



HAWASSA UNIVERSITY
COLLEGE OF LAW AND GOVERNANCE
SCHOOL OF GOVERNANCE AND DEVELOPMENT STUDIES

**DETERMINANTS OF RURAL FEMALE-HEADED HOUSEHOLDS' FOOD SECURITY
STATUS IN CHIRONE WOREDA OF SIDAMA NATIONAL REGIONAL STATE,
ETHIOPIA**

By

ZENEBE DAMENE DASSA

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SCHOOL OF GOVERNANCE AND DEVELOPMENT STUDIES (SGaDS)

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**MA THESIS SUBMITTED TO HAWASSA UNIVERSITY, THE SCHOOL OF
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OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN
DEVELOPMENT MANAGEMENT**

June, 2023

Hawassa, Ethiopia

DECLARATION

I, the undersigned, declare that this study entitled “*Determinants of rural female-headed households’ food security status in Chirone Woreda of Sidama National Regional State, Ethiopia*” is my own work. I have undertaken the research work independently with the guidance and support of the research advisor. This study has not been submitted for any degree or diploma program in this or any other institutions and that all sources of materials used for the thesis have been duly acknowledged.

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ADVISORS' APPROVAL SHEET

This is to certify that the thesis proposal entitled “**Determinants of rural female-headed households’ food security status in Chirone Woreda of Sidama National Regional State**” submitted in partial fulfillment of the requirements for the degree of Master of Arts in Development Management, the graduate program of the school of Governance and Development Studies, and has been carried out by Zenebe Damene Dassa under our supervision. Therefore, we recommend that the student has fulfilled the requirements and hence here by can submit the thesis proposal to the school.

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Final approval and acceptance of the thesis is contingent upon the submission of the final copy of the thesis to the School of Graduate Studies (SGS) through the Department/School Graduate Committee (DGS/SGS) of the candidate’s department.

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ACRONYMS

CSA:	Central Statistics Agency
DA:	Development Agent
CWADO:	Chirone Woreda Agriculture Development Office
CWFEDO:	Chirone Woreda Finance and Economic Development Office
DFID:	Department for International Development
FAD:	Food Availability Decline
FANTA:	Food and Nutrition Technical Assistance
FAO:	Food and Agriculture Organization
FGD:	Focus Group Discussion
FHH:	Female Headed Households
GDP:	Gross Domestic Product
HFIAS:	Household Food Insecurity Access Scale
IFAD:	International Fund for Agricultural Development
IFPRI:	International Food Policy Research Institute
ILO:	International Labor Organization
KII:	Key Informant Interview
SLF:	Sustainable Livelihood Framework
SNNPRS:	Southern Nations, Nationalities, and Peoples Region State
SPSS:	Statistical Package for Social Science
TLU:	Tropical Livestock Unit
UNDP:	United Nations Development Program
USAID	United States Agency for International Development
WFP:	World Food Program

ABSTRACT

The overall objective of the study was to investigate female headed household food security and its determinant factors of rural female headed households in Chirone Woreda of Sidama National Regional State, Ethiopia. The sample sizes of study were 144 female headed households which selected randomly from three kebeles of the study area. These kebeles were selected by using simple random sampling technique. The researcher had applied both quantitative and qualitative approaches and used multistage sampling techniques. The study used both descriptive and econometric statistics during data analysis. To assess household food security status, Household Food Insecurity Access Scale (HFIAS) was used. In addition to this, binary logistic regression model was used to determine factors affecting female headed household food security. The HFIAS output revealed that 40.97% female household heads were food secured, 15.97% female headed households were mildly food insecure, 18.75% female household heads were moderately food insecure and 24.31% female household heads were severely food insecure. The binary logistic regression result further depicted that for female headed household age, level of education, farmland size, TLU and non-farm activities had positive significant and total family size had negative significant on female headed household food security status. The study finding was significant at $p < 0.01$ and $p < 0.05$ level. The study also involves demographic, socioeconomic and institutional factors that had significant effect on female headed household food security in the study area. Finally, the study recommended that rural female headed households need special consideration and support to improve livelihoods as well as to enhance their food security status and livestock holding and cultivated land size play a crucial role by increasing food security.

Key words: Binary logistic regression, Chirone Woreda, Female headed household, Food security, Households Food Security Access Scale

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Food insecurity is a global hazard that is threatening every country of the world. Nearly 124 million people in 51 countries and territories experienced severe food insecurity at crisis levels or worse in (FAO, 2017). For this reason, food insecurity attracted attentions of many program implementers, policy-makers, and decision-makers (A. Sasson, 2012 and FAO, 2013). There are different factors contributing for food insecurity, such as social, economic, cultural and environmental conditions. In developing nations, interlinking factors aggravate the food security problem, including conflict, drought, poor infrastructure, lack of access to technology, low employment and low agriculture production (World Bank, 2015).

Ethiopia is one of the sub-Saharan African 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 Slaiero, 2010; CSA 2009). Agriculture is the major economic contributor, where it directly or indirectly supports people's livelihood, income and employment. Ethiopia's economy is dependent on agriculture, which accounts for 40% of the GDP, 80% of exports, and an estimated 75% of the country's workforce. However, just 5% of land is irrigated and crop yields from small farms are below regional averages. Market linkages are weak, and the use of improved seeds, fertilizers and pesticides remain limited. Despite these challenges, agriculture-led economic growth that is linked to improved livelihoods and nutrition can become a long lasting solution to Ethiopia's chronic poverty and food insecurity (USAID, 2017).

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 is 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). Despite the severity of constraints female headed households face in ensuring their food security, problems differ within and across regions due to the diversity of culture and social norms (Devereux *et al.*, 2006).

In contrary to the above concepts, this study, specifically, planned to investigate household food security status from gender perspective emphasized on female headed household in Chirone Woreda of Sidama National Regional State, Ethiopia. The intention for initiating this study was in one side the issue of the productivity and role of women is diverse in cultural settings. This depicted that the situation in some sectors of the country was not the same in the other corner of the country. Even if some similar studies for example, Lampietti and Stalker (2000), Ye (1998), and Haddad *et al.* (1996), 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. As a result, the prior studies considering as an input, this study touched a particular problem in study area of female-headed household food security status and its determinant factors. Furthermore, the study designed to investigate and identify determinate factors of female-headed household's food security in Chirone Woreda of Sidama National Regional State.

1.2. Statement of the Problem

Food insecurity is a global problem that world is struggling to address since decades back but still far away from a decisive victory. In this regard, FAO (2016) says despite undeniable progress in reducing rates of undernourishment and improving levels of nutrition and health, almost 800 million people are chronically hungry and about 2 billion suffer micronutrient deficiencies. It 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).

In Ethiopia, a number of the food-insecure population increasing from 5.6 million in 2016 to 8.5 million in 2017 (ACAPS, 2018). An estimated 3.6 million children and women in Ethiopia were acutely malnourished in 2017 (IFRC, 2018). The seriousness of food shortage problem in Ethiopia varies one area to another, depending on the state of the natural resources and the extent of development of food shortage (Mitiku et al., 2012).

In Ethiopia, agriculture is the basis for food production which 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 on female-headed households. Factors that affect household food security, especially in rural Ethiopia have been documented in some literature for example, Zerihun & Getachew, (2012); Fekadu, (2010); Mesay, (2008).

The Sidama National Regional State is one of the regional states in Ethiopia. It was formed on June 18, 2020 from the Southern Nations, Nationalities and peoples Region State (SNNPRS) and transformation of the Sidama Zone after a referendum vote in favor of increased autonomy in the 2019. The region is mostly known by food-insecure among regions of Ethiopia. Evidence recommends that food insecurity has prevailed and became more marked since 2002 according to Bureau of Statistics and Population (2006); Five Years Plan of the SNNPRS on Population and

Development held in Hawassa, Ethiopia. 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. Most studies for instance, Nigatu *et al.* (2011), focus on overall household food insecurity problems. Nevertheless, the situation, perspective and coping strategies of female-headed households is unique that deserve special attention. Thus, gender perspective is pertinent in examining 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).

The study area, Chirone Woreda, is characterized by high population pressures, lack of alternative employment opportunities, serious land degradation particularly sample kebeles, high dependency on agriculture based livelihood strategies as well as inappropriate utilization of land base resources which relatively lead to lessening of agricultural land and there by its production and productivity (CWADO report, 2021 and CWFEDO report, 2021). This showed that there were food insecurity problem in the study area. On the other hand, according to Woreda's report of Rural Agriculture Development Office (2020), areas are increasingly facing high population pressures resulting in fragmentation of farmlands, reduction of fallow periods, shifts in cropping patterns, reduced time spent in farming and land degradation.

Chirone Woreda is also one of the most food insecure Woreda in Sidama national regional state. The Woreda embraces one-third of female headed households who are under PSNP support scheme according to the Woreda's safety net data document (PSNP, 2020). According to data from the Woreda's health office (2020) female-headed households are more vulnerable to food insecurity and malnutrition than male-headed households. Moreover, female-headed households who are under malnutrition in the study area are given protein contented foods (CWHO, 2020). Thus, it is essential to investigate determinate factors influencing rural female-headed households' food security status in the study area so as to get insight from it and learn useful experience.

Most of the studies carried out of national level like Sintayehu and Abere (2022), and related studies like Zeleke *et al.* (2016) and Adane, Degefa and Berhanu (2020) conducted in former Sidama Zone in the case of Boricha Woreda, which tried to identify and analyze determinants of rural overall households' level food security status. Their studies did not give due emphasis on female-headed households' food security status. In this regard, there is no research has been conducted in the study area concerning female headed household food security status. Due to lack of in detail study conducted in considering the rural female-headed households, the critical factors causing food insecurity is yet remains not clearly determined in the case of Chirone Woreda. The purpose of this investigation is, therefore, attempts to fill in such gaps which failed to show a broad image of the problem under the study area. To the best of our knowledge, also there was no published research done on assessing those determining factors in this particular Woreda. This problem motivates the undertaking of this study to further investigate and analyze the determinants of rural female-headed households' food security status. Therefore, this study tried to fill the research gap by generating evidence on female-headed households' food security status and identified determinate factors of household food security in the study area.

1.3. Objectives of the Study

1.3.1 General objective

The general objective of this study was to investigate food security status and its determinant factors of rural female headed households in Chirone Woreda, Sidama National Regional State.

1.3.2 Specific objectives

The specific objectives of the study were:

1. To assess food security status of female-headed households in the study area.
2. To compare the background characteristics of food secured and insecure female headed households in the study area.
3. To analyze the determinate factors that influence female-headed household food security status in the study area.

1.4. Research Questions

1. What is food security status of female-headed households looked like in the study area?
2. What are the differences in background characteristics between food-secure and food-insecure female headed households in the study area?
3. What are the determinate factors that influence food security status of female-headed households in the study area?

❖ Research Gaps

The researcher read and reviews so many researches, article journals, as well as unpublished documents related with rural poverty and food security from world perspective in general. Several studies were conducted on causes of food insecurity in Ethiopia. According to Abdusalam A. (2017), a number of factors can explain the trend towards the increasing food insecurity situation in Ethiopia such as environmental degradation, high population growth, diminishing land holdings, and chronic shortage of cash income, lack of on-farm technological innovations.

Factors that affect household food security, especially in rural Ethiopia have been also documented in some literature for example, Zerihun & Getachew, (2012); Fekadu, (2010); Mesay, (2008). The studies of Sintayehu and Abere (2022), and related studies like Zeleke *et al.* (2016) and Adane, Degefa and Denu (2019) conducted in former Sidama Zone in the case of Boricha Woreda, is focused on determinant factors of rural overall households' level of food security status. Contrary to their studies, the researcher found that determinants of rural female-headed households' food security status were not studied in the area. This is one of the gap that the researcher initiated to conduct research entitled determinants of rural female headed households' food security status in the study area.

Additionally, education level of the households as independent variable was found in missing variable to identify either it would have positive or negative significance in relations of rural female-headed household food security status in the study area. According to researcher reviews, some studies like Samirawit A. *et al.*, (2021) the education level of households was not considered as determinant factors of food security. So that, researcher also interested to fill this gap by counting education level of the households to analyze either it affects food security status positively or negatively.

On the other hand, female-headed households' food security status and its determinate factors were not studied in the study area. According to Woreda's safety net data document (PSNP, 2020), CWADO report, (2021), CWFEDO, report, (2021); and CWHO annual report, (2020) food insecurity situation is seen as a problem, but still there were not assessment studies and researches conducted to identify and analyze determinants of rural female-headed households' food security status. Regarding reports of Woreda, female-headed households are more vulnerable to food insecurity. This is another motive that a researcher comes up with particular study to investigate food security status and its determinant factors of rural female 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-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 specify 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. Moreover, the result provides better understanding for subsequent researchers and academicians that would be of help at local and national level development planning.

