COLLEGE OF DEVELOPMENT STUDIES
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DETERMINANTS OF RURAL FEMALE-HEADED HOUSEHOLDS' FOOD SECURITY STATUS: THE CASE OF ANGOLELA TERA WOREDA, AMHARA REGION-ETHIOPIA

BY

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Declaration

This thesis is the result of my own work and that all sources or materials used in this thesis have been properly acknowledged. I confidently declare that this thesis has not been submitted to any other institutions anywhere for the award of any academic MA/MSc degree.

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As research advisor, I hereby certify that I have read and evaluated the thesis prepared by **Samrawit Amare Kasse** under my guidance and knowledge, entitled **"Determinants of Rural Female-Headed Households' Food Security Status: The Case in Angolela Tera Woreda, Amhara Region Ethiopia**". I recommend the thesis for open defense as it fulfills the requirements for the degree of Master of Science in Food Security and Development.

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As members of the Examining Board of this thesis open defense, we certify that we have read and evaluated the thesis prepared by **Samrawit Amare Kasse,** entitled "**Determinants of Rural Female-Headed Households' Food Security Status: The Case In Angolela Tera Woreda, Amhara Region Ethiopia**" and recommend that it is acceptable as a thesis required for the degree of Master of Science in Food Security and Development.

Signed by the examining committee.

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Dedication

This thesis is especially dedicated to my beloved father who fulfilled my desire and supported my success, and I would like to thank you for your unconditional love.

Samrawit Amare

September, 2021

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Samrawit Amare
September, 2021

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Abstract

The objective of this study was to investigate female headed household food security situation and the determinants factors of rural female headed households, Amhara Region, Ethiopia. About 138 sample households were randomly selected (69 female and 69 male headed households) from three kebeles of the study woreda. The kebeles were selected using simple random sampling technique. Both descriptive and econometric statistics were employed during data analysis. To examine household food security status, Household Food Insecurity Access Scale and Household of dietary diversity were applied. Furthermore, ordered logistic regression model were used to determine factors affecting household food security. The HFIAS result revealed that 4.3% female headed household and 21.7 % of male headed household were food secured, 18.8% female headed household and 73.9 % of male headed household were marginally food insecure, 63.8% female headed household and 4.4 % of male headed household were moderately food insecure and only 13.1% female headed household were severely food insecure. Moreover, the result of the Household of dietary diversity indicates that about 14.5% female headed household and 17.4 % of male headed household were high dietary diversity while 33.3 female headed household and 30.4% of male headed household were medium dietary diversity and 52.2% female and male headed household were low dietary diversity. The ordered logistic regression result further indicates that for female headed household age of household head, cultivated land size and amount of crop produced had positive significant and amount of land rent out had negative significant on female headed household food security status. For male headed household cultivated land, TLU and amount of crop produced positively significant and also land rent out and credit access are negatively significant on male headed household food security status, the study finding was significant at $p<0.01$, $p<0.05$ and $p< 0.10$ level. The study conclude that socio-economic and institutional factors had significant effect on female and male headed household on household food security in the study area. Finally, the study recommended that female headed household need attention and support to improve agriculture productivity and to enhance their food security situation and household cultivated land size and household total income have potential on enhancing household food security.

Keywords: Female headed household, Household food insecurity access scale, ordered logit, Household of dietary diversity, Angolela Tera, Ethiopia

Acronyms/Abbreviations

AE:	Adult Equivalent
CSA:	Central Statistical Authority
DA:	Development Agent
FAO:	Food and Agricultural Organization
FGD:	Focus Group Discussion
FHH:	Female-Headed Household
GDP:	Gross Domestic Product
GoE:	Government of Ethiopia
Ha:	Hectare
KII:	Key Informant Interview
KM:	Kilometer
NGO:	Non-Governmental Organization
NMA:	National Metrological Agency
NSZADO:	North Shewa Zone Agricultural Development Office
MoA	Minister of Agriculture
PSNP	Productive Safety Net Program
TLU:	Tropical Livestock Unit

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Food insecurity is a global concern affecting vast majority of the population in the world. There are different factors contributing for food insecurity such as economic, social, cultural, and environmental conditions. In developing countries, interwoven factors exacerbate the problem. These include conflict, drought, poor infrastructure, lack of access to new technology, low employment, and low agriculture production (World Bank, 2015). Ethiopia is one of the Sub-Saharan Africa nations that had been plagued by chronic food insecurity and most of the people depend on agriculture: crops and livestock production, for their livelihoods (Canali and Slaviero, 2010; CSA 2009). Agriculture is the major economic contributor, where it directly or indirectly supports people's livelihood, income and employment. The growth and productivity of agriculture is, thus, fundamental to achieve food security and sustainable economic development that alleviates poverty (World Bank, 2008). Agriculture accounts for more than 85% of employment, 50% of exports, and 47% of GDP (FAO, 2010; CSA 2014). However, the agriculture sector is constrained by low productivity, low input use, post-harvest loss, poor farming practices, fragmentation, high population pressure and land degradation that have led to unsustainable natural resources management and food insecurity (Rashid, et al., 2010).

According to Endalew *et al*., (2015) poor soil fertility, land shortage, occasional droughts, degradation of farmlands, poor farming technologies, weak extension services, and poor social and infrastructural situations are causes of food insecurity in Ethiopia. These constraints have resulted in the serious and growing problem of household-level food insecurity, especially in women-headed household farmers (Hussein, 2006). Female-headed households' lack of access to assets, farmland, labor, credit, employment, and education is more severe in comparison with male-headed households (Little, et. al., 2006). This leaves female-headed households in a continuous cycle of poverty and food insecurity (IFAD, 2010). According to Fentana and Paciello (2010), women play vital role in household food security and agriculture production. In developing countries, especially in rural areas of Ethiopia, women are backbone for food production system in the economy.

Although the kind of activity of women and men in the production may differ considerably from region to region, it can generally be stated that women's tasks include land preparation, weeding, harvesting, threshing, and storing, production of crops in the home-garden, and small animal husbandry in agricultural production for their families' household food enhancement (EARO, 2000).

Hence, women are responsible for more than half of the food production either directly or indirectly. Despite their crucial contributions to their families and communities, women- headed household's role in managing household resources are limited. Economic development cannot be imagined without the active participation of women in the agriculture production (World Bank et al., 2008). Women participate in different income generating activities to increase household income and bear most of the responsibility for household food security and well-being. In order to improve women production capacity and enhance their household food security status, women's capacity has to be increased and they should be given equitable access to land and resources, credit facilities, extension services and improved tools as well as membership in cooperatives and other rural benefits. This will increase their productivity and hence lead to agricultural growth (FAO, 2011). According to FAO (2011), if women get the same access to production resources and services as men, they will be able to increase a production by 20–30 %. This increase can raise total agricultural output by 2.5–4 % in developing countries and reduce hunger for 12–17 % of the global population. Women productivity has positive influence on families and wider society, because women are known to commit more of their income to their household's well-being, health and nutrition than men (USAID, 2011).

Women universally make a critical contribution to agriculture both crop and livestock production activities. Their roles diffracted in many parts of the world. In many countries and under various cultures, women have the responsibilities including crop production (planting, weeding, and harvesting) tending livestock, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water, engaging in trade and marketing, and caring for family members (FAO, 2011). According to a study by Sara (2007), female headed households are involved in casual, informal and unregulated labor in income generating activities such as preparing local beverages (*Tela* and *Areke*) and handicraft, due to lack of resources (land, labor and oxen) and services (credit and extension) to fulfill their household consumption.

In contrary, they have few access to job opportunities and resources to help them increase their livelihood and food security status. The case in Ethiopia is not different from what was reported by Sara (*Ibid*), in that female-headed households have lower income, resource and asset compared to male-headed households. Despite the severity of constraints female headed households face in ensuring their food security, problems differ with in and across regions due to the diversity of culture and social norms (Devereux et al., 2006).

According to Yigremew (2001), female-headed household have small amount of farmland, low labor access, fewer number of oxen and shortage of other livelihood assets compared to the male-headed. A study by Askale (2005) indicates that female-headed households were reported to have a land holding of 0.5 hectare or less in Amhara region. The same report indicates that this figure is exceedingly smaller compared to the holdings of male-headed. This shows unequal access of women to resources and production factors with that of men.

This study, in particular was planned to investigate household food security situation from gender perspective focused on female headed household in Amhara Region, Angolela Tera *woreda*. The rationale for initiating this study was in one side the issue of the productive and role of women is diverse in cultural settings. This entails that the situation in some sectors of the country is not the same in the other corner of the country. Even if some similar studies have been conducted in certain geographic areas of the country, the differences in culture, living standard, social values and resource endowment makes the specific study in its local context an essential in the academic and research settings. Therefore, the earlier studies being an input, this study makes the specific scenario in Angolela Tera *woreda* of food security status of female headed households are concerned. This study is based on the premise that enhancing contribution of women to agricultural production is necessary for fostering household food security. It is aimed to investigating female headed household's food security and its determinant factors in household food security in Amhara Region, Angolela Tera *Woreda*.

1.2. Statement of the Problem

Food security is a multi-faceted phenomenon that can best be understood by exploring the situations at community and household levels. This is due to the fact that variations in vulnerability to food shortage at community and household levels are due to the multiplicity of physical environment, socio-economic, cultural and demographic characteristics of the people (Degefa, 2005). Agriculture is the basis for food production. It provides the necessary components to maintain healthy and active life. Similarly, the production and productivity of the sector is an indicator for food availability at national and household level (FAO, 2010). However, low agricultural productivity keeps rural people trapped in vicious poverty cycles that cause malnutrition, poor health, poor cognitive development and food insecurity (Gollin, 2010). Female headed household specifically have various challenge based on their position in the household. They engage in various activities including agricultural production (with a positive effect on rural economies), food security and nutrition. However, limited education, employment opportunities and cultural norms undermine women's contribution to productive works (USAID, 2017). According to Diiro *et al*., (2018), there is substantial level of gender inequality with provision of education, resource allocation and access of new technology which points to tradition and values within the ideological, political, economic and socio-cultural structure of societies as deep rooted causes. Fletschner and Mesbah (2011) revealed that women farmers have limited access to productive resources which directly affects their production, income gain and the well-being of their families. As a result, a visible gap in food security status has been observed between female-headed and male-headed households.

Amhara Region is one of the nine regional states in Ethiopia. The region is highly prone to hunger and experiences a recurrent drought and famine. Most of the population in the region lives in rural areas and faces similar challenges in securing sufficient food at household level because of the topographic and biophysical barriers and deep-rooted poverty throughout the region (Gebre-Selassie, 2005). According to Babatunde *et al (2007)* food security problem is more severe in female-headed household who experiences in a cycle of low productivity, lack of assets and resource ownership. Despite the natural state of the region, most studies focus on overall household food insecurity problems. Nonetheless, the situation, perspective and copping strategies of female-headed households is unique that deserve special attention.

Gender perspective is relevant in analyzing food security and alternative livelihood interventions due to an increase in food insecurity and poverty among female-headed households in comparison to male headed households as argued by (Chant, 2008). However most of the studies carried out of national level and limited research has been conducted in the study area. Hence, this study tried to fill the gap by gender based comparative study on female and male-headed household food security situation and identifying determinate factors of household food security in gender perspective in the study area.

1.3. Objective of the study

1.3.1. General objective

The general objective of this study was to investigate household food security situation and the determinant factors of rural female headed households in Angolela Tera *Woreda*, Amhara Region.

1.3.2. Specific objectives

Specifically, this study tried to.

1. To examine the difference between female-headed and male-headed household food security status in the study area.
2. Analyze the determinate factors of female and male-headed households' food security status in the study area.

1.4. Research Questions

1. What are the major factors that affect household food security?
2. What is the difference between female-headed and male-headed household food security situation in the study area?
3. What are the determinant factors of food security status of female and male-headed households in the study area?

1.5. Significance of the study

The result of this study will help to set strategies and programs that improve the livelihood of rural women in general and female-headed households in particular. Identifying the determinant factors, constraints and opportunities associated with female and male headed household food security is vital to better understand their circumstances and design strategies that improve their capacity in ensuring food security. Hence, the findings of this study are expected to be useful for many Governments, Non-Government, and Community organizations to devise interventions that could improve female headed household food security.

Identifying the situation of female-headed household and factors that determine their strive in ensuring food security, findings of this will indicate the best option for improving food security status of the rural community, in particular that of the female-headed households. Apart from its significance for development intervention, findings will also contribute to the body of knowledge in framing out how food security frameworks are designed. Therefore, the result of this study is expected to provide reliable information for government policy makers to enhance the potential of study households specifically for female headed household in agricultural production and household incomes generation. Furthermore, the result provides better insight for subsequent researchers that would be of help at local and national level development planning.

1.6. Scope and limitation of the Study

The study was limited to North Showa Zone, Angolela Tera *Woreda*. The limitation was due to geographical inconveniences, cultural dominance of males on farming, and other factors related to resource. Besides, the number of respondent households included in the study was relatively small to represent the total number of population living in the study *kebeles*. From the total population households were 138 households were selected for this study. Hence, the results obtained from the selected sample size may not represent the total population. However, the main limitation was time and budget constraints.

1.7. Ethical Consideration

The researcher prepared informant consent to fully inform the respondents during household surveys, focus group discussants and key informants. They were also informed about the objectives and outcomes of the research quite adequately. Both researcher and the enumerators inform the respondents that their responses kept utmost confidential level. Respondents were informed that their personal information kept out most confidentially that is neither publicized nor given to any third party without their full willingness in case the need arises. This was vividly expressed in the forward part of the questionnaire booklet. Beyond the ethics on human subjects, research ethics also considers acknowledgement of data generated by others and appropriate citations of scholarly research outputs, books, websites, and any other related documents in order to assure intellectual and scientific integrity of the research by recognizing this, the researcher cited and acknowledged all the information taken from scholarly literatures and data generated by other individuals or organizations.

