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SCHOOL OF GRADUATE STUDIES

HOUSEHOLD FOOD SECURITY STATUS: THE CASE OF DILLA ZURIA WOREDA, GEDEO ZONE OF SOUTHERN ETHIOPIA

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Household Food Security Status: The Case of Dilla Zuria Woreda, Gedeo Zone of Southern Ethiopia

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As member of the examining board of the final M.Sc. open defense, we certify that we have read and evaluated the thesis prepared by; Temesgen Feyissa entitled; Household Food Security Status: The Case of Dilla Zuria Woreda, Gedeo Zone of Southern Ethiopia and recommended that it is accepted as fulfilling the thesis requirement for the degree of M.Sc.

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DEDICATION

I dedicate this thesis to My Father Ato Feyissa Shallo and My Mother Adanech Gebeyehu, for growing up me with affection and love and being a constant source of inspiration as without their effort and encouragement the thesis would have not been completed.

STATEMENT OF THE AUTHOR

I declare that this thesis is my original work and that all sources of material used for this thesis have been dually acknowledged. The thesis has been submitted in partial fulfillment of the requirement for a M.Sc. degree at the Dilla University and is deposited at the university library to be made available to borrowers under the rules of library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the awards of any academic degree, diploma or certificate.

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BIOGRAPHICAL SKETCH

The author was born in Dilla town of Gedeo zone southern Ethiopia, on October 2/1990. He completed his elementary and secondary school in Koffe primary and Dilla Preparatory and secondary school respectively. After completion of his secondary education in 2006, he joined Dilla University as a regular student and graduated with bachelor degree in department of Horticulture in 2009.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACAP	Assessment Capacities Project
AE	Adult Equivalent
ATA	Agricultural Transformation Agency
CSA	Central Statically Authority
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussion
FSP	Food Security Program
GDP	Gross Domestic Product
GoK	Government of Kenya
IFRC	International Federation of Red Cross
KII	Key Informant interview
MoARD	Ministry of Agriculture and Rural Development
MOFED	Ministry of Finance and Economic Development
NCFS	New Coalition for Food Security
NGO	Non Governmental Organizations
OoANRD	Office of Agricultural and Natural Resource Development
PSNP	Productive Sefty Net Program
SNNPR	Southern Nation Nationalities People Region
TLU	Tropical Livestock Unit
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency International Development
USDA	United State Department of Agriculture
WFP	World Food Program

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ABSTRACT

Food security is a major concern not only to the government of food insecure countries but to the world at large. Ethiopia is one of the most food-insecure and famine affected countries. A large portion of the country's population has been affected by chronic and transitory food insecurity. The study focus to examine the determinants of food security status among rural households of Dilla zuria woreda of Gedeo Zone, Southern Nations Nationalities Peoples Regional State. A cross-sectional data collected from a total of 123 sample households. The survey data were analyzed by using descriptive and econometric methods. The descriptive result shows that among the total sample respondents 71(57.72%) were food insecure and the rest 52(42.28%) were food secured. The econometric model result shows that out of 13 explanatory variables considered in the econometric model analysis five variables were found to be significantly influencing the rural households' food security status. These variables include farm size, livestock owned, irrigation accesses and credit access were found to have a significant effect with positive relationship to rural household food security status. And on the other hand dependency ratio variable was also found to have a significant effect with negative relationship to rural household food security status. As the result revealed that coping strategy, At initial stage 71.54% ate less preferred foods, 8.13% receive donation in the form of grains or cash from relatives/friends, 7.31% buy food on credit base, 6.5 % selling household asset, 5.69% borrow money to buy food and 0.77 % selling livestock. On the other hand at sever stage participation in food for work (30.8%) as their first option followed by sale of more livestock than usual food for work (29.26%), like wise they also employed sale or consume of seed meant (22.31%) for next season planting, sale of production equipment (9.23%) as their fourth and food aid (7.31%) as fifth alternative and also short term migration of some family member. Based on these results, the study finally recommends alternative policy implications to improve the food security status of the rural households.

Keywords: Binary Logit, Coping Strategies, Dilla Zuria, Food Security

1. INTRODUCTION

1.1. Background of the Study

Ethiopia is one of the most food-insecure and famine affected countries. A large portion of the country's population has been affected by chronic and transitory food insecurity (African Development Bank, 2014). The situation of chronically food insecure people is becoming more and more severe. Food security situation in Ethiopia is highly linked to recurring food shortage and famine in the country, which are associated to recurrent drought.

According to the United Nations Universal Declaration of Human Rights 1948 "everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care. The right to an adequate standard and well-being regarding food implies right to adequate food, freedom from hunger and the ability to acquire food and improve conditions that helped to develop and sustain food security (UNDPIC 1998).

Food security has many dimensions, ranging from global, regional, national, local, and household to the individual level. The determinants of food security differ at different levels i.e. from global to regional and national to household and individual level because food security is deemed to be a multidimensional phenomenon encompassing climate change, civil conflicts, natural disasters and social norms.

Household food insecurity has been endemic in Ethiopia. A historical account of famines in the country goes far back to early years (early nineteenth century). Moreover, since 2015, the country is experiencing its worst drought in over 30 years (Elazar, 2016). The country gets unpredictable amount and distribution of rainfall resulting in reduced food crop yields.(Taye *et .al*, 2010). For poor households, opportunities to generate food and income are often difficult throughout the year. Those households with lessfarm land and large families are more vulnerable (Gebrehiwot and Vanderveen, 2014). Thus, the concept of vulnerability is an important part of food security analyses.

Studies on food security situation of Ethiopia confirmed that, despite some improvements in recent years, poverty and food insecurity remain widespread and the main challenges in Ethiopia. These challenges are further exacerbated by climatic shocks such as failure of rainfall, which adversely affect agriculture and allied activities, the main livelihood activities for the rural population. In fact, following the failure of rainfall during the 2015 agricultural seasons, estimates suggest that about 10.1 million people require emergency food assistance in 2015 (EHRD, 2016). This indicate that food security situation in Ethiopia has been a challenge to government, donors, and other international organizations.

The SNNPRS is one of the poorest regional economies of the country. Many studies shows that most of its households able to feed itself with sufficient food only for less than six to nine months of a year (Amsalu *et al*., 2012). The situation of Dilla Zuria woreda is not different.

The factors for food insecurity involve demographic, socioeconomic, environmental, and other multidimensional causes (Burj, 2008). However, many studies in the field have given more emphasis to the national and regional contexts, where disparities in localities and districts have been less represented. Such evidences may not verify situations at grass root level and may not reveal the extent of food insecurity problem in local contexts.

Despite that high number of households requiring continuous food assistance, little work has been done at the woreda in order to understand the food security problem at the household level. The status and the determinants of food security at household level in the rural areas of Dilla Zuria woreda are not well documented. The purpose of this study is, therefore, to assess the status of household food security and investigate its critical determinants in the rural areas of Dilla Zuria woreda.

1.2. Statement of the Problem

In Ethiopia, food shortage has aggravated the already poor economy of the country and it varies from one area to another depending on the state of the natural resources and the extent of development of these resources. Both chronic and transitory problems of food insecurity are widespread and severe mainly in the rural areas of the country. The reasons are mainly due to environmental and human factors (Webb *et al*., 1992).

The government of Ethiopia has been making relentless effort to ensure food security. The government has designed and implemented the Agricultural led industrialization policy as a major long term strategy to bring about overall development in the country. Under the umbrella of this policy, the contemporary government of the country has designed and launched four major five year development plans to realize various major development goals including ensuring food security (FDRE, 1996).

Despite such efforts of the government and the great agricultural potential of the country due to its water resources, its fertile land areas and its large labor pool, the country is still confronting with reoccurring food insecurity problem, Some empirical studies conducted on food security situation of the country revealed that though favorable food security conditions prevail in most parts of the country, 7.1 million people were estimated to live in conditions of chronic food insecurity and emergency in Amhara, Tigray, Oromia, Southern Nations Nationalities and Peoples, Somali and Afar Regions (WFP, 2016).

On the other hand, the studies conducted by Feleke (2012), kidane *et al*. (2012) and Fekadu *etal.* (2014) showed that the household food insecurity situations and lower resilience capabilities in rural parts of the country is associated with so many social, economic, political and natural factors which varies across locations. Besides, the field report of problem identification team confirmed that household food insecurity is amongst the top priority problems in Dilla Zuria woreda of Gedeo Zone.

In addition, any empirical study has not yet been conducted in this area. Thus, the food security status and the factors affecting household food security status are not clearly known. This indicates that there exists information gap on the food security status and factors influencing household food security status which is paramount important to design and implement appropriate programs, projects and other interventions aimed at ensuring food security. In order to reduce such gaps this study intended to assess the rural household food security status and its determinants in Dilla Zuria woreda of Gedeo zone, Southern Ethiopia.

1.3. Research Questions

The present study attempts to address the following key research questions

1. What is the existing food security status of rural households in the study area?
2. What are the determinants of rural household food security status of rural households in the study area? and
3. What are the coping strategies of rural households to food insecurity in the study area?

1.4. Objective of the Study

The general objective of the study is to identify the determinant factors of food security status of rural households in Dilla Zuria Woreda of Gedeo Zone, Southern Ethiopia.

The Specific objectivesof the study are:

1. To assess the food security status of rural households in the study area;
2. To analyze the determinants of household food security status of rural households in the study area; and
3. To identify the coping strategies of rural households food insecurity in the study area.

1.5. Significance of the Study

A study about the determinants of food security status and generating relevant data on food security status rural households is vital because it had significance in ensuring food security in the study area. Therefore; first, the study provides local level information which can be helpful for planners, policy makers, researchers and development actors in both the governmental and non-governmental organizations working in the area as well as elsewhere in the country with similar socioeconomic, cultural and physical environment in designing comprehensive, appropriate and effective policies of improving household food security. In addition, the study provides documentation on status and determinants of household food security as well as their relationship in the rural area of the study site.

This can also be helpful in supporting informed decision making during design and implementation of household food security programs in the study area. Second, the study was also expected to add to the wealth of information currently available on household, particularly rural, food security, in Ethiopia.

1.6. Scope and Limitations of the Study

The purpose of the study is to identify status and determinants of household food security status in selected rural area of Dilla zuria woreda. The survey of the study was conducted in four kebeles of the woreda on randomly selected 123 sample households. Since, the unit of analyses is household level; intra-household food situation is not analyzed, i.e. it was assumed that all household members equally share the food available for the household. In addition, the study was carried out within few months' time and this has limited time to capture more data by the survey; particularly the data that can indicate chronic food insecurity. That is, the study has no enough data over years to make a comparative analysis of household food security status over long periods. However; qualitative data collected through Focus Group Discussion (FGD), Key Informant interview (KII) and review of relevant government reports and academic papers have supplemented the study with information. The second limitation is, again limited by the data, the current study tried to see nutritional status only in the context of sufficiency of calorie intake.

1.7. Organization of the Thesis

This thesis is organized in five main chapters. The first chapter deals mainly with the background, statement of the problem, objectives, significance and scope and limitations of the study. Relevant literatures related to the study area are reviewed in chapter two. Chapter three focuses on description of the study area andsource and methods of data collection, sampling techniques and sample size determinations, methods of data analysis. In chapter four, the results obtained from the descriptive statistics and econometric models are presented and discussed. Finally, chapter five presents conclusion and recommendations.

2. LITERATURE REVIEW

2.1. Definitions and Concepts of Food Security

Food security is a concept that has evolved over time. As much literature has spiraled, many definitions and conceptual models on household food security have been presented (Smith *et al*., 1992). There are approximately 200 definitions and 450 indicators of food security (Hoddinott, 1999). In Africa, food crisis in the early 1970s stimulated a major concern on the part of the international donor community regarding supply short falls created by production failures due to drought and desert encroachment (Maxwell,1992).In 1983, FAO analysis focused on food access, leading to a definition based on the balance between the demand and supply side of the food security equation: "Ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 1983).In the World Bank (1986) report, Poverty and Hunger, this concept of food security is further elaborated in terms of: 'access of all people at all times to enough food for an active, healthy life.'

