of the Variability of the per capita food availability.

Among the Explanatory Variables out of the twelve variables hypothesized to influence household food security, six were found to be statistically significant. Family size (FASZ), educational status of the household head (EDUC), cultivated land size (CLSZ), total livestock owned (TLU), agro-ecology (AECOLO) and type of household head (HHH) are important determinants identified to influence household food security in the study area. That means, the coefficient of family size, cultivated land size, type of household head and Agro-ecology were statistically significant at less than 1% probability level of significance, whereas total livestock owned in tropical livestock unit (TLU) was statistically significant at less than 5% probability level of significance. The remaining significant variables, educational status of the household head was found to be statistically significant at less than 10% probability level of significance.

Whereas the coefficients of 3 explanatory variables, namely, access to credit, access to irrigation and dependency ratio (DPR), even though they were not statistically significant at the conventional levels of significance they have negative relationship with food security while the rest, non-farm income generating activities (NFIGA), number of oxen owned and age of household have positive relationship with food security. Moreover, the results verified that almost all of the explanatory variables, except number of oxen owned and type of household head, in the model had the signs that confirm with the prior expectations.

*Family size (FASZ)*: This household factor is found to be highly significant to determine household food security in the study area. Household size revealed a positive relationship with food insecurity and statistically significant at 1% probability level. The positive relationship indicates that the large family size is in favor of the probability of being food insecure increases with an increase in the family size. The large family in favor of food insecurity, i.e, in other ways per capita food availability decreases with an increase in the number of household members. This shows that a large family size has more implication on food consumption than on labour supply to boost agricultural production. The regression coefficient in favor of food insecurity, *ceteris paribus*, calorie per capita decreases by a factor of 3.56 as the family size increases by one unit. The likely explanation is that in an area where households depend on less productive agricultural land, increasing household size results in increased demand for food. But this demand will not be matched with the existing food supply so ultimately end up with food insecurity. This finding is in conformity with the findings of Getachew (1993).

*Sex of Household Head (HHH)*: As shown in Table 5.21, sex of household head is found to be statistically significant ( $P < 0.01$ ) and with a negative influence on food availability per capita i.e. in determining household food security status. The coefficient of being food insecure is greater by 2.816 among male headed households compared to female headed households. This was against the prior expectation. This may be due to the mother's relative standing may associated with less spending on adult related goods and giving more emphasis to improve their family nutritional status than male counter parts.

*Education (EDUC)*: Education is positively and significantly related to the household food per capita availability that means it is negatively related with food insecurity in the study area. The possible reasons are literate farm household heads are more willing to adopt better production technologies, accept technical advice from extension workers, and diversifying their source of income than the illiterate ones. As a result, literacy reduces the risk of food insecurity among the sample households. Keeping other factors constant, the coefficient in favor of food per capita availability increases by a factor equal to 0.128 as the household head becomes literate.

*Cultivated land size (CLSZ)*: The coefficient of this variable was hypothesized to influence food security positively i.e. it has positive relationship with per capita food availability of the households. The results of the multiple regression model indicated sample households who had larger farm size have less risk of food insecurity. This is assured by the positive coefficient of this variable indicating it is significantly influencing rural household food security at 1% level of probability. The possible justification is that farm households who had larger farm size had better chance to produce more, to diversify the crop they produce and to get larger volume of crop residues. This result is supported by the findings of Getachew (1993; 1994).

*Livestock holding (TLU)*: The association between the amount of livestock holding in tropical livestock unit and food per capita food availability is positively related i.e. the relation to food security turned out to be positive and significant. The relationship is statistically significant at less than 5 % probability level. This is an indication that ownership of livestock acts as a hedge against food insecurity in the study area. The possible explanation for the positive relationship is that livestock besides its contribution to the subsistence need and nutritional requirement, and crop production by provision of manure, it also serves as accumulations of wealth so that disposed during times of need, especially when food stock in the household deteriorate. This is in agreement with the expectation and also supported by Getachew (1993) and Degafa (2002).

**Table 5.21: Summary of the Results of Multiple Regression Model Analysis**

Model	Un standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3595.381	451.870		7.957	.000
CLSZ	1027.615	363.425	.276	2.828*	.006
TLU	18.671	7.535	.173	2.478**	.015
NFIGA	66.203	175.911	.027	.376	.707
Access to credit	-164.588	206.905	-.053	-.795	.428
Nuoxen	89.298	107.739	.078	.829	.409
IRRIAccess	-58.366	162.762	-.025	-.359	.721
DPR	-57.736	132.871	-.039	-.435	.665
FAMSZ	-220.764	61.962	-.348	-3.563*	.001
HHH	-568.985	202.043	-.183	-2.816*	.006
EDUC	289.552	169.222	.128	1.711**	.040
AGEHHH	3.690	6.706	.038	.550	.583
AGROECO	-268.388	91.263	-.194	2.941*	.004
R			.764		
R <sup>2</sup>			.584		
Adjusted R <sup>2</sup>			.538		
F change			12.763		.000

**Source:** Computed from field survey, December 2010 \* = Sig. at 1%; \*\* = Sig at 5%

*Agro- ecology (AECOL):* There is also difference in the food security status of the household in relation to their place of residences i.e. agro-ecology. This difference was emanating from differences in accessing livelihood assets and vulnerability to bio-physical hazards. Hence, households in the highland agro-ecology are relatively better off in terms of their food security status when compared to households residing in the midland and lowland agro-ecologies. Likewise midland residences are also believed to be better off than lowland residences. Because, the amount of rainfall and its distribution is by far better than midland and the *lowland*; which enhances both livestock and crop productivity. Some of the farmers in highland accessed to irrigation for “*chat*” plantation , practiced fattening because both pasture and water are available. Thus, they are able to bridge the food gap in the household through purchasing. As a result it is hypothesized that agro-ecology will have positive or negative impact on food insecurity of the households. The result of the multiple regression confirmed the prior expectation with significance at the probability of less than 1% ( $P < 0.004$ ). As one move from highland to low land, it is likely that the calorie per capita food availability is decreasing or vice versa.

## **5.5. Summary of the Chapter**

To sum up, following the result of household food balance model, as depicted in Table 5.1, 60.7 % sample households were found to be unable to meet the minimum subsistence requirement, whereas, only 39.3 % households were found to meet their energy requirement.

According to their impression/ perception, more than half of the sampled population (53.7%) categorized themselves as food insecure and 23.1% perceived as their food security status varies from year to years. Whereas only the remaining 23.1% reported to be food secure.

There was a significant difference with respect to mean of family size both in number and adult equivalent, and in the mean of dependent individuals. The mean in each case is higher for the food insecure household group. On the other hand, farm size per capita, livestock's possession in TLU and number of oxen owned differentiated the two groups significantly in their mean values. In this case, the mean values were higher for the food secure household group. With regard to education, percent of illiterate household was higher for the food insecure households group than the food secure ones. According to econometric regression model, the estimated coefficient revealed a mixed impression.

## CHAPTER SIX

### MAGNITUDE AND DISTRIBUTION OF FOOD INSECURITY

This chapter presents the magnitude and distribution of food insecurity, from the findings of the FGT indices and household food access scale analysis made in the study. The FGT indices were employed to estimate the food insecurity gap, incidence. Whereas, the severity of food insecurity analyzed with both FGT and Household food insecurity access scale (HFIAS). Finally livelihood strategies and coping mechanisms' employed by the population of the study area to overcome the food gap was presented.

#### 6.1. Extent and Incidence of Food Insecurity

##### 6.1.1. Incidence of Food Insecurity by Household Factors

Table 6.1, shows the way in which some household factors affect food insecurity by comparing the incidence of food insecurity among household groups sharing similar characteristics. The prevalence of food insecurity among households with five to seven members is found to be 4.5 times more than that of households with four or less members. This increase incidence of food insecurity with increase in family size confirms the result of the regression output discussed in the previous section. The two variables have positive relationship. As hypothesized the incidence of food insecurity also increases as the proportion of children and elders increase in the family. This is also shown in Table 6.1, where incidence of food insecurity in households with dependency ratio greater than 2 is found to be 1.50 times higher than that of households with dependency ration less than 1. Moreover, the head count index is 1.22 times higher for illiterate household heads than that of literate ones. Hence, the risk of incidence of food insecurity decreases with education i.e., to say when the households turned from illiterate to literate status the incidence for the households to become food insecure decreased.