1.8. Organization of the study

The study consisted of five major chapters. Chapter one presents the background of the study, statement of the problem, objective of the study, research questions, scope and limitation, significance of the study and ethical consideration. Chapter two deals with theoretical, empirical and conceptual literature review related to household food security as well as conceptual framework for the study. The third chapter depicts study area description, research design, sampling method, procedure, and method of data analysis. Chapter four presents the result of the study and discussion. The last chapter deals with conclusion and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1. Theoretical Framework

2.1.1. Concepts of food Security

The concept of food security was considered in the mid-1970s defining the phenomenon as availability of sufficient food supply at global, national regional level to meet the demand of population term widely used, on different scales as well as in different associations (Maxwell & Smith, 1992). The attention was primarily on food supply problems of assuring the availability and to some degree the price stability of basic foodstuffs at the international and national level. World Food Conference of 1974a new set of institutional arrangements covering information, resources for promoting food security and forums for dialogue on policy issues (FAO, 2003).

According to Anderson (2009), food security was originally described as whether a country has enough access to food to meet its food energy requirements. Thus, food security implied the ability of a nation to meet the food needs of its populace, suggesting self- sufficiency. The concept of food security has seen widely from availability to access of food at household level. Moreover, household of food security need the household requires pleasing social and health conditions to ensure the availability and access food among household members and optimal physiological utilization by individual household members of nutrients contained in the food (Margaret, 2016).

There is a lot of definitions of food security after the 1996 World Food Summit, when the definition was broadly set as achieving food security “at the individual, household, national, regional, and global levels *"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*". Generally, the understanding of the current food security concept support food security has to ensure all the people at all times physical social and economic access to sufficient safe and nutritious food which meets the dietary need of all people to enable them for an active and healthy life. Food security is a broad concept to extent since it deals in very broad terms with the production, distribution and consumption perspective. From the given definition, there are four basic pillars or dimension of food security, those pillars are food availability, accessibility, utilization and stability.

Food availability is one of the food security pillars, which is defined as ability of obtaining food through all form of domestic production, food aid, and import and purchase, at household level. Food availability is the extent of which food is within reach of households through production and market.

Food access is defined as the ability of a household have sufficient amount of food, through own production, purchase, gift and other the access of food both quality and quantity to insure a safe and nutritious diet. Hence, it is affected by economical, socio-cultural and demographic reasons. The household which has a greater resource has a greater access to food, either directly and indirectly though food production and income generation activity.

Food utilization it refers to the ability of members of a household to make use of the food to which they have access particularly, to the deity diversity intake and to the individual's ability to absorb nutrients contained in the food that is eaten.

Food stability is a household food security condition over time. It changes dramatically because of different reason. Stability defines for the three basic dimensions of food security availability, access and utilization. Periodic inadequate access to food as a result of adverse weather condition, political instability, or economic factor expose the household for food insecurity. Such risk of the household severely damage in its food security status of the households. The status of food security in Ethiopia in households' level varies from region to region and within the region among the *woreda*. According to FAO (2012) finding, the majority of food insecure people in the country exist in rural area, approximately 52% of the rural population and 36% of urban population consume under minimum recommendation daily intake of 2100 kcal/person/day.

2.1.2. Concepts of food insecurity

Food insecurity exists when there is physical unavailability of food, lack of social and economic access to adequate food and inadequate food utilization. Not all households or people suffer inadequate food acquisition for the same period of time. This may vary from a short-term experience to a lifelong condition (Webb *et al*. 2006).

In this regard, a common distinction is made between chronic food insecurity and transitory food insecurity. Chronic food insecurity implies a persistent inability on the part of the household to access adequate food.

Transitory food insecurity

Transitory food insecurity occurs when a household faces temporary decline in the security of its entitlement and the risk of failure to meet food needs of short duration. When facing both cases, households respond in different ways to reverse the situation. Policy statements on food security give less prominence to transitory food insecurity and the risk of acute food crisis (Barrett and Sahn, 2001). According to the World Bank (1986), the major sources of transitory food insecurity are year to year variations in international food prices, foreign exchange earnings and domestic food production and household incomes. These are often related to transitory sharp reductions in a population's ability to produce or purchase food and other essentials that undermine long term development and cause loss of human capital from which it takes years to recover.

Transitory food insecurity means when a shock has depleted the food stores and current income streams of a household to the point that they are unable to meet their immediate food needs, these households are described as transitory food insecure. Transitory food insecurity focuses on intra-and inter-annual variations in household food access. This category can be further divided into cyclical and temporary food insecurity. Temporary food insecurity occurs for a limited time because of unforeseen and unpredictable circumstances. Cyclical or seasonal food insecurity occurs 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 (Barrett and sahn, 2001).

Transitory food insecurity come about as a result of shocks due to economic failures and human induced as well as natural disasters creating food shortages that affect, temporarily all or part of the country population. In addition, even in the absence of chronic and transitory hunger the population may suffer from the lack of essential micronutrients (DFID, 2004). The vast majority of these extraordinarily poor households live in rural areas that are heavily reliant on rain fed agriculture thus, in years of poor rainfall the threat of widespread starvation is high (IFPRI, 2008).

Chronic food insecurity

Chronic food insecurity refers to a persistent inability to access adequate food and nutritional intake, and it generally arises when there is inadequate access to resources and structural in character. Chronic food insecurity has been a defining feature of the poverty that has affected millions of Ethiopians for decades. It is strongly associated with extended periods of poverty, inappropriate political environment, a lack of assets and inadequate access to productive or financial resources. These are the underlying causes, which need long term development interventions in livelihood protection or rehabilitation. However, usually such interventions are underfunded, even though these activities were being discussed since the 1980s and 1990s. This is because chronic food insecurity cannot be clearly defined in time or linked to a specific cause and the political importance is minimal for the donor countries or organizations (Mihret and Tesfahun, 2014). Depending on the level of vulnerability of a household, transitory periods of food insecurity may precipitate the chronic condition.

2.1.3. Household food security

Food security has to encompass all season round access to sufficient supply of healthy and safe and sound food to meet the dietary needs of all members of households. The improvement of household food security as a link-concept has become very important in the assessment of food security at a household level and the fact that national, regional food insecurity cannot necessarily involve food security at the household level for the issue of access to food by households (FAO, 2003).

The World Bank (1990) defines household food security as "a set of principles or values that ought to be adhered in all development measures to ensure access to adequate food by and for household over time. Another important and relevant in relation with the role of women in household food security is defined here as "access to food, adequate in quantity and quality, to fulfill all nutritional requirements for all household members throughout the year" (Barrett, 2010). Based on some definitions the analysis of household food security consists of two main components availability of food in closeness to household and the level and type of resources extended to attain household food security comparative to the total resources available at the household.

The concept of household food security refers to the capacity of a household to guarantee all its members with a continued access to adequate amount and quality of food to live dynamic and healthy life. Household food security can be reflection of the capability to offer sufficient energy intake from food produced directly by household members and or through the availability of sufficient income to purchase food. Therefore, food security strategy has to address household-level food production and investment in food production and storage. These, however, are essential but not sufficient vehicle for solving household-level malnutrition and household food insecurity problem (Rukuni, 2002).

According to FAO (2003) household food security is the capacity of a household to obtain a stable and sustainable basket of sufficient food. However, it is difficult to achieve sufficient food by all households. Adequacy of household food, in terms of quality and quantity of food, which contributes to a diet that meets the nutritional needs of all household members stability also contribute to the household ability to acquire food across seasons and temporary shortage. In farming area, the role of rural women at household level is both at on -farm and, at off-farm. On-farm role involves the cultivation of main food crops, livestock husbandry, local beverage, weaving. Whereas the off-farm role of rural women includes pottery and others related activities such as home management, which includes preserving, processing, and food preparation, child care provision and other household activities are solely the responsibilities of women (Sara, 2007).

2.2. Review of empirical literatures

2.2.1. Food Security Situation in Ethiopia

Food security situation in Ethiopia is highly linked to recurring food shortage and famine in the country, which are associated to recurrent drought. Accordingly, more than 30 percent of the Ethiopian population lives below the poverty line and above 31 million people are undernourished. By using the threshold of 2,550 kilocalories (Kcal) per adult equivalent per day, 40 percent of Ethiopian households of the country were food insecure and undernourished (COMPACT, 2016; UNECA and WFP, 2010). In Ethiopia, food insecurity among the population is widespread (Van der Veen and Tagel, 2011). Serious food shortages and high levels of malnutrition continue to affect a large number of people in several parts of Ethiopia still today.

Determined food security statuses of households based on their daily calorie availability in highlands of Ethiopia and found that majority of households were food insecure or calorie deficient. The number of hungry populations in the region is higher in rural areas rather than in the urban one. This is due to the fact that the majority of the population lives in rural areas (Degye et al 2013). The causes of household food insecurity vary from household to household, the major causes of food insecurity in Ethiopia are closely related to environmental, demographic, economic, social, infrastructural and political factors (Degefa, 2002). Environmental factors related problems such as drought, land shortage and fragmentation, resource degradation and depletion of natural resources are major problem and become a reason to decline agricultural production. The major problems associated with demographic factors are high population growth, land fragmentation and high age dependency are the main cause of household of food insecurity.

The different dimensions of food security from the definitions available are availability, accessibility, utilization, sustainability as well as safety (Omonona and Agoi, 2007; Jrad et al., 2010; IFAD, 2012). Empirical evidence of food security in Ethiopia indicates the prevalence of a high level of food insecurity, with significant idiosyncratic and spatial characteristics. The specific food security studies by Zegeye and Hussien (2011), Abebaw et al. (2011) and Hailu (2012) concurrently suggest that the depth and intensity of food insecurity are high, and these are influenced by poor functioning of marketing systems and other household and socioeconomic factors.

2.2.2. The role of rural female headed household in agricultural production.

According to Devereux *et al.,* (2006) the role of women in household food security depends on their situation in rural areas geographic region, social class, age, ethnicity and access to resource. Women are the backbones who take care of household food security, especially in rural areas they play a crucial role for the sustenance of their communities and family through different participation in domestic tasks, such as agricultural and livestock tasks and also sell any surplus from their harvests at local markets also they play a key role in animal husbandry, fishing and forestry although their work to enhance food production and income to fulfill their family (FAO, 2010).

According to the statement of FAO (2011) it is doable to describe that the rural women's roles in agricultural production and household food security is considerably increasing, particularly in the developing countries such as Ethiopia.

The testimonial of FAO showed that women are playing major role in agricultural production and household food security and rural women perform numerous household tasks such as, land preparation, production of main food crops such as (maize, teff, sorghum, wheat and barley), during sowing seeds, weeding, harvesting and threshing. They are also accountable for post-harvesting, food processing, storing, transporting and marketing agricultural produce.

The roles of women farmers have been strongly obscured by the cultural perception remains strong even though numerous agricultural tasks are deemed "women's work," including crop and animal husbandry in the field, preparing storage containers, managing all aspects of home gardens and poultry raising, transporting farm inputs to the field, and procuring water for household use and some on-farm uses. Crop marketing, and the control over revenues from these sales, is often gender differentiated and, in some cases, vary by crop type. Many female farmers bring the vegetables and fruits, the production of which they manage, to the market, and may retain these incomes to pay for household needs (Sara, 2007).

In contrast, the marketing and income from cash crops grown by the household in larger scale are controlled by the household head though there are many cases where small quantities of these important crops may be sold by the head's spouse (Yigremew, 2001).Also, the study indicates tending to livestock is most commonly performed by boys and young men. For those livestock's types kept near the home such as calves, women are frequently responsible for providing feed and water. In some areas, women are involved in collecting animal dung from grazing lands. Sole cattle ownership by women is not common in Ethiopia, whereas joint ownership between spouses is found in many regions. As the case with many spheres in agriculture, control over the sale of and proceeds from livestock and livestock products is generally gender differentiated, with women tending to market small livestock and poultry, as well as dairy products and eggs.
For instance, a study in Ethiopia indicates that sale of cattle and other large livestock is for the most part in the male domain (Dejene, 2009).

Horticultural production and the raising of poultry and small ruminants has been considered a part of women household resource, leaving women excluded from other kinds of extension advice, training, and credit. Gender differences matter not only for food production but also for how food is used. From a broader perspective of food systems, women are income earners and guardians of household food security.

Women play a crucial role in the distribution of food and nonfood household resources that determine the food security of the household. In a variety of contexts around the world, increasing the resources that women control has been shown to improve the nutritional, health, and educational statuses of their children (Fafchamps, et al., 2009).

2.2.3. Basic determinant factors of household food insecurity situation

Factors or determinants that affect household food security in various developing countries especially in Africa have been documented in some literature. These factors are most often location-specific (i.e., different study areas were found to have variant attributes as food security determinants with some attributes recurring). The Study conducted by Sikwela (2008) in South Africa using logistic regression model showed that per aggregate production, fertilizer application, cattle ownership and access to irrigation have positive effect on household food security whereas household size have negative effect on household food security.

Feleke et al, (2005) reported age, education, sex, and unemployment rate and income level as food security determining factors in Southern Ethiopia. The researchers grouped those factors into social, economic, demographic, and policy related factors. Hailu (2012) identified different factors that aggravate food insecurity in Ethiopia. According to him, poor soil fertility, land shortage, occasional droughts, degradation of farmland, frost attack, chronic shortage of cash, poor farming technologies, weak extension services, high labor wastage, poor social and infrastructural situation were mentioned. The combinations of those factors have resulted in serious and growing problem of household level food insecurity in Ethiopia. In Ethiopia, women have become household head usually at their older age when they lose their spouses or divorce. Thus, women household headship at older age may negatively affect their agricultural production. To see it generally women headed household have different problems in agricultural production compared to male headed households could have better access to different socioeconomic opportunities than females headed households (Rebecca, 2012).

Women involvement in agricultural programs and agricultural production influence national food security either directly or indirectly. Accordingly, to Adekunle (2013) married households have better opportunities in order to have higher agricultural production because of their higher household labor supply to agricultural activities than single, divorced or widowed households who contribute less labor to increased agricultural production because of the loss of labor supply of their spouses.