1.6. Scope of the Study

In order to make the study more manageable, it was delimited geographically and conceptually. Geographically, the study covered Chirone Woreda in Sidama National Regional State. Conceptually, this study was purposively delimited to investigate household food security status and the determinant factors of rural female headed households.

1.7. Limitations of the Study

This study faced the following limitations. Such as; respondent's lack of willingness to fulfill questionnaire and interviewees were busy by their own work to be interviewed; absence of related literature which conducted on the same issue and shortage of internet access to get more references; time and budget constraints as well as shortages of transport access. Thus, due to these factors, the study limited in providing more holistic and wide-ranging results from different view-points. In order to resist the above mentioned limitations, the researcher tried to take some measures. For instance the researcher tried to plan and meet each respondents during the time at which they were free, take permission from his working office to get more time and reduce work load for the effective work of the study.

1.8. Organization of the Study

This research was organized in five chapters. The first chapter dealt with the introduction part which includes the background of the study, statement of the problem, objectives, research questions, significance of the study, scope and expected limitations of the study, and organization of the study. Chapter two is all about review of related literature regarding food security status. It also encompasses conceptual literature review, theoretical literature review, empirical literature review and conceptual framework of the study. The third chapter described research methodology and description of the study area. It further presented research design and method, sampling techniques and procedures, data types and sources, methods of data collection, methods of data analysis, description of dependent and independent variables as well as ethical consideration. The fourth chapter discussed results and discussion of the study. Moreover, it dealt with socio-economic and demographic characteristics of female-headed households, food security status of female-headed households, food security status comparisons of respondents, and determinants of food security status of rural female-headed households. The fifth chapter contracted with summary of major findings, conclusion and recommendations of the study.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. CONCEPTUAL LITERATURE REVIEW

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 1974 a 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 dimensions of food security, those pillars are food availability, accessibility, utilization and stability and each are defined as follows.

Food availability refers to the physical existence of food, be it from own production or on the markets. On national level food availability is a function of the combination of domestic food stocks, commercial food imports, food aid, and domestic food production, as well as the underlying determinants of each of these factors. Use of the term availability is often confusing, since it can refer to food supplies available at both the household level and at a more aggregate (regional or national) level. However, the term is applied most commonly in reference to food supplies at the regional or national level (Riely *et al.*, 1999 cited in Robert, 2013).

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 through food production and income generation activity. Food access is ensured when communities and households and all individuals within them have adequate resources, such as money, to obtain appropriate foods for a nutritious diet (Riely *et al.*, 1999 cited in Robert, 2013).

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. Utilization has a socio-economic and a biological aspect. If sufficient and nutritious food is both available and accessible the household has to make decisions concerning what food is being consumed (demanded) and how the food is allocated within the household. In households where distribution is unequal, even if the measured aggregate access is sufficient some individuals may suffer from food deficiency (Robert, 2013).

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 exposes 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 as follows.

2.1.2.1 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).

2.1.2.2 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 THEORETICAL LITERATURE REVIEW

2.2.1 Food security theories

With the advancement of the food security concept/issue to the mainstream development agenda, there comes various theories or approaches that provides explanation on different aspects of it such as how and at what level should its analysis, measurement and focus be. As argued in Burchi and De Muro (2012) this, the way food security is theorized, measured, and finally analyzed, is important as it affects the typology of policies to be adopted. Some of these theories of food security have been briefly discussed below.

2.2.1.1 Food Availability Decline

Food Availability Decline (FAD) is considered as the oldest and still functional theory whose origin is, arguably, traced back to Thomas Malthus's work of 1789. As it goes in Malthusian tradition, the focus of this theory is on the (dis)equilibrium between population and food and argues that in order to maintain the equilibrium, the rate of growth of food availability should not be lower than the rate of growth of population (Burchi and De Muro, 2012). However, Degefa (2005) disaggregates the FAD theory into two set of theories: climatic theories that links food shortages with natural calamities such as flood and draught and demographic theories that focuses on the nexus between food availability and population growth. The climatic theories link food insecurity with such natural causes like drought and flood. According to Degefa (2005), climatic variables can lead to famine, specially, in rain –fed agricultural areas by causing crop failure, as well as, by adversely affecting other assets of livelihood among subsistence farmers.

Degefa (2005) points out the existence of two divergent and competing theories regarding the relationship between population growth and food availability. The first one focuses on comparing the relative pace at which population and food or means of subsistence increases and argues that while population grows 'geometrically', production and means of subsistence increase only 'arithmetically' with the clear outcome of such imbalance is inducing hunger and other forms of human poverty and misery. This outlook falls in the line of Malthusian thinking and a bit criticized by writers like Devereux (1993) in Degefa (2005) for its failure to foresee the mediation effect of technological improvements such as production, distribution, and communication technologies. This, the claimed, loophole of the Malthusian theory has given impetus for the emergence of alternative views regarding the population and food availability linkage: the Marxist line of thinking that associates food insecurity with the structure of society and the theory of Ester Boserup that argues for the positive effect of population on agricultural production. As indicated in Degefa (2005), Boserup (1965) sees population growth as a force leading to adoption and diffusion of technological innovation that expands agricultural production, thereby reducing vulnerability to food insecurity and hunger.

Though there exist such divergent views under it, food security in the context of FAD theory in general is a matter of aggregate or per capita food availability (Alamgir, 1980 in Degefa, 2001, Burchi and De Muro, 2012) and the focus is merely on food production or supply side variables

(Deverux, 1993 and Sen, 1981 in Tagel, 2012). According to Burchi and De Muro, (2012), achieving availability depends mainly on food production and stocks and also through food trade in the context of open economy. In terms of the level of analysis, the focus of food availability theory is at macro level including the whole globe, a nation or particular sector such as agricultural sector. When it comes to measurement, Food Balance Sheet is a commonly utilized tool for food availability assessment (FAO, 2001 in Burchi and De Muro, 2012).

2.2.1.2. Income based approach

Income-based approach emerged as a critique to FAD whose focus is, as claimed, narrowly on the agricultural production. The FAD approach has been criticized for losing a sight about the interdependent nature of various sectors of the economy and viewing food insecurity as the problem of agricultural sector/production alone (Burchi and De Muro, 2012). In effect, the income based approach broadens the analysis of food security by shifting the attention to national economies as a whole and by bringing into the analysis such variables as Gross Domestic Product (GDP) and economic growth.

Moreover, it has brought a shift from food availability at macro-level to income at micro-level. Here, food insecurity is implicitly assumed as a sub-category of poverty, often referred to as “food poverty”, representing lack of enough income necessary to buy at the given conditions the amount of food required. In particular, the different food items are converted into calories and if people’s calorie availability is lower than a threshold identified by international nutritionists, they are considered food insecure (Sibrian *et al.*, 2007 and Sibrian, 2008 both cited in Burchi and De Muro, 2012). With this, the level of analysis of food security is stretched down to the individual and/or household level with income and expenditure approach being a means of estimating the calorie level consumed. However, the problem with this approach is the difficulty of getting reliable income or expenditure data in the subsistence agricultural economy where people get part or all of their food from own production (Maxwell and Smith, 1992). A related problem of income based approach as argued in Burchi and De Muro (2012) is that it requires making several assumptions to logically move, step-by-step, from income or expenditure to food security. That is, to move from income/expenditure to food through price per unit information; then from food to calorie through equivalence tables; and lastly, from calorie availability to food security/insecurity depending on the threshold.

2.2.1.3 Basic needs/food first/ approach

The basic needs approach emerged in 1970s as alternative to ‘growth models’ for dealing with poverty and inequality (Degefa, 2005). According to Burchi and De Muro (2012), this approach was proposed by the International Labor Organization (ILO) as new model of development. For the proponents of the basic needs approach, development is a process aiming at the satisfaction of basic needs of all people.

Though, the list of basic needs outlined by various authors varies slightly, food has emerged as the dominant basic need under this approach. This can be evidenced from the argument of Magrabi *et al.* (1991: 65) cited in Burchi and De Muro (2012) that “food is a basic need – probably the most basic need of all”. The Maslow’s Need Hierarchy Theory based assertion of Handy (1985:30) quoted in Maxwell & Smith (1992:28) as “Lower order needs are dominant until satisfied, whereupon the higher order needs come into operation ... if you are starving, your needs for esteem or status will be unimportant; only food matters” and the argument of Hopkins (1986:4) also quoted in Maxwell & Smith (1992:28) as “--- Access to necessary nutrients is fundamental, not only to life per se, but also to stable and enduring social order” can also be regarded as arguments supplementing the primacy position that food holds relative to other human needs. Generally, the basic needs based discourse in development literature has heavily affected the debate on food security by giving birth to what is called *food first* view (Burchi and De Muro 2012).

This approach considers food as a dominant basic need and priority element of food security.

The framework focuses directly on whether people eat enough food and with this it contributed for further shifting of the analysis of food security from national/macro level to micro-level. The food security analysis methods such as food frequency assessment, direct observation of food consumption, and dietary diversity score fall under this framework and both individuals and households can be used as unit of analysis in the approach (Burchi and De Muro, 2012)

2.2.1.4. Sustainable livelihoods approach

Sustainable Livelihood Framework (SLF) is general approach to the analysis of development issues such as poverty and food security. According to Burchi and De Muro (2012), the emphasis on livelihood started in the 1980s by Chambers (1983) who introduced the basic elements of this

approach, with a focus on rural development and poverty. Ellis (2000:10) cited in Devereux (2004) conceptualizes livelihoods as “the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by individual or household.” Chambers (1988) cited in Maxwell and Smith (1992) defined livelihood as adequate stocks and flows of food and cash to meet basic needs and linked sustainability with the maintenance or enhancement of resource productivity on the long term basis. A more comprehensive definition of sustainable livelihood is found in Chambers and Conway, (1991, p.6) in LIFT and USAID (2011:8) and Chambers and Conway (1992) in WFP (2009: 24) which says: “A Livelihood comprises the capabilities, assets (stores, resources, claims, and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels in the short and long term.”

The sustainable livelihood framework is more comprehensive approach as it includes the main tents of other approaches such as basic needs and entitlement approaches. It focuses both on gaining the living or necessities of life like basic needs approach and on means of securing living as the case in entitlement approach (Burchi and De Muro, 2012). At the core of SLF is assets commanded by a household, which are very similar to the concept of “endowments” in the entitlement approach. The assets are classified into five categories: natural capital, physical capital, human capital, financial capital, social capital (Ellis, 2000 in Juma, 2009, LIFT and USAID 2011, Burchi and De Muro, 2012, Maxwell and Smith, 1992,). The SLF also explicitly gives attention to the broader context such as political, economic, physical, social, and cultural and is also known for its long term perspectives. These features of it together with the consideration of household assets mentioned here has brought about three interrelated concepts to the analysis of food security: the concept of vulnerability, the idea of sustainability, and coping strategies that represent a set of activities that are undertaken by a household in response to shocks affecting food availability. The framework enables assessment of food security at micro level and household and community is the commonly used unit of analysis (Burchi and De Muro 2012).

2.3. EMPIRICAL LITERATURE REVIEW

2.3.1. Food Security Situation in Ethiopia

Research in food and nutrition security attracts the attention of academicians, policymakers and practitioners around the world in large part as the consequences of food insecurity affect almost every facet of society (Feleke, 2019). This reveals that the food insecurity problems of Ethiopia are very high, indicating that intervention mechanisms need to be designed through evidence-based research.

Food insecurity could be a critical challenge for rural households in Ethiopia, different studies on different parts of the country indicate that the most sources of food insecurity within the country are drought and weather related shocks and disasters. It is also 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 distinctive and spatial characteristics. The specific food security studies by Zegeye and Hussein (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.

2.3.2. 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).

2.3.3. Determinant factors of household food insecurity situation

Identifying the determinants of food insecurity requires exploration of the contributing factors for the main features of food security. It is essential to investigate the determinants of both the availability or/and access to food; the two broadly studied dimensions of household food security (Silvestre *et al.*, 2015).

The availability of food depends on factors determined by the demand-side, while the supply-side determines factor contributing to the access to food. As a result, factors that trigger variations in both the demand and supply of food would additionally influence the availability access to food respectively. This eventually results in food insecurity. Food insecurity at the household level is related to several factors, including poverty, low income, level of education, household size, employment status, age, the type of household head(gender) and food price (Bashir *et al.*, 2013). Understanding the characteristics and determinants of household food insecurity is crucial to developing policies that address the challenges associated with household hunger and food insecurity (Ihab *et al.*, 2015).

Several studies were conducted on causes of food insecurity in Ethiopia; some of those are the following. According to Abdusalam A. (2017), a number of factors can explain the trend towards the increasing food insecurity situation in Ethiopia. The interaction between environmental degradation, high population growth, diminishing land holdings, outbreak of plant and livestock disease, chronic shortage of cash income, poor social and infrastructural facility, instability and armed conflicts, pre and post-harvest crop loss and lack of on-farm technological innovations led to a significant decline in the productivity per households and cause food insecurity and starvation. These trends have combined with the repeated effects of drought over years, to substantially erode the productive assets of rural households.