With regard to gender of household head, female-headed households had a slightly lower incidence of food insecurity than male-headed ones, i.e. 52.9% and 61.9%, respectively. This result confirms the result of the regression output discussed in the previous section. Though, this difference cannot be interpreted as significant, since only 19 female-led households were sampled. Likewise the prevalence of food insecurity declines as farm size of the household increases.

**Table 6.1: Incidence of Food Insecurity by Household Groups**

HH factor	Group interval	Number of HH in range	HH Number of food insecure	Incidence of food insecurity
Dependency ratio	0	1	0	0.0
	1-2	33	11	33.3
	3-4	45	28	62.2
	5-6	41	33	80.5
	7+	2	2	100.0
	Total	122	74	60.7
HH size	1-3	7	2	28.6
	4-6	49	27	55.1
	7-9	65	44	67.7
	10+	1	1	100.0
	Total	122	74	60.7
Sex of HH head	Male	105	65	61.9
	Female	17	9	52.9
	Total	122	74	60.7
Education	Literate	64	26	40.6
	Illiterate	58	48	82.8
	Total	122	74	60.7
Land size	Landless	5	3	60.0
	0-0.25	50	34	68.0
	0.26-0.5	47	30	63.8
	0.6-0.75	12	5	41.7
	0.76-1.0	6	1	16.7
	1+	2	1	50.0
	Total	122	74	60.7
Oxen	Oxen less	46	42	91.3
	1	21	14	66.7
	2	47	15	31.9
	3	6	2	33.3
	Total	120	74	

Source: Field survey, December 2010

### 6.1.2. Extent of Food Insecurity

Head count index, food insecurity gap and severity of food insecurity were the indices employed to capture the incidence and severity of food insecurity with HFIAS.

As it is already discussed in Chapter 3, head count index measures the incidence of food insecurity and shows the proportion of households below the threshold level. In the study area the incidence of food insecurity was found to be 60.7. That means 60.7% of the sample households cannot meet the energy requirement recommended for subsistence. In other words, head count ratio of 0.607 for 122 sampled household means 74 sample households are deemed food insecure.

The head count index or incidence of food insecurity is good indicator to assess food insecurity but it does not take into account the severity of the food insecurity. Therefore, to address how far the food insecure households are below the subsistence energy requirement level, food insecurity gap was calculated from the survey data. Accordingly, the food insecurity gap index ( $P_1$ ) came out to be 0.14. This means that if the woreda mobilizes resources that can cover or meet the 14% of the daily calorie requirement for every food insecure households and distribute these resources to bring each households up to the given daily calorie requirement level, then at least in theory food insecurity will be eliminated.

In other words, assuming that the households are representative to the rural population of the *woreda* and according to office of *Agriculture of woreda*, it is estimated that the rural households of the *woreda* to be 19540 households which is on average equivalent to 107470 in AE, of this 65556.7 AE or 61% are assumed to be food insecure. Hence, based on the recommended subsistence energy (2100kcal per day per person), the total resource required to bring all households at least to get the daily subsistence is amounted to 19273669.8 kcal per day. When this amount of calorie is converted to cereals, assuming that cereals can produce an average of 3700 kcal per kg, it becomes 5209.01 kg or 52.091 quintal of cereals per day. This implies that an estimated 19013.23 quintal of cereals per year is required to bring all households at least to get the daily subsistence energy in a year, in other ways when this is converted into Birr it is about 11407929 Birr is needed per year to maintain those households food security.

Further, to address the most food insecure segment of the sample household measure of the extent of food insecurity is provided by the index of severity, which gives a higher weighting ( $\alpha = 2$ ) food insecure, was calculated. As is already discussed severity of food insecurity is a measure closely related to the food insecurity gap but giving those further away from the given subsistence energy requirement level a higher weight in aggregation than those closer to meet the daily recommended energy level. Hence, the survey result reveals that the severity of food insecurity in the study area is 2.28, indicating that not only is the incidence of food insecurity relatively high in the region but the inequality among the food-insecure households is intense.

## 6.2. Analysis of Household Food Insecurity Access Scale (HFIAS)

### 6.2.1. Household Food Insecurity Access-related Conditions

These indicators provide specific, disaggregated information about the behaviors and perceptions of the surveyed households. The indicators present the percent of households that responded affirmatively to each question, regardless of the frequency of the experience. Thus, they measure the percent of households experiencing the condition at any level of severity. Each indicator can be further disaggregated to examine the frequency of experience of the condition across the surveyed households (Coates *et al.*, 2006).

**Table 6.2: Percentage of Household Experiencing Food Insecurity Related Conditions at Any Time during the Four Weeks of Prior to the Survey Period**

Occurrence of HFIA access-related conditions	Percentage of households who responded affirmatively (% of 'yes')							
	Highland (N=42)		Midland (N=41)		Lowland (N=39)		Total (N=121)	
	No	%	No	%	No	%	No	%
Q1: Worry about food	7	16.7	11	26.8	26	66.7	44	36.7
Q2: Not able to eat foods they preferred	29	69.05	35	85.4	37	94.87	101	83.4
Q3: Eating just a few kinds of foods	34	87.2	33	80.5	38	97.4	106	87.6
Q4: Eating foods that are not preferred	32	76.2	32	78.1	37	94.87	101	83.4
Q5: Household members eat a smaller meal	31	73.8	32	78.1	26	66.67	89	73.5
Q6: Household members ate fewer meals in a day	27	64.3	31	75.6	28	71.8	86	71
Q7: No food at all in the household	1	2.4	6	14.6	4	10.25	11	9.1
Q8: Household members went to sleep hungry	1	2.4	6	14.6	17	43.6	24	19.9
Q9: Household members went a whole day without eating	1	2.4	6	14.6	2	5.13	9	7.5

**Source:** Field survey, December 2010

In this survey, household were asked about the nine occurrence questions of HFIAS, which relate to the household food insecurity related conditions, to get information about behavior and perception of the sample households. As shown in Table 6.2, the survey result revealed that 83.4% of the surveyed households were unable to get preferred food or the kind of foods during the recall periods. That is they were having limited choices in the type of food that they ate. Likewise the percentage of households experiencing the conditions of going to sleep hungry and going the whole day without eating anything because there was not enough food were 19.9%, while the percentage of households who reported their personal experiences with uncertainty and anxiety about acquiring food during the recall period was 36.7%.

When we see across the agro-ecology, the population in the highland area was less anxious and uncertain about their households food stocks prior to survey period than midland and lowland sampled households with 16.7%, 26.8% and 66.7% respectively.

### 6.2.1. Household Food Insecurity Access Scale-Related Domains

In this case, households' actual experiences of food insecurity related to three basic domains, such as anxiety and uncertainty, insufficient quality, and insufficient food intake, was examined as shown in Table 6.3, the proportion of households with insufficient food quality seemed relatively higher than that of households with insufficient quantity of food. That means the majority of sampled households had limited choices in the type of food (were unable to eat foods according to their preferences) and/ or they ate monotonous diet (little dietary diversity) during recall period. As depicted in Table 6.3, with regard to three household food insecurity access-related domains. The percentage of households experiencing food insecurity related to insufficient quality of food was 87.6%. About 36.7% the sample households had worried about food, whereas 73.55 % of households felt that they had experienced food insecurity related to insufficient food quantity, considering all the three domains across agro-ecology, the percentage of sampled households in the lowland are more likely experiencing food insecurity than midland and highland households, with 64.1%, 24.4 and 14.3% respectively.

**Table 6.3: Percentage of Household Experiencing With One or More Behaviors in the Domains of HFIAS at Any Level of Severity**

HFIAS-related domains	Percentage distribution across different agro-ecology							
	Highland (N=42)		Midland (N=41)		Lowland (N=39)		Total (N=121)	
	No.	%	No.	%	No.	%	No.	%
Domain 1. Anxiety & uncertainty	26	61.9	11	26.8	7	17.95	44	36.7
Domain 2. Insufficient quality of food	39	92.9	33	80.5	34	87.2	106	87.6
Domain 3. insufficient food intake	31	73.81	32	78.1	26	66.67	89	73.55
All three domains	6	14.3	10	24.4	25	64.1	41	33.9

**Source:** Field survey, December 2010

## 6.2.2. Household Food Insecurity Access Scale Score

The HFIAS score is a continuous measure of the degree of food insecurity (access) in the household (in the past 30 days). First, a HFIAS score *variable* is calculated for each household by summing the coded frequency of experience for each question. Simply by summing up the coded responses, the HFIAS can be derived ranging from zero (food secure) to 27 (very food insecure). The higher the score, the more food insecurity (access) the household experienced. The lower the score, the less food insecurity (access) a household experienced (Coates *et al.*, 2006).