Households with large family size (in the productive age group) have been reported as one of the most important contributing variables for increased agricultural production, may favor the supply of labor for farm activities (Bukusuba et al., 2007; Shimelis, 2009). Agricultural resource holdings such as land size and livestock size are supposed to positively contribute to household income (Maser, 2011) and the amount of farm size 'owned' is an indicator of wealth and source of capital for agricultural production particularly where agriculture is a major source of livelihood.

Livestock size is an important production factor in agriculture. Livestock is sources of manure, cash and labor all of which are assumed to contribute positively for agricultural production. Access to land and livestock is important to cultivate agricultural commodities. Furthermore, access to land and livestock is often linked to access to other resources such as credit and membership of cooperatives as has been stated above, officially women have access to land, especially when Female Headed Households (FHH) are concerned. In practice, women face challenges in accessing and controlling land however. Inadequate access to land and livestock has continually been a bane to the success and implementation of agricultural extension services among women farmers (Rebecca, 2012). Livestock is source of main power for preparing the land for cultivation. Lack of access to livestock in general and to oxen in particular proves to be quite problematic for farming households. Since many of female headed households are without oxen, they usually are forced to give their lands to other farmers to sharecropping arrangements, which is disadvantageous for them. A household's access to credit has positive contribution to agricultural production (Pappoe, 2011). Ethiopia's farmers have seasonal or irregular cash flows, uncertain harvests, and, in the current land-ownership construct, little to no physical collateral. Farmers' access to agro-credit (and financial services more broadly), however, remains inadequate for all farmers in general and for female headed farmers in particular.

Use of improved seeds is believed to increase annual agricultural production (Rebecca, 2012). Emerging evidence shows that seeds are one of the enablers in agriculture services though there are many challenges hindering the Ethiopian seed system, it has been reported that only about 12 to 15% of farmers use improved wheat and maize; less than 1 percent of farmers use improved seed for teff, barley, and sorghum (Spielman, et al., 2010). The report further reported that sadly enough, the problem appears to be worst at women farmers.

2.3. Conceptual Framework

The conceptual framework of this study (Figure1) is based on the assumption of the female and male headed household food security status as well as the determinant factors that affect their role in agricultural production and its impact on household food security. The framework constructed based on different studies and research that household food security can be influenced by a variety of factors.

The framework contains different factors that mainly determine the household food security and agriculture production. These include in the demographic characteristics of household head's such as age, sex, education level, marital status, household size, and farming experience have a big role in the increasing of the rural household production. Socioeconomic factors that relate to social activities and capital of farmers like of agricultural inputs, the household total livestock unit, land holding, farming experience and engagements with off-farm activities. The other factor related with household food security are institutional factors category includes access to credit, access to market, farming characteristics such as farm size, livestock holding, and household's access to extension services.

Which all factors have positive or negative implication to increase food production and household income related with household food security. According to Babatunde et al. *(*2012) rural households are more vulnerable to food insecurity and depended on agriculture production and productivity which related to into demographic, socio-economic, institutional factors.

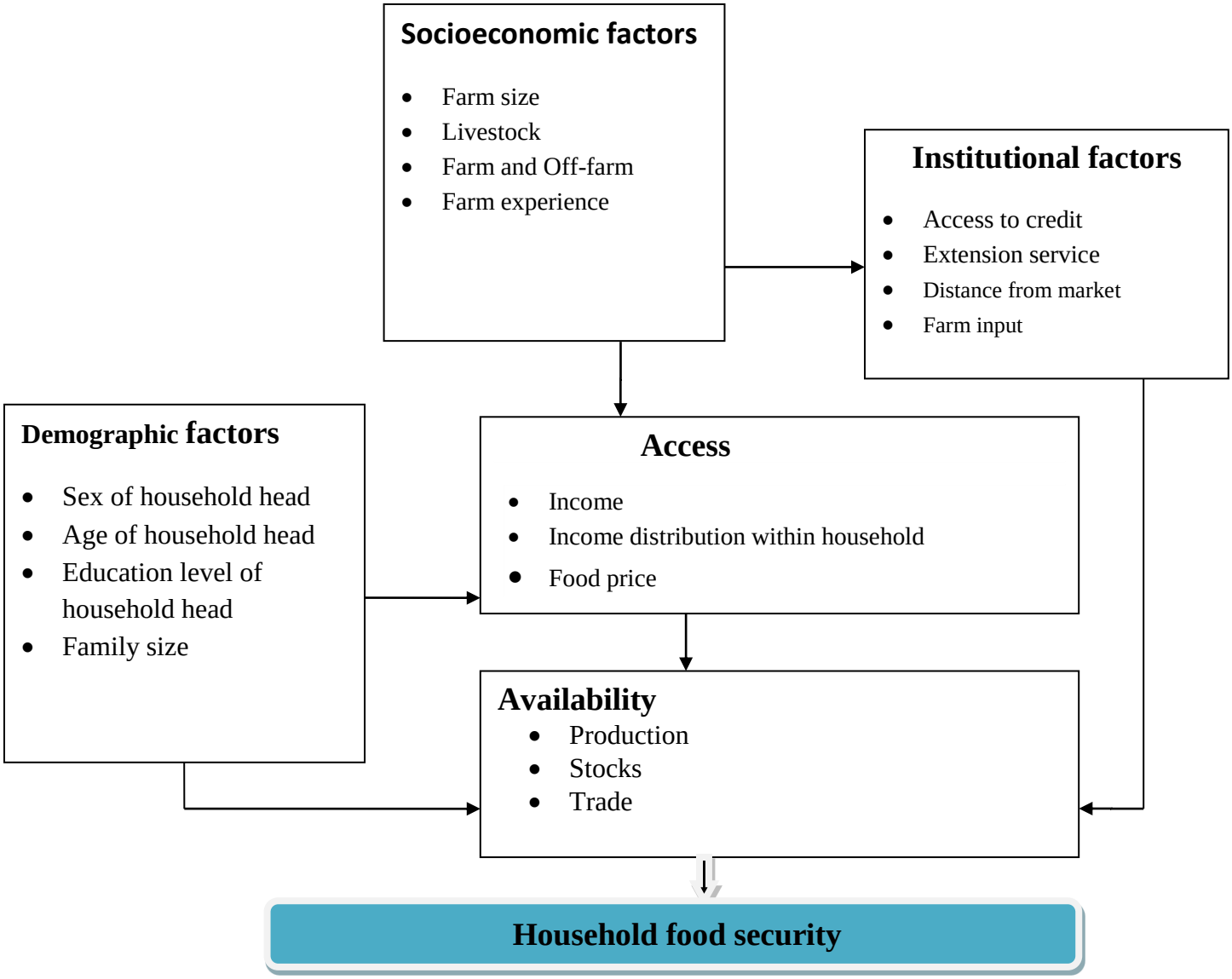

Figure 2.3 Conceptual Framework

(*Sources*: Adapted and modified from literatures)

CHAPTER THREE: RESEARCH METHODS

3.1. Description of the study area

This study was carried out in Angolela Tera *woreda* of Angolela Tera is one of the *woreda* in the North Shewa Zone of the Amhara National Regional State Ethiopia. The *woredas*, is located about 110 km north-east of Addis Ababa on Addis- Dessie Highway. It is 20 km away from the Zone capital, Debre Berhan. The administrative center of this *woreda* is Chacha. The *woreda* shares boarders with Berehet, Hagere Mariam, and Kessem *woredas* in the south-west, Oromia region in the west, Baso-Worana *woreda* in the north, Asagirt *woreda* in the south-east and Ankober *woreda* in the east. Located between 9^0 38'00''-09^0 41'00''00 North Latitude and 39^03^0'00''-39^0 32'00''00 East Longitude (MoA, 2016).*Woreda* soil types include Red, Brown, Black Vertic, Black Non-Vertic and Gray.

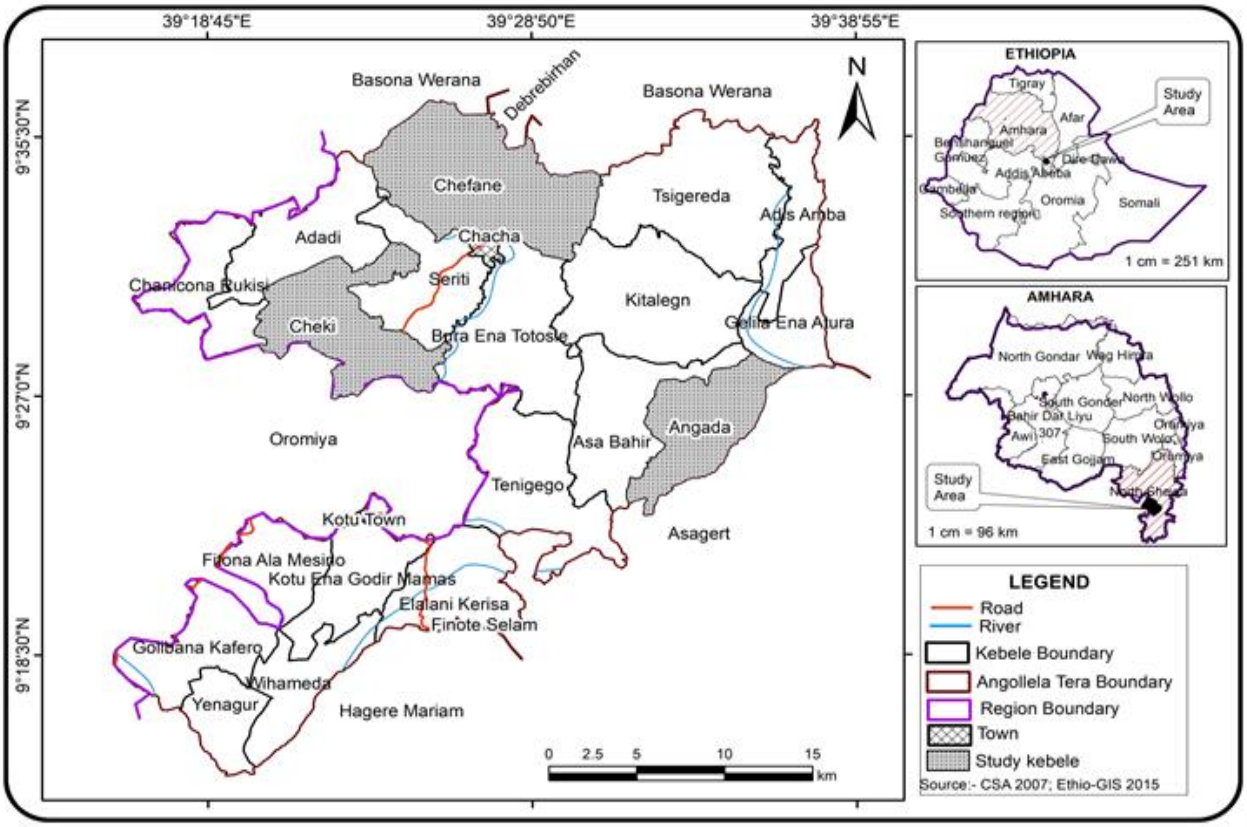

Figure 3.1. Map of the study area *Source: CSA 2007, Ethio-GIS 2015*

Angolela Tera *woreda* is agro ecological zone is categorized under 19 kebele 12Dega, 5 Woina-Dega and 2 Kolla *kebele*. Its topography is mostly hilly with rugged terrain or upland plateaus. The land use classification of the study *woreda* is 52.1% is cultivated land, 36.89% grazing land, 2.89% forest covered, 5.79% shrubs and bush, and the remaining 2.33% is covered with water bodies. The average land holding size of the community in the *woreda* is estimated at about 1.88 hectors per households. However, there are 4750 landless households in the *woreda*. The mean annual rainfall range from 900-1500 mm. The average elevation of the *woreda* is 2570m above sea level with an average maximum temperature 19 c^0 and average minimum temperature of 16 c^0. The mean annual temperature of the study area is 13.3 c^0 (MoA, 2016). Angolela Tera *woreda* has been subjected to recurrent drought and crop failure emanating from unfavorable climatic conditions.

According to CSA (2017) the *woreda* has an estimated total population of 88,002 of whom 45,404 is men and 42,598 are women 5,644 or 5.66% of its population are urban dwellers. Agriculture is the major means for their livelihood in study area. Mixed agriculture practices (crop production and livestock rearing) are sources of household consumption and income. Food crops such as Barley, Wheat, Faba Bean, Teff and Maize are the major ones cultivated in the area. Rearing Dairy cows, Sheep and Goat somehow fattening is the main activities production system for households. The majority of the people the two largest ethnic groups reported in this *Woreda* were Amhara (80.21%) and the Oromo (18.28%) all other ethnic groups made up 1.51% of the population. The majority of the inhabitants practiced orthodox Christianity accounting for 96.59% of the population while Muslims contribute 1.48%. According to the *woreda* agricultural office, the main source of livelihood and economy for the population is mixed agriculture: crop and livestock production. In the agriculture production activities both men and women are participated. To gate extra income, some households participate in different income generation activities such as petty trade to fulfill household need. Angolela Tera *woreda* has been subjected to recurrent drought and crop failure emanating from unfavorable climatic conditions.

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3.2. Research Design

This research had cross- sectional research design and used to compare different variables at the same time. The research applied both qualitative and quantitative approach that is used as inputs for analysis and discussion. Accordingly, both qualitative and quantitative data type are used for both primary and secondary sources of data. The integration and blending of quantitative and qualitative research methods was maintained in the process of this study. Integrating the two approaches help to examine and understand the research problem from different perspectives and to enhance the research outputs.

According to Venkatesh, *et al*., (2013), the uses of quantitative and qualitative methods in the same research inquiry help to develop a rich insight into various phenomena that cannot be fully understood using only either quantitative or qualitative research method. This command a mixed methods approach in all stages of research activities. Quantitative research involves the collection and analysis of numerical data, while qualitative research considers narrative data (Hayes et al., 2014). Qualitative and quantitative elements are interlinked to produce a fuller account of the research problem.