Food insecurity in Ethiopia is caused by population pressure, drought, shortage of farmland, lack of oxen, deterioration of food production capacity, outbreak of plant and animal disease, poor soil fertility, frost attack, shortage of cash income, poor farming technologies, weak extension services, high labor wastage, poor social and infrastructural facility and pre and post-harvest crop loss (Birara *et al.* 2015).

The finding of Echebiri *et al.*, (2017) also showed that the food security status of the rural households was influenced by years of education, credit access, farm size, monthly income, age and family size. Access to agricultural extension services, off-farm income, and number of oxen, total land size and safety net participation were determinants of household food insecurity (Negash & Alemu, 2013). Household food insecurity was affected by family size, total income, and distance from the market, total livestock holding, and losses of crops (Yehuala *et al.*, 2018).

Also investigators such as Mut (2013), Abafita and Kim (2014), and Dendir (2014) also identified tropical livestock units, number of oxen and total land size as determinants of food security status of rural households in Ethiopia, respectively.

According to Wondim *et al.*, (2022), there are several determinants that influence rural household food security status such as age of household, sex, total family size; total farmland size, TLU, on-farm/off-farm income, market distance and access to training in Ethiopia.

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).

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.

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.

Considering the gender aspect, female-headed households in South Africa have not only been found to be food insecure but also distinguished and marred with other socio-economic mishaps. Mncayi and Dunga, (2017) looked at determinants of housing insecurity in South Africa and found that female-headed households were most likely to fall in the category of those being severely household insecure. Similarly, a female-headed household was also found to be poorer.

2.4. CONCEPTUAL FRAMEWORK OF THE STUDY

This section summarized the framework or the model of the study in terms of variables relationships. The framework constructed based on different studies and researches that household food security could be influenced by a variety of factors. 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, and institutional factors. Likely, this framework of the study contains similar factors that mainly determined the household food security and agriculture production. These included the demographic characteristics of household head's such as age, sex, marital status, and household size that had played a big role in increasing of the rural female headed households food security. Socioeconomic factors that related to social activities and capital of rural female-heads like of farmland size, the household total livestock unit, land holding, education level, farming experience and engagements with off-farm activities as well as income distribution. The other factor related with female-headed household food security are institutional factors category included access to credit, access to market, farm inputs, access to irrigation and access to extension services. All these factors had either positive or negative implication to increase food production and household income related with female-headed household food security.

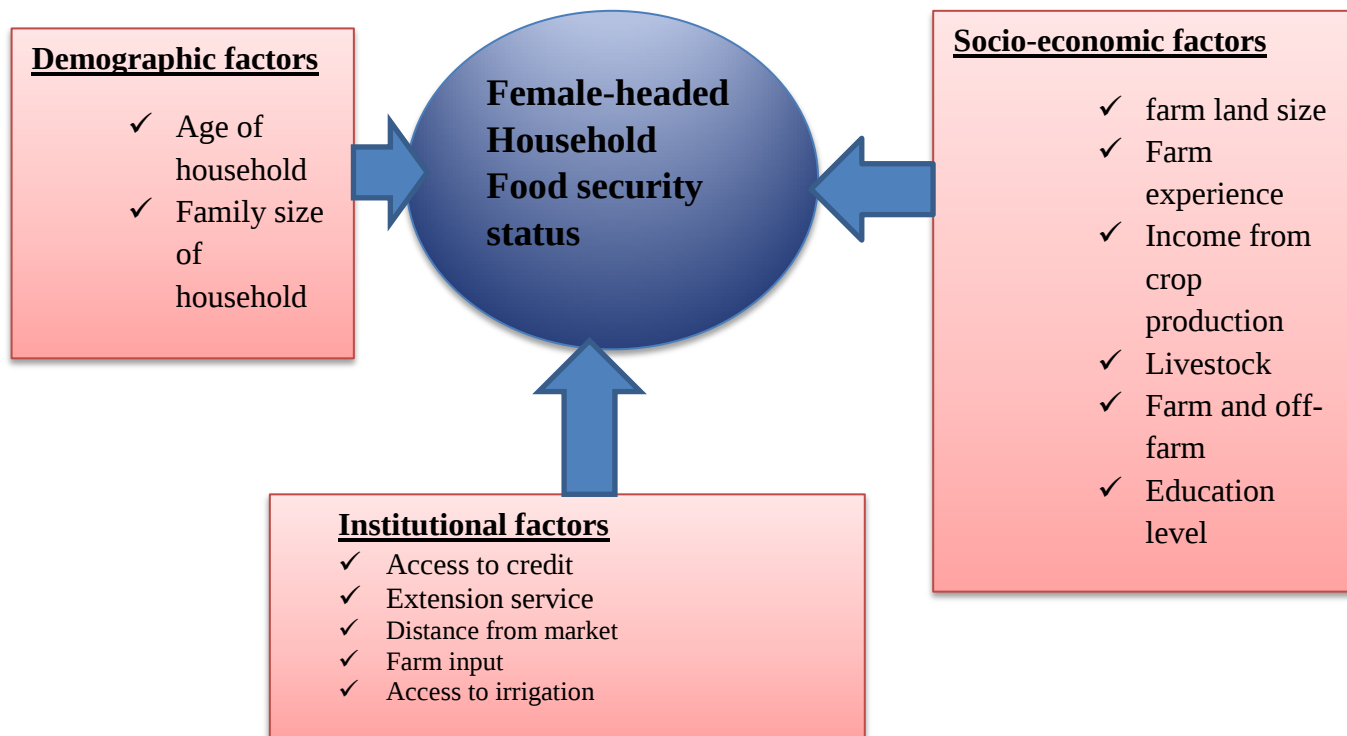


Figure 2.1: Conceptual framework of the study

Source: Developed by the researcher based on literature review, 2023

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Description of the Study Area

This study was conducted in Chirone Woreda of Sidama National Regional State, Ethiopia. It is one of Woreda's among 36 Woreda in Sidama National Regional State. It is far away from capital city of Hawassa by 112km. Chirone Woreda is bordered on the south and south east by the Oromiya regional state, Bore Woreda, north by Hula Woreda, and on the east by Bona Zuria Woreda. This Woreda has latitude and longitudes of 6°45'N 38° 64'E respectively and an elevation between 2537m and 8323m above the sea level. The Woreda comprises 9 kebele. The Woreda is further divided into 7 rural and 2 urban kebele for administrative purposes. The administration center of the Woreda is located in Chirone town (CWOA, 2021).

3.1.1 Population growth and pattern

According to Chirone Woreda Finance and Economic development Office, the total population of the Woreda is 52,765 persons, out of which 27693 (52%) were males and 25,072 (48%) were females (CWFEDO, 2021). From the total population of the Woreda, 14765 were households and the average household size is 6. The area of study is 276 km² and the average density of 189 persons per km².

3.1.2 Climate

The Chirone Woreda is generally categorized into Dega and Woina Dega agro-climatic zone. The annual average rainfall is estimated to vary from 1200mm to 1700mm and the annual average temperature varies from 15°C to 27°C. There are two agricultural crop production seasons in a year in Belg (short rainy season) occurs from May to in Meher (long rainy season) while occurs from June to mid of November. From end of November to mid of February was a dry season in the area.

3.1.3 Economic activities of the study area

The residents of the Chirone Woreda are engaged in different economic activities. The major sources of the income in the Woreda are crop production, livestock rearing and rarely mixed agricultural activities. The major crops produced in the Woreda are maize (*zea mays* L), Haricot bean (*phaseolus vulgaris*), potato, wheat, barely, Teff, and apple. Household who live in the Woina Dega are dependent on maize and haricot bean production while in the mid highlands (woynadega), Enset (*Ensetventricosum*), maize and potato are largely produced. Haricot bean (*phaseolus vulgaris*) is produced for market while maize and Enset (*Ensetventricosum*) are produced for both consumption and market. The live stocks reared in the study area are cattle; sheep, goat, horse and donkey and they have significant contribution for income (CWADO, 2021).

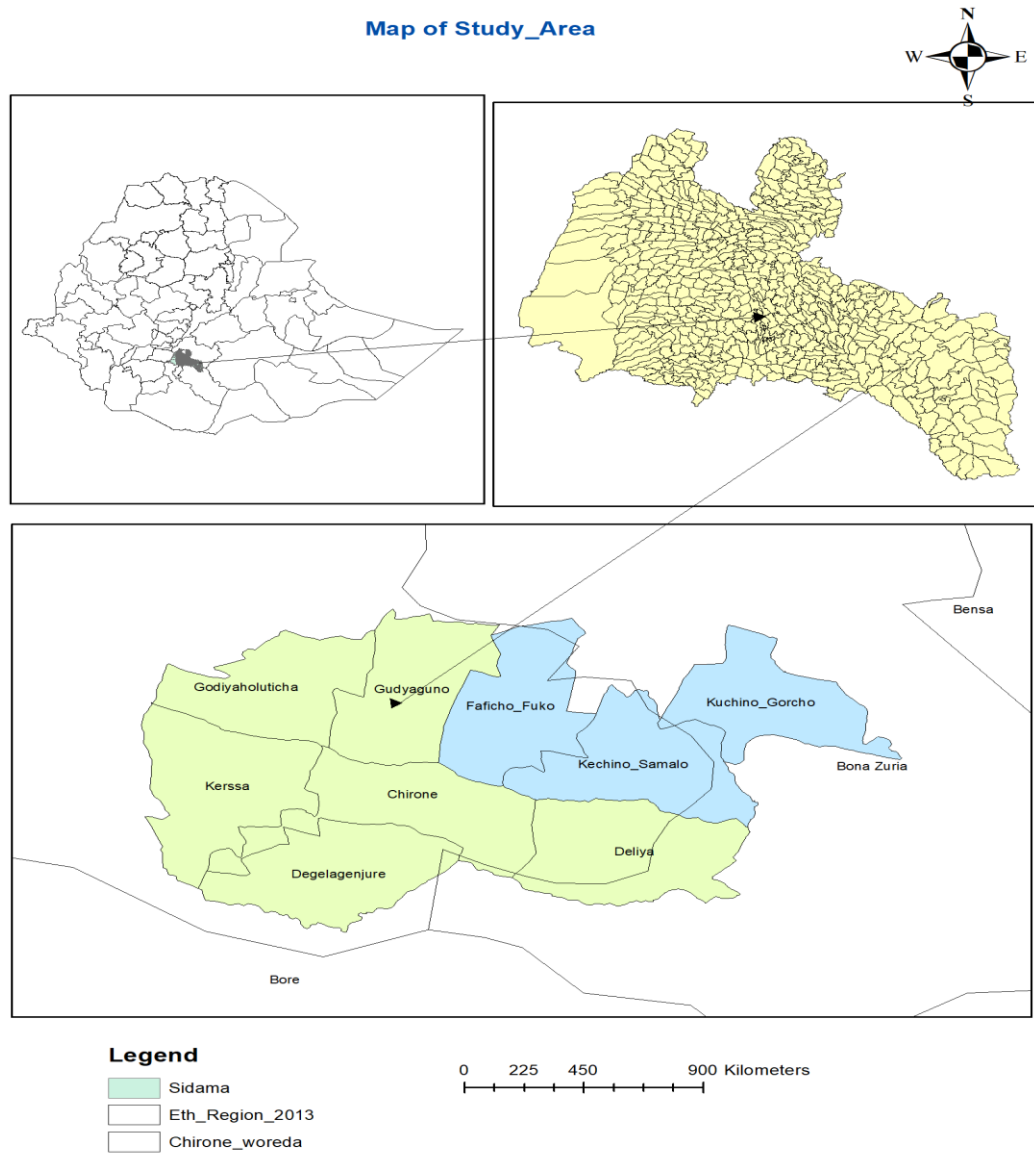


Figure 3.1: Map of the study area

Source: Sidama National Regional State Plan Commission, 2023

3.2. Research Design and Method

This study used cross-sectional research design which helped researcher to compare different variables at the same time. The researcher applied both qualitative and quantitative approaches. Qualitative and quantitative research methodologies, as Bryman (1988) argues, are “simply denotations of different ways of conducting social investigations and which may be conceived of as being appropriate to different kinds of research questions.” On the other hand, Deacon (1999: 114) suggests using “more than one analytical method has the advantage that the weaknesses of any single method qualitative or quantitative are balanced by the strength of other methods.” He further affirms that “the use of different methods that are appropriate to the different stages and focuses of a research work is a key step towards achieving reliable and valid data, figures, opinions and topic specific information” (ibid: 116).

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 tips 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.