In order to calculate HFIAS score, the following procedure were followed:

- 1) The frequency of occurrences for the nine questions was coded as '0' for all cases where the answer to the corresponding occurrence questions was 'No' (i.e, if Q1=0, Q2=0, etc); '1' for the frequency of occurrence was rarely; '2' for some times and '3' for often.
- 2) The frequency of occurrence codes for each frequency, if occurrence question were summed up to get the households food insecurity score, then the result ranges from 0-27.

**Table 6.4: HFIAS Score the Respondents by Agro-Ecology**

Agro-ecology	Total score	Mean score	SD deviation	minimum	Maximum
Highland(N=42)	281	6.7	4.66	0	18
Midland(N=41)	307	7.5	3.565	0	12
Lowland(N=39)	364	9.33	6.73	0	27
Total	952	7.75	5.16	0	27

**Source:** Field survey, December 2010

Based on these indicators, the household survey result showed that, the mean score of HFIAS for the sampled households was 7.75, with 5.16 SD. Generally more than 52 % of the surveyed population have the score greater than the mean score (7.75) of the sample. While only 9.8% of the respondents had zero score. To date, there is no universally accepted approach to setting these cut-off points (Coates *et al.*, 2006). But if we assume the cut point to be mean score and we categorized those households bellow the mean as food secure and those scored above mean as food insecure. Based on this assumption, 54.24% of the households will be considered as food insecure, while the remaining 45.76% will fall under the category of food secure. This result was almost the same as the results from the perception of the households explained in previous chapter five. Moreover, this indicates as the results from the subjective methods are more or less become similar in contrast to the objective method.

### 6.2.3. Household Food Insecurity Access Prevalence (HFIAP)

By examining the pattern of responses to the nine questions used to compute the HFIAS, households can be placed into one of four food Insecurity status categories. Accordingly, the HFIAP indicator categorizes households into these four levels of household food insecurity (access): food secure and mild, moderately and severely food insecure.

A food secure household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely. A mildly food insecure (access) household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a monotonous diet or less-preferred foods, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions (going a whole day without eating, going to bed hungry, or running out of food). A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or less-preferred foods sometimes or often, and/or has started to cut back on quantity by reducing size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions. A severely food insecure household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (going a whole day without eating, going to bed hungry, or running out of food), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last 30 days is considered severely food insecure, for details of how to categorize (see appendix-2).

**Table 6.5: Percentage Category of Household Food Insecurity Access Prevalence (HFIAP)**

Prevalence category (access)	Percentage distribution across different agro-ecology							
	Highland(N=42)		Midland(N=41)		Lowland(N=39)		Total (N=122)	
	No.	%	No.	%	No.	%	No.	%
Food Secure	3	18.8	9	56.2	4	25.0	16	13.1
Mildly Food insecure	9	42.9	6	28.6	6	28.6	21	17.2
Moderately Food insecure	23	41.8	15	27.3	17	30.9	55	45.1
Severely Food insecure	7	23.3	11	36.7	12	40.0	30	24.6

**Source:** Field survey, December 2010

It is immediately clear that the HFIAS questions capture a different dimension of food insecurity than does the calorie per capita consumption. For instance, 86.8% of households that were categorized in the highest calorie per capita consumption are categorized as 'food insecure' on the basis of this analysis.

Based on the survey result, the HFIAP was categorized 86.9 % of sampled households as food insecure (access) with different level of severity (17.2% mildly, 45.1% moderately, and 24.6% severely food insecure). Since the households' survey was conducted during the harvest season, it was expected that the majority of the farm households feel food secure during this time, but the result didn't show as expected. In this analysis of the survey results to examine patterns in household food security, a relatively homogeneous pattern is seen. The rural households in all three agro-ecology face relatively high levels of food insecurity. However, rankings based on one indicator of food security, such as a calorie per capita consumption, are not necessarily maintained when the households are ranked using another indicator of food security, such as the HFIAS. This confirmed when we disaggregate the food secure population into different agro-ecology, 18.8% , 56.2%, 25% were from the highland, lowland and midland respectively, which is almost the opposite of what calorie per capita shows.

Though there is evidence of reliably food secure households residing in the highland area, the majority of households according to this indicator are deem food insecure and vulnerable to loss of access to sufficient food to meet the needs of household members. While the severity is high in lowland, as shown in the Table 6.5, about 40% of the severely food insecure were found in low land, followed by midland with 36.7% being severely food insecure and it was 23.3% in the highland.

### **6.3. Livelihood Strategies in the Study Area**

Agriculture is at the heart of their livelihood strategies. Mixed farming, both rain fed and irrigation based, agriculture is the primary source of livelihood with mainly wheat, sorghum and maize grown as staple food crops, vegetables predominantly ,tomato and onion, root crops such as sweet potato and potato, and *chat* and coffee are some perennial cash crops. However, even though all these crops are grown in the area, the livelihood of the farm households heavily depend on the success and failure of cereal production which include wheat, sorghum and maize.

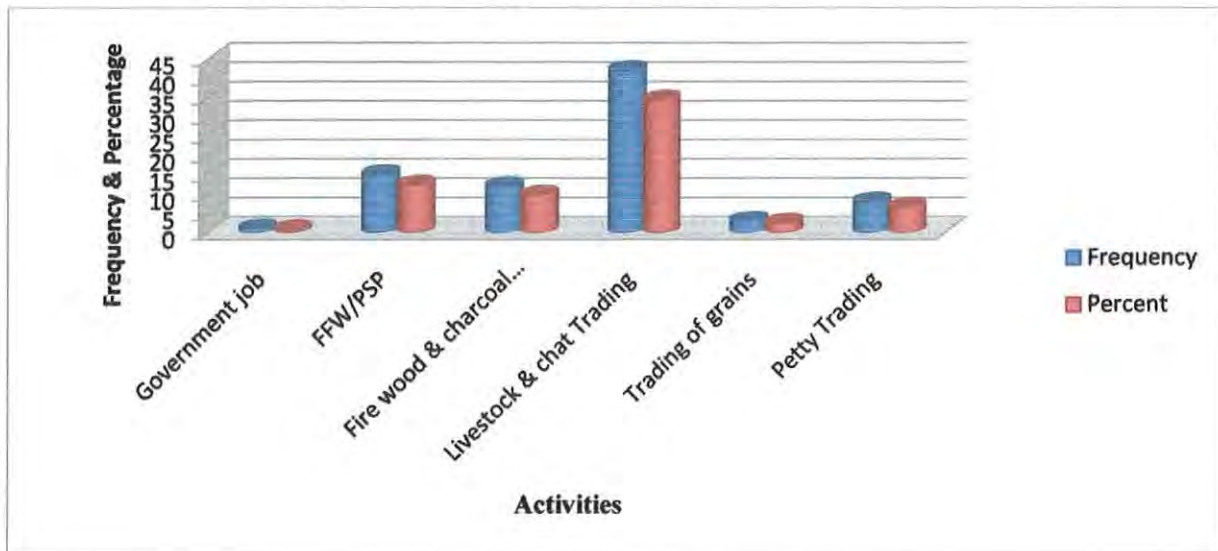
The other important livelihood activity, which plays an indispensable role in the mixed farming operation, is livestock production. Of the different livestock species in the production system holders pay greater emphasis to the small ruminants (sheep and goat), and cattle production because of their high capacity to generate income in a shorter period. Moreover, livestock in addition to their contribution to the nutritional requirement of the household and their gravity to increase household income, they provide better social status to the holder.

As there are uncertainties and risks involved around crop and livestock production, and inadequate returns from the sector, to maintain the household for the entire year, many rural households are performing different off farm activities to boost their income. These activities include participation in employment generation scheme, livestock trading, grain, vegetable and chat trading, FFW, fuel wood and charcoal selling. Of the total sampled households 66.4% are generating some income by involving in these activities which contribute considerable amount of the annual income of the households in the study area. These activities in some households of the sample performed only for 5-6 months while other households still perform throughout the year according to key informants. The scale of these activities reaches to its climax during the years when the shortage of foods believed to be at its maximum point, i.e, as confirmed by Focus Group Discussants' and key informants both before *belg* and *meher* crop harvests.