3.2.1. Data types and sources

For this study, both quantitative and qualitative data from primary and secondary sources were gathered and analyzed. Primary data was collected through household survey using a set of pre-tested questionnaires. Focus group discussions comprising of 6-8 farmers drawn from the selected *kebele* were made so as to identify key issues as inputs for the study. Secondary data sources were collected from offices of agriculture in North Shewa Zone and study *Woreda* and from Development Agents (DAs) of offices and *kebele* administration offices of the study areas. Furthermore, secondary data were collected from literatures related to gender and food security issues.

3.2.2. Sampling Techniques and Sample size determination

This study applied multistage sampling technique in the selection of respondents. In the first stage Angolela *Woreda* was randomly selected out of 21 *Weredas* in North Shewa Zone Amhara Regional State.

In the next stage, considering available resource and time, three *Kebeles namely* Chefanen, Cheki and Angada were selected from 19 *Kebeles* in Angolela *Woreda* using simple random sampling technique.

In the third stages, farm households in each kebele were stratified by gender groups (as female-headed and male-headed household). From the stratified sampling frame, a total to 138 sample farm households were randomly selected based on the sample size formula developed by Cochran (1997). In this study, equal representation of female and male headed farm households were considered. Finally, the study assigned the total sample farm households of the study to each kebele and gender groups using probability to proportion to size (PPS). The sample size formula is given as follow:

$$n_o = \frac{pqz^2}{d^2}$$

where, n is the desired sample size, Z is the standard normal variable that represent the desired confidence level equals $1-\alpha$. In this study, 95% confidence level is considered at α=0.5%, hence, the value Z equals 1.96. p is the estimated characteristics of target population (variability of population parameter) that the researcher assumes, and $q = 1-p$. In our study, p is assumed to be the food security status of farm households in North Shewa Zone. Nonetheless, on account of meager empirical studies in the study area, it was difficult to determine the value of p from the previous studies. If the variability of the population is unknown, it is suggested to use 0.5 for p and q, which provides large sample size. Hence, provided that available budget and time, the researcher determined the value of p equals 0.1 based on personal judgment that the sample size could represent the entire study population. d is desire level of precision or marginal error that equals 0.05. Accordingly, 138 farm households were determined to be the sample size of the present study as estimated below.

$$n_o = \frac{pqz^2}{d^2} \qquad \frac{1.96^2 x\ 0.1x0.9}{0.05^2} = 138 \text{ Households}$$

Table 3.1. Distribution of Sample Households by Agro-ecology

Kebeles	Total number of household		Total	Sample household		Total
	Female Headed	Male Headed		Female Headed	Male Headed	
Cheki	194	740	934	20	20	40
Chefane	186	797	983	21	21	42
Angada	213	1110	1323	28	28	56
Total	593	2647	3240	69	69	138

Source: secondary data from respective *kebeles* and *woreda* administration.

3.2.3. Methods of data collection

Data for this study were collected by using household surveys, focus group discussions, field observation, key informant interviews and secondary data to gather quantitative data and these are explained as follows.

Household Surveys

Questionnaire-based household surveys were administered with selected 138 sample households by using standard procedures after obtaining the consent of the respondents as a research ethics. With this technique, data related to household demography, socioeconomic, biophysical, farming practices, productivity and technology selection were collected. Enumerators were oriented on issues related to data collection, procedures and ethics. 20 Pilot studies were undertaken for pre-testing the questionnaire in order to estimate the time needed to complete and implement it. The questionnaires were edited in the light of the results of the pilot study. Computer-based data cleaning was carried out to check for the completeness, consistency and accuracy of data and to identify errors that may occur during data collection or coding process.

Key informant interviews (KII)

Key informant participants were selected based on the objectives of the study. Various government officers have been identified based on their responsibilities in implementing and supporting agricultural production.

In this procedure, administration officials, agricultural officers, women affairs officers, cooperative officers, and micro finance officers, and extension workers from each kebele were interviewed.

Focus group discussions

Three focus group discussions (FGDs) were carried out with the six individual each. These were elders, female-headed households, male-headed household, DAs, and the youth. The discussants respectfully requested for their consent, time and the information before the discussion. During the discussions, issues related to gender perspective challenges in household food security, land access and adequacy household agriculture production, public services, and the existing support to women from the government and NGOs were addressed.

Field observation

A field visit was executed by the researcher to substantiate and augment the information obtained through other primary and secondary data collection tools. Biophysical and socioeconomic conditions of the study areas were observed and required data were collected through the field observation. In the meantime, informal discussions and interviews were held with experts and administrators in the *woreda* and *kebeles.*

Secondary data sources

Besides the abovementioned data collection techniques and procedures, intensive desk review of published and unpublished literatures such as books, journals, articles, reports and e-resources, and documents from various Amahra bureaus of Agriculture, Ministry of Agriculture, Central Statistical Agency (CSA), National Metrological Agency (NMA) were used.

3.2.4. Method of data analysis

Data collected through quantitative and qualitative techniques were analyzed using quantitative and qualitative methods. Quantitative data collected through household surveys were treated using descriptive statistics and econometric models (ordered logit model). Measure of central tendencies (mean) and measures of dispersion (standard deviation) were major descriptive techniques that were used to summarize and compare the data.

Quantitative data were administered and analyze mainly using STATA-version-13 software. Qualitative data collected through focus group discussions, key informant interviews and field observations were qualitatively analyzed. Opinions and explanations of the discussants and informants narrated and transcribed and used to strengthen the quantitative information.

3.2.4.1. Analysis of food security

To assess the food security status, there are a number of measurement tools available of household. They differ based on the scope and purpose of the assessment. Likewise, a combination of tools was used to generate data. In this study, the two food security measurements were applied household food insecurity access scale and Dietary Diversity Score.

Household Food Insecurity Access Scale (HFIAS)

Food and Nutrition Technical Assistance (FANTA) Project and its partners have identified a set of questions. Household food insecurity access scale generic questions were used to distinguish the food secure from food insecure households. Household Food Insecurity Access Scale consists of nine occurrence questions that represent a generally increasing level of severity of food insecurity (access) and nine "frequency-of-occurrence" questions that are asked as a follow-up to each occurrence question to determine how often the condition occurred. The frequency-of-occurrence question is skipped if the respondent reports that the condition described in the corresponding occurrence question was not experienced in the previous four weeks (30 days). Some of the nine occurrence questions inquire about the respondents' perceptions of food vulnerability or stress (e.g., did you worry that your household would not have enough food?) and others ask about the respondents' behavioral responses to insecurity (e.g., did you or any household member have to eat fewer meals in a day because there was not enough food?). The questions address the situation of all household members and do not distinguish adults from children or adolescents. All of the occurrence questions ask whether the respondent or other household members either felt a certain way or performed a particular behavior over the previous four weeks. The method is based on the idea that the experience of food insecurity (access) causes predictable reactions and responses that can be captured and quantified through a survey and summarized in a scale.

The HFIAS indicator categorizes households into four levels of household food insecurity (access): food-secure, marginally food insecure, moderately food insecure and severely food insecure. Households were categorized as increasingly food insecure as they respond affirmatively to more severe conditions and/or experience those conditions more frequently.

Household Dietary Diversity Score (HDDS)

It is a measurement of household food access and availability through measuring the quality and quantity of food to meet all household members nutritional requirement for productive lives. In this case, it helps to provide an approach to measure household's dietary diversity. Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods FAO (2011). Data on HDDS collected using 24 hours of recall dietary intake. The information that was collected on dietary consumption allowed calculating a dietary diversity score, defined as the number of different food groups consumed by household members over 24 hours.

HDDS is measured by a number of food group consumed over a given reference period. The reference period can vary but is most often the previous day or week (FAO & WFP 2009). HDDS reflects a quality diet, the numbers of different food groups consume were calculated, rather than the number of different foods consume. A list of meals, all food items and beverages consume in the last 24 hours were recorded. The twelve food groups, recommended by (FAO, 2006) were used to HDDS. The consumed foods were allocated to the following food groups are composed of: Cereals (1) White tubers and roots (2), Vegetables(3), Fruits (4), Meat (5), Eggs (6), Fish and other seafood(7), Pulse/ Legumes(8), Milk and milk products (9), Oils and fats (10), Sugar or Honey (11), Spices, condiments and beverages (12). Data for HDDS indicator were collected by using a series of Yes and No categories. Yes, was given a score of one (1) to each food group for the household consumed at least one food item within 24 hours. No was given zero (0) score for a particular food group household who did not consume any food item from that food group. Finally, the scores were counted from each food group and HDDS were calculated based on the FAO (2011) guidelines for measuring household dietary diversity. An HDDS of less than or equal to three food groups were regarded as low household dietary diversity. Four to five food groups were regarded as medium dietary diversity and more than 6 food groups were regarded as high dietary diversity.

3.2.4.2. Model specification and description of dependent and independent variables

Ordered Logit Model

According to Chen and Hughes, (2004), regression models are commonly used in inferential statistical analysis to determine the relationships between independent and dependent variables and to determine significant forecasters related to dependent variable. The regression models can also be used to describe the magnitude and direction of predictors 'effects on the dependent variable.

In this study Ordered logistic regression model was used to estimate the relationship between the dependent and independent variables. Ordered logit preferred because it gives standard result for discrete choice estimation. In order to identify the determinate factors that are hypothesized to affect household food security status ordered Logit regression model was used. According to (Jackman, 2000), the ordinal dependent variable is non-linear, represented by 0 to 1 probability as in Logit model non-linear model must have a different error structure and the error term does not have constant variance.

When the response variable of interest is ordinal, ordered logit regression model can be used (Gujarati, 2004; Grilli and Rampichini, 2014). The dependent variable households food security status (food-secure, mild food insecure, moderately food insecure and severely food insecure), each category of the dependent variable has been affected by the independent variables mentioned in the above.

The explanation of the ordered logit regression model is given here below. According to Long and Freese (2003), symbols rather than actual variable names are used. Then, Y is an ordinal dependent variable with c categories, and Pr ($Y \leq j$) denotes the probability that the response on Y falls in category j or below (i.e., in category 1, 2…or j). This is called a cumulative probability. It equals the sum of the probabilities in category j as shown below:

$Pr(Y \leq j) = Pr(Y = 1) + (Pr(Y = 2) + Pr(Y = j)$ ……...……... (1)

A —c-category Y-dependent variable has c cumulative probabilities: $Pr(Y \leq 1)$, $Pr(Y \leq 2)$

Pr ($Y \leq c$). The final cumulative probability uses the entire scale as a consequence, therefore

$Pr(Y \leq c) = 1$. The order of forming the final cumulative probabilities reflects the ordering of dependent variable scale, and those probabilities themselves satisfy

$Pr(Y \leq 1) \leq Pr(Y \leq 2) \leq$ .....(1)

$\leq Pr(Y \leq c) =$ …….……...……. (2)

In ordered logit model, an underlying probability score for an observation of being in the i^{th} response category is estimated as a linear function of the independent variables and a set of cut points. The probability of observing response category *i* corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut points estimated for that response.

As mentioned in the above, to measure the respondents 'food security status which represent the dependent variable having the ordinal nature (food-secure, mild food insecure, moderately food insecure and severely food insecure), the best fitting statistical model for handling the ordered outcome is known as an ordered-logistic regression model, which was used as an analytical model in this study to determine factors expected to affect the female and male headed households food security status.

For this study analysis, post-estimation test was done after logistic regression. In order to test the existence of multi-collinearity, the explanatory variable was checked using Variance Inflation Factor (VIF) between the dependent variable to identify the determinate factor that affect household food security. The VIF of a variable exceeds 10 that variable is said to be highly collinear and it can be concluded that multi-collinearity is a problem (Gujarati, 1995).

3.2.5. Description of dependent and independent variable

The dependent variable used in this analysis was female headed household's FOOD SECURITY STATUS, which was assumed to be affected by different factors that include demographic, socio-economic, environmental and other different resources. Their effects on the dependent variable were estimated using logit regression model using Stata softwareversion-13. The independent variables hypothesized in this study are those expected to influence the dependent variable.

Age of household head: It is an independent continuous explanatory variable measured in years. It was assumed to determine household food security. The age of the household head has been considered as positive contributing to household food security. In Ethiopia, most women are head for their household in their older age when they lose their spouses die or got divorce. While, for this study age of household was assumed positively affect household food security. household head in older age tend to be more experienced farming than the younger aged household head. older household heads had greater access to resources than households headed by younger members, which thus could afford to facilitate production on the farm.

Household family size: It is a continuous variable and refers to the number of household members which can adjust through adult equivalent factors. Household in adult equivalent of a family size is calculated through conversion factors. It is an important variable which determines the state of household food security interims of increasing labor access for agriculture production which is they are in productive age and expected to have positive effect on household food security. Likewise, a household had large number family size might be food insecure than small number (Shimelis, 2009). It was hypothesized negative effect on household food security.

Household Livestock Holding (TLU): It is a continuous variable and measured in Tropical Livestock Unit (TLU) refers to the total number of livestock in household. Total livestock unit is calculated by each type of animal using conversion factor. For rural households its source of food for household consumption and income, had positive relation with household food security and supply manure to improve soil fertility. Households with large livestock size are expected to be less vulnerable to food insecurity especially in times of drought when crops production fails due to different reason (Little et al., 2006). Therefore, possession of large size of livestock may positively affect women production activities.

Household farmland size: Size of cultivated farm land is a continuous variable measured in hectare. Cultivated land is a major resource expects to associate with a household's food security status. The size of cultivated land is associated positively with food security. Amount of crop production of household related with farmland size. As the cultivated land size increases, provided other associated production factors increased, the possibility that the household gets more output as it remains high basic capital input in food production.

Amount of land rent out: continuous variable refers to the farmer if they rent out their land for farming activity. In agriculture production land is the major recourse, but household due to lack of labor access, oxen, seed, fertilizer and other factors cannot cultivated their plot so they rented out with share cropping or in cash money. While for this study land rent out may have negative result in household food security.

Amount of crop produced

It is continues variable refers to amount of annual crop production measured by kilo gram. Crop the major source of food in study area besides source of income for household. The variable expected has positive result in household food security. Because of low access of resource, labor and agricultural input female headed household have low participation in crop production. Female headed household may have poor food security situation.