3.3. Sampling Techniques and Procedures

This study had applied multistage sampling techniques. In the first stage, the study area, Chirone Woreda, was selected purposively taking into account available resource and time constraints. In the second stage, three kebeles were selected out of 9 kebeles in Chirone Woreda by using simple random sampling technique. These kebeles were Kachino Gorcho, Kachino Samalo and Faficho Fuko. In the third stage, households of female-heads in each kebele was grouped with different variables such as age, level of education, farming experience and income of household. From the sampling frame, a total of 144 sample female farm households were randomly selected with probability proportional to sample size. From kachino-Gorcho 54, Kachino-Samalo 70 and Faficho Fuko 100 female headed households were participated in the study as observed in the following Table 3.1. Hence, there are several ways for determining the sample size and for this study the researcher used a simple formula from Yamane (1967) to determine the sample size.

Yamane provided a simplified formula to calculate sample sizes. This formula was used to calculate the sample with a 95% confidence level and $e = 0.5$ are assumed (Yamane, 1967 cited in Glenn, 1992). The formula is depicted as follows; the basis for determining the sample size in each option is the level of precision or sampling error, the confidence level and the degree of variability in the attributes being measured. Since the population is large the following simplified formula was applied.

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

Where: N = Population Size

n = Sample Size

e = Precision (Sampling Error) at 5%

Accordingly, to determine sample size the researcher assumed option 2. In this scenario the researcher assumed the confidence level, the degree of variability and the sampling error as follows: Confidence Level = 95%

Degree of Variability = 50% (Maximum Variability)

Sampling Error = $\pm 5\%$

Total Population = 224

The sample size is computed as follows:

$$n = N / 1 + N(e)^2$$

$$n = 224 / 1 + 224(0.05)^2$$

$$n = 144 \text{ Households}$$

Table 3.1: Distribution of sample households to each sample kebele

Name of selected kebeles	Population of female-headed households	Sample of female-headed households
Kechino_Gorcho	54	28
Kechino_Samalo	70	36
Faficho-Fuko	100	60
Total	224	144

Source: Chirone Woreda Land Management Office, 2022

3.4 Types and Sources of Data

In this study, both primary and secondary data sources were used.

3.4.1. Primary Data

The primary data was collected through household survey method using a structured questionnaire. Before starting the actual data collection, the questionnaire was pre-tested on the basis of the results obtained; the necessary modifications were made to the questionnaire. The female headed households were asked about food security status and related issues to gather quantitative and qualitative data relating households' demographic, socio-economic and institutional characteristics including asset possession, off-farm/non-farm income, and livestock holding. The primary data was also gathered through focus group discussions and key informant interviews.

3.4.2. Secondary Data

Secondary data sources were collected from offices of agriculture in Sidama National Regional State and study Woreda and from Development Agents (DAs) of offices and kebele administration offices of the study areas. Furthermore, secondary data was collected from literatures related to gender and food security issues and also obtained from published and unpublished materials, such as internet, books, magazines, reports and journals.

3.5 Methods of Data Collection

For this study data were assembled by using household survey questionnaires, focus group discussions and key informant interviews and these are explained as follows.

3.5.1 Household survey questionnaire

The household's survey was used to generate quantitative data regarding household characteristics and proved important understandings into people's food security status, and compares background characteristics of food-secured and food-insecure female headed households. Coates et al. (2011) states that, the household survey used to assess the prevalence of household food insecurity in resource poor areas.

The questionnaires were administered with selected 144 sample households by using standard procedures after obtaining the consent of the respondents as a research ethics. The types of questionnaires were close-ended and open-ended questions to collect necessary data. The close ended questions were designed to obtain accurate information as relevant to the objectives of the study and the research questions. On the other hand, open-ended questions were also administered to enable respondents to express their opinion and views in a comprehensive manner with attempt to collect adequate information.

The questionnaire was designed to gather quantitative data relating to demographic characteristics particularly age and family size, access to asset, as well as types and amount of food consumed by female-headed households in a specific period. Regarding socio-economic characteristics, questionnaires like farmland size, livestock ownership, farm and off-farm activities and farm experience were prepared and asked to obtain relevant information. Furthermore, institutional factors such as use of farm inputs, access to credit, access to extension service, utilization of irrigation and access to market questionnaires were employed and information was collected from sampled households using structured schedule.

To achieve the validity of data collection instrument, the questionnaires were prepared in English. It was carefully articulated to ensure clarity, to avoid bias and to get reliable information. Then it was checked the language in order to comment the extent to which the items are appropriate in securing relevant information to the research. Questionnaire-based survey was administered to sample households by using a standard questionnaire after obtaining the consent of respondents as a research ethics. The questionnaire was translated in to Sidama language for the purpose of

simplicity and ease of communication between the enumerators and the respondents. Enumerators were oriented on issues related to data collection, procedures and ethics. 14 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.

3.5.2. Focus group discussion (FGD)

To increase the reliability of data, Focus group discussion (FGD) was organized in each selected kebele with 6 participants to generate additional information on the status of female-headed households' food security and its determinants of the area. Three FGDs were conducted; one focus group discussant in each sampled kebele and efforts had made to include elders, female-headed households, DAs, and the youth. Structured and unstructured checklists were prepared. Purposive sampling technique was used to select participants of the group discussion. The discussants respectfully requested for their consent, time and the information before the discussion. During the discussions, issues related to gender perspective challenges in female-headed households' food security, land access and adequacy household agriculture production, public services, and the existing support to women from the government and NGOs were addressed.

3.5.3. Key informants interviews (KIIs)

Semi-structured interview questions were employed as a tool of data collection. The purpose of this tool was used to triangulate and strengthen research findings which were gathered through a quantitative approach to investigate determinants of food security status in the study area. The in-depth interview was held with key informants and they were administered by the researcher to generate necessary information on the background and socio-economic characteristics of sampled households.

To generate necessary data structured and unstructured interview was conducted with three (3) kebele managers, three (3) agriculture extension experts, four (4) women affairs administrators two(2) cooperative officers, one (1) micro finance officer and two (2) from Woreda office of agriculture managers based on the objectives of the study. Key informants were selected purposively because of their experiences and profession. Various government officers were

identified based on their responsibilities in implementing and supporting agricultural production. The interview was conducted in face-to-face contact by researcher based on a predesigned checklist. The information collected from KIIs was used to triangulate and increase reliability of the data collected by other techniques.

3.6 Methods of Data Analysis and Presentation

The collected data was edited, coded and entered into the computer using Statistical Package for Social Science (SPSS) software version-26. Then, the data were analyzed using quantitative and qualitative methods. The quantitative data collected through household survey questionnaire were analyzed using descriptive statistical methods such as frequency, percentage and mean. Moreover, inferential statistics like Chi-square test and econometric models (Binary Logit model) were used to identify the determinants of food security status in the study area. Quantitative data were managed and analyzed mainly using SPSS statistics version- 26 software. Qualitative data collected through focus group discussions and key informant interviews were qualitatively analyzed using narrative for triangulation. Opinions and explanations of the discussants and informants described and recorded and used to strengthen the quantitative information.

3.6.1 Analysis of Food Security

To examine 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. In this study, Household Food Insecurity Access Scale (HFIAS) measurement tool was applied and explained as follows.

Household Food Insecurity Access Scale (HFIAS)

Over the past several years, USAID's 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 (example, did you worry that your household would not have enough food?) and others ask about the respondents' behavioral responses to insecurity (example, 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.

This 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. Its 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.

3.6.2. Specification of the Model

3.6.2.1 Binary Logistic Model

Logistic regression is used to predict a categorical (usually dichotomous) variable from a set of predictor variables. With a categorical dependent variable, discriminant function analysis is usually employed if all of the predictors are continuous and nicely distributed; Logit analysis is usually employed if all of the predictors are categorical; and logistic regression is often chosen if the predictor variables are a mix of continuous and categorical variables and/or if they are not nicely distributed (logistic regression makes no assumptions about the distributions of the predictor variables).

Binary logistic regression is a type of regression analysis where the dependent variable is a dummy variable (coded 0, 1). The logistic distribution is an S-shaped distribution function (cumulative density function) which is similar to the standard normal distribution and constrains the estimated probabilities to lie between 0 and 1. 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 predictor's effects on the dependent variable.

For this study analysis, before entering the variables, contingency coefficient (CC) and variance inflation factor (VIF) were calculated for dummy and continuous independent variables, respectively, to check the multi- collinearity problems. 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). Thus, in this study binary logistic regression model was used to estimate the relationship between the dependent and independent variables. Binary logistic 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 binary 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. Thus, this linear regression formula was accepted like, $Y = \beta_0 + \beta_1 X_1 + \dots + \beta_x K_x$ where each X is a predictor and each β_1 is the regression coefficient. Remember that for binary logistic regression, the dependent variable is a dichotomous (binary) variable, coded 0 or 1. So we express the regression model in terms of the Logit instead of y.

$$\text{Logit} = Li = \beta_0 + \beta_1 X_1 + \dots + \beta_x K_x \dots \dots \dots (1)$$

3.6.3. Definition of dependent and independent variables

3.6.3.1. Dependent variable

Under this study, the dependent variable used in the analysis of female headed household is “food security status”, which was expected to be affected by different factors that include demographic, socio-economic, environmental and other different resources.

It had two possible outcomes. Firstly, there are probabilities of female-headed households were food secured and secondly, there is a probability of female-headed households were food insecure. Such variables are characterized as dichotomous and these two outcomes were coded 1 and 0 respectively.

3.6.3.2 Description of independent variables

Under this study, the independent variables which hypothesized were expected to influence the dependent variable and defined as follows.

Age of household head: It is an independent continuous explanatory variable measured in years. 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 will have 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 might 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 was associated positively with food security.

Amount of crop produced: It is continuous variable refers to amount of annual crop production measured by kilo gram. Crop is the major source of food in study area besides source of income for household. The variable expected had positive result in household food security.

Extension Service Participation: is dummy variable refers to a contact between extension agents 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 had contact with extension agents and received training on agriculture production are more food secure than who did not contact with extension agents

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: 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 is therefore hypothesized that off-farm participation will 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: 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: 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 was assumed that credit access has negative relation with household food security.

Uses of farm-input: 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.

Education level: education is a categorical variable and is a social capital, which could impact positively on household ability to take good and well informed production and nutritional status (Babatunde *et al.*, 2007). Based on Amaza *et al.* (2006) and other literatures, the higher education level of household head, the more food secure the household s expected to be. The same relation had also assumed in this study.

Table 3.2: Lists of independent variables summary affecting female headed household food security status

Independent variables	Measurement	Continuous/Dummy variable	Expected Coeff. Sign
Age	Year	Continuous	+
Family size	AE	Continuous	-
Farm land size	Hectare	Continuous	+
Farm experience	Year	Continuous	+
Income	ETB	Continuous	+
Livestock ownership	TLU	Continuous	+
Off-farm	Yes/No	Dummy	+
Market distance	Kilometer	Continuous	+
Education level	Literate/ Illiterate	Categorical	+
Access to credit	Yes/No	Dummy	+
Extension service	Yes/No	Dummy	+
Uses o farm input	Yes/No	Dummy	+
Utilization of irrigation	Yes/no	Dummy	+

3.7. Ethical Considerations

According to Best and Khan (2002), involving in a research work, it is important considering the ethical principles lay down to protect them. Thus, in this research work consideration was given to ethical issue. Therefore, the researcher tried to get the willingness of the research participants for collecting the data from them keeping their confidentiality. Concerns to ethical issue consideration during distribution of questionnaires and collection of data, the researcher respected the culture, traditional beliefs as well as religion of community. Furthermore, no information revealing the identity of any individual respondents has been included in this final report without their prior consent. To prevent plagiarism, as much as possible all the materials used in this study were properly acknowledged in the document

CHAPTER FOUR

RESULTS AND DISCUSSION

The chapter provides a comprehensive overview of the results and discussion of a study conducted on rural female-headed households' food security status. The first section focused on the socio-economic and demographic characteristics of respondents. The second section dealt with food security status of female-headed households. It presents an in-depth analysis of the food security status of these households, identifying the extent of food insecurity among them. The third section compared the background information of food-secure and food-insecure female-headed households. The comparison includes demographic characteristics, household size, and income level. The last section identified the determinants that influence food security status of rural female-headed households in the study area. The results are presented in the form of tables and diagrams, followed by interpretations and inferences.

4.1. Socio-Economic and Demographic Characteristics of Respondents

The socio-economic and demographic characteristics of respondents play a crucial role in understanding the dynamics of a population and its interactions with various aspects of society. In this study, the researcher delves into the comprehensive analysis of these characteristics, providing valuable insights into the social and economic fabric of the respondents.

4.1.1. Demographic Characteristics of Respondent

Understanding the demographic characteristics of respondents, particularly their age and household size, is crucial for gaining insights into the composition and structure of a population. In this study, researcher focused on analyzing these specific demographic factors to provide a comprehensive understanding of the individuals surveyed. Age served as a significant determinant of various aspects of life, including social behaviors, consumption patterns, and preferences. Additionally, household size plays a vital role in examining living arrangements, resource allocation, and family dynamics. By exploring the age and household size of the respondents, we aim to unravel the intricate relationships between these demographic factors and their influence on societal trends, decision-making processes, and overall community dynamics.