Having these means of livelihoods, rural households of the area follow different strategies to achieve increased income and food security thereby sustain their livelihood. The most important and leading livelihood strategy adopted in the study area is diversification of activities as we can understand from Figure 6.1, This came into being because increasing household income through extensification, increasing farm size, became almost impossible.

As the group discussion demonstrated, the ever increasing population and the associated gradual fragmentation of cultivated land and the increasing demand for food, the dwindling potential cultivable land, low return from mono-cropping, the unavailability of sufficient moisture and agricultural input at reasonable price necessitated the adoption of diversification of livelihood activities as a prime strategy in the area.

**Figure 6.1: Distribution of Households in Different Non-Farm Income Generating Activities (Multiple Responses Possible)**



In addition to the above evidence for diversification of livelihood, the information obtained from FGD and survey was consistent. To this end sample households were asked whether their products is satisfying their households consumption need throughout the year, more than 90% of the sample responded as it is in adequate. For bridging the gap a significant number of households fill it by purchasing 58.2%, borrowing from other farmers 5.5% others 33.6% are employing both purchasing and borrowing to supplement the shortfall of grain production. So it is evident as most the households was engaged in diversified livelihood strategies

As it is already noted at the beginning of this section, households diversified their agricultural production within crop and livestock production; and between crop and livestock production. The diversification within the crop production ranges from annual to perennial crop production. Among the sample households, more than 96 % of the respondents had crop land for annual crop production where as about 50% of them had land for perennial crop production. Likewise, the diversification within livestock production is expressed through the production of different species of animals, like cattle, sheep and goat, camel, poultry, and donkey. Therefore, farmers by integrating these two diversified, crop and livestock production activities are trying to sustain their livelihoods.

Diversification was also made possible between farming and non-farm activities. Some of the household members, in order to smooth their income and meet their food requirement throughout the year, engaged themselves in non-farm activities while other active household members are making themselves busy on crop and livestock production. Most of the time active female household members are engaged in selling agricultural products like chat, coffee, grain, vegetables, egg, butter, and milk either from home production or through purchase for resale from neighboring districts of the woreda. Male household members also try to boost the household income through fattening and sale of live animals from either source. Farmers of the area also consider the employment generation scheme program like FFW/PSP as their supportive means of livelihood wherein the income obtained from these activities invested on purchase of live animals, farm inputs, and to fulfill social obligations.

In the study area households also use different institutions as a beneficial strategy for their livelihood. Of the different institutions *Equb* is the one most frequently involved in by the households. *Equb* is voluntary money pooling association rotating the sum among the members weekly, biweekly or monthly. However, it is only traders or those involved in non-farm income generating activities are practicing this *Equb* in monetary terms. Otherwise, the most frequent type of *Equb*, known as *Anan fareka* locally, wherein almost all households who have milking cow involved in is pooling the daily produce of milk to a member of 4-6 women. Every member gets exactly equal quantity of milk what she has contributed to each member in every 4-6 days. As the group discussion demonstrated, this type of *Equb* has got its own advantage and disadvantage. However, what so ever the condition may be it would not be shared among the members. Rather, the individual member who gets the chance will take it completely. If the price of milk rises the individual will get better benefit than the other.

Likewise, if the price falls or if the milk is not sold by chance or so all the risk will be to the individual on time of the turn. Nevertheless, this strategy is very helpful to get better sum of income to invest on new animals, farm inputs, to buy clothes for special days, wedding and holidays.

## 6.4. Coping Strategies

Coping strategies are mechanisms that households employ to keep all or some of their members alive under severe food stress. It can be categorized into two-asset disposal and adaptive strategies. Asset disposal refers to the use of household resources that are accumulated during the normal time, while adaptive refers to the way that the household use (non asset disposal) mitigating strategies involving like fuel wood selling, meal skipping, wage labor, borrowing grain or money etc. (Adane,2008)

Coping strategies can also be classified as *early* and *late or crisis* strategies. The early coping strategies are reversible and do not cause durable damage. Including collection of wild food, selling of non essential asset or sending the family member to work and generating income elsewhere etc. whereas, later strategies can lastingly challenge future food security. It may cause, stress or mass migration, deforestation, prostitution, selling of strategic assets etc (Adane, 2008).

Regarding coping mechanisms of the study area, households employed different mechanisms but the most commonly practiced ones are fourteen coping strategies: As shown in Table 6.6, borrowing grains or money from relatives and selling of small ruminants was used by 55.7% and 53.3% of the households of those reported to face food shortage in the last 12 months these are the most commonly used coping strategies in the study area. Whereas consuming less preferred food and selling of firewood was used by 50% of the households. Following these, about 40.2%, 34.7% and 32.8% of the households were used to rely on relief food, migration to nearby towns and rural area for wage labour (especially migrate to *Awoday* , *Haramaya* and *Kombolcha areas*) respectively. While borrowing money from moneylenders, destocking, sell of farm oxen, and leasing out land were also reported by 14.8, 14, 11.5 and 9 % households.

Moreover, rural households of the area mostly face severe and repeated challenges related with moisture shortage and crop production failure, this was confirmed by 84% of the sampled households who believe that environmental impact are the most severe challenge to produce enough food for his family along the population growth..

**Table 6.6: Summary of Household Coping Strategies**

Types of Coping Strategies	Frequency	%
Livestock dispersal or de-stocking	15	14
Change cropping patterns	9	7.4
Migration to nearby towns for wage labour	42	34.7
Consuming famine period or less preferred foods	61	50
Borrow grains from relative	68	55.7
Borrow grain or cash from money lenders	18	14.8
Migrate to other rural areas for wage labour	40	32.8
Sell off small animals	65	53.3
Firewood and charcoal selling	61	50.
Rely on relief grains	49	40.2
Sell off farm oxen	14	11.5
Lease out land	11	9
Sell off land	3	2.5
Desperate migration	4	3.3

**Source:** Field survey, December 2010

The frequency of using the particular coping strategy is also shown in Table 6.7. Regarding the frequency of using these strategies, the most frequently used coping strategy mentioned by more than half of the respondents was consuming less preferred food in daily basis. Whereas, about 43.44% and 40.2% of the households were reducing the size of their food and number of meals in daily basis in order to keep their food reserves last long.

**Table 6.7: Coping Strategies Related to Food Consumption (Multiple Responses Possible)**

Types of coping strategies	Every Day	4-5 times/ week	1-2times/ week	Never	Number of Respondents
Eating foods that were less preferred	14(11.5%)	6 (4.9%)	43(35.2%)	7 (5.7%)	71
Borrowing grain or money to buy food	2 (1.6%)	6 (4.9%)	53(43.4%)	8 (6.6%)	70
Buy food on credit basis	--	2 (1.6%)	16 (13.1)	52(42.6%)	71
Receiving donation from relatives or friends	3 (2.5%)	5 (4.1%)	38(31.1%)	24(19.7%)	71
Depending on foodstuffs sold along streets	--	1(0.8%)	7 (5.7%)	62(50.8%)	71
Reducing consumption during each meal	21(17.2%)	13(10.7%)	19(15.6%)	17(13.9%)	71
Skipping meals for adults to feed children instead	3 (2.5%)	7 (5.7%)	14(11.5%)	46(37.7%)	71
Reducing the number of meal per day	21(17.2%)	8 (6.6%)	20(16.4%)	21(17.2%)	71
Not eating for whole days at a time	--	1 (0.8%)	3(2.5%)	66(54.1%)	71

**Source:** Field survey, December 2010

## 6.5. Integration among Various Methods

The objective of this subtopic will be to compare measures of self-perceived food security from household survey data with standard quantitative indicator of food security, namely calorie per capita. To that end, the study has analyzed data from household survey which collected information on these subjective measures as well as the objective indicator of food security.

The simple descriptive analysis presented suggests that, overall, calorie availability, are at best weakly correlated to subjective perceptions of food security status. Whereas as can be shown from Table 6.8, the results indicate that the subjective indicators (HFIAS and perception of food security) are correlated, although weakly at the 1 % level of significance. The correlation among subjective indicators may be due also to ‘attitudinal characteristics’ of the respondents and not to relative food insecurity or to vulnerability.

The correlation coefficient between subjective food security and calories was only (- 0.1), while the correlation with household food insecurity access scale (HFIAS) score and calories per capita availability is (-0.042), statistically also was insignificant. There is an evident correlation between the subjective measures, perception of food security on one side, and the HFIAS measures, on the other side. The higher the total score, the more likely is that a household reported food insecure, as it can be seen in Table 6.8, The correlation coefficient between subjective food security status and HFIAS score is only 0.271, therefore, this can be true only on average.