At the 1996 World Food Summit 182 nations agreed and adopted a still more complex definition: 'Food security, at the individual, household, national, regional and global levels. Food security is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO, 1998). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food. As a result, a synthesis of these definitions, with the main emphasis on availability, access, and utilization, serves as working definition in projects of international organizations.

FAO defined food security as a situation "when people, at all times, have physical and economic access, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". According to this definition, there are three important interlinked components of food security: food availability measured by food production and food supply, food access measured by the level of income; and food utilization measured by nutrition, health and care giving FAO (1998).

Food security is defined in different ways by international organizations and researchers. 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" (FAO,2010). Currently, a synthesis of these definitions, with the main emphasis on availability, access, and utilization, serves as working definition in the projects of international organizations.

Food security is a concept that has evolved considerably over time. Most definitions of food security vary around that proposed by the World Bank (Maxwell, 1996); wherein, food security defined as access by all people at all times to enough food for an active, healthy life (World Bank, 1986).

The essential elements in this definition are the *availability* (adequate supply of food); *access* through home production, purchase in the market or food transfer; *stability*, when availabilityand access are guaranteed at all times; and *utilization* which refers to the appropriate biophysicalconditions (good health) required to adequately utilize food to meet specific dietary needs andsecurity, as the balance between vulnerability, risk and insurance; and time (Maxwell andFranken berger, 1992).

Food availability means that sufficient quantities of appropriate, necessary types of domestically produced food, commercial imports or food aid are consistently available to individuals or are within reasonable proximity to them. At the national level, it is the sum of domestic food stocks, net commercial imports, food aid, and domestic production. Individuals have sufficient access to food when they have "adequate incomes or other resources to purchase or barter to obtain levels of appropriate foods needed to maintain consumption of an adequate diet/nutrition level".

Finally, adequate food utilization is realized when "food is properly used, proper food processing and storage techniques are employed, adequate knowledge of nutrition and child care techniques exists and is applied, and adequate health and sanitation services exist" (USAID 1992). Gradually, the concept of food security took on a more subjective meaning than at the outset, integrating the quality and diversity of needs from one individual to another, respect for local eating habits beyond a purely quantitative approach. Food security is a multidisciplinary concept,

which includes economic, political, demographic, social, cultural and technical aspects (EC, 2009).

2.1. 1 Concepts of Food Security Measurement

Food security is an essential, universal measurement of household and personal welfare. Its absence demonstrated by food insecurity and hunger is detrimental to the wellbeing and also is potential antidotes to nutritional, health, and developmental problems.

Food Security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (World food Summit, 1996). The concept of food security is complex and requires elaborate measures to accomplish. At first the definition focuses on the daily consumption of food where distribution systems ensure a continuous availability of food. Secondly, the concept of access to sufficient and safe food includes the continuous physical availability of food, and thirdly, it implies the sustained economic ability to acquire food through the supply system. This system includes: food produced for own-consumption; food commercialization schemes; public distribution systems with subsidized prices; or institutionalized food aid. Social access refers to acceptable food products supplied for consumption by population groups based on their cultural preferences.

Correspondingly, food insecurity refers to limited or uncertain availability and/or uncertain ability to acquire acceptable foods in socially acceptable ways *(*Bickel *et al, 2000).* Manifested through breakdown or inefficiency of food supply systems leading to food poverty, and marked by the inability of the households to access their food requirements.

Hunger is a persistent predicament especially in developing countries, worsening people's wellbeing, productivity and often their continued existence *(*Smith *et al., 2006).* For instance, the 2007/2008 food price crisis and subsequent global economic recession, have pushed the number of hungry to historical levels; exceeding one billion people worldwide (FAO and WFP, 2009). Surprisingly, some schools of thought indicate that world food production per capita has constantly increased since the beginning of sixties and will continue doing so till at least 2030 (FAO, 2002). However, world poverty and income inequality have unambiguously fallen over the

last three decades (Sala-i-Martin, 2006), and thereby posing serious challenges in addressing food insecurity.

In view of the above concepts there is need to employ indicators that are suitable and reliable for identifying food insecure in the population. Accurate information on the extent of food insecurity is essential to anchor sound policy and decision making platforms for eradicating hunger and malnutrition. Decisive steps towards assessing relative trends in food insecurity are paramount in order to understand the magnitude of food deficiencies and to identify the sections of population who are food insecure and their locations to enhance interventions.

Paradoxically, accurate data and information on the magnitude of food insecurity is hard to achieve especially in developing countries where it is needed most. In Kenya for instance, food insecurity information is generated through estimates based on unstructured observations of extension workers rather than formal statistical process and survey techniques (GoK, 2011). However, these aggregate estimates do not shed light on access to food by households, and therefore presents a major drawback in formulating food security policies. This puts the country on precarious position as far as addressing food insecurity problem is concerned. The present study highlights the significance of sound diagnostic actions that are essential to policy analysts as they seek to solidify their resolve on addressing food insecurity.

2.2. Theoretical Review on Food Security

Different theories viewed by different authors in relation to food security which clustered in three broad categories (Sen, 1981; Devereux, 1993).

I) **Political economy theory:** it mainly related with land tenure in security, weak targeting of safety nets, lack of accountability and transparency in local governance. Food insecurity is a political phenomenon that is not only caused by lack of food production nor by market irregularities, but due to political powerlessness. Thus, rather than sticking to the availability of food and people access to food as the only means out of food insecurity and famine, political economy theory proposes that interventions have to focus on state reconstruction, good governance and accountability (Arega, 2013).

II) **Food economy theory:** this theory incorporate two important food economy approach such as food entitlement decline and food availability decline approaches. In addition lack of delivery of inputs to increase agricultural production and weak marketing infrastructure, lack of access to purchase the basic needs are related to the food economy theories in respect to food availability and accessibility decline theories (Arega, 2013).

III) **Food accessibility decline theories**: academic and policy focus started to shift towards micro level issues affecting food security status of individuals, households and communities. Theoretical basis for this paradigm shift will set by Amartya Sen's 'entitlement approach'. The 'entitlement approach' and later works that build on it focus on the access of households to food through own production, income, gathering of wild foods, community support (claims), assets and migration. Hence, during the 1980s, due to the growing incidence of hunger, famine and malnutrition in many parts of the third world, the concept of food security will be redefined in such a way that the unit of analyses shifted from national and global levels to household and individual levels. It will be also made to focus on food availability as well as on access to food. The argument on 'accesses' in the early 1980s was a turning point to the progress of the concept and assessment of various food security related problems. In this approach, hunger and famine are the results of failure in specific socio-economic groups in the society to obtain adequate food by legitimate economic means. This means, lack of physical, human or social resources causes people's access to food to fall below their subsistence needs (FAO, 1983).

2.3 Review of Analytical Model

2.3.1 Binary choice models

Various models have been used in the analysis of the determinants of food security. Among these the use of limited dependent and qualitative variable such as probit and logit are worth considering. It has become a standard practice to analyses the determinant of food security through above mentioned categorical regression (World Bank, 2002). In this model it assumed that the actual per-capita income or consumption of households is not observed. We act as if we only know whether the household is poor or not, which is denoted by categorical variable that takes the value 1 if the household is poor and 0 if the household is not poor. Under the hypothesis of normal distribution for the error term, the model is estimated as probit. If the error term is

assumed to have logistic distribution, the model is estimated as logit. The general expiration for the binary choice model is described as (Greene, 2003).

Prob($\left(P = \frac{1}{x}\right) = \emptyset\ (x'\beta)$

2.3.2 Ordered models

Ordered model we can handle, when we identify different population sub groups in several stages. In the first stages we identify poor and not poor. In the second stage we examine the probability of being in extremely poverity conditional on being identified as poor. In the case of binary food security status, the previous binary model can be handle it.

Naturally ordered model is an extension of binary choice model (Madalla, 1983) this approach is justifiable, because we can moderate poverty line as cut-off or threshold points in a cumulative distribution of expenditure. Since this categories have a natural order, the ordered logit is the appropriate model to be employed in the estimation of relevant probably (Maddala, 1983; Greene , 2003)

$P *= \beta x + e$

The binary logit model was used to investigate the determinants of household food security among the rural households surveyed. The USDA Household Food Security Scale(Revised in March 2000) was used to disaggregate the households into food secure and food insecure households. The dependent variable in this case, food security, was a binary variable which took a value of one if a household was found to be food secure, and zero if otherwise.

A variety of models can be used to establish the relationship between the potential determinants and food security. Thus, this study used the binary logit model to estimate the determinants of food security status in the study area.

2.4 Food Security in Ethiopia

Ethiopia is the second most populous country in Africa with an estimated population of 94.3 million people in 2013 (CSA, 2013). As indicated by Africa Food Security and Hunger/ Undernourishment Multiple Indicator Scorecard, Ethiopia ranked as first in having the highest

number of people in state of undernourishment/ hunger which is 32.1 million people. This makes it, the fourth African country scoring (37.1%) of the population being undernourished/ in hunger (African development Bank, 2014). The livelihoods of rural Ethiopian people are highly sensitive to climate. Food insecurity patterns are seasonal and linked to rainfall patterns, with hunger trends declining significantly after the rainy seasons. Climate related shocks affect productivity, hamper economic progress and exacerbate existing social and economic problems (Anderson *et al.*, 2015). Food insecurity situation in Ethiopia is highly linked up to severe, recurring food shortage and famine, which are associated to recurrent drought. Currently there is a growing consensus that food insecurity and poverty problems are closely related in the Ethiopian context. Droughts and other related disasters (such as crop failure, water shortage, and livestock disease, land degradation, limited household assets, low income) are significant triggers, more important factors which increase vulnerability to food security and undermined livelihoods (MoARD, 2009)

Ethiopia has been a net importer of food for more than three decades. In the decade between 1985 and 1994, net domestic production of cereals that on average account for about 85 per cent of household food consumption ranged between 82.7 and 93.8 per cent of total supply. Even though, different factors are contributing to vulnerability of the country which includes rapid population growth with low per capita income, rain-fed agriculture, under-development of water resources, land degradation, low economic development, and weak institutions. Drought, human and livestock diseases as well as resource-based conflicts are aggravating factors for the food insecurity situation in Ethiopia (Fisseha, 2014). UNICEF (2014), about 10 percent of Ethiopia's citizens are chronically food insecure and this figure rises to more than 15 percent during the frequent drought years. World Food Program found long-term effects of chronic malnutrition cost Ethiopia approximately 16.5 percent of its GDP each year. 2.7 million People will require emergency food assistance in 2014 and 238,761 children require treatment for severe acute malnutrition in 2014. Estimated number of food insecure people was 4.5 million August, 2015 and by the end of the same year this figure had more than doubled to 10.2 million Ethiopians.

Asefa and Zegaye (2003) found that factors contributing to the current of food insecurity includes production fluctuations, low non-farm employment, low income, regional fragmentation of the markets, high rate of natural degradation, low level of farm technology, high level of illiteracy and inadequate quality of basic education, poor health and sanitation, high population growth,

poor governance and inter-state, intra-state military conflicts and wars all these factors impede the achievement of food security and sustainable economic development.

As cited in (Endalew*et et al.,* 2015) their review in Ethiopian food security situation assessment found that survey results of Goal Ethiopia and concern worldwide in two woredas of the Gambella regional state of Ethiopia's (Jikawo and Lare) indicated that the global acute malnutrition was 19.2 percent and 18.2 percent respectively. In the same way, deterioration of food security situation in Oromiya regional state is prevailed in Arsi zone. The affected woredas are Jeju, Diksis, Sude, Robe, Bilbilo, Sire and Guna. Poor performance of the belg seasonal rains led to shortage of pasture and water and poor development of planted crops.