The following Table 4.1 showed demographic characteristics of respondents.

Table 4.1: *Demographic Characteristics of Respondents*

Variables	Mean	Std. Deviation
Age of household head	46.21	10.264
Total household size	7.28	2.617

Source: Own survey, 2023

The results of the study indicated that the mean age of the household heads surveyed is 46.21 years, with a standard deviation of 10.264. This suggests that, on average, the household heads tend to be in their mid-forties. The standard deviation indicates the degree of variation or dispersion in the data, implying that there may be some variability in the ages of the household heads, with some being younger or older than the mean.

Furthermore, the study revealed that the total household size has a mean value of 7.28, with a standard deviation of 2.617. This suggests that, on average, the households surveyed consist of approximately 7 individuals. The standard deviation implied that there is some variability in household sizes, with some households being larger or smaller than the mean.

These findings provided valuable insights into the demographic characteristics of the respondents. The average age of the household heads and the size of the households surveyed could help researchers and policymakers understand the composition and structure of the population under study. Additionally, it offers a basis for further analysis to explore the potential implications of these demographic factors on various social, economic, and policy-related aspects. The following section (4.1.2) presented the social- economic characteristics of sample respondents; these characteristics educational level, total household size, tropical livestock unit, and income

4.1.2. Socio-Economic Characteristics of Respondents

Understanding the socio-economic characteristics of respondents is crucial for comprehending the dynamics of a population and its interaction with various aspects of society. In this study, researcher emphasized on analyzing key socio-economic indicators, including the education level of the household head, total land size, tropical livestock unit, and income. These indicators provide valuable insights into the educational attainment, land ownership, livestock resources, and economic well-being of the respondents. By examining these socio-economic characteristics, it aimed to unravel the complicated relationships between education, land resources, livestock ownership, and income levels. This exploration would shed light on the socio-economic profile of the respondents, enabling us to gain a deeper understanding of the factors that shape their livelihoods, economic activities, and overall well-being. Such insights are crucial for policymakers, researchers, and development practitioners to design targeted interventions and policies that address the specific needs and challenges faced by different socio-economic groups within the population.

Table 4.2: *Socio-Economic Characteristics of Respondents*

Variables	Mean	Std. Deviation
Education level of household head	4.83	3.885
Total land size	.9111	.64877
Tropical livestock unit	3.4124	3.00542
Income	2143.9097	188.92589

Source: Own survey, 2023

The study found a mean education level of 4.83 and a standard deviation of 3.885 for household heads. This shows that household heads have a median education level. The standard deviation suggests that some household heads are more educated than the mean. The mean total land size is 0.9111, with a standard deviation of 0.64877, according to the report. This implied that surveyed families have tiny land sizes. The standard deviation showed that families own land plots of different sizes.

The study found a mean tropical livestock unit of 3.4124 and a standard deviation of 3.00542. This shows that households with tropical cattle have a reasonable amount. The standard deviation suggests that some families own more tropical cattle units than the mean. The survey found a mean income of 2143.9097 and a standard deviation of 188.92589. This implied that surveyed households earn around the mean. Some households earn more than the mean, as shown by the standard deviation. The following section (4.2) presented the food security status of female household heads in the study area.

4.2. Food Security Status of Female-headed Household

The researcher used Household Food Insecurity Access Scale (HFIAS) to measure the food security status of female headed households in the study area. This was due to the fact HFIAS is a comprehensive and validated tool that captures different dimensions of food insecurity, including the quality, quantity, and accessibility of food, as well as the coping strategies employed by households to deal with food shortages. This makes HFIAS a more nuanced and accurate measure of food security compared to other measures that only focused on one or two dimensions of food insecurity.

Likewise, HFIAS is a standardized tool that can be easily adapted and used in different contexts, making it more comparable across different regions and populations. This allows for more accurate and meaningful comparisons of food insecurity prevalence and severity across different populations and regions. Finally, HFIAS is designed to be user-friendly and easy to administer, even in low-resource settings. This means that it can be easily implemented by non-experts, such as community health workers, making it more accessible and cost-effective than other types of food security measures that require specialized training and equipment. Overall, the comprehensiveness, standardization, and ease of use of HFIAS make it a preferred tool for measuring food security in different settings.

The following (Figure 4.1) showed food security status of female-headed respondents.

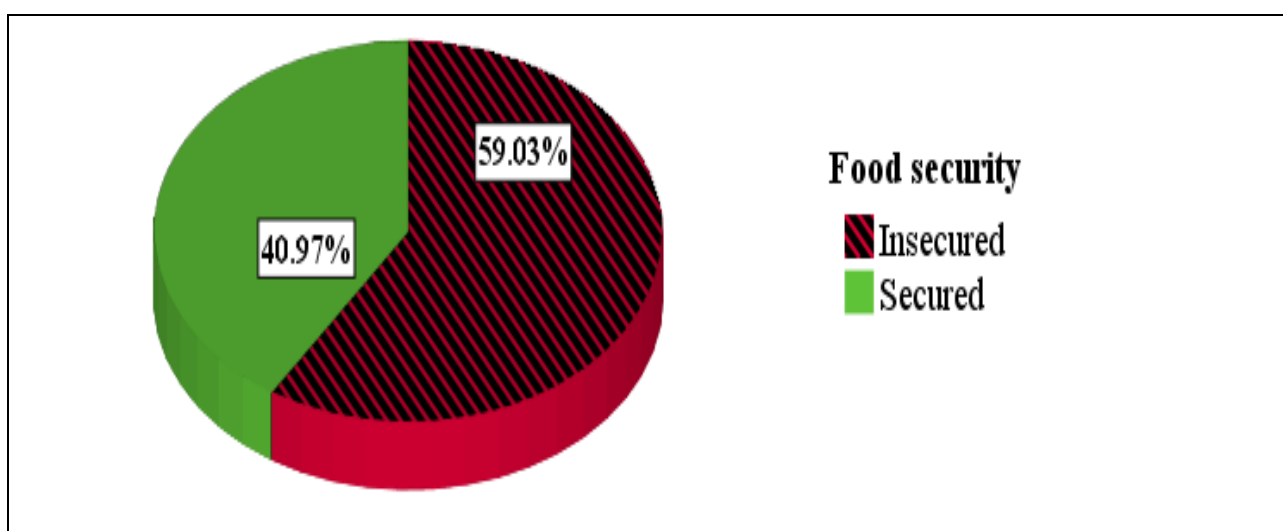


Figure 4.1: Food security status of respondents

Source: Own survey, 2023

The study conducted on female-headed households in the study area revealed that out of the total sample, a significant proportion of 59.03% of the sampled respondents were classified as food insecure. This implied that these households had limited or uncertain access to sufficient, safe and nutritious food that met their dietary requirements and food preferences for an active and healthy life. Conversely, the remaining 40.97% of the sampled female-headed households were classified as food secured, indicating that these households had access to enough and nutritious food. These findings highlight the alarming food insecurity problem among female-headed households in the study area and the urgent need to address it.

Table 4.3: *The Households Food Insecurity Access Scale and the Frequency of Occurrence*

Item no	Statements	No		Yes					
				Rarely		Sometimes		Often	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
1	In the past four weeks, did you worry that your household would not have enough food?	83	57.6	12	19.7	33	54.1	16	26.2
2	Any household member not able to eat the kinds of foods you preferred because of a lack of resources	60	41.7	21	25.0	33	39.3	30	35.7
3	Any household member has to eat a limited variety of foods due to a lack of resources	34	23.6	23	20.9	30	27.3	57	51.8
4	Any household member has to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food	50	34.7	59	62.8	24	25.5	11	11.7
5	Any household member has to eat a smaller meal than you felt you needed because there was not enough food	68	47.2	37	48.7	24	31.6	15	19.7
6	Any other household member has to eat fewer meals in a day because there was not enough food	85	59.0	30	50.8	17	28.8	12	20.3
7	There ever no food to eat of any kind in your household because of lack of resources to get food	75	52.1	40	58.0	29	42.0	0	0.0
8	Any household member goes to sleep at night hungry because there was not enough food	89	61.8	40	72.7	15	27.3	0	0.0
9	Any household member goes a whole day and night without eating anything because there was not enough food	144	100	0	0.0	0	0.0	0	0.0

The results of Table 4.3 indicated that many respondents expressed concerns about insufficient food in their households. This worry was reported to occur sometimes for 54.1% of the respondents, while 19.7% rarely experienced it, and 26.2% often faced this concern. The uncertainty regarding food availability reflects the vulnerability of these households and the challenges they face in meeting their basic needs. It emphasizes the importance of addressing food insecurity through targeted interventions and support systems to ensure adequate and nutritious food supply access.

In addition to worrying about food availability, many respondents indicated that household members had to compromise on the quality and variety of foods due to resource limitations. The survey findings revealed that 41.7% of respondents reported that sometimes household members could not eat the foods they preferred. This lack of choice and control over their diets can negatively affect nutrition and overall health. Recognizing the importance of access to diverse and nutritious foods in promoting well-being and preventing malnutrition is essential.

Regarding having to eat a limited variety of foods due to a lack of resources, the data shows that many respondents had to face this situation to varying degrees. Out of the total respondents, 23.6% indicated that they rarely experienced the need to restrict their food choices due to resource constraints. Another 20.9% said they rarely faced this challenge, implying that their access to a diverse range of foods was occasionally limited. Moreover, a notable 27.3% of respondents expressed that they sometimes had to eat a limited variety of foods, indicating a frequent occurrence of having to make do with restricted options. However, it is noteworthy that the majority, accounting for 51.8% of the respondents, responded that they often had to eat a limited variety of foods, suggesting that a substantial portion of the population frequently encountered this limitation, highlighting the significant impact of resource scarcity on dietary choices.

Regarding consuming unwanted foods due to resource constraints, the data reveals a significant prevalence among the respondents. Approximately 34.7% of the participants indicated that they rarely had to eat foods they did not want to eat due to limited resources. This suggests that the need to compromise on food preferences was infrequent for a considerable portion of the population. However, a majority of 62.8% responded that they often faced this situation,

indicating that a significant proportion of respondents frequently had to consume foods they did not desire due to resource constraints. Furthermore, 25.5% mentioned that they sometimes had to eat unwanted foods, indicating that compromising on food preferences was occasional for this subset of respondents. Remarkably, only 11.7% of participants rarely experienced the need to consume foods they did not want, implying that this was an infrequent occurrence for a relatively small percentage of the population. These findings underscore the challenges most respondents face in adhering to their preferred dietary choices due to limited resources, emphasizing the impact of resource constraints on food consumption patterns.

The survey findings revealed that many households faced situations where members had to eat smaller meals or go without food due to limited resources. For instance, 47.2% of respondents reported that sometimes they had to eat smaller meals than they felt they needed, while 48.7% often faced this situation. This highlights the struggle of households to meet their basic dietary needs, potentially leading to malnutrition and compromised health.

Concerning the impact on other household members, the data reveals that a significant majority of respondents, accounting for 59%, rarely had to reduce the number of daily meals due to insufficient food resources. This suggests that skipping meals was infrequent for a substantial portion of the respondents. Additionally, 50.8% of participants mentioned that they sometimes experienced this situation, indicating that they occasionally consumed fewer meals than desired due to inadequate food availability. Furthermore, 28.8% of respondents indicated that they sometimes had to eat fewer meals, suggesting a moderate frequency of this occurrence. Interestingly, 20.3% of participants reported that they rarely faced the need to consume fewer meals, indicating a relatively lower occurrence of this challenge for this subset of respondents. These findings highlight the varying degrees to which respondents had to adjust their meal intake due to insufficient food resources, with a majority experiencing this situation occasionally or rarely. The data reveal significant insights regarding experiencing a complete lack of food in their households due to resource constraints. A majority of 52.1% of respondents indicated that they rarely encountered a situation where their households had no food due to insufficient resources. This suggests that a complete lack of food was a relatively infrequent occurrence for a significant proportion of the respondents. However, 58% of participants mentioned that they sometimes faced this situation, implying that they experienced episodes where their households had no food

to eat due to resource constraints. Furthermore, 42% of respondents responded that they often had no food, indicating a relatively high frequency of experiencing a complete lack of food. Notably, none of the respondents indicated that they never had any food to eat, suggesting that some food availability was present even in the most extreme cases. These findings underscore the challenges a considerable portion of the population faces in ensuring consistent access to food due to resource limitations, with a substantial proportion experiencing occasional or frequent instances of complete food scarcity in their households.

The survey findings indicated that many households reported instances where household members went to sleep hungry due to insufficient food. Specifically, 61.8% of respondents rarely had household members going to bed hungry, while 72.7% often faced this situation. This highlights the severe impact of food insecurity on individuals' daily lives and overall well-being. Likewise, the data reveals that 100% of the respondents reported that no household member goes a whole day and night without eating anything due to insufficient food, highlighting their resilience and resourcefulness in ensuring that all members of their households have access to at least some food within 24 hours, underscoring their unwavering commitment to addressing food scarcity and safeguarding the well-being of their families even in challenging circumstances. The following Table 4.4 presented the food security status based on HFIAS category result.