What is surprising is the lack of correlation between calorie per capita availability and perceptions of households food security, especially the (weakly) negative correlation found between them has to do with the mind set up of the respondents.

**Table 6.8: The Pearson Correlation Coefficient among the Various Methods**

		Subjective measure	HFIAS score	Calorie per capita
Subjective measure	Pearson Correlation	1		
	Sig. (2-tailed)			
HFIAS score	Pearson Correlation	.271**	1	
	Sig. (2-tailed)	.003		
Calorie per capita	Pearson Correlation	-.100	-.042	1
	Sig. (2-tailed)	.273	.649	

**Source:** Field survey, December 2010, \*\*. Correlation is significant at the 0.01 level (2-tailed).

For instance, Migotto *et al* (2007) explained on this issue by further analyzing the information for Madagascar and they were found that households that are poorer compared to their neighbors holding household and community level wealth constant may have a lower perception of food adequacy. In another way, if the household's economic situation has worsened in the past, holding wealth constant, the household is much more likely to have a lower perception as well. These two results together suggest that the food adequacy questions may be capturing relative food adequacy, in comparison with neighbors, and respondent's perception of changing status over time Migotto *et al*.(2007).

Therefore, from the above discussion theoretically we can conclude that 'Subjective' and 'objective' indicators do not classify the same households as food secure or insecure exactly.

## **6.6. Summary of the Chapter**

According to FGT indices, in the study area the incidence of food insecurity was found to be 60.7%, which is similar with the result of food balance model. When food insecurity gap index came out to be 0.14, the severity of food insecurity in the study area was 2.28.

When, Household Food Insecurity Access Scale (HFIAS), 36.67 % of the respondents were concerned and uncertain about the household food supply within the past 30 days, whereas about 87.6% of the sampled households were reported to sustain on insufficient food quality. It also shows as 13.1% of the population was categorized under food secure, while 17.2%, 45.1%, and 24.6% of the population was classified as mildly, moderately and severely food insecure respectively. The most identified livelihood strategies of the rural households were found to be a composite of different activities adopted in search of their sustainable livelihoods. By analyzing the relationships of 'Subjective' and 'objective' indicators and we conclude that they do not classify the same households as food secure or insecure exactly.

## CHAPTER SEVEN

### CONCLUSION AND POLICY IMPLICATIONS

#### 7.1. Conclusion

The overall aim of this research was to assess the dimension of food insecurity and livelihood strategies and coping mechanisms of rural households in *Jarso Woreda*. The specific research objectives were within the context of rural households to: study the socio-economic characteristics of the food in/secure; identify the determinants and dimension of food security; estimate the food insecurity gap and its severity; and to examine the livelihood strategies among rural households.

Based on the survey data, an attempt was made to describe the socio-economic characteristics of the food insecure and food secure sample household groups, i.e., whether there exists mean difference between the two groups with respect to the different socio-economic attributes. Accordingly, the survey result revealed that there were significant differences with respect to mean of family size both in number and adult equivalent, and in the mean of dependent individuals. The mean in each case is higher for the food insecure household group. On the other hand, farm size per capita, livestock's possession in TLU and number of oxen owned differentiated the two groups significantly in their mean values. In all the three cases, the mean values were higher for the food secure household group. Moreover, with regard to education, percent of illiterate household was higher for the food insecure households group than the food secure ones. Therefore, the findings indicate that as there was systematic relationship (directly or indirectly) between the different socio-economic attributes and food security.

When we come to the second objective, it was focused on identifying the determinants and dimension of food security among the rural household. In order to identify the determinants of food security among the rural households in the study area multiple regression model was fitted, taking calorie per capita availability as dependent variable and different socio-economic variables as independent one using the survey data. Accordingly, the result of estimated coefficient revealed a mixed impression. Among the twelve hypothesized variables, family size, education, farm size, livestock owned in TLU, and agro-ecological differences showed

theoretically consistent and statistically significant effect, while the sex of household head showed theoretically inconsistent and statistically significant effect. On the other hand, dependency ratio, participation in non-farm income generating activities, access to credit and irrigation, number of farm oxen, age of household head were not found to be statistically significant in determining food security of the rural households in the study area. Therefore, it is better if emphasis was given to the significant factors if the food insecurity was to be curtailed.

With regard to the assessment of dimensions food security which includes availability, accessibility and utilization, it was analyzed through both (objective and subjective methods) including household food balance model, household perception of food security and household food insecurity access scale. Food availability is the first pillar of food security that was assessed on the basis of food availability from production; market etc, by using household food balance model. Consequently 60.7% of the sample households were found to have less than daily recommended calories per capita food availability, when only the remaining 39.3% have more than or equals to what is recommended. As a result the availability was what needs attention in relation to other dimensions, which touches up on many levels.

Whereas, access to food which is the second important condition of food security, was assessed through household food insecurity access scale. The results from this scale which is categorical, classifies the households into three domains: anxiety & uncertainty, insufficient quality, and insufficient food intake, thus, it was found that, 36.7%, 87.6% and 73.55% of the households was experiencing the above domains respectively. Likewise, the household food insecurity access prevalence indicator that categories households into four levels food insecurity (access): as a result 86.9% of the sampled households was found to be food insecure (access) with different levels of severity (17.2% mildly, 45.1% moderately, and 24.6% severely food insecure). From this we can infer that the issue food insecurity is not something which is solved by only making food available, but addressed by physical, economic, social and institutional integration.

Finally, for the assessment of utilization, we use the proxy indicators which are availability of health facilities and safe drinking water. For instance, according to Khan *et al.*, (2009 pp.14), access to safe drinking water is essential for good health, and then may increase food absorption. Therefore, food absorption was found to be positively related with safe drinking water. Cognizant to this, our survey outcome shows in the highland it takes only 12% the households to

rich the water point, where as 87.5% of the midland and 100% of the lowland households have to go more than one hours to fetch the drinking water. In addition to distances most of the lowlanders use water from pond; midlanders from spring whereas almost all of the highland populations were reported to have access to hand pump water. Therefore; in all of the above, when we see across agro-ecology in all of the three dimensions, the lowland have less probability for food availability, access and utilization compared to midland and highland. While the highland have more probability to have food availability, accessibility and are more likely to food secure in utilization.

The third objective of this paper was to estimate the food insecurity and its severity among rural households. To achieve this objective the FGT indices were employed to estimate the food insecurity gap, incidence and severity of food insecurity. Accordingly, similar to household food balance model, 60.7% of the sample households were food insecure whereas, the food insecurity gap and severity of food insecurity were 14% and 228%, respectively.

Lastly, it was also made possible to examine and identify the livelihood strategies of the rural households. These were found to be a composite of different activities adopted in search of their sustainable livelihoods. These activities include mixed crop-livestock farming, diversification of crop production, diversification of livestock production, integration of crop production with off-farm activities. Moreover, the importance of social institutions, especially Equb, was also found to be an important social capital in their day-to-day livelihood activities. From this it is proved that, in the midst of serious food scarcity and insecurity, the local institutions are playing a mediating role for households' access to a wide range of livelihood resources and serving as a gateway to livelihood security. It is presumed that, in the absence of formal and well established system such as Safety Net Programs, the role of these local and informal social institutions are of paramount importance.

## **7.2. Recommendations/Policy Implications**

Based on the findings of the study, the following policy recommendations are given. Because of variations in power of execution and nature of responsibilities of the stakeholders, the recommendations are applicable at different levels:

As family size is negatively related to food security, a serious attention has to be given to limit the increasing population in the study area. This can be achieved by creating sufficient awareness to affect family planning in the rural households. Even though every individual has a natural right to multiply himself with his willing partner, this right should be effected with the ability to furnish his descendants with all the necessary or basic needs, especially food. Otherwise, the ever-shrinking productive resources in the study area coupled with increasing population would hamper any development intervention from achieving its objectives. So, along with creation of effective family planning through effective extension services some methods of incentives, such as material reward for those households accepting a given number of children by the end of reproductive age, to limit the family size should be considered.