Access to irrigation: It is one of continuous independent variable measured by hectare if the household head participates in irrigation practice. Small-scale irrigation is important to enhance household food security through increasing agricultural production, intensifying the cropping pattern and increasing income by producing high value crops for the household.

Off/non-farm Participation: it is a dummy variable that takes value of 1 if a household has participated off-farm activity and 0. The more off-farm income the farmer generates, the higher resolves financial constraints. It was therefore hypothesized that off-farm participation has negative influence on the status of household food security. Access to work in any non-agricultural activity does not assure household of food security. Households who engage in off-farm activities in the study area had probability to unable to meet their food requirements and food insecure.

Market Distance: It is a continuous variable measured by kilometer which is the difference between household farm and local market to sale their agricultural product. Closeness to market centers creates access to additional income via off farm employment opportunities, easy access to information on inputs and decreased burden transportation (Dorward et al., 2003). Therefore, it was assumed that there is a positive relationship between access to the market center and household food security.

Access to credit: it is a dummy variable that takes value of 1 if a household has access to credit and 0 otherwise. Household which has access to credit does increase their income by initiate investment on farm and non-farm activities and achieve food security. Rural credit could be an important source of cash for households, however, finance institution, requires high amount of down payment by the loan taker and due to lack of required assets. The study assumed that credit access has negative relation with household food security.

Uses of Improved seed: It is a dummy variable taking value of 1, if a farmer uses improved seed and 0 otherwise. Improved seed is important to increase productivity on agriculture product. Households using improved seed are expected to have better production than the non-users. Hence, household which uses improved seed is expected to be more food secure than the nonusers.

Extension Contact: It is dummy variable refers to a contact between extension agent with farmer and measured as 1 if a farmer has access to extension services on the agricultural production and 0 otherwise. It gives more access for farmers to get valuable information, learning new technology from DAs through extension programs. However, unless they can have training on crop and livestock production farmers obtain require skill to face some difficulties and to understand and apply improved agricultural technologies. So, those farmers have contact with extension agent, who got training and more willing to apply improved agricultural technologies have increase their agricultural product and income than those who did not have contact and receive training. The hypotheses with this study, those farmers who have contact with extension agents and received training on agriculture production are more food secure than who did not contact with extension agents.

Table 3.2 List of independent variables

Independent variables affecting women headed household in crop production	**Measurement**	**Continuous /non contentious**	**Expected coef.sign**
Age of household head	Year	Continuous	-
Household family size	AE	Continuous	-
Household cultivated land size	Hectare	Continuous	+
Amount of land rent out	Hectare	Continuous	-
Amount of crop produced	Kg	Continuous	+
Household Livestock holding	TLU	Continuous	+
Off-farm income	Yes or No	Continuous	-
Market distance	Kilometer	Continuous	+
Access to irrigation	Yes or No	Dummy	+
Access to credit	Yes or No	Dummy	-
Access to improved seed	Yes or No	Dummy	+
Access to extension service	Yes or No	Dummy	+

Chapter Four: Results and Discussion

This chapter presents the main results and discussions of the study, and has three subsections. The first sub-section describes the background information of the respondent's socioeconomic and demographic characteristics. The second sub-section presents the food security status of households measured using household food insecurity access scale and household dietary diversity. The third sub section presents the results from econometric analysis. It identifies determinate factor household food security status of households.

4.1. Demographic and socio- economic characteristics of participants

Age of the household heads

The participant age group in this study range from 18 up to above 65. The result presented in Table 4.1 shows that the mean age of female headed household respondent was 52.78 and male headed household 50.49 the statistical analysis (t-value = -1.2025 P= 0.8844) also shows there was significant mean difference with in female and male headed household in age category. The result implies that female headed household has higher mean value than male headed household. This suggest that most women are head for their household in their older age when they lose their spouses die or got divorce in the study area.

Family size of the household

Number of family size at productive age conceder as labour recourse in agriculture activity. The result shows that mean family size for female and male headed household were 4.68 and 5.79, respectively in terms of Adult equivalent (AE) (Table 4.1). The t-test result (t = 4. 0279 P= 0.000) it indicates there was significant mean difference at 1% level. The significant value show that female and male headed household had different family size and male headed household had large family size. Large number of family size at productive age may the major resource in terms of labour access for agricultural production (Shimelis, 2009).

Total livestock holding

Livestock holding is the most important source of livelihood, it indicates that having large livestock size could lead to enhance household conception and income. The result shows that mean TLU for female and male headed household were 3. 95 and 3.93, respectively (Table 4.1)

the t-test result show (t-test = -0.0606 P= 0.5241) there was insignificant relationship between the two groups. The finding indicates that there is no as such much variation in livestock holding between female headed compared to male headed household.

Household farmland holding

Land is major resources for the household its sources of household income and consumption. The result shows (Table 4.1) that the male headed households had higher farm holding size (M=1.63 ha) as compared to female headed households (M=0.77ha). The statistical test show (t-test = 12. 856 P= 0.000) there was at 1% significant level difference in farmland holding with in female and male headed household. The result indicate amount of farm land holding for female headed is relatively small size than male headed and it's have effect on their livelihood. Land is a basic resource for agricultural production, while female headed household have low access to land.

Land rent out

The study result indicate (Table 4.1) that the male headed households had higher mean value (M=0.068 ha) as compared to female headed households (M=0.289 ha). The statistical test show (t-test = -4.658 P= 0.000) there was at 1% significant level difference in amount of land rent out with in female and male headed household.

Amount of Crop produced

Likewise, (Table 4.1) result indicate female headed households (M=772.46) had lower mean values than male headed household (M=2152.17) amount of crop produced in kg. The statistical result show (t-test = 13.214 P= 0.0000) that the mean of crop production of female headed household had lower mean value than of male headed household at 1% significant level. The result indicates female headed household had limited resources such as land and labor also had negative effect on crop production. One of the reasons in household food insecurity is amount of crop production. The production decline especially in female headed household it causes shortage of food for household consumption (FAO, 2013).

Market distance

Market distance is one of continuous study variable. The result indicates that the mean market distance that female headed household nearest market (M=7.797) and male headed household is (M=8.028) km (Table 4.1). The t- test result show (t-test 0.3911 P= 0.3482) there was significant mean difference between female and male headed household on market distance.

Table 4.1. Demographic, socioeconomic and institutional characteristics of the study households (Continuous variable)

Variables	Female Household	Male Household	Total Household	T-Value	P-Value
	N=69	N=69	N=138		
	Mean (SD)	Mean (SD)	Mean (SD)		
Age	52.78 (11.33)	50.49 (11.03)	51.63 (11.20)	-1.2025	0.8844
Family size	4.68 (1.69)	5.79 (1.57)	5.23 (1.72)	4.0279	0.0000
TLU	3.95 (2.01)	3.93 (1.97)	3.94 (1.98)	-0.0606	0.5241
Cultivated land	0.771 (0.385)	1.637 (0.405)	1.204 (0.586)	12.8569	0.0000
Land rent out	0.068 (0.218)	0.289 (0.328)	0.179 (0.299)	-4.6580	0.0000
Crop produced	772.46 (614.02)	2152.17 (612.51)	1462.31 (923.43)	13.2143	0.0000
market distance	7.797 (3.50)	8.028 (3.463)	7.913 (3.471)	0.3911	0.3482

Note: ***, **, * show significance at p<0.01

Source: from own survey, 2021

Irrigation access

In agricultural production irrigation increase the productivity and had positive effect on household food security. In this study try to assess the significant difference using irrigation in agriculture in female and male headed household. The result shows (Table 4.2) female headed household 14.5% while male headed household 31.9% has access to irrigation. The statically analysis (X^2 = 5.8585 P = 0.016) at 1% significant difference between female and male households. According to study result, the uses of irrigation in agricultural production in female household less than compared to male headed household. This shows there are several problem in the female headed household had result on poor agriculture productivity and its leads to household food insecurity.

Off -farm activity

Off- farm activity is one of household income sours. The result indicate (Table 4.2) participation of off –farm household was 36.2% for female headed and 27.5% male headed households. There was statically difference (X^2 =1.2012 P =0.273). The result implies male headed household less participate in off-farm activity than female headed household it may be male headed household has probability more participate in agriculture activity than off-farm activity.

Access to credit

The result shows that only 18.8 % female headed household have credit access, while 34.8 % of male headed household have access to credit (Table 4.2). The difference between the two groups is statically significant (X^2 = 4.4683 P =0.035) at 5% significant level. This result indicates men headed household have better access compered to female headed household to take credit from micro finance institution.

Improved seed

In agricultural production different kind of inputs used to increase the productivity and have positive effect on household food security. In this study try to assess the significant difference by using agriculture inputs like improved seed in female and male headed household. The result shows (Table 4.2) female headed household 13.1% improved seed use while male headed household 46.4% use improved seed. The statically analysis (X^2 = 18.356 P = 0.000) at 1% significant difference between female and male households. According to study result, the uses of crop improved seed in female household less than compared to male headed household.

Extension service

The study result shows (Table 4.2) the access of extension serves to female and male headed household have 73.9% and 91.3% respectively. The statically analysis (X^2 =9.611 P =0.008) at 1% significant difference between female and male households. It indicates female headed households have less participation on agriculture extension serves. According to the result this study most of extension services participant are male, because male is mostly involved in agriculture production.

Even if the extension agents try to contact both male and female households only few females participate in extension package. They claim that female assumed to be busy on housework. It is confirmed by the key informants the extension services usually used by male headed household because they are willing to participate in extension program like training, filed demonstration and individual practical assistance on farm therefore training and skill upgrading giving for male farmer this indicate they may increase the productivity and enhance household food security.

Table 4.2. Demographic, socioeconomic and institutional characteristics of study household (Dummy variables

Variables	Category	Female Household (N=69)		Male Household (N=69)		Total Household (N=138)		X^2	P-Value
		Count	Percent	Count	Percent	Count	Percent		
Irrigation access	Yes	10	14.5	22	31.9	32	23.1	5.8585	0.016**
	No	59	85.5	47	68.1	106	76.9		
Off-farm participation	Yes	25	36.2	19	27.5	44	31.9	1.2012	0.273
	No	44	63.8	50	72.5	94	68.1		
Credit access	Yes	13	18.8	24	34.8	37	26.8	4.4683	0.035**
	No	56	81.2	45	65.2	101	73.2		
Extension	Yes	51	73.9	63	91.3	114	82.6	9.6110	0.008***
	No	18	26.1	6	8.7	24	17.4		
Improved seed	Yes	9	13.1	32	46.4	41	29.7	18.356	0.000***
	No	60	86.9	37	53.6	97	70.3		

Note: ***show significance at p<0.01 and p< 0.05
Source: from own survey, 2021

4. 2. Food Security Status of Sample Households

4.2.1. The study household food insecure access scale (HFIAS)

The study results in Table 4.3 indicate that male headed household are more likely to have available access for food production and good household consumption than female headed household. Based on the result finding, about 64(92.8%) female headed household and 28(40.6%) male headed household were worried about having no enough food and the resting 5(7.2%) female headed household and 41(59.4%) male headed household were not worried about having no enough food.

Likewise, from the total respondent farmers have worried about having no food on average the households in the study area lacks enough food at least for thirteen (13) and nine (9) days per a month for female headed household and male headed household respectively. From the total respondent from this data 67(97.1%) female headed household and 53(76.8%) male headed household were found to be worried about having not able to eat balance food kinds. Similarly, the remaining 2(2.9%) female headed household and 16(23.2%) male headed household were not worrying about having not able to eat balance food kinds.

Beside, from the total respondents, who were found to be worried about having not able to eat the food for eleven (11) and seven (7) days per a month for female headed household and male headed household respectively. Then, from the total respondent from study data 39(56.5%) female headed household and 42(60.9%) male headed household have eaten limited variety of foods due to lack of resource and the remaining 30(43.5%) female headed household and 27(39.1%) male headed household have not eaten limited variety of foods due to lack of resource.

Moreover, from the total respondents households eaten limited variety of food due to lack of resource for eight (8) and seven (7) days per a month for female headed household and male headed household respectively. Meanwhile, in the study area about 52(75.4%) female headed household and 43(62.3%) female headed household have eaten unwanted food in the case of lack of resource to obtain other types of food and the remaining 17(24.6%) female headed household and 26(37.7%) male headed household have not eaten unwanted food due to lack of resource to obtain other types of food.

Furthermore, the total respondents has eaten unwanted food due to lack of resource to obtain other types of foods for eighth (8) and five (5) per a month for female headed household user and male headed household respectively.

Study result implies that about 45(65.2%) female headed household and 41(59.4%) male headed household to eat smaller per day due to lack of enough food and the rest 24(34.8%) female headed household and 28(40.6%) male headed household not to eat smaller meal per days because of enough food in study area. However, from the respondents has to eat smaller meal per day because of lack of enough food for five (5) days per a month for both female headed household and male headed household. More importantly, about 43(62.3%) female headed household and 4(5.8%) male headed household has to eat fewer meal per day due to lack of food and the remaining about 26(37.7%) female headed household and 65(94.2%) male headed household has not eat fewer meal per day and households has to eat fewer meal per day because of lack of food for five(5) and three (3) days per a month for female headed household and male headed household (Table 4.3). According to study data, 28(40.6%) female headed household and 0(0%) male headed household has no food due to lack of resource to get food. Whereas, 41 (59.4%) of female headed household and 69 (100%) of male headed household has enough food because of efficient resource and households has no food because of lack resource to get food for five (5) days per month for female headed household. From the total households 16(23.1%) female headed household and 0(0%) male headed household go to sleep at night hungry due to there was no enough food and the remaining 53(76.9%) female headed household and 69(100%) don't go to sleep at night hungry due to there was enough food and households go to sleep at night hungry due to lack of enough food for three (3) days per a month for female headed household (Table 4.3). Based on household food insecurity access scale from total respondent 69(100%) female headed household and 69(100%) male headed household don't go without eating anything a whole days and night. Finally, the result implies that in household food insecure access scale indicator male headed household had been rarely and sometimes while most of female headed household were categorized under in sometimes.