Table 4.4: *Food Security Status Based on HFIAS Category*

HFIAS Category	<i>n</i>	%
Food secure	59	40.97
Mildly food insecure	23	15.97
Moderately food insecure	27	18.75
Severely food insecure	35	24.31
Total	144	100

Source: Own survey, 2023

Note: n = number of respondents, % = percentage

Based on the results presented in Table 4.4, it can be interpreted that out of the total 144 respondents, 40.97% were food secure, 15.97% were mildly food insecure, 18.75% were

moderately food insecure, and 24.31% were severely food insecure. This information provided insights into the food security situation of the population under study. It indicated that a significant proportion of the population was food insecure, with almost 60% of respondents being either mildly, moderately, or severely food insecure. The percentage breakdown of each category provided a clear understanding of the severity of food insecurity. It shows that a higher proportion of respondents were severely food insecure compared to those who are mildly or moderately food insecure. The key informants added that food insecurity is a significant challenge in the area and that there is a need for interventions to improve food security, particularly for those who are severely food insecure. These insights can inform targeted interventions and policies that specifically address the needs and empower female household heads, ultimately contributing to the overall improvement of their livelihoods and well-being. The following section (4.3) compares food security status of respondents.

4.3. Food Security Status Comparisons of Respondents

In this section of the study, a comparison is made between the background information of food-secure and food-insecure female-headed households. The comparison focused on three key factors: demographic factors, socio-economic factor, and institutional factors. The purpose of this comparison was to identify any significant differences between the two groups that could help explain the differences in their food security status. The results of this comparison are presented in the form of tables for easy interpretation.

Accordingly, the following Table 4.5 presented the finding results of farm input and food security status between the two groups.

Table 4.5: *Farm Inputs and Food Security Status*

Farm Inputs	Food Security Status						χ^2 (p-value)
	Food insecure		Food secured		Total		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Yes	57	67.1	51	86.4	108	75.0	6.977** (0.008)
No	28	32.9	8	13.6	36	25.0	
Total	85	100	59	100	144	100	

Source: Own survey, 2023

Note: ** Significant at 1% probability level

As Table 4.5 showed, among food secured respondents the majority (86.4%) of them had farm inputs, while among food insecure respondents, the majority (67.1%) of them had farm inputs. Furthermore, the *Chi-square* analysis ($\chi^2 = 6.977$, $p < 0.01$) revealed that there was statistically significant association between food security status and availability of farm inputs. The finding suggests that using farm inputs such as fertilizers, pesticides, and improved seeds may increase food security by increasing the yield and productivity of crops. The key informants indicated that it is important to note that the use of farm inputs might be had implications for environmental sustainability and health, and therefore, a balanced approach should be taken to ensure that the benefits outweigh the potential risks.

The following Table 4.6 presented relationship between non-farm income participation and food security status of female household heads.

Table 4.6: *Non-farm income Participation and Food Security Status*

<i>Non-farm income Participation</i>	Food Security Status				Total		χ^2 (p-value)
	Food insecure		Food secured				
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
No	26	30.6	9	15.3	35	24.3	4.451* (0.035)
Yes	59	69.4	50	84.7	109	75.7	
Total	85	100	59	100	144	100	

Source: Own survey, 2023

Note: * Significant at 5% probability level

The result of the study indicated that among the sampled food secured respondents, the percentage of female headed households members involved in non-farm income were greater for food secured respondents (84.7%) than food insecure respondents (69.4%). Contrarily, the percentage of household members did not involve in non-farm income were greater for food insecure respondents (30.6%) than food secured respondents (15.3%).

Additionally, the result of *Chi-square* analysis ($\chi^2 = 4.551$, $p < 0.05$) this showed that food security status and non-farm income activities of the household heads had statistically significant

association. This indicated that female headed households who were involved in non-farm activity had more probability of being food secured. The key informants also argued that non-farm income participation has great contribution to pull household from food insecurity situation into food security. It had been also broadly indicated during FGD and key informant interview participants that, as the household involved in non-farm activities more likely reduced the risks of food shortage during periods of unexpected crop failure. According to FGD participants, the presence of non-farm work opportunities can increase income and enable households to maintain food security status of their households thereby avoiding the risk of vulnerability into food insecurity. The following Table 4.7 presented relationship between extension service participation and food security status of female household heads.

Table 4.7: *Extension Service Participation of Households and Food Security Status*

Extension Service	Food Security Status						χ^2 (p-value)
	Food insecure		Food secured		Total		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
No	71	83.5	14	23.7	85	59.0	51.496**
Yes	14	16.5	45	76.3	59	41.0	(0.000)
Total	85	100	59	100	144	100	

Source: Own survey, 2023

Note: ** Significant at 1% probability level

The majority of food insecure households (83.5%) did not receive extension services compared to only 23.7% of food secure households, and the difference was statistically significant ($\chi^2 = 51.496$, $p < 0.01$). On the other hand, a higher proportion of food secure households (76.3%) received extension services compared to food insecure households (16.5%). These findings suggest that extension services play an important role in improving food security among households. The results from the key informant interview and focus group discussion revealed that extension services provided access to information, knowledge, and technologies related to farming practices and crop management. Therefore, households that utilize extension services may be better equipped to make informed decisions regarding crop selection, fertilization, irrigation, and pest control, which could ultimately lead to improved yields and increased food

security. The following Table 4.8 presented relationship between utilization of irrigation and food security status of female household heads.

Table 4.8: *Utilization of Irrigation Households and Food Security Status*

Irrigation utilization	Food Security Status						χ^2 (p-value)
	Food insecure		Food secured		Total		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
No	49	57.6	16	27.1	65	45.1	13.107**
Yes	36	42.4	43	72.9	79	54.9	(0.000)
Total	85	100	59	100	144	100	

Source: Own survey, 2023

Note: ** Significant at 1% probability level

As summarized in Table 4.8, out of food secured respondents, 72.9% of them had utilization of irrigation, where among food insecure respondents the majorities (57.6%) of them did not use irrigation. Additionally, the *Chi-square* analysis ($\chi^2 = 13.107$, $p < 0.01$) showed that food security status and irrigation utilization of the female headed households had statistically significant association. This indicated that using irrigation increased the female headed household food security. The key informants also informed that irrigation could increase agricultural productivity and contribute to enhance crop production and farmer incomes to improve food security.

The following Table 4.9 presented relationship between credit utilization and food security status of female household heads.

Table 4.9: *Credit Utilization of Households and Food Security Status*

Credit utilization	Food Security Status						χ^2 (p-value)
	Food insecure		Food secured		Total		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
No	31	36.5	12	20.3	43	29.9	4.327*
Yes	54	63.5	47	79.7	101	70.1	(0.038)
Total	85	100	59	100	144	100	

Source: Own survey, 2023

Note: * Significant at 5% probability level

Among the sampled food secured respondents the percentage of respondents who had utilize credit were greater for food secured respondents (79.7%) than food insecure respondents (63.5%), whereas the percentage of respondents who did not use credit were greater for food insecure respondents (36.5%) than food secured respondents (20.3%). Moreover, the *Chi*-square analysis ($\chi^2 = 4.327$, $p < 0.05$) showed that food security status and utilization of credit had statistically significant association. This implied that female-headed households who have utilization of credit have greater chance to be food secure than households who had no utilization to credit. The key informants indicated that credit could be used to diversify income sources, such as starting small businesses or investing in livestock. This diversification of income can help households to cope with unexpected events that affect their food security, such as crop failure or job loss.

The following Table 4.10 presented the mean comparison of continuous variables.

Table 4.10: *Mean Comparison of Continuous Variables*

Variables	Food Security Status				t-test	p-value
	Food insecure		Food secured			
	Mean	SD	Mean	SD		
Age	47.72	10.598	44.03	9.428	2.145*	0.034
Educational level	3.74	3.519	6.41	3.874	-4.289**	0.000
Total family size	7.75	2.395	6.61	2.792	2.630**	0.009
TLU	2.30	2.197	5.01	3.30	- 5.91**	0.000
Total land size	0.73	0.54	1.17	0.71	-4.29***	0.000
Market distance	4.72	1.89	3.97	1.96	-2.299*	0.023
Farm experience	26.08	10.01	22.51	10.35	2.078*	0.040
Income	2088.2	61.51	2224.1	267.3	-4.523**	0.000

Source: Own survey, 2023

Note: * and ** Significant at 5% and 1% probability level, respectively

As presented in Table 4.10, the average age of sample food insecure household was (M=47.72, SD= 10.598) years, whereas the average age of food secured was (M=44.03, SD=9.428) years. This implies that the average age of food secured household was lower than the average age of food insecure households, which means food secured households were younger than food insecure households. Furthermore, the test result (t-test=2.145, $p<0.05$) indicated that there is statistically significant difference between age of the respondents and food security status.

The result of Table 4.10 also showed that food secured female household heads had better educational level (M=6.41, SD=3.874) than food insecure households (M=3.74, SD= 3.519). Furthermore, the t-test result (t-test=- 4.289, $p<0.01$) indicated that there was a statistically significant difference between female headed households educational level and food security status. Therefore, from this it could be concluded that as household education level of the female headed household heads increased the probability of food security were also high. The fact here is that, educated households had positive advantages of increasing their agricultural and labor productivity by adopting technology and new practices which might enhance availability of to their household.

The result indicated that the total number of the family has negatively related to household food security status and it is statistically significant. The negative sign implies that the probability of food security decrease with an increase in family size. The average family sizes of food secured households (M=6.61, SD=2.792), which was smaller than food insecure households (M=7.75, SD=2.395). Furthermore, the t-test result (t-test= 2.630, $p<0.01$) showed that there was statistically significant difference between family size and food security status. This indicated that with increase in household family size, the household would not become food secured. In addition, it has been reported by focus group discussion (FGD) and key informant interviews' participants that large family size had a pull effect for aggravating food insecurity.

Regarding tropical livestock unit, the result indicated that it had positive association with food security and the average TLU of food insecure household was (M=2.30, SD= 5.01) lower than the average TLU of food secured household (M=5.01, SD = 3.30). In addition, the t-test result (t-test=-5.91, $p<0.01$) indicated that there was statistically significant mean difference between tropical livestock unit and food security status. This implied that with increase in household

livestock holding increase the household food security. On top of this, as it was reported by focus group discussions (FGD) and key informant interviews' participants that, livestock was considered as money saved in Bank account. Because they were sources of food and income as well as a household with more livestock herds could easily afford their food and other needs of a household.

The result in Table 4.10 presented, food secured households had greater land size ($M=1.17$, $SD=.71$) than food insecure households ($M=0.73$, $SD=0.54$). Additionally, the t-test result ($t\text{-test}=-4.29$, $p<0.01$) showed that there was statistically significant difference between land size and household food security status. This indicated that with increase in household landholding size, the household became food secured. During the discussion held with FGD participants, it was noted that households who owned large cultivated landholding size were more likely be food secure than those who had small landholding size. According to FGD and key informant interview participants, small landholding size accompanied with the large family and low productivity, had be deteriorated the effort of households to produce adequate consumption for their household members.

Regarding market distance, the result of Table 4.10 showed that food secured households had better proximity to the nearest market ($M= 3.97$, $SD= 1.96$) than food insecure households ($M= 4.72$, $SD= 1.89$). Furthermore, the t-test result ($t\text{-test}= -2.299$, $p<0.05$) indicated that there was a statistically significant difference between distance in kilometer to the nearest market and food security status. This implied that as the distance to the nearest market increases, the probability of food security decreases.

The mean years of farming experience for food insecure households was 26.08 years with a standard deviation of 10.01 years, while for food secured households the mean was 22.51 years with a standard deviation of 10.35 years. The t-test result showed a significant difference between the two groups ($t = 2.078$, $p < 0.05$), which indicated that more experienced farmers better equipped to achieve food security. The results of the key informant interview and the focus group discussion suggests that more experienced farmers had better knowledge and skills in managing their farm operations and coping with challenges such as weather variability, pests, and diseases,

which can affect crop yields and income. Additionally, experienced farmers might have better access to credit, markets, and other resources that can enhance their productivity and income.

The mean income of food insecure households was ($M=2088.2$, $SD = 61.51$), which was lower than the mean income of food secure households ($M=2224.1$, $SD = 267.3$). Furthermore, the t-test result ($t = -4.523$, $p = 0.01$) revealed that the mean difference between the two groups was statistically significant. This suggested that having a larger income might be an important factor in achieving food security. Higher income gives more purchasing power, which may allow households to acquire sufficient and variety food, particularly during economic distress.