The estimates reveal results: over 41 per cent of Ethiopian population is considered to be undernourished (FAO, 2010). In addition, an estimated 7.6 million (or 11 per cent of the rural population) are currently considered chronically food insecure, meaning each year they are relying on resource transfers to meet their minimal food requirements. Over the past four years between 2.2 and 6.4 million additional people were food-insecure or not able to meet their food needs in the short term due to transitional factors. They are temporarily dependent on relief food assistance (FAO, 2015)

Both the number of undernourished people and the prevalence of undernourishment have declined steadily since 1990 (FAO/WFP, 2010) "State of Food Insecurity in the World". Rome: FAO/WFP). Even though, significant progress in reducing undernourishment was shown in the period 1990- 2005, Ethiopia is faced one of the strongest drought shocks for many years like that of 2015 where 27 million Ethiopian became food insecure and 18.1 million dependent on relief food assistance (Catley *et al.,* 2016).

2.4.1 Food security policy context of Ethiopia

The government of Ethiopia made significant changes to its existing food security program, scaling up its level of intervention toward food security problems. In 2003, the government launched a large scale consultation process called the New Coalition for Food Security (NCFS) by incorporating with a large Productive Safety Net Program (PSNP). PSNP is a component of the Ethiopian government Food Security Program (FSP), and is essential feature of the food security investment strategy for chronically food insecure Woredas, launched in 2005. The goal of

the PSNP is food security status for chronically food insecure household's members through: direct grants to labor-poor, elderly or incapacitated individuals, and payments to able-bodied members for participation in labor intensive Public Works activities (MoARD, 2014)

The government was invested in many pro-poor strategies including the PSNP which was committed to reduce food insecurity. However, while maintaining internal stability, drought and other related disasters sustainable food security in the long term will be more challenging with a 2.5 percent population growth rate which implies a doubling of the population in less than 30 years (Anderson *et al.,* 2015). According to WFP one of the PSNP funding agents, Ethiopian Productive safety net program operates in Afar, Amhara, Dire Dawa, Harari, Oromiya, SNNP, Somali and Tigray Regions. WFP and eight other development partners contribute to PSNP. The Ministry of Agriculture's Disaster Risk Management and Food Security Sector, along with regional governments, is responsible for program coordination, management and implementation Launched in 2005, the program has grown from 4.5 million to around 7.6 million beneficiaries in 2012, or eight percent of Ethiopia's population; there were plans to reach 8.3 million people by 2015 (World Bank, 2012), However, planning PSNP to reach 8.3 million Ethiopian, the program succeeds to reach 7.9 million by 2015/16 according to Humanitarian Requirements report in Ethiopia. This indicates that the Ethiopian government and international NGOs are still facing great challenges in reducing food security and related problems in the country.

The PSNP targeted towards chronically food insecure households/districts, having accurately identified households that engage in activities which generate low returns and are mainly pursued by poor people. PSNP participants have been poorer in both incomes and assets, and cultivated less land than non-beneficiary households the same is true for districts that are not covered by PSNP and other Ethiopian food security programs. According to World Bank one of the funding agents of PSNP a given households to include in the program should be chronically food insecure household as "having faced continuous food shortages (usually three months of food gap or more) in the last three years.

2.4.2 The causes of food insecurity in Ethiopia

Ethiopia has been severing with drought and food insecurity problems for decades. There is no problem of underdevelopment that can be more serious than food insecurity that has an important

implication for long term economic growth of low income countries. Ethiopia has been plagued with food insecurity for decades. The problem is worsening, despite massive resources invested each year into humanitarian aid and food security programs. Food insecurity in the long run may cause irreparable damage to livelihoods of the poor, by reducing self-sufficiency (Eneyew and Bekele, 2011)

The causes of food insecurity in Ethiopia are many and interlinked each other but vary from one region to another. Study by Sewnet (2015), in rural part of the country found that major causes of food insecurity in Ethiopia as general includes natural disasters such as drought and climate change, population growth, land fragmentation and land degradation, lack of secured land tenure, lack of infrastructure, absence of functional multi party political system, and armed conflict with neighboring countries specially Eritrea and Somalia.

For decades both chronic and transitory problems of food insecurity are severe in Ethiopia. Chronic food insecurity exists due to the high ratio of urban unemployment and limitation of rural landholdings. More than one third of the households have less than 0.5 hectares, which under rain-fed agriculture, is adequate for subsistence production of food crops. Lack of draft animals like oxen intensifies the vulnerability associated with excessively smallholdings (Farah, 2015)

El Niño was expected to last at least until April/May 2016, exacerbating the food insecurity caused by the upcoming lean season. Over 15 million people are expected to be in need of humanitarian assistance in 2016. Poor households in affected areas in southern Afar and Sitti (former Shinile) zone in Somali region, in East and West Hararghe zones in Oromiya, and in Wag Hemra and North Wollo in Amhara region, are expected to remain in Emergency (UNICEF, 2015).There is no doughty that drought is the main driving forces in food insecurity problems in Ethiopia, many more other disaster that contribute to food deterioration related to currently weather and climate changes. The Endalew *et al.* (2015) were reviewed different studies that have been done on deteriorating situation of food insecurity in Ethiopia.

These are population pressure, drought, shortage of farmland, soil erosion, lack of oxen, deterioration of food production capacity, outbreak of plant and animal disease, poor soil fertility, frost attack, chronic shortage of cash income, poor farming technologies, weak extension services, high labor wastage and poor social and infrastructural facility and pre and post-harvest

crop loss. To scope the problem, the households respond to the problems caused by seasonal and disaster related food insecurity through sale of livestock, agricultural employment, and migration to other areas, requesting grain loans, sales of wood or charcoal, small scale trading and limiting size and frequency of meal.

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 and lack of on farm technological innovations led to a significant decline in the productivity per households and cause food security problems. These trends have combined with the repeated effects of drought over years, to substantially erode the productive assets of communities and households (Kebede, 2008). The Gilligan, *et al.,* (2008),finding indicated that Ethiopian populations have experienced long periods of food insecurity which directly related to several factors which include recurring droughts and also farm lands degradation, soil erosion, inappropriate storage agricultural facility, less purchasing power of households, small and fragmented land size, lack of off-farm income opportunity. These factors have limited the household's ability to have physical and economic access to sufficient, safe and nutritious food that is necessary to meet their dietary needs and food preferences for an active and productive life.

Food insecurity in Ethiopia is persistently caused by a combination of factors that include recurrent drought which has increased in frequency of every 3 to 5 years; the flooding that has become more frequent in flood prone areas along the main river basins. Small land holdings with an average of 0.5 to 2 hectares per household associated with population growth has resulted in land degradation as one of the most critical problems especially in the north eastern, south central and eastern highlands (WFP, 2009). According to DPPC (2011) chronic food insecurity situation in Ethiopia is frequently aggravated by (unexpected) shocks such as drought. During the normal years, on average, over 5 million people have been affected by drought related factors. On the other hand the transitory food insecurity is aggravated by a sharp reduction in domestic or imported supply of food because of crop failure, civil war and interruptions in food trade.

The food insecure situation in Ethiopia include: the urban unemployed, people in areas of conflict, destitute peasants, pastoralists who depend on markets for cereal supply and the refugees

from neighboring countries, mainly from Somalia and South Sudan. A number of studies have confirmed that there is severe food insecurity in Ethiopia covering a wide range of areas and affecting a large number of people (Farah, 2015)

Food security situation in Ethiopia deteriorated by intra-and inter- state military conflict and war, different studies indicated that Ethio-Eritrea war and recurrent drought eroded the country resources which become the main causes of food security problems during 1999-2000, pastoralist community in the country come into the conflict due to the control over the pasture and water resources.

Ethiopia has relative political stability in Horn of Africa, however several areas are insecure. UNICEF, 2016 reports suggest that from clashes between government forces and the Ogaden National Liberation Front which was persisted since 1994 in Somali region up to mid-December 2016, the resent violent protests broke out in the Oromiya region, against the urban planning strategy of the government to expand the Addis Ababa city's urban territory many millions of

Ethiopian citizens faced difficult to get food from market and through their own production. This indicates that conflict and civil unrest is the major sources of food insecurity problems and lead to serious disaster in Ethiopia, by disturbing the country ongoing economic growth and development progress.

In recent studies by Hadji and Gelaw (2012), found that Ethiopia has experienced an unprecedented inflation of food prices, particularly concerning cereal prices, which have been among the highest in Sub-Saharan Africa. Rising food prices hit especially poor people rural part of the country, because they have to spend a higher share of their income on food items. Rising food prices therefore decreases their real income substantially, often with negative consequences for their food and nutritional status.

In the past history of Ethiopia, food price inflation was associated with high variations in agricultural outputs mainly caused by recurring droughts. However, the empirical study of *(Loening et al., 2009),* reveals contrary findings, by stating that: "growth of food prices in Ethiopia is determined by external sector. Inother words, the exchange rate and international pricesexplain a large fraction of Ethiopia's inflation". While the debate on the causes for the hike

of food prices in Ethiopia is still ongoing World Bank (2014) report indicate that food price has significant impact on food consumption status of Ethiopian population.

MoARD (2007), cited in Endalew *et al,* (2015) argue that immediate causes of food insecurity in Ethiopia include frequently recurring droughts and erratic rainfall patterns, ecosystems degradation, rapid population growth, the low levels of technology employed in agriculture and the resulting low productivity of the sector, poor rural infrastructure and legacies of the past policy constraints are also considered as basic causes of food insecurity and widespread poverty in the country.Combinations of natural and man-made have resulted in this serious and growing food insecurity problem in many parts of the country.

Food insecurity is a critical challenge for rural households in Ethiopia, different studies on different parts of the country indicate that the main sources of food insecurity in the country are drought and weather related shocks and disasters. AFI (2012),the most common causes of food insecurity problem in Sub-Saharan African countries which Ethiopia is the first and other third world countries were; drought and other extreme weather events, pests, livestock diseases and other agricultural problems, climate change, military conflicts, lack of emergency plans, corruption, and political instability, cash crops dependence, aid and rapid population growth. These factors deplete the productive assets of rural households and cause adverse effects on household's food security status and all are endemic in Ethiopia.

Studies and discussions about causes of Ethiopian food insecurity problem is very complex concept to be addressed; this is why different scholars and researchers given those multiple factors such as Environmental degradation, rapid population pressure, and conflict are deteriorating food security situation in the country. However, different researchers agreed on drought remain one of the key drivers of food insecurity in Ethiopia. Since 1950, the country experienced more than twelve drought-induced food security crises (WFP 2014).

2.5 Food Security Situation in SNNPR

According to the 2010 DPPC half year report on SNNPR food security situation, the Southern Nations, Nationalities and People's Regional State (SNNPR) is one of the food insecure regions in Ethiopia. The report also revealed that the food insecure in rural areas of the region includes the

following vulnerable groups: landless and the poor without assets, very small and fragmented land holders, female- headed households, families with large size, dislocated pastoral members, drought and pest affected households.

2.6 Determinants of Food Security

Factors that affect household food security in various developing countries especially in Africa have been documented in some literature and these factors or determinants are most often than not location-specific (i.e. different study areas were found to have variant attributes as food security determinants with some attributes recurring).

The study conducted in Nigeria by Oluwatayo (2008) using probit model found out that sex of household head, educational level, age and income have positive influence on food security whereas household size has negative influence on household food security. Study 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 farm size and household size have negative effect on household food security.

Babatunde *et al*.(2007) is another detailed work on food insecurity in Nigeria. The study utilized a three-stage random sampling technique to obtain a sample of 94 farm households and a cross sectional data in year 2005. Using the recommended calorie required approach; the study revealed that 36 percent and 64 percent of the households were food secure and food insecure respectively. The Shortfall/Surplus index showed that the food secure households exceeded the recommended calorie intake by 42 per cent, while the food insecure households fell short of the recommended calorie intake by 38 per cent. A logit regression model estimated showed that household income, household size, educational status of household head and quantity of food obtained from own production were found to determine the food security status of farming households in the study area.