Productive resources especially land is very limiting and highly binding resource in the study area. And hence, even if the model result showed farm size and food insecurity have inverse relationship, tackling the problem of food insecurity through increasing farm size would not bring any sustainable improvement. So a medium and longer-term food security strategy through increased food production must be introduced. In a medium or shorter term, resettlement and allocation of cultivable land, which was not under cultivation, thereby increasing output should be made. This would give short period relief from the problem; otherwise the amount of return from such a strategy would not be by any means sufficient and sustainable to up-root the problem from the present setting. As a result, strong effort should be made to improve the production and productivity in the agricultural sector in the longer term. The possible measures that can be undertaken to achieve this strategy include crop diversity, timely and low cost supply of inputs like fertilizer, improved seed, agrochemicals, further development of micro-irrigation.

Moreover, improving production and productivity of agriculture has strong tie with research, extension and education. Blanket recommendations of fertilizer use, improved seed and management practices should be banned. Research that solves the specific problems of the rural households should be encouraged. The link between research and extension should also need to be revised. However, what strong the link between research and extension is also determined by the awareness, understanding and knowledge of the small farmers. So, in order to bring food security at the household level, the development strategies need to encompass education programmes to the smallholders. So, short-term trainings that were attempted in FTC should be practiced in a planned and organized way whenever necessary.

Sticking to the findings of this study, livestock sub sector plays a great role in the struggle to eliminate food insecurity. Its contribution to the household food energy requirement and total income is significant. Hence, necessary effort should be made to improve the production and productivity of the sector. This can be done through the provision of adequate veterinary services, improved water supply points, introduction of timely and effective artificial insemination services to up-grade the already existing breeds, launching sustainable and effective forage development program, provision of training for the livestock holders on how to improve their production and productivity, improving the marketing conditions, etc.

Rural households in the study area have very limited room for alternative generation of income. Hence, for these households to enhance their welfare in general and food security in particular, they must have diversified access to income alternatives. In the face of this, provision of credit must be taken as a measure, though not the only one, to build the capacity of farmers to invest in the agricultural sector, such as purchase of fertilizer, pesticides, improved seed, live and productive animals. Moreover, development strategies should be able to identify income alternatives other than agriculture.

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## APPENDICES

### Appendix 1.

Conversion factor used to estimate Tropical Livestock unit

Livestock Type	Tropical livestock Unit (TLU)
Calf	0.2
Heifer	0.75
Cows/Oxen	1.00
Horse/Mule	1.10
Donkey	0.7
Donkey (Young)	0.35
Sheep/Goat	0.13
Sheep/Goat (young)	0.06
Camel	1.25
Chickens	0.013

Source: Storck et al, (1991) cited in Mulu, (2008).

Conversion factor used to calculate adult equivalent (AE)

Age categories (in Years)	Male	Female
Less than 10 years	0.6	0.6
10-13	0.9	0.8
14-16	1	0.75
17-50	1	0.75
Greater than 50	1	0.75

Stock et al, (1991) cited in Mulu, (2008)

Energy content per 1k grams of edible portions, selected foods

Food type	Kilocalories
maize	4.03
Other cereals	3.78
Legumes	4.07
Oilseeds	4.07

Source: Agren et al. (1968) which quoted in Degefa 2002

**Appendix 2:** below illustrates this categorization. The categorization scheme is designed to ensure that a household's set of responses will place them in a single, unique category.

Categories of food insecurity (access)

Questions	Frequency		
	1-Rarely	2-Sometimes	3-Often
1			
2			
3			
4			
5			
6			
7			
8			
9			

Food Secure	Mildly food insecure	Moderately Food insecure	Severly food insecure
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HFIA category	<p>Calculate the Household Food Insecurity Access category for each household. 1 = Food Secure, 2=Mildly Food Insecure Access, 3=Moderately Food Insecure Access, 4=Severely Food Insecure Access</p> <p>HFIA category = 1 if [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]</p> <p>HFIA category = 2 if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]</p> <p>HFIA category = 3 if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0]</p> <p>HFIA category = 4 if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3]</p>
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Source: (Coates et al., 2006).

### Appendix 3: Household Survey Questionnaire and Check Lists for FGD

1. Location Identification:

Zone – East Hararghe, Woreda Jarso

Agro-ecology: 1. Highland \_\_\_ 2. Midland \_\_\_ 3. Lowland

2. Interviewer's Name: -----

3. Date of the Interview:-----

4. Time of Interview: Starting time:-----Finishing time:-----

5. Interviewee name \_\_\_\_\_

6. Name of peasant association \_\_\_\_\_ Name of village \_\_\_\_\_

#### Demographic Characteristics

1.1. Name of household head \_\_\_\_\_

1.2 .Sex of household head 1. Male 2. Female

1.3. Age of household head in years \_\_\_\_\_

1.4 .Type of household head 1. Male- headed 2. Female-headed

1.5. Education level of household headed (years of schooling) \_\_\_\_\_

1.6. Marital status: 1. Married 2.divorced 3. Widowed 4. Others

1.7 .If married 1.monogamy 2.polygamy

1.8. Ethnicity 1.Oromo 2.Amhara 3. Others \_\_\_\_\_

1.9 .How many members are there in your households? Male \_\_\_\_\_ Female \_\_\_\_\_

1.10. The roof of the house for the household is made up of? 1. grass/straw 2. iron 3. Others

Please, provide additional information on your household members and their relation to the household (HH) as per the table below

#### II. Access to Natural Capital

1. Do you have a land for agricultural use? 1. Yes 2. No

2. If yes, how did you get access to it? 1) Through inheritance 2) through land redistribution 3) gift from relatives 4) through share cropping 5)Free access to some ones land 6) Rented 7) Others specify \_\_\_\_\_

3. What are the total sizes of the following land types that you own?

S/No	Types of land	Kindi	Hectare
1	Cultivated land		
2	Fallow land		
3	Grazing land		
4	Forest land		
5	Settlement land		
6	Others		

4. Do you give your land to someone in the form of share cropping, sell or renting in this year?

1. Yes 2. No

5. If your answer is yes why did you do this? (Multiple responses are possible)

- 1) Need of cash to buy food
- 2) Lack of seed and fertilizer
- 3) Need of cash for family health care
- 4) Elderly and unable to operate
- 5) Having extra land
- 6) lack of oxen
- 7. Others, specify \_\_\_\_\_

6. What was the trend of your household land holding size since the last two decades?

1) Increasing 2) Decreasing 3) No change

No	Name of the member	Age	Sex	Relation-ship to the household	Educational level
1					
2					

Codes : Relationship to household 01=Head 02= Wife 04=Daughter 05=Others 03= Son	Codes: Educational Level 0=illiterate 1=read and write 2=primary school 3=secondary school 4= higher education
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7. If decreasing/ increasing what was the reason? Specify \_\_\_\_\_
8. Do you use any irrigation? 1. Yes 2. No
9. If yes what is the source of water for irrigation system? 1) Pond 2) Spring 3) both 4) others
10. If your answer for question No 8 is yes for what purpose did you use the irrigation scheme?

Types of crops	Size of the areas(Kindi)	Total production	consumption	Sale

11. What is the productivity of your land for the last 10 years?

- 1) Increased 2) Decreased 3) Unchanged

12) If it was decreased what was the reason?

No	Reason for decrease of productivity	Rank
1	Soil erosion	
2	Crop pests	
3	Deforestation	
4	Poor farming system	
5	Shortage of rainfall	
6	Lack of input	
7	Others specify	

13. How many times do you produce in the year? 1) One times in a year 2) two times in a year

14. If your answer is once, why? \_\_\_\_\_

15. Do you practice mixed cropping? 1. Yes 2. No

16. What kind of crops do you mix crop?

Chat mix with A) maize B) ground nut C) sorghum D) sweet potato Others specify \_\_\_\_\_

Coffee mix with A) maize B) ground nut C) sorghum D) sweet potato Others specify \_\_\_\_\_

17. Do you practice animal fattening? 1. Yes 2. No

Please would you give me the detail information according to the following table

Fattened animals	Purchase Price	Cost of feeding & vet.services	Sells price	Net income

If yes to the above Q.17, what is the source of feed? \_\_\_\_\_

18. Which of the following land productivity practice do you carry out in order to maintain/increase the productivity of your farmlands?

No	Productivity practice	1. Yes 2. No
1	Field rotation	
2	Crop rotation	
3	Animal manure	
4	Use of compost	
5	Chemical fertilizer	
6	Inter-cropping	
7	Others Specify	

### III. Crop Production and Livestock Production

1. Would you tell me the amount of crops you have grown and the amount of income you have earned from the crop in the last twelve months?