4.4. Determinants of Food Security Status of Rural Female-headed Households

In this section, the study aimed at to identify factors that significantly influenced the food security status of female-headed households in the study area. The factors examined in this study included demographic factors, socio-economic factors, and institutional factors. Binary logistic regression model is used to estimate the effect of these factors on food security, and the results presented in the form of coefficients, p-values, and confidence intervals. Prior to conducting the model analysis, the researcher checked multicollinearity issue and determined that it was within acceptable levels (refer to Appendix A for further details). The following Table 4.11 presented the result of binary logistic regression of determinate factors influencing food security status.

Table 4.11: *The Binary Logistic Regression Output*

Variables	B	S.E.	Sig.	Exp(B)
Age	.047	.035	.174	1.048
Education level	.281*	.123	.022	1.325
Total family size	-.547**	.184	.003	.579
TLU	.412*	.189	.029	1.511
Total land size	1.809**	.835	.030	6.106
Farm input	.094	.931	.920	1.098
Non-farm activities	2.840**	1.082	.009	17.112
Extension service	2.445**	.781	.002	11.535
Irrigation access	2.087**	.788	.008	8.059
Credit facilities	.902	.830	.277	2.466
Market distance	-.347	.224	.121	.707
Farm experience	.012	.052	.821	1.012
Income	.008*	.003	.012	1.008
Constant	-24.42	7.683	.001	.000
Number of observation	144			
LR $Chi^2(13)$	127.18			
Prob> Chi^2	0.000			
Pseudo R^2	0.791			

Source: Computed from Own survey, 2023

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

The *Chi*-square result ($\chi^2 = 127.18$, $p < 0.01$) from the model summary indicates that the overall model was significant when all independent variables (Age, education level, total family size, TLU, total land size, farm input, non-farm activities, extension service, irrigation access, credit facilities, market distance, farm experience, and income). The following paragraphs discussed significant variables as follows:

Educational level: As indicated in Table 4.11, educational level had positive and significant effect on farming female headed household food security status. Educational level was found to be significant at 1% level of significance ($\beta = 0.281$, $p < 0.05$). The positive value of beta

coefficient implies that the probability of food security status of households' increased as the female household heads increased their educational level. The odds ratio of educational level also indicates that other independent variables being constant, the likelihood of female households to be food secured increased by 1.325 as female household heads educational level increased by one grade. In connection to this finding, UNDP (2012) found out that educated household heads are more likely to be food self-sufficient than less educated or uneducated household heads. This is because educated households can use any technological innovation faster than their uneducated counterparts. Educated farmers can take a note and can read and understand any important information about their farm and their farm sales; they can listen to media which present in non-local languages. They can easily accept and are more optimistic about future government developmental plans.

Total family size: Family size was found to be a determinant factor of food security status of female headed household in the study area. The coefficient for family size was found to be negative and statistically significant at 1% level of significance ($\beta = -0.547, p < 0.01$). The negative relationship implied that the probability being food secure decreases as a family size increases. As family size was increased by one member of that family, the probability of female headed household to be food secured would be decreased by 0.579 units. This meant the existence of large number of family in a household affected their wealth as it was segregated by it. The result revealed that households with large family size tended to be food insecure compared to households having small family size. The possible explanation was that those households who depended on limited productive resources will face food insecurity by increasing family size. This result was inconformity with the findings of a study conducted by the Endale (2013), who reported that family size is likely to play a role in determining the state of food insecurity at the household level. This result is also consistent with findings of (Echebiri et al., 2017; Endale et al., 2014; Mut, 2013; Negash &, 2013; Sani & Kemaw, 2019; Yehuala et al., 2018).

Livestock ownership (TLU): The result of the model revealed that this variable was found to be statistically significant at 1% probability level and positively influenced food security status of households ($\beta = 0.412, p < 0.01$). This positive relationship was explained by the factor that herd size being a proxy for household's resource endowment, those sample households with large herd size had better chance to earn more income from livestock production. This in turn enabled them

to purchase food on cash whenever they faced food shortage, and invested in purchase of farm inputs that increased their food production, and thus ensuring food security at household level. The odds ratio for livestock ownership converted to TLU indicated that other independent variables being constant, the likelihood of being food secure was increased by 1.511 units as the livestock ownership was increased by one TLU. This result reaffirmed with the findings of Endale (2013) who argues that a household with more amount of livestock is more likely to be food secure than those who have less size of livestock. Furthermore study is also consistent with findings of (Faustine, 2016; Mut, 2013; Welderufael, 2014; Yehuala et al., 2018) TLU is positively related to the food security of the household.

Total farm land size: Land size was positively and significantly associated to food security status of the household at 1% probability level of significance ($\beta = 1.809, p < 0.05$). It was obvious that land holding stands for a host of factors such as wealth, access to credit, capacity to risks, and source of income. The positive relationship implied that the households with owned land resource were accessed to these opportunities. The implication was that as the cultivated landholding size was increased by one hectare, the probability of being food secure was increased by 6.106 unit. This showed that as the farm land size of household head increased the probability of being food secure was also increased. Similarly, Bogale (2009) indicates that households who have large cultivated land area are more likely to be food secured than those with smaller cultivated land area. Thus, this result was in convenience of the hypothesis that the land holding size is likely to play a role in ensuring the economic justice on the rural households.

Non-farm activities: Non-farm activities are those forms of income generating activities which are practiced out of owner's own farm, and it was one factor that affected the food security status of the household in the study area. As expected non-farm activities were found to be positively and statistically significantly associated with the household food security status ($\beta = 2.840, p < 0.01$). The odds ratio of non-farm activity indicated that as the participation of the household head in non-farm activity was increased by one unit, the probability of a household to be food secured would be increased by 17.112 units, holding other variables constant. This indicated that the household head participation in non-farm activity enables to accumulate asset that enabled them to modernize their production by giving them opportunity to reduce risks of

food shortage during periods of unexpected crop failures. This result reaffirmed with the study finding of Beyene (2010).

Extension service: The coefficient of 2.445 with a p-value of 0.002 suggested that there was a significant positive relationship between receiving extension services and food security status. This meant that female households who received extension services were more likely to be food secure than those who did not receive these services. The values of the odds ratio was 11.535, it meant that the odds of having food secure was 11.535 times higher for those who had access to extension services compared to those who did not have access to extension services. This finding is consistent with previous studies that showed a positive relationship between extension services and food security. For example, extension services can provide farmers with information on best practices, new technologies, and markets, which can improve their crop yields and income, and thus their food security status (Ashour *et al.*, 2018; Bezu *et al.*, 2014).

Irrigation access: Access to utilization of irrigation in the study area was identified as a factor that influences the household food security status positively and significantly at 1% significance level ($\beta = 2.087, p < 0.01$). The odds ratio estimated of access to irrigation showed that keeping other variables constant, a one unit increase in the irrigation usage of the household head increased households' probability of being food secured by 8.059 unit. This implied that those households with access to irrigation were at better position in securing enough food than their counterparts. In line with this finding, Pieter's (2013) argues that to achieve food security for its productive citizens, a nation needs to increase agricultural production through irrigation usage. This is due to the fact that small scale irrigation improves farm households' diet, incomes, health and food security (Torell & Ward, 2010).

Income: The binary logistic regression analysis output showed a significant relationship between income and food security status. The beta coefficient value of 0.008 indicated that there was a positive relationship between income and the likelihood of having food security. The sig-value of 0.012 suggested that this relationship was statistically significant. The odds ratio of 1.008 meant that for every one unit increase in income, the odds of having food security increase by a factor of 1.008. Therefore, the results indicated that higher income was associated with a higher likelihood of having food security. This finding is consistent with Gregory & Coleman-Jensen (2017) the study finding which show a strong correlation between income and food security, as individuals with higher incomes have greater access to food and are less likely to experience food insecurity. This result highlights the importance of addressing income inequality as a key strategy in reducing food insecurity, particularly for vulnerable populations such as low-income households.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter provided an overview of the main findings, conclusions, and recommendations of the research. The chapter commenced with a synopsis of the principal findings gathered from both quantitative and qualitative outcomes. This was then followed by the study's conclusion. Lastly, recommendations based on the findings are presented.

5.1. Summary of Major Findings

The major objective of the study was to investigate female headed household food security status and its determinant factors of rural female headed households in the study area. A total of 144 female households were participated in responding the questionnaire and the collected data was analyzed using frequency, percentage, *Chi-square*, independent sample t-test and binary logistic regression. The data also collected through qualitative data collection instruments like KIIs and FGDs. Based on the information from analysis and discussion parts, the following major findings of the study were summarized.

- ✓ According to the study on female-headed households in the study area, 59.03% of selected respondents were classed as having limited or uncertain access to enough, safe, and nourishing food, which is problematic. In contrast, 40.97% of the studied homes were identified as having adequate access to nourishing food, suggesting food security.
- ✓ According to the results shown in Table 4.1, out of the 144 respondents, 40.97% had access to enough food, 15.97% had mild food insecurity, 18.75% had moderate food insecurity, and 24.31% had severe food insecurity. A good sense of the severity of food insecurity might be gained from the percentage breakdown of each group, which showed that more respondents experience severe food insecurity than mild or moderate insecurity. According to the findings, food insecurity posed a serious problem in the research area and calls for actions to increase food security, especially for those who were extremely food insecure.
- ✓ The study also found that, 86.4% of food secures respondents and 67.1% of food insecure respondents had farm inputs. Chi-square analysis showed a statistically significant association ($p < 0.01$) between food security status and availability of farm inputs. Farm

inputs might increase food security by increasing crop yield and productivity, but a balanced approach is needed to ensure benefits outweigh potential risks

- ✓ In the study area, more female-headed household members involved in non-farm income for food-secure (84.7%) than food-insecure (69.4%) respondents. More household members did not involve in non-farm income for food-insecure (30.6%) than food-secure (15.3%) respondents. Chi-square analysis showed a statistically significant association ($p<0.05$) between food security status and non-farm income activities of household heads. Non-farm income participation can increase income and reduce the risk of food shortage during unexpected crop failure, contributing to food security.
- ✓ Regarding food security status and extension services, 83.5% of food insecure households did not receive extension services, while 76.3% of food secure households did receive them. *Chi-square* analysis showed a statistically significant association ($p<0.01$) between food security status and extension service receipt. Moreover, 72.9% of food-secure respondents and 42.4% of food-insecure respondents used irrigation. Chi-square analysis showed a statistically significant association ($p<0.01$) between food security status and irrigation utilization of female-headed households.
- ✓ Likewise, 79.7% of food-secure respondents and 63.5% of food-insecure respondents used credit. Chi-square analysis showed a statistically significant association ($p<0.05$) between food security status and utilization of credit. Credit can be used to diversify income sources and cope with unexpected events, contributing to food security. Also, average age of food-secure households ($M=44.03$, $SD=9.428$) was lower than that of food-insecure households ($M=47.72$, $SD=10.598$), and there was a statistically significant difference ($p<0.05$) between age and food security status.
- ✓ In the study area, food-secure female-headed households had a better educational level ($M=6.41$, $SD=3.874$) than food-insecure households ($M=3.74$, $SD=3.519$), and there was a statistically significant difference ($p<0.01$) between educational level and food security status. Furthermore, food secured households had smaller average family sizes ($M=6.61$, $SD=2.792$) compared to food insecure households ($M=7.75$, $SD=2.395$). There was a statistically significant difference between family size and food security status based on the t-test result ($t\text{-test}= 2.630$, $p<0.01$).

- ✓ Food insecure households had lower average tropical livestock unit (TLU) (M=2.30, SD=5.01) compared to food secured households (M=5.01, SD=3.30). There was a statistically significant difference between TLU and food security status based on the t-test result (t-test=-5.91, p<0.01). Food secured households had larger average land sizes (M=1.17, SD=.71) compared to food insecure households (M=0.73, SD=0.54). There was a statistically significant difference between land size and food security status based on the t-test result (t-test=-4.29, p<0.01).
- ✓ Food secured households have better proximity to the nearest market (M=3.97, SD=1.96) compared to food insecure households (M=4.72, SD=1.89). There is a statistically significant difference between distance to the nearest market and food security status based on the t-test result (t-test=-2.299, p<0.05). More experienced farmers had better chances of achieving food security according to the t-test result (t=2.078, p<0.05). Likewise, income is an important factor in achieving food security according to the t-test result (t=-4.523, p<0.01). Higher income provides more purchasing power to access sufficient and diverse food, especially in times of economic hardship.
- ✓ The statistical analysis of the model revealed that all the independent variables collectively had a significant impact on the outcome variable, i.e., household food security status ($\chi^2 = 127.18$, p<0.01).
- ✓ Educational level was found to have a positive and significant effect on food security status, with the probability of food security increasing as the educational level of female household heads increased. The odds ratio of educational level also indicates that the likelihood of female households being food-secure increases by 1.325 as female household heads' educational level increases by one grade.
- ✓ Family size was identified as a determinant factor of food security status, with a negative relationship between family size and food security status. As family size increased by one member, the probability of female-headed households being food-secure decreased by 0.579 unit.
- ✓ Livestock ownership was found to be a significant determinant of food security status, with a positive relationship between livestock ownership and food security. The odds ratio

for livestock ownership indicated that the likelihood of being food-secure was increased by 1.511 unit as the livestock ownership increased by one TLU.