A study in Pakistan by (Asghar and Muhammad, 2013) found that household size, household income, irrigation facility, and age determine food security. In contrast to the results by (Greenwell and Pius, 2012), found that age has a positive impact on household food security and justified that experience has more weight for a household status to be in food security.

According to a study in Bangladesh by (Majumder *et al*., 2012) profession and crop cultivated, farm size and professional support found to be significant determinant of the household food security. In this study, it seems that variables like age and other household characteristics are not controlled. In a South African township of Kwakwatsi a study revealed that male headed households, vulnerability to food insecurity increases with age of the household headed but it would decrease with an increase in household income and the employment status of the household headed. In female- headed households' vulnerability to food insecurity increases with household size and age of the household headed, while it decreases with household income (Ndobo, 2013).

(Greenwell and Picus, 2012) in their study in Malawi, used reported food security status, a continuous dietary diversity index and food end time as measure of food security. Logistic, ordinary least square, and quintile regressions were used as an estimation method. This study found that household food security is determined by credit access, age, sex of the household head, extension information, assets or wealth and education. In this literature age is found to have negative association with the food security status. The justification given is that even if young farmers tend to be less experienced, yet they are more food secure due to their dynamic and energetic nature. The type of food insecurity observed in Sub-Saharan Africa is a combination of widespread chronic food insecurity, resulting from continuing or structural poverty, transitory emergency related food insecurity, which occurs in periods of intensified pressure caused by natural disasters, economic collapse, or conflict (FAO, 2004).

However, 99% of the food insecurity in Sub-Saharan Africa is grown under rain fed agriculture. Hence, food production is vulnerable to adverse weather conditions. The reason behind is that there was an over decline in farm input investment including fertilizers, seeds, and technology adoptions. Other causes include rapid population growth, limited access to agriculture related technical assistance, under developed agricultural sector and lack of knowledge about profitable soil fertility management practices leading to expansion in to less-favorable lands (Boussard et al., 2005). The situation in Ethiopia is not much different from the conditions in other developed and developing regions. All these studies are conducted using cross-sectional data. Despite these works are carried out in different regions, we may need to know, if the determinants found to be similar or different.

According to (Hiwot, 2014) based on the results of the conditional logit model, among the priority variables fitted in to it, rainfall shock and household size negatively and significantly determine food security. While, farm land size, land quality and credit access positively and significantly determine food security at varying levels of significance. In the fixed effects model these same sets of variables significantly determine nutritional status in the same sign as they determined food security with only differences in magnitude and significance of the coefficient estimates. Additionally, off-farm income, fertilizer use and oxen ownership are priority variables that are found to be significant in this model.

A study by (Haile *et al*, 2005) at korodegaga, a peasant association found in Oromia Region of Ethiopia, used cross- sectional data and a binary logistic regression as the econometric model. The study controlled for many factors which meant to have an impact on food security status of a given household in the district. Out of the eleven factors that was fitted to the model, farm land size, oxen ownership, fertilizer application, education of the household head, and household size found to be significant determinant of household food security. This study again did not take in to account rain fall shock.

Similarly, a study at Ada Berga, a district in the central Ethiopia, (Beyene and Muche, 2010) found that off-farm income, livestock and land holdings, agricultural practices and farming activities significantly affect household food security. Chemical fertilizer uses 17 also affects food security positively. In a study in Jiggiga district of central Ethiopia, that uses an empirical analysis by a logit model, (Hussien and Janekarnkij, 2013) find out that fertilizer use, credit access, extension service, and household income have positive influence on food security.

Generally complex sets of variables such as size of land, quality of available land, educational level of the farm owner, quality and quantity of technology and capital available are important factors in influencing the level of food production (Foster, 1992). A study done in Wolaita Zone Offa Woreda showed that education level of household head, access to credit, total cultivated land, household active labor forces, household members participation into income generating activities participation in rural institutions, participation in off-farm activities, dependency ratio, participation in non-farm activities, frequency to extension contact and livestock rearing were significantly associated with household food insecurity (Bogale, 2014). Thus, controlling for all

these complex sets of variables is useful to obtain an unbiased estimate of it and their corresponding impacts on food security.

The analysis of food security determinants by Awassa Research center (2000) in southern Ethiopia using logistic regression model specified with food security as a function of various farmers' characteristics as explanatory variables confirmed that the following are the most important determinants. The analysis revealed that incidence of disease (inset merely bug), soil fertility problem, agro ecological conditions, inset farm size, wealth status. Ethnicity, type of staple food and production of cash crops (coffee) are determinants of food security. Moreover, inset farm size, agro ecological conditions, ethnicity, low soil fertility and wealth status were identified to be the most important determinants of food insecurity in order of importance in the study area.

However, the analysis of determinants of food security of rural households remain a long-standing challenge. Thus, to identify the determinants of food security, assessing the status of household food security and its association with different demographic and socio-economic factors is the main drive of this study to guide policy decisions, devise appropriate interventions and integrated efforts to combat food security problem in the study area.

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

2.7 Conceptual Framework of the Study

As it is shown in the figure, there are different categories of factors (independent variables) related to household's demographic characteristics, socio-economic factors and institutional factors such as the household's agricultural credit use, Institutional and infrastructural factors, Distance to market, Extension contact and extension services. These are expected to affect household's food availability and access through their influence on production, purchase, gift, transfer, food aid and borrowing.

Demographic factors such as age and sex of household head, household size and educational status of household head have an influence on food availability and access at household level which in turn affects the food security status of the farm households. Age of household head has positive

relationship to status of household food security, however; some literatures also show that age has mixed results with household food security. Sex of household head was expected to have influence on household food security, i.e. male headed households have better status of household food security than female headed households. Dependency ratio was expected to have negative influence on the status of household food security, while educational status of household head was expected to have positive contribution to the status of household food security.

The socio-economic or productive resources of a household such as farmland size, irrigation utilization, total livestock ownership and participation in off/non-farm income generating activities also have an immense influence on status of household food security. From this study it was expected that farmland size, irrigation water utilization, total livestock owned by the household (in terms of TLU) and participation in off/non-farm income generating activities would affect food availability and access at the household level and therefore, would have positive correlation with food security status of the household.

Agricultural credits, and agricultural extension contact was expected to have positive and market distance expected to have negative influence on the availability and the access of food to a household, which in turn, contributes to better status of household food security. In the diagram, these factors are shown as institutional factors.

Apart from the variables mentioned above, a number of factors interact to determine food availability and access at household level; which in turn affects the status of household food security. These are natural related factor such as the occurrence of crop pests and diseases and agro-ecology.

The following diagram (figure 1) visualizes the variables stated above and expected to determine the status of household food security.

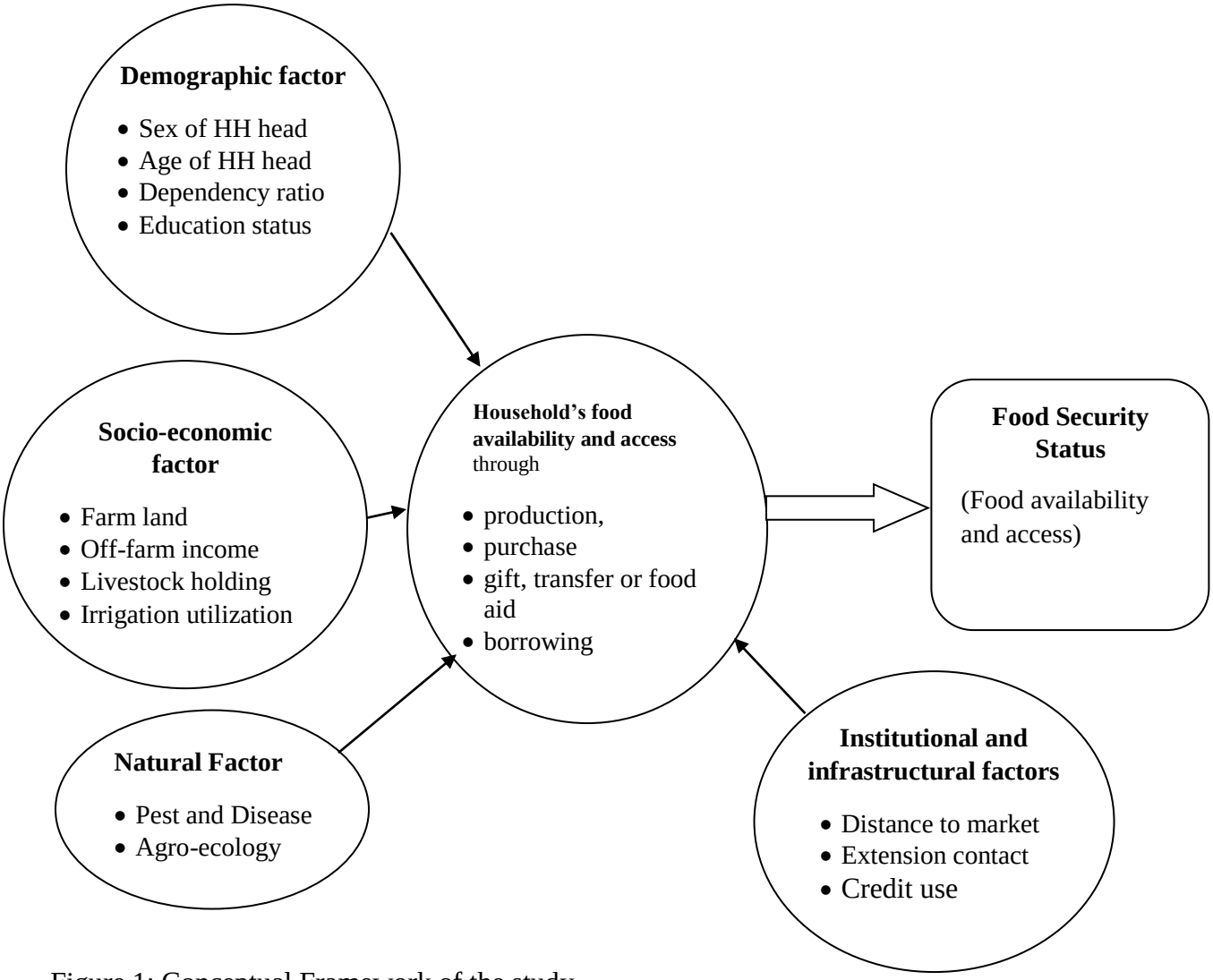


Figure 1: Conceptual Framework of the study

Source: Own construction, 2020

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

3.1.1. Location

Dilla zuriaworeda is suited in Gedeo zone which is named after its major town, Dilla zuria, which is located 6km far from Dilla town, 95 km from capital city of the region Southern Nations, Nationalities, and Peoples' Region and 371 km away from the capital city of Ethiopia Addis abeba. The woreda is estimated has an estimated area of 12044 hectare that comprises of 17 rural kebeles. And it is found North latitude 6° 21 " to 6° 42 " Easting longitude 38° 18" to 38° 41" . The woreda is bordered on the west by the Oromia Region, and on the south and Oromia region and Wonago woreda, on the east by Bule, on the north Dilla town and Sidama zone. Figure 2 shows the geographical location of the study area.