Table 4.3. Household Food Insecurity Access Scale (HFIAS) Measurement Tool

No	Question	Female headed household			Male headed household	
		Count		%	Count	%
1	In the past four weeks, did you worry that your household would not have enough food?	Yes	64	92.8	28	40.6
		No	5	7.2	41	59.4
1.1	If yes How often did this happen?	13			9	
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	Yes	67	97.1	53	76.8
		No	2	2.9	16	23.2
2.2	If yes How often did this happen?	11			7	
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	Yes	39	56.5	42	60.9
		No	30	43.5	27	39.1
3.3	If yes How often did this happen?	8			7	
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	Yes	52	75.4	43	62.3
		No	17	24.6	26	37.7
4.1	If yes How often did this happen?	8			5	
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	Yes	45	65.2	41	59.4
		No	24	34.8	28	40.6
5.5	If yes How often did this happen?	5			5	
6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	Yes	43	62.3	4	5.8
		No	26	37.7	65	94.2
6.1	If yes how many days within the month?	5			3	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	yes	28	40.6	0	0
		No	41	59.4	69	100
7.1	If yes How often did this happen?	5				
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	yes	16	23.1	0	0
		No	53	76.9	69	100
8.1	If yes How often did this happen?	3				
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	Yes	0	0	0	0
		No	69	100	69	100
9.1	If yes How often did this happen?					

Source: from own survey, 2021

4.2.2. Household food security status based on HIFAS categorized result

Household food security was assessed, and the result was present in (Table 4.4) The categorical household food security status was based on the household food insecurity access scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project of USAID. The scale provides a continuous measure of household food insecurity which can be categorized into four levels of household food insecurity (access) prevalence.

Table 4.4. Household food security status of the study household based on HIFAS result

Household food insecurity access scale			Sex of the household		Total	X^2	P-value
			Female Headed	Male Headed			
Food Security Status	Food secure	Frequency	3	15	18	75.33	0.000***
		Percentage	4.3%	21.7%	13%		
	Marginally insecure	Frequency	13	51	64		
		Percentage	18.8%	73.9%	46.4%		
	Moderately insecure	Frequency	44	3	47		
		Percentage	63.8%	4.4%	34.1%		
	Severely insecure	Frequency	9	0	9		
		Percentage	13.1%	0%	6.5%		
Total		Frequency	69	69	138		
		Percentage	100.0%	100%	100.0%		

Source: from own survey, 2021

The HIFAS result shows that18 (13%) of respondents are food secure. Among this, 3(4.3%) are female headed household and the rest 15 (21.7%) are male-headed household. In the marginally food insecure category 64 (46.4%) which is 51 (73.9%) are male-headed household and 13 (18.8%) are female-headed household and also in moderately food insecure category 47(34.1%) which is 3(4.4%) female headed household and 44(63.8%) are male-headed household. While the rest are female headed 9 (13.1%) were severely food insecure which is the study shows there is no male headed household in severely food insecure condition. The statistical result show that male-headed household has significantly more food secured than female-headed household at 1% significant level. This implies that female-headed household were highly food insecure than male counterparts.

The positive association between female-headed household and food insecurity is due to several factors. Compared to male-headed households, female-headed households tend to have a low access to recourses, labor, socio-economic and intuitional factor. In addition, men headed on average have more access than women. Moreover, in female-headed households where there is no other person which take responsibility, the women is not only responsible for generating income but also for completing domestic tasks and it's have negative effect on the income generating opportunities for female-headed households to increase household income and improve household consumption. Even if women who head their household have greater decision-making freedom, and even if they do spend a greater percentage of their earnings on household necessities such as food, whether female-headed households in study area are more food insecure compared to male headed households. (Chant, 2003 and Molyneux, 2006).

4.2.3. Household of dietary diversity (HDDS)

The HDDS were counted from each food group for 138 household respondents and were calculated based on the FAO (2011) guidelines for measuring household dietary diversity. From the total 138 household 22 (15.9 %) were high dietary diversity score, which is 10(14.5%) female-headed household and 12(17.4%) male-headed household. The result presented in Table 4.5 shows that 44 (31.9 %) of household consumed medium dietary diversity score, in which 23 (33.3%) are female headed and 21 (30.4%) are male-headed household.

In the low dietary diversity category from 72 (52.2%) households, similarly both female and male-headed household 36 (52.2%) consumed low dietary diversity, which means below 3 food groups (Table 4.5).

The study implies there is no such significant difference between female and male-headed household under the category of household dietary diversity. Even if male-headed households have the advantage of more sources of income instead of female-headed, especially when both partners are involved in different activities that increased household income. Also, female-headed household play a crucial role in providing and improving household dietary diversity. Female-headed household are more likely than male-headed household to use available resources and skills to further improve the welfare of their family especially the nutrition and health aspects. When women have over control agriculture income, asset it's more likely to be spent on nutrition, household consumption, health and education and they favor agriculture products that support and ensure household food security. (Schutter, 2013 and Sraboni et al. 2014)

Table 4.5. Household dietary diversity percentage

Household dietary diversity			Sex of the household		**Total**
			Female Headed	Male Headed	
Dietary diversity Status	High dietary diversity	Frequency	10	12	22
		Percentage	14.5%	17.4%	15.9 %
	Medium dietary diversity	Frequency	23	21	44
		Percentage	33.3%	30.4%	31.9%
	Low dietary diversity	Frequency	36	36	72
		Percentage	52.2 %	52.2%	52.2 %
Total		Frequency	69	69	138
		Percentage	100%	100%	100%

Source: Survey data, 2021

4.2.4. Description of household food security status

Age of household head

As the result indicated in the (Table 4.6), the mean age of the food secured and marginally insured household is 44 and 52.57 while, 52.7 and 44.22 for moderately and severely food insecure household. The one way ANOVA result indicate that there is significant mean difference between the groups of HFIAS categories (F=2.02, P =0.114) there is significant difference on the mean age of the household head in the household groups.

Household family size

In this study of the household family size result indicated that, there is a significant mean difference between the groups. The mean value for household food secured and marginally insured household is 5.5 and 5.79 while, 4.68 and 3.66 for moderately and severely food insecure household. Besides, the difference is statistically significant with (F=7.51, P =0.001). This implies that the mean difference was found to be statistically significant at 1%. This result asserts that as the number of family members engaged in food production has positive implication on household food security.

Livestock ownership

The study implies amount of TLU was found have a significant effect household food security. The mean value for household food secured and marginally insured household is 4.69 and 3.85 while, 3.87 and 3.39 for moderately and severely food insecure household. The one way ANOVA result indicate that there is a significant mean difference between household groups (F=1.14, P =0.333). The result indicate food secured household had large amount livestock ownership than food insecure household.

Cultivated land holding

Amount of farmland holding, on household food security has found to be statistically significant in determining the food secured and food insecure of the households. The mean value of the land holding was found to be 1.83 and 1.45 for food secured and marginally insured household and 0.73 and 0.67 for of the moderately and severely food insecure households respectively. There was mean difference statically significant at 1% level (F=47.56, P =0.000).

The result implies food secured household has large amount of farmland compared with food insecure household category and if land holding size increased had probability to increased food production of the household. Moreover, household with large cultivated land more food secured than who has less farm size because of household with large size have chance to diversified type of crop produced and increase quantity of crop production.

Land rent out

The study result indicate (Table 4.6) the mean value of the land holding was found to be 0.078 ha for marginally insured households and 0.29 and 0.67 ha for of the moderately and severely food insecure households respectively. There was mean difference statically at 1% significant level (F=21.45, P =0.000). The study result indicates food secured household don't rent out their farm land. It implies that household due to lack of labor access, oxen, seed, fertilizer and other factors cannot cultivated their plot so they rented out there land with share cropping or in cash money.

Crop produced

The study further show (Table 4.6) amount of household crop production on household food security has mean deference which is the mean value of the land holding was found to be 2561.1 and 1907.81kg for food secured and marginally insured household and 714.8 kg for the moderately food insecure households. Severely food insecure households don't have crop production. There was mean difference statically significant at 1% level (F=47.56, P =0.000). Large amount of crop production increased home consumption and source of cash income for the household to purchase other food commodity. The result indicates when household crop production increased household can consume more dietary food and there was probability to be food secured.

Market distance

Market distance is one of the continuous variable, the study result indicates that (Table 4.6) the mean value of the total household market distance was found to be 7.67 and 8.22 km for food secured and marginally insured households and 7.62 and 7.77 for of the moderately and severely food insecure households respectively.

There was mean difference statically significant (F=0.31, P =0.8186) there was insignificant mean difference between household groups in nearest market distance. Near and accessible market is one of the reasons to increased household income beside if the market distance near to the household had probability to minimize time which spend to go to market and can easily get other household commodity used to household consumption. The result revile food secured household has more nearest market than food insecure household.

Table 4.6 Description of household food security for continuous variables

Variables	Food Secured Household(18)	Marginally insecure(64)	Moderately insecure(47)	Severely insecure(9)	F-Value	P-Value
	Mean Value (SD)	Mean Value(SD)	Mean Value(SD)	Mean Value(SD)		
Household Age	44 (11.747)	52.57 (10.44)	52.70 (11.64)	49.22 (10.25)	2.02	0.1142
Family Size	5.5 (1.61)	5.79 (1.58)	4.68 (1.66)	3.66 (1.32)	7.51	0.001
TLU	4.69 (2.226)	3.85 (2.003)	3.87 (1.892)	3.39 (1.696)	1.14	0.333
Cult_ land holding	1.83 (0.462)	1.45 (0.463)	0.73 (0.333)	0.67 (0.2795)	47.56	0.000
Land rent out	-	0.078 (0.239)	0.29 (0.296)	0.67 (0.279)	21.45	0.000
Crop produced	2561.1 (561.65)	1907.81 (602.98)	714.89 (432.87)	-	96.79	0.000
Market distance	7.67 (3.514)	8.22 (3.475)	7.62 (3.486)	7.77 (3.700)	0.31	0.8186

Note: ***, **, * show significance at p<0.01, p<0.05 and p< 0.1 respectively
Source: Analysed from own survey 2021

Irrigation access

In household food security irrigation access has positive effect to increased food production. The study indicates there was deference between household groups. The value shows (Table 4.7) household the irrigation access was found to be 27.7% and 28.1% for food secured and marginally insured households and 14.9% and 22.2% for the moderately and severely food insecure households respectively. There was statically difference (X^2 =2.908 P =0.406) Based on the study result, food secured household has more access to irrigation in agricultural production.

Off -farm activity

Off- farm activity is one of income sours in households but in the study area the study indicate there was low off-farm activity. The result indicate(Table 4.7) participation of off –farm household was 22.2% and 23.4% for food secured and marginally insured households and 36.2% and 88.9% for the moderately and severely food insecure households respectively. There was statically difference (X^2 =16.739 P =0.001). The result implies food secured household less participate in off-farm activity than food insecure household it may be food secured household has probability more participate in agriculture activity than off-farm activity.

Access to credit

Household food security has relation with financial capacity of the household and credit is one of way to get financial capacity. The study finding indicate 27.8% and 29.7% for food secured and marginally insured households and 19.1% and 44.4% for the moderately and severely food insecure households respectively had access to credit. There was statically difference (X^2 =3.1107 P =0.375). For the most rural household in the study area small and micro finance are means of get loan to solve financial limitations.

Improved seed

To improve household food security agricultural inputs like improved seed play big role to increase crop productivity. The study finding show most household not used improved seed in (Table 4.7) from food secured household 50% and 40.6% for food secured and marginally insured households and 12.8% for the moderately food insecure households had access to use improved seed. Severely food insecure households don't use improved seed. There was statically difference (X^2 =17.465 P =0.001) at 1% significant difference between household HFIAS category. Improved seed can increase agricultural productivity by boosting overall production, which in turn contributes to attaining food security at the household level (Lipton, 2005; Dorward et al., 2003).

Extension service

The study result implies (Table 4.7) the access of extension serves for food secured and insecure households. 100% and 89% for food secured and marginally insured households and 70.2% and 66.7% for the moderately food insecure households had access to extension serves.

There was statically difference (X^2 =14.685 P =0.023) at 5% significant difference between households. It indicates most households groups are actively participate in extension service and food insecure household has less participation on agriculture extension serves. It implies to low participation in extension serves has negative effect on household food security.

4.7. Description of household food security for dummy variables

Variables	Category	Food Secured (18)		Marginally in secured 64)		Moderately insecure(47)		Severely insecure(9)		X^2	P-Value
		Count	Percent	Count	Percent	Count	Percent	Count	Percent		
Irrigation access	Yes	5	27.7	18	28.1	7	14.9	2	22.2	2.9088	0.406
	No	13	72.3	46	71.9	40	85.1	7	77.8		
Off-farm participation	Yes	4	22.2	15	23.4	17	36.2	8	88.9	16.739	0.001
	No	14	77.8	49	76.6	30	63.8	1	11.1		
Credit access	Yes	5	27.8	19	29.7	9	19.1	4	44.4	3.107	0.375
	No	13	72.2	45	70.3	38	80.9	5	55.6		
High Yield Variety	Yes	9	50	26	40.6	6	12.8	0	0	17.465	0.001
	No	9	50	38	59.4	41	87.2	9	100		
Extension access	Yes	18	100	57	89	33	70.2	6	66.7	14.685	0.023
	No	0	0	7	11	14	29.8	3	33.3		

Note: ***, **, show significance at p<0.01, and p<0.05 respectively

Source: Analysed from own survey 2021

4.3. Econometric result

4.3.1. Model diagnosis test result

This study all the necessary model diagnosis test includes model specification test for the overall model fit (goodness of fit), multi-collinearity problem and test for model specification error test was conducted. In this regard, model test carried out before running the logistic regression while model specification error test (linktest) were carried out after running the regression. The explanatory variables were checked for existence of multi-collinearity or association between the dependent variables to identify the determinant factors that affecting household food security. Multicollinearity was tested using variance inflation factor (VIF). Accordingly, VIF was 1.84 and the result revealed that there is no problem of multi-collinearity observed because the tolerance greater than 10% among explanatory variable. (Table 4.8)

Table 4.8. Diagnostic test result

Test	Measurement	p-value
Omitted variable test	Prob > F	0.7917
Linktes	Hat	0.007
	Hattsq	0.903
Vif	Multicollinearity	1.84

Hence, since the F-value (0.35) was found non-significant (Prob>F, 0.7917), did not reject the null hypothesis that the model has not mitted variables. The link test identified the model specification error occur when the relevant variables are omitted from the model, or one or more irrelevant variables are included in the model. The null hypothesis shows there is no model specification error. In this specific study, the p-value of hatsq shows is not significant then we fail to reject the null hypothesis and conclude the model is correctly specified. For factor determine household food security the p-value is 0.903. The p-value implies it is not significant, so we fail to reject the null hypothesis and conclude that there is no model specification error.