- ✓ Land size was positively and significantly associated with food security status, with the probability of being food-secure increasing by 6.106 unit as the cultivated landholding size was increased by one hectare.
- ✓ Non-farm activities were identified as a factor that positively and significantly affected food security status. The odds ratio of non-farm activity indicated that as the participation of the household head in non-farm activity increased by one unit, the probability of a household being food-secure would increase by 17.112 units, holding other variables constant.
- ✓ Receiving extension services was found to have a significant positive relationship with food security status. The odds ratio for extension services indicated that the odds of having food security were 11.535 times higher for those who had access to extension services compared to those who did not have access to extension services.
- ✓ Access to irrigation was identified as a factor that positively and significantly influenced household food security status. The odds ratio estimates of access to irrigation indicated that a one unit increase in the irrigation usage of the household head increased households' probability of being food-secure by 8.059 unit.

5.2. Conclusion

The results of this study highlighted the importance of several factors in ensuring food security among female-headed households in rural Ethiopia. The findings revealed that education level, family size, livestock ownership, farm land size, non-farm activities, and access to extension services are all significant factors that influence the food security status of these households. Education level was found to be positively and significantly associated with the food security status of female-headed households. Educated households had better access to information, so that they were more likely to adopt new technologies, and are better equipped to respond to changing market conditions.

Family size was found to be negatively associated with food security status, which implied that larger households were more likely to be food insecure than smaller households. This is because larger households might have to share limited resources among more people, which could reduce their overall food intake. Livestock ownership was found to be positively associated with food security status. Households with more livestock were more likely to be food secure because they had better access to income and could purchase food on cash whenever they faced food shortages. They were also able to invest in farm inputs that increased their food production, thus ensuring food security at the household level.

Larger farmland helped households to skip from food insecurity, suggesting that households with larger land holdings had better access to resources like credit and income and were better equipped to deal with unforeseen crop failures. Likewise, by acquiring assets and modernizing their output, households involved in non-farm occupations decreased the likelihood of food shortages during periods of unanticipated crop failures. Moreover, Farmers' crop yields and income can be increased by using extension services, which can give them information on best practices, front-line technologies, and markets.

5.3. Recommendations

Based on the main findings of the study, the following recommendations were made in order to close any gaps in knowledge regarding the factors contributing to food insecurity at rural female-headed households' level in the study area. It was thought that by better understanding the situation and factors contributing to food insecurity at the household level, policymakers would be better able to create and implement effective policies and programs for the poor, improving food security status:

- The level of education has a favorable and considerable impact on the food security status of the household. As a result, the office of education and other stakeholders should pay attention to adult education programs and take into account the educational standing of farmers while providing agricultural training.
- It was discovered that family size was a significant factor affecting households' levels of food security in the research area. Particularly, dependent members of the household increased the household's burden. This suggested that governmental initiatives aimed at better family planning to decrease household size should receive proper consideration and importance. For rural households in the research area, education that covers all facets of training and results in behavioral changes aimed at lowering fertility levels is crucial. The Woreda Administration Office should therefore pay adequate attention to limiting the population's growth. This could be done by using integrated health education services to properly raise awareness and promote family planning practices.
- A household's level of food security was significantly impacted by the quantity of cattle in TLU. In order to encourage households to engage in livestock husbandry, the Woreda Agricultural Office should offer better livestock technologies, such as health services, improved breeds, and animal diets.
- The size of the land has an impact on a household's level of food security. Therefore, the Woreda Job Creation and Food Security Office should prioritize the rapid development of labor-intensive rural employment opportunities as well as the promotion of labor-intensive technologies.

- Participating in non-farm income activities significantly improved the sampled households' level of food security in the research area. Therefore, the Woreda Job Creation Office should identify various non-farm activity possibilities and provide assistance with the knowledge and skills of the various non-farm activity possibilities that could enhance their current level of food security.
- Since extension services were positively connected with food security status, female-headed households should have better access to them by increase financing for agricultural extension services and initiatives, especially women-targeted ones. This might include funding extension worker training and capacity building and developing creative and successful extension initiatives. Mobile phone-based information systems and radio media platforms may also increase extension service accessibility and quality. These systems can give farmers real-time advise on farming methods, market situations, and other food security issues.
- Access to irrigation has been found as a factor that has a positive and significant impact on the level of food security in the family. Utilizing irrigation helps households produce more and earn more money, ensuring their access to food. Therefore, government and non-government organizations should pay more attention to water harvesting schemes, which the Woreda agricultural office should develop in collaboration with other stakeholders, and encourage households to use irrigation.
- Since higher income is connected with food security, there are numerous ways to promote food security in low-income households: This could include programs that train, resource, and support entrepreneurs and farmers. Give low-income people access to savings, loans, and insurance to save, invest, and manage risk. This will boost income, assets, and shock resilience. Smallholder farmers need help accessing markets, credit, and technical skills. Training, inputs, and extension services can boost production and income. Give needy households cash, food, or vouchers to cover their basic requirements and increase their food security.

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APPENDIX-I

HAWASSA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF LAW AND GOVERNANCE
SCHOOL OF GOVERNANCE AND DEVELOPMENT STUDIES
MA IN DEVELOPMENT MANAGEMENT

Data Collection Tools

Questionnaire for the Selected Farm Female-Headed Households Respondents

Introduction

My name is **Zenebe Damene**. I am a master's student in Hawassa University studying College of Law and Governance: School of Governance and Development studies (Specialization in MA in Development Management). I am doing my thesis on: **Determinants of Rural Female-Headed Households' Food Security Status** in Chirone Woreda, Sidama National Regional State, Ethiopia. Thus, I would like to express my appreciation in advance for your cooperation in giving your time and being committed for the success of this work. The information from respondents will keep confidential and will not affect any body in any way. So you are kindly requested to give your honest opinion

Thank you

1. General information

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

Interviewer name -----

Supervisor name -----

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

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

Part I:

2. Demographic Characteristics of Respondents

(To assess background information of households)

2.1. Sex of the household head

0= Male ☐ 1= Female ☐

2.2. Age of the household head _____

2.3. Education level of the household head

0= illiterate ☐ 1= literate ☐

2.4. Marital status of the household head

0=Married ☐ 1=Divorced ☐ 2=Widow/widower ☐ 3=Never married ☐

2.5. Number of households _____

2.6. Other, specify _____

3. Socio-economic Characteristics of Respondents

(To analyze determinate factors that influence food security status)

3.1. 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 your answer is (YES) in question 2.1, please try to answer questions under Table 3.2 and Table 3.3

3.2. Households' farm land size

Total landholding 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		

3.3. Type of crops produced and Income obtained from crop production in last year

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

3.4. 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)_____

3.5. 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)					

Bull					
Oxen					
Fatten oxen					
Calves					
Sheep					
Goats					
Chicken					
Heifers					
Donkey					
Horse					

3.6. 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					
Butter					
Cheese					
Eggs					
Sold livestock					
Others, (specify)					
Total					

3.7. Source of off- farm and non-farm income for your household in last year

Sources of income	Response 1= Yes 0= No	If yes, please tell us the amount of income obtained in Birr
Trade		
Craft		
Tree production		
Honey production		
Backyard vegetable production		
Other, specify		

4. Institutional characteristics

(To analyze determinate factors that influence food security status)

4.1. 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) _____

4.2. Access to farm 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

4.3. 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_____

4.4. Extension Service participation

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) _____

4.5 Utilization of irrigation

1 Does your farmland have access to irrigation water?

1. Yes 2. No

2. If you don't have access to irrigation, how do you farm your land during dry season? Please tell us other alternative did you take? _____

PART_ II

Household Food Insecurity Access Scale (HFIAS) Measurement Tool Questions (to assess food security status of female-headed households)

Each of the questions in the following table is asked with a recall period of **four weeks (30 days)**. The respondent is first asked an **occurrence question** – that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers “**yes**” to an occurrence question, a **frequency-of-occurrence** question is asked to determine whether the condition happened **rarely** (once or twice), **sometimes** (three to ten times) or **often** (more than ten times) in the past four weeks.

No	Questions	Response Options	Code
1	In the past four weeks, did you worry that your household would not have enough food?	0= No(skip to Q 1.1) 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..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)	
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	
3.1	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)	
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	
5.1	How often did this	1 = Rarely (once or twice in the	

	happen?	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)	
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PART- III

Questionnaires to be asked to assess food security status of female headed households

Checklists for Key Informants Interview (KII)

1. How is the food security status of the female headed households in Chirone Woreda?
2. What are the main activities 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 terms 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 pattern)?
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 foo 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?

Questions 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?

APPENDIX-II

Appendix A: Multicollinearity Test for Variables included in the Model

A1. Variance Inflation Factor (VIF) for continuous variables

Variables	Tolerance	VIF
Age of household head	.934	1.070
Education level of household head	.653	1.531
Total household size	.792	1.263
Tropical livestock unit	.723	1.383
Total land size	.642	1.558
Market distance	.865	1.156
Farm experience	.500	1.999
Income	.911	1.098

A2. Contingency Coefficient (CC) for categorical variables

Variables	Farm input	Non-farm	Extension service	Irrigation	Credit
Farm input	1				
Non-farm	0.121	1			
Extension service	0.184	0.109	1		
Irrigation	0.151	0.104	0.212	1	
Credit	0.009	0.019	0.111	0.253	1

Appendix B: Table of Conversion TLU

Animal category	TLU
Calf	0.25
Weaned calf	0.34
Heifer	0.75
Cow and ox	1.00
Horse	1.10
Donkey (adult)	0.70
Donkey (young)	0.35
Camel	1.25
Sheep and goat (adult)	0.13
Sheep and goat (young)	0.06
Chicken	0.013

Appendix C: SPSS Output

Logistic Regression

Case Processing Summary

Unweighted Cases ^a		N	Percent
Selected Cases	Included in Analysis	144	100.0
	Missing Cases	0	.0
	Total	144	100.0
Unselected Cases		0	.0
Total		144	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Insecured	0
Secured	1

Block 0: Beginning Block

Classification Table^{a,b}

			Predicted		
			Food security		Percentage
			Insecured	Secured	Correct
Step 0	Food security	Insecured	85	0	100.0
		Secured	59	0	.0
	Overall Percentage				59.0

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.365	.169	4.643	1	.031	.694

Variables not in the Equation

			Score	Df	Sig.
Step 0	Variables	Age of household head	4.518	1	.034
		Education level of household head	16.512	1	.000
		Total household size	6.687	1	.010
		Tropical livestock unit	28.423	1	.000
		Total land size	16.493	1	.000
		Farm input	6.977	1	.008
		Did you participate in any off-farm/non-farm activities to generate cash income	4.451	1	.035
		Extension service	51.496	1	.000
		Does your farm land have access to irrigation water	13.107	1	.000

	Credit facilities	4.327	1	.038
	Market distance	5.167	1	.023
	Farm experience	4.249	1	.039
	Income	18.134	1	.000
	Overall Statistics	89.064	13	.000

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	Df	Sig.
Step 1	Step	127.184	13	.000
	Block	127.184	13	.000
	Model	127.184	13	.000

Model Summary

	-2 Log	Cox & Snell R	Nagelkerke R
Step	likelihood	Square	Square
1	67.722 ^a	.587	.791

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Classification Table^a

			Predicted		
			Food security		Percentage
			Insecured	Secured	Correct
Step 1	Food security	Insecured	77	8	90.6
		Secured	7	52	88.1
	Overall Percentage				89.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1 ^a	Age of household head	.047	.035	1.852	1	.174	1.048
	Education level of household head	.281	.123	5.235	1	.022	1.325
	Total household size	-.547	.184	8.834	1	.003	.579
	Tropical livestock unit	.412	.189	4.775	1	.029	1.511
	Total land size	1.809	.835	4.695	1	.030	6.106
	Farm input	.094	.931	.010	1	.920	1.098
	Did you participate in any off-farm/non-farm activities to generate cash income	2.840	1.082	6.886	1	.009	17.112
	Extension service	2.445	.781	9.813	1	.002	11.535
	Does your farm land have access to irrigation water	2.087	.788	7.005	1	.008	8.059
	Credit facilities	.902	.830	1.182	1	.277	2.466
	Market distance	-.347	.224	2.406	1	.121	.707
	Farm experience	.012	.052	.051	1	.821	1.012
	Income	.008	.003	6.261	1	.012	1.008
	Constant	-24.420	7.683	10.103	1	.001	.000

a. Variable(s) entered on step 1: Age of household head, Education level of household head, Total household size, Tropical livestock unit, Total land size, Farm input, Did you participate in any off-farm/non-farm activities to generate cash income, Extension service, Does your farm land have access to irrigation water, Credit facilities, Market distance, Farm experience, Income.