3.1.2 Topography of the study area

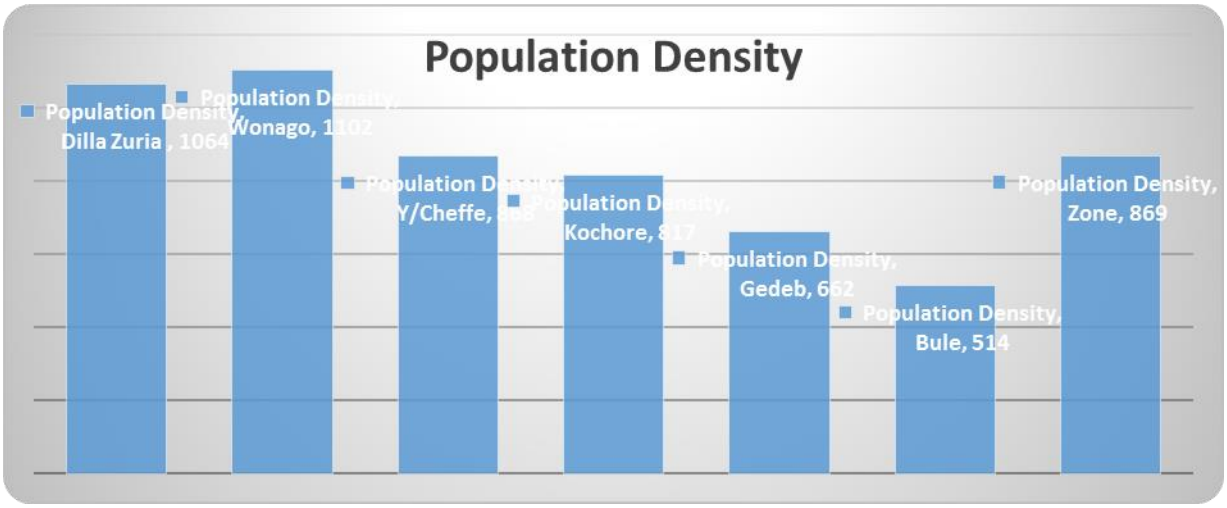
Dilla zuria woreda has an average slope ranging 45% and the altitude is found at elevation 0f 1550- 2800 a.s.l(GZFED, 2019)

3.1.3 Climate condition and Soil type

Dilla zuria woreda has 89% woinadega and 11% dega climatic condition on average rain fall range 900-1400mm, the average temperature range 16^0c to 24 ^{0}c and the soil type is clay loam. (GZFED, 2019)

3.1.4 Demographic characteristics of the study area

Dilla Zuria woreda had a total population of 127,583 of which 64,039 are men and 63,544 women. As it is shown clearly below that the population density of Dilla zuria woreda is the second after wonago woreda which above zonal average. (GZFED, 2019)



Source 2: Gedeo zone sector of Finance and Economic Development (2009 E.C/2016)

3.1.5 Land use and Farming system

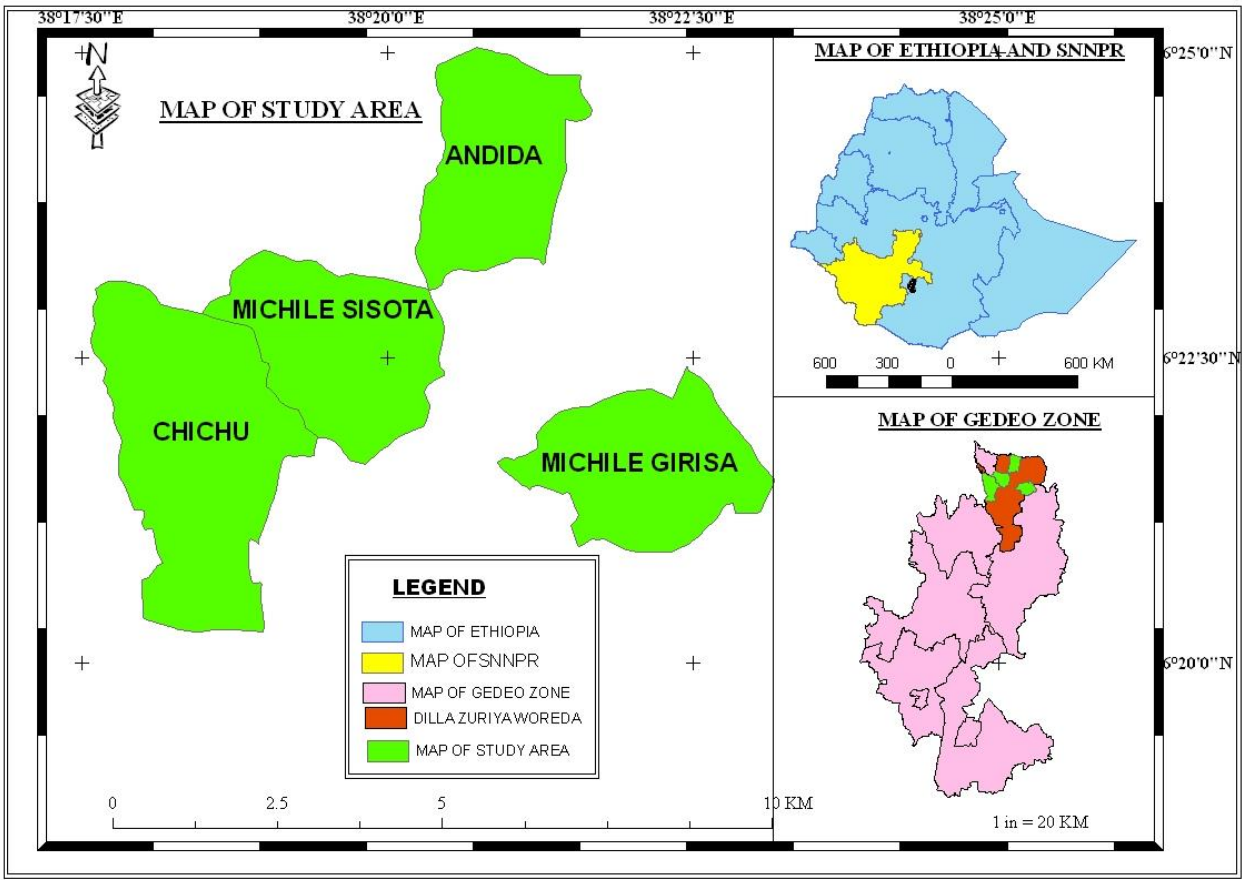
Dilla zuria woraeda is one of majorly cash crops growing area. Out of the total land coverage 12044 ha about 9226 ha is covered by Perennial crops like coffee and Enset and only 2408 ha is covered by annual crops like maize, wheat, barley and haricot bean and seasonal crops /horticultural crops/ the rest covered by others (Dilla zuria woreda OoANRD, 2019). Out of 17 rural kebeles in the woreda 15 kebeles are specializing coffee production and diversify different annual crops the rest 2 kebeles are crop potential areas and has coffee in some parts of the kebele.

There are two cropping seasons in the study area, i.e.*Belg* (short rainy season) which runs from March to May and *Meher* (main rainy season) which occurs in the months of June to September.

Belg rains are mainly used for land preparation and planting long cycle crops such as maize, haricot bean, coffee seedling plantation, Enset planting and horticultural crops (Fruit and Vegetables) The *Meher* rains are used for planting wheat, haricot bean, and sweet potato horticultural crops (Fruit, Vegetables, Root and tuber crops) and to some extent teff (Dilla zuria woreda OoANRD, 2019). The area generally depends on rain fed agriculture and uses mixed farming system. Both crop production and animal husbandry are commonly practiced.

The main crops grown during the two cropping seasons are Enset, maize, barley, wheat, broad bean haricot bean, potato, sweet potato. The main livestock species are cattle, sheep, goats, and poultry.

Figure 3: MAP OF THE STUDY AREA



Source: Extracted from Ethio-Gis by Gis Expert (2020)

3.2. Data Sources and Data Collection Methods

The study was used both secondary and primary data. The primary data was collected through household survey from sample households using a structured questionnaire. During the survey, information was gathered on issues related to the socioeconomic, institutional and agro ecological factors that affect household food security status in the study area. Structured questioner which were filled by enumerators, key informants interview and Focus group discussion (FGD) were also held to collect the primary data.

Secondary data were collected from published and unpublished documents obtained from research papers, booklets, internet, CSA, FAO, Zone and woreda Agriculture and Natural Resource Offices.

3.3. Sample Size and Sampling Technique

If a population from which a sample is to be drawn it does not constitute a homogeneous group, stratified sampling technique was generally applied in order to obtain a representative sample. Under stratified sampling, the population wasdivided in to several sub population that are individually more homogeneous than the total population (the different sub population are called "strata") and then select items from each stratum to constitute a sample.

Since each stratum is more homogeneous than the total population, we are able to get more precise estimates for each stratum and by estimating more accurately each of the component parts; we get better estimate of the whole. In brief, stratified sampling results are more reliable and detailed information (Kothari 2004)

In this study, a multi stage random sampling technique was used. The details of sampling method applied is presented and discussed below. In Dilla zuria woreda there are 17 rural kebeles among which only two kebeles located in dega agroecology and the remaining 15 were located in woinadega agroecoloy.

From strata of 15 rural *woinadega kebeles* three kebeles and one kebele from second strata of *daga kebele* were selected randomly. Among the four randomly selected kebeles 123 households were selected based on probability proportional to sample size sampling technique.

The sample size for the study was determined following Yamane (1967).

N

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

Where n is the sample size needed, N is the population size of the study area and e is the desired level of precision (in this case, e= 9%) with the same unit of measure as the variance and e^2 is the variance of an attribute in the population. There for;

$$n = \frac{31814}{1 + 31814(0.09)^2} = 123$$

Table 1: Sample size by kebeles

Agroecology	Kebeles	Total household	Sample household
Woinadega	Chichu	11381	44
	Michile sisota	8950	34
	Anidida	7982	31
Dega	Michile Girissa	3501	14
	Total	**31814**	**123**

Source: Gedeo zone sector of Finance and Economic Development (2020)

3.4. Methods of Data Analysis

In this study, both descriptive and econometric methods were used to analyze the data.

3.4.1. Descriptive and Inferential statistics

Descriptive statistics which was used for analyzing data for this study include mean, standard deviation, frequency, ratio, percentages, graphs and tables. The hypothesis was tested by using t-test and chi-square analysis.

3.4.2. Econometric model

The data analysis was started with the conversion of the weekly consumption data into kilocalorie using the nationally standardized food composition table manual (EHNRI, 1997). The converted data was again divided by household Adult Equivalent (AE). Following this, the amount of energy intake in kilocalorie (kcal) available for the household was recorded.

Then after, the results were compared with the minimum subsistence requirement per AE per day (which is 2,200 kcal). Households which consume below this minimum requirement was categorized as food insecure and those households which consume above the threshold was considered as food secure.

Following the previous step variables that are assumed to have association with food security at a household level were identified. As the dependent variable has a dichotomous nature (food secure or insecure households), a binary logistic regression was used where the estimated probabilities lie between logical limit 0 and 1. Food security as a dependent variable, thus, assumes the value of Y= 1 if a household is food secure, 0 otherwise. Following Gujarati, (1995), the functional form of logistic regression model specified as follows:

$\text{Ln} = \frac{\ln P}{1-P} = \beta_{\circ} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots \beta_n X_n + Ui$ WhereLn = natural logarithm

P = probability of being food secure

1-P = probability of being food insecure

β_n = coefficient of explanatory variables

X_n = predictor variable $Ui = \text{error term}$

3.5. Variables Definition and Working Hypothesis

The dependent variable which was used in the logistic regression analysis is a binary variable which takes a value of one for food secured and zero for insecure households. The most important reason of a qualitative choice model is to determine the probability that an individual with a given set of attributes was make one choice rather than another. Household's food insecurity situation was determined by comparing total kilocalorie consumed in household per adult equivalent per day with the daily minimum requirement of 2200 Kcal/AE/day.

Independent variables of the study

After an analytical procedure clearly delineated, it is necessary to identify the potential explanatory variables that can influence the state of household food security. Thus, the following explanatory variables were identified and their influences on household food security situation were examined.