Type of crop	Total harvest	Home consumed	Amount Sold	Net income	Total income
Maize					
Barley					
Wheat					
Teff					
Sorghum					
Horse bean					
Chick peas					
Others					

2. Would tell us about your perennial crops, fruits and vegetables and the income you earn from them in the last twelve months?

S/N	Type of crop	Amount	Monthly income	Annual income
1				
2				
	1= chat 2=coffee 3=fruits and vegetables 4=others			

3. Do you have any kind of livestock? 1. Yes 2.No

4. Would you tell me the number of livestock you own?

Type	Number in 2005	Equivalent in cash	Number at present 2010	Equivalent in cash
Cows				
Oxen				
Bulls				
Heifers				
Sheep				
Goats				
Horses				
Donkey				
Chickens				
Camels				
Calves				
Total				

5. Do you get an income from the sale of the products of livestock in the last twelve months? 1. Yes 2.No

6. If your answer is yes what is the total income that you get from the sale of the products of livestock in the last twelve months? \_\_\_\_\_

7. Which of the followings are the constraints to rearing livestock? (Multiple responses are possible)

1) Shortage of grazing land 2) Lack of additional fodder 3) Disease prevalence

4) Insufficient veterinary services 5) Shortage of water 6) Attack by wildlife 7) Others, specify \_\_\_\_\_

8. Do you have a bee hive? 1. Yes 2.No

9. If your answer is yes, is it modern or traditional? 1. Modern 2.traditional 3. Both of them

10. If your answer is both of them, how many kilo grams of honey do you produce from them?

\_\_\_\_\_ Kg of honey from Modern hive

\_\_\_\_\_ Kg of honey From Traditional hive

11. What is the total income from it per annum, \_\_\_\_\_

#### IV. Social Capital

1. Do your community members support each other? 1. Yes 2.No
2. If your household had a problem and needed money or food urgently, would you be able to get it from people in your community or from relatives? (Circle one) 1. Yes 2. No
3. If someone in your household fell ill or was injured, and you needed help with farming or other work, would you be able to get it from people in your community or from relatives? 1. Yes 2. No
4. In the last 12 months (between now and the same month last year), has your household received any of the following types of assistance from anyone outside the household? Exclude food aid or other formal transfers. 1. Yes 2.No
5. If your answer is yes who gave you this help - a relative, friend or neighbor, or someone else? Where does the person live - in your community, or somewhere else? Please fill the following table.

Item	1. Yes 2. No	From whom?	Where does he live?
Cash gift			
Cash loan (no interest)			
Food or grain gift			
Grain loan (no interest)			
Seed gift			
Seed loan			
Free labour			
Free use of oxen or plough			
Free use of donkey/mule			
Horse			
Others			
		Codes: From whom? 1=son/daughter 2 = relative 3 = friend or neighbor 4 = trader 5 = other	

6. In which of the following community-based organizations (CBO) do you participate?

Institution	Contribution per month		Benefit earned	
	Cash	In kind	Cash	In kind
Afooshaa				
Quubii				
cooperative				

7. Do you participate in the social support activities? 1. Yes 2. No

8. If yes, what are the social support activities your household engaged in?

1) Gumaata 2) Guuza (Daboo) 3) Faraqaa 4. Gargarsa 5) Others specify \_\_\_\_\_

9. In the last two years, has your household received assistance from government or humanitarian organizations?

Type of assistance received	Amount	2002	2003	Estimate in cash
Food for work				
Cash for work				
Credit/loan				
Chickens				
Livestock				
Free fertilizer				
Free food				
Free cash				
Others specify				

### V. Access to Infrastructure

1. In the following table, indicate one-way walking distance in (minutes/hours) between your home stead and the nearest basic services

Services	Walking Distance (hours/ minutes)
Primary school	
Grain mill	
All weather roads	
Main market	
Health center for human	
Health center for livestock	
Source of water for livestock	
Wet season 2. Dry season	
Source of fuel ( firewood)	
Nurseries / demonstration sites	

2. How do you transport your produce to the nearby market? (1. On donkey back  
2. On camel back, 3. Carry it yourself 4. By using public transportation 5. 1 and 4  
6. Others specify-----)
  3. Is the market faire for both purchasing and selling? (For both croppers and agro-pastoralists)  
1. Yes 2. No
  4. Regarding the health status of your family, what changes have you observed in the last 5 years? (1. It was fine and now well improved. 2. It was fine and the same now  
3. It was fine but now not, 4. It was not and is not fine.)
  5. If your response is 3rd or 4th choice, why?  
(1. Lack of income for treatment 2. Health center is not found around  
3. Treatment cost is high 4. Other (specify) -----)
  6. What is the source of drinking water for your household? 1) River 2) protected spring  
3. Unprotected spring 4) pond 5) wells 6) others specify \_\_\_\_\_
  7. What is the source of drinking water for your cattle? 1) River 2) protected spring  
Unprotected spring 4) pond 5) wells 6) others specify \_\_\_\_\_
- Agricultural Extension Services
1. Is there development agent in your PAS? \_\_\_\_ 1) Yes 2) NO
  2. If yes, how far is it from your house? \_\_\_\_ (Hours of walk?)
  3. Has your household received any type of extension service from any government and Non-government organizations? 1) Yes 2) No
  4. For how long DA has visited your farm? \_\_\_\_ since last year.
  5. What were the purpose of this visits \_\_\_\_ (Multiple answer is possible).  
1) To give advice on crop production 2) To give advice on animal production  
2) To give advice on soil conservation 4) To collect taxes  
5) To collect other debt 6) Other (specify) \_\_\_\_\_
  6. Have you participated in the agricultural extension package program? \_\_\_\_\_  
1) Yes 2) No
  7. If yes for how long? \_\_\_\_\_
  8. Is there extension service for women? 1) Yes 2) No
  9. What kind of services \_\_\_\_\_
  10. Could your spouse get this service? 1) Yes 2) No 3) What type \_\_\_\_\_



4. Which of the following conditions most influence your household to diversify livelihoods?
  1. Weather fluctuation
  2. Yield reduction
  3. To overcome food shortage
  4. Work opportunity
  5. Resource degradation
  6. Accumulation of asset
  7. Drought
  8. conflict
  9. Death of family member
  10. To mitigate risk
  11. Others specify \_\_\_\_\_
5. What personal factor have you observed from your household to diversify livelihood?
  1. High motivation
  2. low motivation
  3. willingness to respond to change
  4. willingness to participate
  5. Unwillingness to participate
  6. Others specify \_\_\_\_\_
6. Are there human related determinant that have an effect to diversify livelihoods in your locality?
  1. Yes
  2. No
7. If your answer is Yes what are these factors?
  1. Human health
  2. Education status
  3. Nutrition
  4. knowledge and skill
  5. Capacity to work
  6. Working culture
  7. Capacity to adopt
  8. Others specify \_\_\_\_\_
8. From the factor which is listed in Qn, No 7 which do you think is more influential to your household?

### VIII. Food Security

1. What are the grains you often utilize as a stable food/ give the rank?

Food groups	Response	The three most important give rank	
	Yes    2. No		
Cereals		First	
Roots/tubers			
Legumes			
Milk/milk products		Second	
Eggs			
Meat			
Fish/seafood			
Oil/fat		Third	
Sugar/honey			
Fruits			
Vegetables			
Other specify			

2. How many meals do your family eat per day? \_\_\_\_\_
3. What food stuffs do you often eat at different meal times?
  1. Breakfast \_\_\_\_\_
  2. Lunch \_\_\_\_\_
  3. Dinner \_\_\_\_\_
4. What is the total demand of grains for your household consumption per month in quintals? \_\_\_\_\_
5. Do the grains you produce from your farm land satisfy your households' food consumption demand?
  1. Yes
  2. No

if yes pass to question No.10
6. If No how do you supplement it?
  - By purchasing from market
  - By borrowing from other farmers
  - By borrowing from ider
  - By requesting relief support
  - By reducing the amount of consumption during the shortage month
7. If you purchase from market what is the source of money?
  1. Borrowing from other farmers
  2. Borrowing from edir
  3. selling livestock
  4. Income from non-farm activity
  5. From cash crop
  6. Others specify \_\_\_\_\_
8. Does the income you earn from non-farm activities enable you to buy food for bridging the deficiency?
  1. Yes
  2. No
9. What are the reasons for lack of sufficient and viable income from non-farm activities to become food secure at household level? \_\_\_\_\_