4.3.2. Factors determine female and male household food security

In this study marginal effects of ordered logit were used to see the effect of the independent variables on dependent variable. As presented in previous section the food security status of the households was analyzed by categorizing into four groups: food secure, marginally insecure, moderately insecure and severely insecure. The categorical household food security status was based on the household food insecurity access scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project of USAID.

4.3.3. Marginal effects of ordered logit for female headed household

Age of the household head:

The ordered logistic model result for female headed household shows that 10% significant and positively association between household head age and household food security. Additionally, the result of the marginal effect revealed that (Table 4.9) age of the household head increased by one, considering other factor constant the probability to be food secured increased (more likely food secure) by 0.09%, marginally food insecure categories increased (more likely in marginally) by 0,22%, Whereas in moderately food insecure categories decreased (less likely in moderately) by 0.096% and severely food insecure categories decreased (less likely food insecure) by 0.21%. The result shows that household head in older age tend to be more experienced farming than the younger aged household head. Older household heads had greater access to resources than households headed by younger members, which thus could afford to facilitate production on the farm.

Cultivated land size

The ordered logit model result indicate that female headed household land size has a positive and significant effect on households' food security situation. Land size positively affected household food security at 10% significant level (P= 0.063). The result of the marginal effect revealed that (Table 4.9) as cultivated land increased by one, considering other factor constant the probability to be food secured increased (more likely food secured) by 3.4%, marginally food insecure categories increased (more likely in marginally) by 7.9 %, Whereas in moderately food insecure categories decreased (less likely in moderately) by 3.5 % and severely food insecure categories decreased (less likely food insecure) by 7.8%.

Amount of crop production of household related with farmland size. As the cultivated land size increases, provided other associated production factors increased, the possibility that the household gets more output as it remains high basic capital input in food production. Consistently, Beyan and Muche (2010) found out more cultivated farmland increased had positive implication on household consumption and food security

Amount of crop produced

The ordered logit model result show amount of crop produced statistically and positively significant in household food security at 5% (P= 0.040) level. The study revealed that (Table 4.9) marginal effect of crop produced increased by one, considering other factor constant the probability to be food secured increased (more likely food secured) by 4.3%, marginally food insecure categories increased (more likely in marginally) by 10.1 %, Whereas in moderately food insecure categories decreased (less likely in moderately) by 4.5 % and severely food insecure categories decreased (less likely food insecure) by 10%. The result shows that amount of crop production had positive implication on household consumption and it also source of cash income for the household to purchase other food items.

Cultivated land rent out

The ordered logit model result indicates female headed household farmland rent out has a negative and significant effect on household food security situation at 10% significant level (P= 0.094). The study result of the marginal effect revealed that (Table 4.9) farmland rent out increased by one, considering other factor constant the probability to be food secured decreased (less likely food secured) by 5.9%, marginally food insecure categories decreased (less likely in marginally) by 13.7% and moderately food insecure categories increased (more likely in moderately) 6.1% and severely food insecure categories increased (more likely food insecure) by 13.5%. The result indicates that female headed household due to lack of labor access, oxen, seed, fertilizer and other factors cannot cultivated their farm land so they rented out there land with share cropping or in cash money.

Table :4.9. Marginal effects of ordered logit for female headed household

Variables	ME(dy/dx)food secured	ME(dy/dx) Marginally insecure	ME(dy/dx) moderately insecure	ME(dy/dx) severely insecure
Household Age	0.00092	0.00215	-0.00095	-0.0021
Family Size	-0.01066	-0.02490	0.01102	0.02454
TLU	0.00135	0.0031	-0.00140	-0.00312
Cult_ land holding	0.03397	0.07934	-0.03512	-0.07819
Cult_ land rent out	-0.05882	-0.1373	0.06081	0.13540
Crop produced	0.04329	0.10110	-0.04475	-0.09963
Irrigation access	0.02267	0.05295	-0.02344	-0.05219
Off-farm income	-0.0099	-0.02323	0.01028	0.02289
Market distance	0.00019	0.00046	-0.00020	-0.00045
Credit access	-0.03612	-0.08436	0.03734	0.08314
High Yield Varies	0.02808	0.065590	-0.0290	-0.06464
Extension access	0.01911	0.044634	-0.01975	-0.04398

4.3.4. Marginal effects of ordered logit for male headed household

Cultivated land size

The ordered logit model result indicate that male headed household land size has a positive and significant effect on households' food security situation. Land size positively affected household food security at 1% significant level (P= 0.004). The result of the marginal effect revealed that (Table 4.10) as cultivated land increased by one, considering other factor constant the probability to be food secured increased (more likely food secured) by 42.42%, marginally food insecure categories decreased (less likely in marginally) by 29.94% and moderately food insecure categories decreased (less likely in moderately) by 12.47%. In the study area are male headed household has large farmland size compered to female headed.

This result is consistent with the finding of (Maser, 2010); Beyan and Muche (2010) found that, the amount of farm size 'owned' is an indicator of wealth and source of capital for agricultural production particularly where agriculture is a major source of livelihood. This due to land size owned was an indicator to wealth status and households with large land size were expected to have diversified the quantity and type of crop produce, which may be in turn leads to increase in consumption and household food security

Amount of crop produced

The ordered logit model result show amount of crop produced statistically and positively significant in household food security at 1% (P= 0.017) level. The study revealed that (Table 4.10) marginal effect of crop produced increased by one, considering other factor constant the probability to be food secured increased (more likely food secured) by 33.97%, marginally food insecure categories decreased (less likely in marginally) by 23.98% and moderately food insecure categories decreased (less likely in moderately) by 9.99%. The result shows that an increase in crop production of the household, the probability of to be food secured would increase. It was expected that households with better production are most likely food secure than who has less farm size. This due to land size owned was an indicator to wealth status and households with large land size were expected to have diversified the quantity and type of crop produce, which may be in turn leads to increase in consumption and household food security. The result consists with the finding of Hailu (2012).

Cultivated land rent out

The ordered logit model result indicates male headed household farmland rent out has a negative and significant effect on household food security situation at 1% significant level (P= 0.003). The study result of the marginal effect revealed that (Table 4.10) farmland rent out increased by one, considering other factor constant the probability to be food secured decreased (less likely food secured) by 96.05%, marginally food insecure categories increased (more likely in marginally) by 67.8% and moderately food insecure categories increased (more likely in moderately) by 28.25%. The result indicates that even if the household has cultivated land also, they had problem on oxen, labor and farm input.

Most household especially female headed household gave their land to rent with different contractual agreement within share produced crop or renting the land in money. As the result the household got minimum production after sharing the crop and not enough for their household consumption also other household which they rent their farmland in very small money and it's hard to secure their livelihood. It was expected that households which rented there farmland most likely food insecure.

Access to credit

As hypothesized, ordered model shows that the access to credit has a negative and significant effect on households‟ food security situation at 5% significant level (P=0.071). The study result of the marginal effect revealed that (Table 4.10) household access to credit increased by one, considering other factor constant the probability to be food secured decreased (less likely food secured) by 22.13%, marginally food insecure categories increased (more likely in marginally) by 15.62% and moderately food insecure categories increased (more likely in moderately) by 6.51%. The result further shows that most household were unable to had credit access on time and Micro Finance Institution, requires high amount of loan payment. Rural credit could be an important source of cash for households, however, according to the FGD and interview with the district credit team leaders, most peasants were unable to pay back their credit on time and Micro Finance Institution, requires high amount of down payment by the loan taker most households are unable to benefit from such kind of services due to lack of required assets. Only few relatively better households are able to involve in such credit giving institutions as they fulfill the necessary collateral (land/ oxen and other assets) to take loan. Also, the result revealed access to credit and household food security has negative relationship.

Livestock ownership

The ordered logit model result show amount of livestock ownership statistically and positively significant in household food security at 10% (P= 0.093) level. The study revealed that (Table 4.10) marginal effect of crop produced increased by one, considering other factor constant the probability to be food secured increased (more likely food secured) by 2.8%, marginally food insecure categories decreased (less likely in marginally) by 1.9% and moderately food insecure categories decreased (less likely in moderately) by 0.82%.

The result shows that household with more livestock holding had positive effect on their household consumption and household food security status. The result was consistent with the finding of (Kebede, 2011)

Table: 4.10. Marginal effects of ordered logit for female headed household

Variables	ME(dy/dx) food secured	ME(dy/dx) Marginally insecure	ME(dy/dx) moderately insecure
Household Age	0.00479	-0.00338	-0.00140
Family Size	-0.01507	0.01063	0.00443
Livestock holding (TLU)	0.02802	-0.01977	-0.00824
Cult_ land holding	0.42420	-0.29941	-0.12478
Cult_ land rent out	-0.96058	0.67802	0.28256
Crop produced	0.33976	-0.23981	-0.09994
Irrigation access	0.18276	-0.12899	-0.05376
Off-farm income	0.01070	-0.00755	-0.00314
Market distance	0.00444	-0.0031	-0.00130
Credit access	-0.22139	0.15626	0.06512
High Yield Varies	0.04654	-0.03285	-0.01369
Extension access	0.13359	-0.0943	-0.03929

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The household food security measured by HFIAS. The result reveled that majority of the household were mildly food insecure and moderately food insecure while the rest small number of households were in food secured and severely food insecure. Most female headed household were in moderately food insecure and only female household were in severely food insecure. Moreover, this result implies female headed households were relatively more food insecure than male headed in the study area. It was also indicated that female-headed households are concentrated among lower productivity which means limited access and control over productive assets and lower incomes than male-headed households. In the dietary diversity measurement from the total household 15.9 % were high dietary diversity score, 31.9% of household were consumed medium dietary diversity and 52.2% were low dietary diversity from the total respondent household, the result show equal amount of male and women headed household consumed low dietary which means below 3 food groups. The study findings revealed that most of the households were in low dietary diversity category.

The marginal effect of ordered logit regression model used to identify determinate factors of household food security based on HFIAS result. For female headed household age of household head, cultivated land size and amount of crop produced positively determine household food security and amount of land rent out had negative significant on female headed household food security status. For male headed household cultivated land, TLU and amount of crop produced positively determine household food security also land rent out and credit access are negatively significant, the study finding was significant at $p<0.01$, $p<0.05$ and $p< 0.10$ level. Generally, the finding of the study reviled that female headed household compared with male headed had low access to recourse, asset, and low productivity in the study area.

5.2. Recommendations

Based on the finding of the study the following recommendations have been suggested to improve household food insecurity in gender perspective. The recommendations are assumed to give insight for the future policy formulation regarding to female and male headed household food security and helps to input for further investigation in the study area. Moreover, this policy recommendation possibilities to mitigate issues related to socio-economic and demographic problems of people living in the Angolela Tera *woreda* and the people who live in the same characteristics in other area of the country.

- The study finding for both female and male household indicates that, cultivated land and amount of crop produced was positively and significantly contributed to household food security. Therefor National, Zonale, Regional, *woreda* and *kebele* level administrator work collaborate to get significant result to increasing productivity especially for female headed household.
- Similarly, the study also implies cultivated land rent out influence on household food security for female and male headed study household significantly and negatively. Therefore, regional, zonal and *woreda* agriculture level administrator facilitate different farm input for household which they rent out their land to increase their capacity and should be encouraged to cultivate their land rather than rent out.
- Study finding indicate that access of credit was negatively significant to male headed household on their food security situation. In the study area because of poor credit service and short repayment and high interest rate especially female headed household fail in getting support from the credit service provider sectors. So, to overcome these issues *woreda* and regional micro finance department must work together in facilitating credit service. So that they can access in long term repayment period and micro finance have to give loan with minimum interest rate in this study area.

- Also, by creating attractive and encouraging economic environment for female headed household to enhance off-farm income generation activities, rural institution should design women sensitive financial system to reduce barriers of access to participate off farm income generate activity which used to increase their income and enhance food security status.

- Finally, to gender blind study not specifically address female headed household food security problem. Therefore, gender perspective further study needs to address both female and male headed household to increase household food security. Moreover, international, and local government organization implement women focused development program with objective of women asset building to increased household food security.