Age of household head (AGEHHH):it is a continuous variable measured in years. The direction of the influence is not, however, clear and there are always mixed results from empirical analysis. Older farmers may have more experience, resource or authority that would allow them more possibility for trying new technology. On the other hand, it might be that young farmers are more likely to adopt new technologies, because they may have more schooling than older farmers and have been exposed to new ideas and hence more risk takers (Assefa and Gezahegn 2010)

Dependency ratio (DEPRATIO): Dependency ratio is obtained by dividing inactivelabor force (age less than 15 and above 65) by the active labor force (age between 15and 65) with in a household. The higher the dependency ratio the higher is the household to be food insecure that with less dependency ratio households. When a large household size corresponds with the availability of adequate adult labor, it could have a positive effect. But a household withmore inactive productive labor force compared to the active age shows a highdependency ratio and it is more likely to be food insecure (Bigsten *et al*., 2002).Therefor dependency ratio is expected to have negative effect on food security status of household.

Livestock holding: - It is the total number of livestock holding of the household and a continuous variable measured in Total Livestock Unit. Since the study area is known by shortage of land available for expansion of crop cultivation the ratio of exclusive land allotted for fodder production and grazing land is hardily available for additional livestock holding in the study area. Because of the above constraints therefore, this variable expected to have negative impact on the level of food security in the study area.

Sex of household head (SEXHHH): This is a dummy variable that takes a value of 1 if the household is male 0 if female.Household head is a person who economically supports or manages a household or for reason of age or respect is considered as head by other members of the

household. Male-headed households have more access to agricultural technologies and more security to farmland as compared to female-headed households. Women farmers may need a long adjustment period to diversify their income sources (Gladwin *et.al*, 2001). As most female-headed households lack labor, they often rent their land on a share-cropping basis. Hence, male-headed households are in a better position to pull labor force than the female-headed ones.

Education level of household head (EDUHHH): It is a dummy variable defined 1 for literate and 0 for illiterate. Education is an important variable determining household food security where educated households have a better chance of managing their farm by adopting improved practices, which in turn increases total yield. It is assumed that a literate household head often tends to adopt new skills and ideas which in turn have positive effects on food security (Garrett and Ruel, 1999); hence, it is positively related with household food security.

Off/non-farm activities participation: This is a dummy variable which takes a value of 1 for off farm participant and 0 otherwise. The presence of off-farm activity and ability to generate additional income had a positive association with household food security status (Tsegaye, 2009). Hence, households who did not engage in off-farm activities are more likely to face food deficit, if farm income is not enough. Yet, **(**Basher, 2010) indicated that the availability of offfarm income and food security have positive relationship. It is hypothesized that households who managed to earn higher off/non-farm income are less likely to be food insecure. Thus, off/non-farm income is expected to have a positive impact on food security.

Farm size (FARMSIZE): Size of farm is a continuous variable measured in hectare. Cultivated land is a salient resource expected to be associated with a household's food security status. Some have assessed that size of cultivated land is associated with food security (Garrett and Ruel, 1999; Grootaert and Narayan, 2004). As the cultivated land size increases, provided other associated production factors remain the same, the possibility that the household gets more output is high as it remains the basic capital input in food production. Therefore, it was hypothesized that households with large cultivated land were less likely to be food insecure and vice versa.

Pest and disease: Is dummy variable which takes a value of 1 for households affected by pest and disease and 0 otherwise. The variable is one of the factors affecting production and reducing yield. (FSB, 2007) reported that among the major challenges, pests and disease plays grate role on

food security in Ethiopia. Hence, it is expected that households affected by pest and disease have negative linkage with household food security than not affected households.

Access to irrigation: It is a dummy variable which takes a value of 1 for households having access to irrigation and 0 for those with no access. Since this variable may favor food security, it is hypothesized that access to irrigation has a direct relationship with all dependent variables. It means that, Households who use irrigation is more likely to be food secure. If a household uses the irrigation water for crop production purposes, then the food security should be improved.

Distance to nearest market (DISTMART)*:* It is dummy variable that takes value of 1 if a household has market access and 0 otherwise. Closeness to market centers creates access to additional income via off-farm/non-farm employment opportunities, easy access to information on inputs and transportation *(*DORWARD *et al.,* 2003*).*

It is thus, expected that a household having better access to market has better opportunity to be food secure than the one which does not have access. Therefore, it is hypothesized that there is positive association between access to the nearest market center and household food security.

Credit use (CREDRECIVED): Credit serves as a means to boost production and expand income generating activities (Diagne, 1998; Devereux, 2001). It is a dummy variable taking the value 1, if the household takes credit 0 otherwise. Thus, a household which has access and use credit does initiate investment in farm and non-farm activities and achieve food security. Thus, it is hypothesized that a household which has access to credit is more likely to be food secure.

Frequency of extension contact (FEC): Is a continuous variable and the effort to disseminate new agricultural technologies are mainly successful if there is smooth and frequent contact between development agent and the rural household. Here, extension contact between a farmer and development agent has potential force to accelerate effective dissemination of adequate agricultural information, which in turn, enhances farmers' decision to adopt new technologies (Kidane *et al*., 2005). Therefore, it is hypothesized that households who frequent extension contact would have positive relation with household food security than zero contact.

Agro ecology (AGECO): This variable stands for climate expressed in terms of agro-ecological classification. And it is a dummy variable that take a value 1 for dega and 0 otherwise. A farming system is a classification of agro-ecological zones where diversity in land quality, distribution of rainfall and ability to grow diverse food crops is differentially distributed within the two agro-ecological zone(The woreda is classified by two agro-ecological zone Highland areas/ Dega/ 11% and Midland /Woinadega/ 89%). Source (Dilla zuria woreda OoANRD, 2019). In the highlands the distribution and amount of rainfall is better as compared to the midlands. Hence it is hypothesized that the magnitude of household food security declines as we go from highlands to midlands.Therefore, it is expected that this variable has a negative relationship with the dependent variables.

4. RESULTS AND DISCUSSION

The results of the study are presented and discussed in this chapter. The first section presents results of the descriptive and inferential statistical analysis. The second section deals with the discussion of the econometric model outputs and the final section deals with households coping strategies.

4.1. Descriptive Statistical Results

As already noted, the present study is based on data collected from a total of 123 sample households from four rural kebelesof the study woreda. The descriptive analysis was addressed through describing the characteristics of the sample households in terms of demographic characteristics (sex of household heads, age of household heads, Dependency ratio and educational level of household heads), socio-economic factors (farm size, livestock owned, off/non-farm participation and Irrigation), Institutional factors (credit access, frequency of extension contacts and Distance to market), Natural factor (Agro ecology and pest and disease problem) and coping strategies.

4.1.1. Descriptive statistics of sample households' characteristics for continuous variable

As indicated in the table 2, the average age of the total respondents was 43.28 years with the ranges of 20 to 82 years. Similarly, the mean age of food secure and insecure household heads were 43.44 and 43.17 years respectively.

As far as the educational status of the respondents is concerned, on average the education level of sample household was 2.66 with the minimum and maximum of 0 and 9 respectively. Furthermore, the mean education level of sample household of the food secure and food insecure households were 2.73 and 2.62 respectively.

The average Dependency ratio of the total sample households was 0.41 with the minimum and maximum sample respondent were 0.2 and 1 respectively. Furthermore, the mean Dependency ratio of the food secure and food insecure households were 0.54 and 0.28 respectively. The t-test results showed that there is a statistically significant difference at 5% level of significance. This

imply that the households with large dependency ratio were more likely to be food insecure than their counterparts.

The farm size per sampled households ranged from 0.11 hector to 6.5 hectare and the average farm size of the total sample households was 1.02 hectare. As shown in the table below, the mean farm size of food secure household was 1.87 hectare and 0.40 for the insecure households. As indicated in table 2 that there was statistically significant difference between food secure and insecure sample households in the mean cultivated land. In addition, during in the time of FGD, the discussants confirm that the study area is categorized by very small and highly fragmented land holdings. This implied that food insecure households were relying on very small pieces of land to meet their food requirement.

Livestock production is also an important source of livelihood which contributes as a source of transport, nutrition, income and serves as coping strategies during food deficit. The survey results revealed that, the minimum and maximum livestock holding range from 0 up to 11.25 TLU and its average size of livestock is 4.44 TLU. The mean livestock holding for food secure and insecure households were 6.66 and 2.80 TLU respectively. This implies that livestock owned by food secured household is higher than that of food insecure households.

Rural farm households who have more frequent extension contact are more likely to adopt improved technologies to improve production and productivity than less frequent extension contact households. Hence, it was hypothesized as, farmers who use frequent services are found to be food secure than those less contact. In this study, farmers advised and visited a number of times by development agents per a year have less production problems than their counterparts.

The survey result revealed that, the minimum and maximum extension contact are 5 and 12 times per year and its average extension contact is 7.00 times per year. And the mean frequencies of extension contact for the food secure and insecure households were 7.17 and 6.88 times per year respectively (Table 2).

Distance to nearest market; the accessibility of market was proxied by the distance between farmers residence and the nearby market. The walking distance measured in hours from farmer

residence to the nearby was found to be about 0.88 hr food secured households and 0.78 hrs for insecure households.

Table 2: Household characteristics of the sample households

Variables	Food	Number	Mean	SD.	Mean	Min	Max	t-value
Age of household head	Insecure	71	43.17	13..66	43.28	20	82	-0.10
	secure	52	43.44	14.61				
Educational level	Insecure	71	2.62	2.35	2.66	0	9	-0.29
	secure	52	2.73	2.03				
Farm size	Insecure	71	0.40	0.38	1.02	0.11	6.5	-10.59***
	Secure	52	1.87	1.07				
Frequency of Extension contact	Insecure	71	6.88	1.13	7.00	5	12	-1.09
	Secure	52	7.17	1.77				
Tropical livestock unit (TLU)	Insecure	71	2.80	1.74	4.44	0	11.25	-11.59***
	Secure	52	6.66	1.94				
Dependency Ratio	Insecure	71	0.28	0.11	0.41	0.2	1	9.61**
	Secure	52	0.54	0.17				
Distance to nearest market	Insecure	71	0.78	0.24	0.82	0.5	1	-2.40
	Secure	52	0.88	0.21				

Note: *** and ** means significant at 1% and 5 % probability level respectively
Source: Own survey results, 2020

4.1.2. Household characteristics for dummy variables

As indicated in (Table 3), data was collected from 123 sample households of which 111(90.2%) were male-headed and the rest 12 (9.8%) were female-headed sample households. Among food secure households, 36.58% were male-headed and the remaining 5.69% were female-headed. On the other hand, from food insecure households 53.66% were male-headed and the remaining 4.07 % were female-headed.

Concerning Irrigation it was also observed that about 39.03% of the food secured households and 8.13% of the food insecure respondents had access to irrigation for agricultural production. The result of chi-square test showed that there was a significant difference in access to irrigation households head at 1% level of significance between the two groups (X^2=73.71). This result shows that food secured households has more access to irrigation than insecured households in the study area.

The availability of off-farm income earn supports the households' food security by increasing income. Among food secure and insecure households 52.85% had participation in off-farm activity. On the other hand, the rest 47.15% sample households had not participated in off-farm activity. From the total interviewed respondents about 80.49% households were affected by pest and disease problem from both food secure and insecure side and the remaining 19.51% were not affected by pest and disease problem. Moreover, during on the KIs and FGD the discussant strongly mentioned that the pest and disease problems are the main challenges of crop production in last cropping season in the study area. .

It was also observed that about 35.77% of the food secured households and 8.13% of the food insecure respondents had received cash credit for agricultural production from credit institutions the result of chi-square test showed that there was a significant difference in credit use households head at 1% level of significance between the two groups (X^2=60.63). However, the result show that there was limited use of cash credit use for agricultural production in the study area.

As far as Agro ecology concerned, nearly 110 (89.4%) of sample respondents resides in Woinadega and the rest sample respondents resides in Dega agro ecology. similarly in the study area it was observed that 6.50% of food insecured household and 28.45% food secured households are resides in Woinadega agro ecology.