10. According to your own perception, what is the food security status of your household?

1. Food secure 2. Food insecure 3. Varies from one year to another 4. do not know

11. What is the total grains your household needs per annum to be food secured? \_\_\_\_\_

12. what if your answer is NO.2, what do you think the main reason for being food insecure? \_\_\_\_\_

13. which of the following factors have been responsible for the failure to produce adequate food? Indicate the impact of each of the following factors as either nil, moderate and severe constraints

No	Factors	Responses		
		1.No impact	2.Moderate	3.Severe
1	Environmental Drought Erratic rain fall Soil erosion disease pests weed Poor soil fertility Stoniness of farm land Dependence on single harvest frosts Hail storm Others specify-----			
2	infrastructural Accessibility to roads Absence of irrigation Absence of rural roads Absence of rural credit Inadequate extension services Poor storage facilities Lack of veterinary services Low prices of agri. outputs	1.No impact	2.moderate	3.severe
3	Demographic factors Rapid population growth Diminishing land holds Farm fragmentation Absence of fallow Over grazing	1.No impact	2.moderate	3.severe
4	Economic factors Lack of cash Absence of off-farm incomes Shortage of farm oxen Low modern farm inputs Traditional farm implements and practices	1.No impact	2.moderate	3.severe
5	Social factors Shortage of human labour Health problems Low levels of education Poor food rationing Absence of saving tradition	1.No impact	2.moderate	3.severe

14. Identify the three most important environmental and socio-economic factors for your household food insecurity? 1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_

15. During which season do you often face the shortage of food supply/

1. Before the harvest of belg crops
2. Before the harvest of meher crops
3. Before both belg and meher crop harvests
4. Most of the times of the year

16. For each of the following questions, consider what has happened in the past 30 days. Please answer whether this happened never, rarely (once or twice), Sometimes (3-10 times), or often (more than 10 times) in the past 30 days?

No	Question	code
1	Did you worry that your household would not have enough food?	
2	Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	
3	Did you or any household member eat just a few kinds of food day after day due to a lack of resources?	
4	Did you or any household member eat food that you preferred not to eat because a lack of resources to obtain other types of food?	
5	Did you or any household member eat a smaller meal than you felt you needed because there was not enough food?	
6	Did you or any other household member eat fewer meals in a day because there was not enough food?	
7	Was there ever no food at all in your household because there were not resources to get more?	
8	Did you or any household member go to sleep at night hungry because there was not enough food?	
9	Did you or any household member go a whole day without eating anything because there was not enough food?	
codes 0 = Never 1 = Rarely (once or twice in the past 30 days) 2 = Sometimes ( three to ten times in the past 30 days)      3 = Often (more than 10 times in the past 30 days)		

17. In the following table, indicate the type and amount of crops consumed, sold out and used for seed from own production between December 2002 E.C and December 2003 E.C

Type of crop	Amount consumed (Qtl)	Amount sold (Qtl)	Seed reserve (Qtl)
Maize			
Barley			
Wheat			
Teff			
Sorghum			
Horse bean			
Chick peas			
Others			

18. In the following table, indicate the type and amount of crops obtained by purchasing, and amount obtained for FFW & free relief food between December 2002 E.C and December 2003 E.C

Types of crops	Amount purchased (Qtl)	Food for work (Qtl)	Relief aid or gift (Qtl)
Maize			
Barley			
Wheat			
Teff			
Sorghum			
Horse bean			
Chick peas			
Others			

### IX. Coping Strategies

1. Do you encounter food shortage problem in the last twelve months? 1. Yes 2. No  
 2. If your answer is yes, How do you cope with the problem of food shortage?

No	Coping strategy	1. Yes 2. No	Use a strategy when food shortage is:
			1. Less 2. Moderate 3. Severe
1	Livestock dispersal or de-stocking		
2	Change cropping patterns		
3	Migration to nearby towns for wage labour		
4	Consuming famine period or less preferred foods		
5	Borrow grains from relative		
6	Borrow grain or cash from money lenders		
7	Migrate to other rural areas for wage labour		
8	Sell off small animals		
9	Firewood and charcoal selling		
10	Rely on relief grains		
11	Sell off farm oxen		
12	Lease out land		
13	Sell off land		
14	Desperate migration		

3. Which of the following types of consumption related coping strategies did you use during food shortage and how often?

No	Strategy	How often	
		1. Every day 2. 4-5 times per week 3. 1-2 times per week 4. Never	
		2002	2003
1	Eating foods that were less preferred		
2	Borrowing grain or money to buy food		
3	Buy food on credit basis		
4	Receiving donation from relatives or friends		
5	Depending on foodstuffs sold along streets		
6	Reducing consumption during each meal		
7	Skipping meals for adults to feed children instead		
8	Reducing the number of meal per day		
9	Not eating for whole days at a time		

*Thank you!!!!*

## Check lists for Focus Group Discussions

The following are issues discussed during the focus group discussions:

### 1. Agricultural Production

- 1.1. Major crops grown in the area.
- 1.2. Prioritization in terms of their importance as food crop and cash source.
- 1.3. Production constraints.
- 1.4. Productivity of major crops (kg per hectare or any other local measurement).
- 1.5. Months that own harvest could cover food need ( months, all year round etc.) in good and bad years.
- 1.6. Any year in the past that households were able to cover all their food and cash needs.
- 1.7. Farmer's perception of the last crop season (2010) (good or bad), and level of production.
- 1.8. Frequency (cycle) that drought attacked the area (every two, three, five, ten years).
- 1.9. Wealth categorization (rich, medium, poor) and the criteria used to come up with this categorization.
- 1.10. Livestock productivity (litre of milk/goat, litre of milk/cow, litre of milk/camel, etc.).
- 1.11. Livestock migration pattern.
- 1.12. Adequacy of veterinary services.
- 1.13. Pasture and water availability.

### 2. Relief Aid

- 2.1. Food aid ration size (average rate) kg/month/individual (for cereals, pulses, oil).
- 2.2. Frequency of distribution (half-monthly, monthly, quarterly, etc.).
- 2.3. Length of time they have been receiving food aid continuously in the past few years.
- 2.4. Any Food-for-Work (FFW) or Cash-for-Work (CFW) programmes before and present.
- 2.5. Farmer's preference for FFW and CFW, which one is more appropriate and satisfies their need more.
- 2.6. Decision making in selecting beneficiaries and the criteria employed for selecting.
- 2.7. Food aid sharing with neighbors and relatives.

### 3. Income Sources

- 3.1. Major source of income for covering household basic needs (food and non-food need).
- 3.2. Traditional credit and saving practices.
- 3.3. Existence of small micro-finance activities supported by the government and/or NGOs.

### 4. Coping Strategies

- 4.1. Coping strategies farm households employ in time of food shortage (according to their severity).
  - Rely on less preferred and less expensive foods
  - Purchase food on credit
  - Gather wild food
  - Consume seed stock held for next season
  - Send household members to live elsewhere
  - Limit portion sizes at mealtimes
  - Skip entire days without eating
  - Sold farm implements to purchase food
  - Borrow food, or rely on help from friends or relatives
  - Restrict consumption of adults so children can eat
  - Reduced the number of meals eaten in a day

### 5. Access to Market

- 5.1. Major trading commodities (food grains, livestock, etc.).
- 5.2. Location (Ejersa Goro or other places and distance from the villages).
- 5.3. Seasonality (seasonal or throughout the year).
- 5.4. Adequacy in terms of satisfying basic needs.

### 6. Social service

- 6.1. Drinking water sources and distance from home (both for livestock and human use).
- 6.2. Health facilities (proximity and adequacy, number of clinics and health personnel).
- 6.3. Source of fuel (distance from home, who is responsible, frequency of fetching in a week/month).

## DECLARATION

I, the under signed, declare that this thesis entitled “Dimensions of Food Security and Livelihood Strategies among Rural Households: The Case of Jarso Woreda of Eastern Hararghe Zone; Oromia Regional State” is my original work and has not been presented for a degree in any university, and that all sources of materials used for the thesis have been dully acknowledged.

### **Declared by:**

Name: Mukerem Taha Seid

Signature: \_\_\_\_\_

Place: Addis Ababa University

Date: June 2011

This thesis has been submitted for examination with my approval as a university advisor of the candidate.

### **Approved by:**

Name: Dr. Degefa Tolossa

Signature: \_\_\_\_\_

Date: June 2011