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Appendix

Appendix 1. Conversion factors used to estimate Tropical Livestock Unit (TLU)

Livestock	Conversion factor
Cow	1
Ox	1
Bull	0.60
Heifer	0.75
Calves	0.20
Donkey/Mule	0.70
Horses	1.10
Shoats	0. 13
Poultry	0.013

Source: Stock, et al., 1991

Appendix 2. Conversion factor used to calculate man and adult equivalent

Age Group (Years)	Adult Equivalent (AE)		Man Equivalent (ME)	
	Male	Female	Male	Female
<10	0.6	0.6	0	0
13-15	0,9	0.8	0.2	0.2
14-16	1	0.75	0.5	0.4
17-50	1	0.75	1	0.8
>50	1	0.75	0.7	0.5

Source: Storck (1991)

Appendix. 3. Ordered logistic regression for female headed study household

```
. ologit HFIAS_Cat Age_Head Family_Size Cult_land Land_rent_out lnCrop_kg Irr_access lnOff_income_ETB Mar
> U if Sex_Head==1

Iteration 0:   log likelihood = -70.404083
Iteration 1:   log likelihood = -44.193421
Iteration 2:   log likelihood = -36.853494
Iteration 3:   log likelihood = -34.905577
Iteration 4:   log likelihood = -34.695473
Iteration 5:   log likelihood = -34.692157
Iteration 6:   log likelihood = -34.692153
Iteration 7:   log likelihood = -34.692153

Ordered logistic regression                     Number of obs     =         69
                                                LR chi2(12)       =      71.42
                                                Prob > chi2       =     0.0000
Log likelihood = -34.692153                     Pseudo R2         =     0.5072
```

HFIAS_Cat	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Age_Head	.0642191	.0382819	1.68	0.093	-.010812	.1392502
Family_Size	-.3106482	.2568151	-1.21	0.226	-.8139965	.1927001
Cult_land	2.460451	1.323564	1.86	0.063	-.1336878	5.054589
Land_rent_out	-3.499058	2.090059	-1.67	0.094	-7.595499	.5973823
lnCrop_kg	4.023423	1.955339	2.06	0.040	.1910298	7.855817
Irr_access	1.243882	1.268076	0.98	0.327	-1.241501	3.729265
lnOff_income_ETB	-.1026105	.15583	-0.66	0.510	-.4080316	.2028106
Market_km	-.0410987	.1099745	-0.37	0.709	-.2566448	.1744474
lnCr_income	-.1188576	.1073216	-1.11	0.268	-.3292041	.0914888
HYVs	1.106513	1.048407	1.06	0.291	-.9483264	3.161352
Extension	.8986499	.8194612	1.10	0.273	-.7074646	2.504764
TLU	.0722827	.1613171	0.45	0.654	-.243893	.3884584
/cut1	1.299032	2.599783			-3.79645	6.394514
/cut2	11.52079	4.022623			3.636598	19.40499
/cut3	15.02879	4.295443			6.609879	23.44771

Appendix. 4. Ordered logistic regression for male headed study household

```
. ologit HFIAS_Cat Age_Head Family_Size Cult_land Land_rent_out lnCrop_kg Irr_access lnOff_income_ETB Market_km lnCr_income HYVs Extension T
> U if Sex_Head==0

Iteration 0:   log likelihood = -50.386268
Iteration 1:   log likelihood = -34.094405
Iteration 2:   log likelihood = -28.560149
Iteration 3:   log likelihood = -27.507807
Iteration 4:   log likelihood = -27.457929
Iteration 5:   log likelihood = -27.457852
Iteration 6:   log likelihood = -27.457852

Ordered logistic regression                     Number of obs     =         69
                                                LR chi2(12)       =      45.86
                                                Prob > chi2       =     0.0000
Log likelihood = -27.457852                     Pseudo R2         =     0.4551
```

HFIAS_Cat	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Age_Head	.0372671	.0478672	0.78	0.436	-.0565509	.131085
Family_Size	-.0174111	.3406052	-0.05	0.959	-.6849851	.6501629
Cult_land	4.840876	1.677276	2.89	0.004	1.553475	8.128277
Land_rent_out	-9.431575	3.131855	-3.01	0.003	-15.5699	-3.293252
lnCrop_kg	4.737769	1.989989	2.38	0.017	.8374626	8.638076
Irr_access	1.355135	1.293688	1.05	0.295	-1.180447	3.890716
lnOff_income_ETB	.1801606	.144057	1.25	0.211	-.102186	.4625072
Market_km	.0653547	.1154957	0.57	0.571	-.1610127	.2917221
lnCr_income	-.1770419	.0981848	-1.80	0.071	-.3694804	.0153967
HYVs	.3607458	.7084558	0.51	0.611	-1.027802	1.749294
Extension	1.541442	1.443922	1.07	0.286	-1.288593	4.371476
TLU	.3110399	.1850026	1.68	0.093	-.0515586	.6736384
/cut1	15.98451	5.478232			5.24737	26.72165
/cut2	26.28625	7.453906			11.67686	40.89564

Appendix. 5.VIF for variables

```
. vif
```

Variable	VIF	1/VIF
lnCrop_kg	3.89	0.257120
lnOff_inco~B	2.62	0.382070
Cult_land	2.14	0.466625
Family_Size	2.04	0.489663
Irr_access	2.01	0.498018
Land_rent_~t	1.90	0.527071
Age_Head	1.70	0.589599
lnCr_income	1.22	0.818050
Extension	1.20	0.832609
HYVs	1.20	0.834142
Market_km	1.09	0.918634
TLU	1.06	0.942492
Mean VIF	1.84	

Appendix 6. Linktest for variables

```
. linktest
```

Source	SS	df	MS	Number of obs	=	138
				F(2, 135)	=	173.40
Model	61.1778091	2	30.5889046	Prob > F	=	0.0000
Residual	23.8149445	135	.176406996	R-squared	=	0.7198
				Adj R-squared	=	0.7156
Total	84.9927536	137	.620385063	Root MSE	=	.42001

HFIAS_Cat	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	1.046082	.3807877	2.75	0.007	.2930012	1.799163
_hatsq	-.0092124	.0753636	-0.12	0.903	-.1582583	.1398335
_cons	-.053313	.4603122	-0.12	0.908	-.9636689	.8570429

Appendix 7. Omitted variable test

```
. ovtest

Ramsey RESET test using powers of the fitted values of HFIAS_Cat
      Ho:  model has no omitted variables
                F(3, 122) =      0.35
                 Prob > F =      0.7917
```

Appendix 8: Data collection tools

Questionnaire for the Selected Farm Households respondent

Dear respondent,

The main objective of this questionnaire is to collect primary data to undertake an assessment on gender difference on householder food security status in **Angolela Tera Woreda**. Your responses to the questions are valuable and will be held in utmost confidentiality to be used only for the analysis of this research. You will not be identified by name in any case.

1. General information

Date of the interview ----------(DD/MM/YYYY)

Interviewer name ----------

Supervisor name ----------

Checked on----------(DD/MM/YYYY)

District ----------Kebele----------Village----------

2. Household head Characteristics

1. Sex of the household head

0= Male ☐ 1= Female ☐

2. Age of the household head

……

3. Education level of the household head

0= illiterate ☐ 1= literate ☐

4. Marital status of the household head

0=Married ☐ 1=Divorced ☐ 2=Widow/widower ☐ 3=Never married ☐ 4. Other, specify

3. Demographic Characteristics

3.1. Age, sex and education status of household members

Name of members	Age of member s	Sex of member	Education level in grades	Are they help you in production	In which activity they involve
1.					
2.					
3.					
4.					
5					
6					

4. Socio economic Characteristics

4.1. **Are you engaged in crop production?**

1=Yes
2=No

If No, what is the reason?

1. Health problem
2. Absence of crop land
3. Shortage of labor
4. Shortage of input access
5. Others (specify) _____

If yes, answer the question under 4.2 and 4.3

4.2.Household's farm land size

Total land holding of household in last cropping season	**In Timad**	**In ha**
1 Total crop land		
2 Total forage land		
3 Total grazing land		
4 Total pasture land		

4.3.Type of crops produced and Income obtained from crop production in 2010/2011 E.C

No	Crop types	1. Yes 2. No	Amount of crop produced (Quintal)	Amount of Crop sold-out (Quital)	Income obtained (Birr)
1	Wheat				
2	Maize				
3	Teff				
4	Barely				
5	Sorghum				
6	Gerema				
7	Other, specify				

4.4. Land Rented

1. Have you rented any plot of land for agricultural purpose?
    1. Yes
    2. No
2. If yes, why do you rent the land?
    1. Shortage of agricultural land
    2. Excess agricultural labor
    3. To produce more for household conception
    4. Other (specify)_____
3. If No, why didn't rented agricultural land?
    1. I have sufficient agricultural land
    2. Don't have money to rent in agricultural land
    3. I don't want to rent
    4. Other (specify)_____
4. What did you pay for the land you rented in?
    1. Cash ----------amount of birr
    2. Sharing the produce
    3. Agricultural labor
    4. Other (specify) _____
5. Did you rented out your land last year?
    1. Yes
    2. No
6. If yes, why do you give your land for rented out?
    1. To get money for the purchase of agricultural inputs like improved seed, fertilizer
    2. Lack agricultural labor to undertake farm operation
    3. Lack of oxen
    4. To pay taxes
    5. Drought
    6. Other (specify) _____

7. What do you receive for the land you give rented out?
    1. Cash _____ amount of birr
    2. Share the produce
    3. Agricultural labor
    4. Other (specify)_____

4.4. Information on current Livestock ownership of the household

Do you own	**Response: 1=Yes 0=No**	Local (Number per Household)	Improved (Number per Household)	Total number of livestock	Remark
Milking cows					
Non-Milking cow (mature)					
Heifers					
Calves					
Bull					
Oxen					
Chicken					
Fatten oxen					
Sheep					
Goats					

4.5. Incomes from livestock production

Cash income from livestock production Type of product	**Unit**	**Quantity produced**	**Quantity sold(Q)**	**Unit price(P)**	**Total (P*Q)**
Milk					
Eggs					
Butter					
Cheese					
Others(specify)					
Sold livestock					
Total					

4.6. Source of off- farm and non-farm in come for your household in the 2010/11 E.C

Income source	**Response:** 1=Yes 0=No	**If yes, please tell us the amount of income obtained in Birr**
Craft		
trade		
Tree production		
Honey production		
Back yard vegetable production		
Other, specify		

5. Institutional characteristics

5.1. Access to credit

1. Have you ever taken credit in the last 2years? 1=Yes 0=No
2. If yes, amount of credit that you take ----------Birr
3. For what purpose did use credit you got?
    1. To buy agricultural inputs
    2. To For household consumption
    3. To buy livestock
    4. Others (specify) _____
4. Do you have any problems in getting credit?
    1. Yes 2. No
5. If yes, what is the nature of your credit problems?
    1. Bank loans not available
    2. Do not have required collateral
    3. Loans from informal sources not available
    4. Repayment terms are unfavorable
    5. Interest rates are too high
    6. Others (specify) _____

5.2. Access to input

1. Do you have access to farm input for food production?

   1. Yes 2. No

2. If yes, which inputs did you access?

   1= Fertilizer 2=Improved seed 3. Other, specify

5.3. Access to market

1. Do you have market access?

   1. Yes 2. No

2. Please tell us the distance from home to nearby market in km

   …….

5.4. Extension Service

1**.** Did you consulted by DAs in the last cropping season?

   1. Yes 2. No

2. If yes for how they helped you?

   1. Practical assistance at farm
   2. Demonstration
   3. Training at FTC
   4. Other (please specify) _____

3. Have you ever attended any demonstration or field days arranged by DAs or research center?

   1. Yes 2. No

4. Which institution was your first source of information about improved seed and fertilizer?

   1. BOA
   2. Other farmers
   3. Research center (BARC)
   4. NGOs (specify) _____
   5. Relatives **6**) other (specify) _____

6. Information on household food security (consumption and dietary diversity)

1. Please tell me what the household member consumed over the last seven days for **breakfast, lunch, and dinner.**

Food group	HDDS **0 or 1**	day 1	day 2	day 3	day 4	day 5	day 6	day 7
Any **cereal** crops? bread, wheat, teff, or any other foods made from millet, sorghum, maize, rice								
Any **root and tuber** crops? potatoes, sweet potato, yams, beat root, cassava or any other foods made from roots or tubers								
Any **vegetables**? Spinach, carrot, cabbage, pumpkin, beet root...								
Any **fruits**? Orange, apple, mango, pineapple, avocado, banana, lemon, strawberry.								
Any **beef**? Sheep and goat, chicken, or other organ meats?								
Any **eggs**?								
Any **fresh or dried fish**?								
Any foods made from beans, peas, lentils, chickpea, grass pea or nuts?								
Any cheese, yogurt, milk or other milk products?								
Any foods made with oil, fat, or butter?								
Any sugar or honey?								
Any other foods, such as condiments, coffee,								

7. Household Food Insecurity Access Scale (HFIAS) Measurement Tool

No	Question	Response Options	Code
1	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q1.1) 1=Yes	
1.1	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q2.1) 1=Yes	
2.2	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q3.1) 1=Yes	
3.3	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
4	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No (skip to Q4.1) 1=Yes	
4.1	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q5.1) 1=Yes	
5.5	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	

6	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q6.1) 1=Yes	
6.1	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q7.1) 1=Yes	
7.1	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q8.1) 1=Yes	
8.1	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (skip to Q9.1) 1=Yes	
9.1	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	

Checklists for Key Informants Interview (KII)

1. How is the food security Status of the household in Angolela Tera Woreda?
2. What are the main activates of your organization in household food security?
3. How do you assess the production and productivity in Woreda?
4. How do you characterize the food security situation of female headed household in the woreda in termers of food availability, access and utilization?
5. What are the roles of women in agriculture production?
6. Do female farmers get sufficient extension service and training from GO & NGO?
7. What are the changes/ improvements/ you observed the impacts on female headed household's food security status (households' dietary diversity and consumption patter)?
8. What are the constraints to be food secured?
9. Describe any social, economic and environmental problems in the district associated with food security?
10. What intervention must be used for better implementation in the future to increase the level female headed households of food security?

Checklists for focusing group discussion (FGD)

1. Are you aware of about food security? Is there any increasing or decreasing trend about the food security status of the household?
2. Did you get on food security and nutrition related training?
3. What are the major problems you think challenging on food security?
4. Does the income from agricultural and non-agricultural activities is enough to be food secured?

   If no what are the constraints?
5. What could be done for better improvement to increase the level women participation in agriculture production and their of food security situation?

For women affairs officer

1. How is your office role in household food security program in the woreda?
2. Do you give any capacity building training/orientations related to food security to female headed farmers? If yes, who do participate and how?
3. What roles do you play in female headed household to enhance their food security status?
4. What achievements or good practices have you documented thus far?
5. What problems do you see in the current status of food security in the woreda?
6. Please mention all problems associated to female headed household regarding to their food security status?
7. What intervention must be used for better implementation in the future to increase the level female headed households of food security?