Table 3: Household characteristics for discrete variables

Variables	Categories		Total households (N=123)		Chi square
			Frequency	Percent	
Sex HH	Insecure	Male	66	53.66	
		Female	5	4.07	1.41
	Secure	Male	45	36.58	
		Female	7	5.69	
Irrigation	Insecure	Access to irrig	10	8.13	
		No access to irrig	61	49.59	73.71***
	Secure	Access to irrig	48	39.03	
		No access to irrig	4	3.25	
Pest and disease problem	Insecure	Yes	60	48.78	
		No	11	8.94	1.73
	Secure	Yes	39	31.71	
		No	13	10.57	
Credit use	Insecure	Yes	10	8.13	
		No	61	49.59	60.63***
	Secure	Yes	44	35.77	
		No	8	6.51	
Agro ecology	Insecure	Woina dega	8	6.50	0.08
		Dega	68	55.24	
	Secure	Woina dega	46	28.45	
		Dega	6	8.12	
Off farm participation	Insecure	Yes	40	32.52	
		No	31	25.20	0.82
	Secure	Yes	25	20.33	
		No	27	21.95	

Source: Own survey results, 2020

4.1.3. Household food security status of sample households

Food insecurity status at household level measured in many ways. In this study, it was assessed by direct survey of consumption/caloric acquisition from sample households per AE per day employed to identify the food secure and food insecure households. Data on food consumption including own production, purchases and transfers in terms of gifts or wage in kind the last seven days were collected and further converted into calorie values using Food Composition Table for Ethiopia (EHNRI, 1997). Following this, the amount of energy in Kcal available for

the household was calculated on a person- day basis. Then, the results were compared with the minimum recommended calorie; *i.e.* 2200 Kcal per AE per day (MoFED, 2013). Based on this criterion, the household categorized as food insecure if their caloric consumption is less than 2200 Kcal per AE per day and food secure if its consumption was above.

The survey result depicted that, from the total sample respondents, 71(57.72%) households were found to be food insecure and 52(42.28%) of them were food secure. The minimum and maximum calorie consumed for food insecure households were 799 and 2071 kcals and that of the food secure households were 2200 and 4794, Kcals per AE per day respectively. The mean calorie amounts became 2913.5 kcals per AE per day for food secure and 1524.78 kcals per AE per day for insecure households. Consequently, the standard deviation for food insecure and food secure households were found to be 344.49 kcals and 641.41 kcals per AE per day respectively. The t-test (-14.77) value indicates that, there was statistically significant mean difference in calorie consumption between food insecure and secure households groups at less than 1% significance probability level (Table 4).

Table 4: Households' food security status

Calorie per AE	**Food secure (N=52)**	**Food insecure (N=71)**	**Total (N=123)**	**t- value**
Min	2200.13	799.11	799.11	14.77***
Max	4793.98	2070.90	4393.98	
Mean	2913.49	1524.78	2103.75	
SD	**641.41**	**344.49**	**846.96**	

Note: ***means significant at 1% probability level
Source: Own survey result, 2020

4.1.4. General food security situation of the sample household

As shown in Table 5, from the 123 respondents more than 89.43% stated that they strongly disagree and disagree on the availability of food to feed their family members throughout the year. This indicates that the majority of respondents in the study area have no enough physical availability of food throughout the year. Likewise, about 77.23% of sample households conveyed that strongly disagree and disagree on the accessibility of good physical and economic access to food for their family members throughout the year. This indicates that the majority of

respondents in the study area have no enough physical and economic accessibility and availability of food throughout the year.

The result shows that from the total sample households, about 7.32% mentioned that agree and strongly agree on the acceptability of food that was nutritious and safe, and produced in environmentally sustainable ways throughout the year for their family members. This shows that, about 92.68% of the respondents have no adequate food for their family members. In addition, from the total sample households about 89.43% are reported that disagree and strongly disagree on the availability of food and access to food are unstable. This confirms that in the study area there was no food stability throughout the year for their family members. Also, more than 86.99% of the respondents were reported that strongly disagree and disagree on the utilization of healthy diet for all their family members throughout the year (Table 5).

Table 5: General food security situation of the sample household

Variables	Categories	Frequency	Percent
There is enough food available in your farm land to feed the family members throughout the year	Strongly disagree	90	73.17
	Disagree	20	16.26
	Neutral	6	4.87
	Agree	5	4.06
	Strongly agree	2	1.62
All family members in your farm land have good physical and economic access to food through the year.	Strongly disagree	80	65.04
	Disagree	15	12.19
	Neutral	10	8.13
	Agree	10	8.13
	Strongly agree	8	6.50
All family members in your farm land have access to food that is nutritious and safe, and produced in environmentally sustainable ways	Strongly disagree	100	81.30
	Disagree	10	8.13
	Neutral	4	3.25
	Agree	6	4.88
	Strongly agree	3	2.44
There are periods where all family members in your farm land are food insecure b/c availability of food or access to food is unstable	Strongly disagree	100	81.30
	Disagree	10	8.13
	Neutral	6	4.88
	Agree	6	4.88
	Strongly agree	1	0.81
In your farm land all family members use their food in ways that amount to a healthy diet	Strongly disagree	101	82.11
	Disagree	6	4.88
	Neutral	8	6.50
	Agree	7	5.69
	Strongly agree	1	0.81

Source: Own survey results, 2020

4.2 Coping Strategies against Food Insecurity

Food shortage in the study area is common phenomenon due to irregular rain fall situation viz. it does not come on time and excess during harvest time, soil infertility problem and population pressure. However, the respondents employed different coping strategies to escape initial and severe stage of food shortage. As illustrated (Table 6), the survey result revealed that, the households used several coping strategies to cape up the effects of food shortage at different stages. At initial stage 71.54% ate less preferred foods, 8.13% receive donation in the form of grains or cash from relatives/friends, 7.31% buy food on credit base, 6.5 % selling household asset, 5.69% borrow money to buy food and 0.77 % selling livestock as their 1st, 2nd, 3rd, 4th, 5th and 6th rank of coping strategies respectively. Similarly, the sample households respond differently when the food shortage becomes severe.

Unlike to the initial stage of food shortage the respondents replied to the sever stage in a different way These are participation in food for work(30.8%) as their first option followed by sale of more livestock than usual food for work (29.26%), like wise they also employed sale or consume of seed meant (22.31%) for next season planting, sale of production equipment (9.23%) as their fourth and food aid (7.31%) as fifth alternative and also short term migration of some family member, sale of agricultural tools and children discontinue from school respectively were also among the important coping strategies used in the study area.

Table 6: Categories of coping strategies at **initial** and **sever stage** of food deficit

Rank	Variables	Frequency	Percent
1st	Migrate HH member to the nearby town for labor work	88	71.54
2nd	Receiving donation from relatives or friends	10	8.13
3th	Buy food on credit basis	9	7.31
4th	Selling household assets	8	6.5
5rd	Borrowing money to buy food	7	5.69
6th	Selling livestock	1	0.77
	At sever stage	**123**	**100**
1st	Participate in food for work	37	30.08
2nd	Sale of livestock more than usual	36	29.26
3rd	Sale/consume seed meant for production	29	22.31
4th	Food aid	12	9.23
5th	Sale of production equipment	9	7.31
Total		**123**	**100**

Source*:* - Own survey results, 2020.

4.3 Econometric Analysis

In this study on binary logistic regression model was used, which specified in the methodology part of this study, to see the relative influence of household‘s demographic, socio-economic and institutional variables on food security situation. Before running the model, the presence of strong multicollinearity among the hypothesized continuous and dummy explanatory variables were checked by using Variance Inflation Factors (VIF). The result revealed that there was no strong multicolinearity problems among the variables included in the model (Appendix Table 3). Hence, none of the continuous and dummy variables were excluded from the model due to multicolinearity problem. Heteroscadesticity was also checked as shown (Appendix Table 5) that there is no problem of Heteroscadesticity. The overall model goodness of fit represented by model count R-square is very good and about 77.6% of the households were correctly predicted out of the 123 sample household heads. This indicates that the model has adequately estimated the respondents in terms of the variables considered.

The estimates of variables expected to determine the rural household food security status are displayed (Table 7). The result shows that, from the total of thirteen explanatory variables which were included in the model, five variables were found to be statistically significant in influencing the food security status, while the remaining eight variables were not.

Farm size (Farmsize); the size of land cultivated is a basic input in farming, and significantly associated with food security status of a household. Land in this woreda serves as means of coping mechanism during serious food shortage and collateral to receive credit service. This means households with large cultivated land produce more for household consumption and for sale and have better chance to be food secure than those having relatively small size of cultivated land. This variable is found to have a positive and significant effect on household’s food security status at less than 1% significance level. The odds ratio in favor of food security increases by the factor 6.58 when the area under cultivation is increased by one hectare. According to Van Der Veen (2010), food production can be increased extensively through expansion of areas under cultivation. With large farm size households can produce more and also diversify. This outcome is consistent with the finding of Bogale and Shimelis (2009).

Access to irrigation (ACCIRR): Irrigation, as one of the technology options available. It enables the farmers to diversify their production, practice multiple cropping and supplement moisture deficiency in agriculture, in doing so, it helps a farmer to increase production. This variable is significant at 1% probability level and positively associated with food security status. The result indicates that, as irrigation user's increase by one unit, the probability of household to be food secure, increase by a factor of 56.86 keeping other variables constant. This means that Irrigation user households were more likely to be food secure compared to non- irrigation users households. This implies that irrigation enables households to grow food crops more than once a year, hence increased production, income and food availability of the household. This result is similar with the result of Fekadu and Fanadzo (2012).

Livestock holding (TLU): Livestock holding in terms of TLU is significant at 1% level of significance and it has positive association with food security status of household. In the study area livestock production is the second major source of farm households' income next to crop production. The households with more livestock produce more milk, milk products and meat for direct consumption of their family which enable the owners to be more food secured. Besides, holding more livestock enables the farm households to have better chance to earn more income from the sale of the livestock that could be invested in purchasing food for the family during food shortage months. Moreover, income from livestock sale could be invested in purchasing productive farm inputs that increase food production, and enable in ensuring household food security.

The result indicates that, as livestock owned increase by one TLU, the probability of household to be food secure, increase by a factor of 2.63 keeping other variables constant. This result is consistent with the finding of Fekadu (2012).

Dependency ratio (DEPTRATIO): dependency ratio in the study area found to be highly significant in determining household food security status. This variable is significant at 5% probability level and negatively associated with food security status. The negative relationship indicates that the odd ratio in favor of the probability of being food secure decreases with increasing in the dependency ratio. The odd ratio of 13879 for dependency ratio implies that, other things being constant, the odd ratio in favor of being food secure decreases by a factor of

13879 as the dependency ratio increase by one unit. It also explained that those households with money children could face food insecurity because of high dependency ratio. This also imply that those household with large economical non-active family members in the family tend to be food insecure than those who has small family size. This result coincides with the hypothesis of the study and findings of (Tekele and Berhanu, 2015).

Credit use (CREUSE): credit is source of investment on activities that generate income for farm households. The households can purchase agricultural inputs (seed, fertilizer) and livestock. This variable is found to have a positive and significant effect on household's food security status at less than 1% significance level. The household with more access to credit use have possibly to reduce the probability of being vulnerable to food insecurity. From the model result, holding other factors constant, having access to credit increases the odds ratio in favor of being food insecure by a factor of 1840.4. The study result was consistent with (Tegaye, 2009) in that credit use helped the rural farmers to exit from food insecurity significantly. This is due to the reason that as the rural farmers having the access to and use credit, they intend to invest in various income generating activities.

Table 7: Determinants of rural household food security status model result

Security	Coef.	Std. Err.	Odds Ratio	Z – value
Age	-0.001	0.002	1.036	-0.08
Sex	-0.042	0.079	0.724	-0.53
Farmsize	0.105	0.031	6.580	3.32***
Irrig	0.245	0.081	56.865	3.05***
PESTDES	-0.006	0.058	0.214	-0.1
FEC	-0.009	0.017	1.426	-0.57
TLU	0.047	0.012	2.628	3.83***
Offfarm	0.038	0.048	56.217	0.8
EDULEVEL	0.003	0.008	0.792	0.4
DEPTRATIO	-0.337	0.151	13879.59	-2.24**
Credit use	0.255	0.066	1840.387	3.84***
Agroecology	-0.085	0.075	0.001	-1.14
ACESSMART	-0.099	0.102	2.683	-0.98
_cons	0.066	0.228	4.221	0.29

Likelihood	13.657	Number of obs	123
Pseudo R2	0.772	Prob > chi^2	000

*** And * significance at 1% and 5% probability level

Source*:* - Own survey results, 2020

5 CONCLUSION AND RECOMMENDATIONS

On the base of the findings of the results presented in the preceding chapters, this chapter attempts to present the general conclusions and useful recommendations.

5.1 Conclusion

This study was conducted to examine food security situation of rural households and coping strategies of food insecurity using descriptive statistics and binary logistic regression model to ascertain factors that influence rural households in Dilla Zuria woreda. The survey result of this study indicated that, from total sample households 57.72 % were food insecure and unable to get the minimum daily energy requirement. Also, in the study area, only 42.28 % of the household were food secure while their own production was not covering yearly consumption requirement of their households.

In general, the majority of respondents in the study area have no enough physical and economic availability and accessibility of food throughout the year i.e., from the total respondents more than 73.17% and about 65.04% respectively were conveyed that strongly disagree . Similarly, more than 81.3% household respondents were confirmed that there was no adequate, stable and utilization of food for their family members throughout the year.

The output of the binary logistic regression model revealed that, out of thirteen independent variables entered in the model, five variables were found to be statistically significant in influencing food security status while the remaining variables were statistically insignificant. These variable Farm size, Irrigation access, Livestock size and Credit access were found to significantly influence household food security in the study area positively. However, Dependency ratio was found to influence food security negatively at the household level.

The study was also investigated some coping mechanisms employed during food shortage. so, the survey result of this study indicated that, 71.54%, 8.13%, 7.31%, 6.5%, 5.69% and 0.77 of the vulnerable groups migrate household member to the nearby town for labor work, receiving donation from relatives or friends, buy food on credit basis, selling household assets, borrowing many to buy food, selling household livestock as their 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th} and 6^{th} coping strategy

respectively during at initial stage of food deficit. similarly, 30.08%, 29.26% , 22.31%, 9.23% and 7.31% of the vulnerable households employ food for work, sale of more livestock than usual, sale or consume seed meant for next season planting, food aid and sale of production equipment/tools as their 1st, 2nd, 3rd, 4thand 5th coping strategy respectively during at sever stage of food stress.

5.2 Recommendations

Based on the findings of this study, the following recommendations are stated as a possible area of interventions to improve food security situation and coping strategies:

- **Farm size:** farm size was found to be significantly and positively affecting food security status in the study area. In the study area the land holding size is declining from time to time due to rapid population growth. There for increasing agricultural production and productivity is possible through integrated watershed management and strengthen land tenure security. Moreover, the research and extension have to look for the better expanding diversified agricultural practice like growth of food, fodder, improving agroforestry, growing Enset, fruit tree and horticultural crops and also extending small scale irrigation so as to improve the farmers' food access sustainably.
- **Access to irrigation**: model result reveals that irrigation and food security are positively and significantly related in the study area. Therefore, development strategies and programs related with food security through agricultural production should think about the importance of irrigation. Hence, the governmental and non- governmental organization should expand access of small scale irrigation to households in poverty reduction and improve food security. Strong regulatory mechanism should be designed to overcome problems related to irrigation use to provide incentives to committed and disciplined farmers
- **Livestock holding (TLU):** The size of livestock owned had a significant positive effect to food security status. Thus the study suggested strengthen the existing crop-livestock production system through providing improved health service, better livestock feed/forage/ targeted credit and adopting agro ecologically based high-yield breed and disseminating through artificial insemination in the area. .

- **Dependency ratio:** Dependency ratio is contributing negatively to food security status in the study area. Thus, concerned bodies have to reduce the dependency through creation of job opportunity by introducing possible investment opportunity (labour intensive) and family planning programs should be strengthened to reduce the average family size to create proportional change between economy of household and its family size in the long-run.
- **Credit use:** In the light of the findings from the study, it is recommended that efforts to improve access to credit by farmers should be pursued by both local and central government structures in Ethiopia to improve the household food security situation in rural woreda. Policies that will make micro-credit from government and non-governmental agencies accessible to rural farmers will go a long way in addressing their resource acquisition constraints and eventually improving household food security in the country.
- **Coping strategies:** Food shortage in the study area is common phenomenon due to irregular rain fall situation viz. it does not come on time and excess during harvest time, soil infertility problem and population pressure. It can be recommended that government and non-governmental body should have to create job, improve livestock sector to provide appropriate technology and facilitate credit access for rural household in order to reduce dependency ratio and improve household food security status.

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7 APPENDICES

Appendix 1: Conversion factor used to calculate man equivalent.

age group (years)	man days (MD)	
	Male	Female
<10	0	0
11-13	0.2	0.2
14-16	0.5	0.4
17-50	1	0.8
>50	0.7	0.5

Source: Storck (1991).

Appendix 2: Conversion factors used to estimate Tropical Livestock Unit equivalents.

animal catagories	TLU
Calf	0.25
donkey (young)	0.35
weaned calf	0.34
Camel	1.25
Heifer	0.75
sheep and goat(adult)	0.13
cow and oxen	1
sheep and goat young	0.06
Hourse	1.1
chicken	0.013
Donkey (adult)	0.7

Source: Storck (1991).

Appendix 3: Variance inflation factor for the variables used in the model

Variable	VIF	1/VIF
Irrig	3.08	0.324995
Farmsize	2.2	0.454203
Credit	2.16	0.462539
TLU	2.1	0.475883
Dependency~o	1.72	0.58302
frequencyo~t	1.21	0.82932
Acesstonea~t	1.18	0.849315
Offfarm	1.15	0.871256
sexofhouse~e	1.13	0.886485
Educationa~l	1.09	0.917914
pestsanddi~o	1.08	0.922801
Agroecology	1.07	0.934121
Age	1.05	0.953177
Mean VIF	1.55	

Appendex 4: Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of security
chi2(1) = 5.55
Prob > chi2 = 0.185

Appendix 5: QUESTIONNAIRE FOR HOUSEHOLDS

This questionnaire is designed to obtain information about determinants of food security status in your district. The information will be used to learn about the household characteristics and production. And Please be aware that participation in is voluntary and that the information you and other households provide in this survey will be strictly confidential. At the analysis stage of the study, specific names will not be attached to any results and the information you provide will be used only for statistical reporting purpose.

A. House hold information					
A1	Region		A6	HH code	
A2	Zone		A7	Date of interview	
A3	Woreda		A8	Enumerator name	
A4	Kebele		A9	Supervisor name	
A5	Household head				

B	**Demographic characteristics of HH**				
No	Name of house hold	Age a	Sex b	Marital status c	Year of schooling d

Refer; marital status 1. Married 2. Unmarried 3. Divorced 4. Widowed

Sex 1. Female 0. Male

C)ACCESS TO EDUCATION INFORMATION

c.1 If you have children and other school-age family dependents, how many of them are currently attending school?_____

c.2 What is your average educational expenditure per year? Amount in birr _____

c.3 Does the number of your family attending school for the last two years is

a) Increased b) stayed same c)decreased

i) If increased, why?

a) Income improvement b) Building school c) Others

ii) If decreased, why?

a) Low level of income b) Too far school c) No need of attending school d) Others (specify)

c.4 If there are school-age children, not attending school, why

a) Needed for help in the business activities b) Needed for help in non- business activities

c) Too far school d) insufficient money e) Disabled f) Lady Child

g) No need of school h) has attained enough (specify his/her grade)

D	**Family size (number)**	Categories	Male A	Female b	Total c
a		<15 years			
b		15-64 years			
c		>64 years			
d		Total			

E. Land Resources

E. Land Resources			
e.1	Do you have your own land?	A)yes	B)no
e.2	if yes, what is the total size of your land holding? …… in Timad A) Cultivated area…….. D) Forest land area…… B) Grazing area ……...……. E) Others specify……. C) Fallow land area…….		
e.3	What is the total area of land you cultivated last year? …… in Timad A) Owned…… B) Rented in……. C) Share cropped……		

	D) Received as a gift…… E) Others specify……		
e.4	Do you think that your piece of land is enough to support your family?	A)yes	B)no
e.5	If no state the reason A) Infertility of land B) Small size of land C)Lack of agricultural inputs to increase productivity D)Large family size E) Others specify		

❖ **Information regarding livestock ownership**

✓ Please fill the following based on the response given by household head regarding the livestock ownership of the farmer

F	**Livestock resources**		
No	**Type of live stock**	Number a	Remark b
a	Oxen		
b	Cow		
c	Heifer		
d	Bull		
e	Calve		
f	Sheep		
g	Goats		
h	Donkey		
I	Mule		
J	Horse		
K	Poultry		
L	Others		
m	Total		

G	**Off -farm income**		
g.1	Do you have any source of income other than farming?		☐ 1. Yes ☐ 0. No
A	If yes, what is the source?	☐ 1. Mining ☐ 2. Hand crafts (pottery, metal works, etc) ☐ 3. Salary/wage ☐ 4. Rent from asset or real estate ☐ 5. Sale of local drinks ☐ 6. Pension payments ☐ 7.Other specify	
B	Income amount		
	Family member	Type of job	Annual income

b1			
b2			
b3			

g. 2) **Do you think that your employment opportunities have been improved for the last two years?**
a) Yes b) No

g. 3) Have you improved number for your business activities? a) Yes b) No

g. 4) Do you think that your income has been improved because of improvement in job opportunities, which is financed from the loan?

a) Yes b) No

g. 5) Have you used hired labor in your business activities? a) Yes b) No

g. 5.1) If yes, a) How many _____b) Is it seasonal or permanent? _____

c) For which activities? _____

g. 5.2) If no, why? _____

g. 6 For the business, which gives you the greatest earnings, who in your household decides?

a) Husband only b) Mostly husband c) Husband and wife equally

d) Mostly wife e) only you (for single)

7. Did you have **livestock?** 1. Yes 2. No

8. If yes to question number 7, please fill the following Table?

No	Type of animal	Number
1	Oxen	
2	Sheep(young)	
3	Sheep(adult)	
4	Goats(young)	
5	Goat(adult)	
6	Horse	

7	Donkey(young)	
8	Donkey(adult	
9	Heifer	
10	Cow	
11	Hen	
12	Chickens	
13	Beehives	
14	Lamb and kid	

H	**Credit Use**	
A	Do you have any sources of credit?	A) Yes☐ B) No☐
B	If yes, what sources of credit do you have?	1. Formal ☐ C) Both ☐ 2. Informal ☐
C	What are the formal sources of credit institutions?	☐ 1. Commercial banks ☐ C). NGOs ☐ 2. Omo micro finance ☐ D) Other specify ----------
D	Have you received any borrowing from the formal institutions for the last two years?	☐ A) Yes ☐ B). No
E	For what purpose do you borrow?	☐ A) for input purchase ☐ B).For school ☐ C) For Medicine ☐ D) For consumption ☐ E) Husbandry improvements ☐ F) Other specify
F	How much money did you received for the last year?	…….Eth birr
G	What is the interest rate?	----------%
H	What collateral (security) was requested for the credit?	☐ 1. Animal ☐ 2. Durable ☐ 3. Land ☐ 4. Relatives ☐ 5. Other specify

h. 1) Of the total amount you borrowed over the last two years, what proportion have you repaid? ----------
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h. 2) If it is not totally repaid, reason for that ----------

h. 3) What are the main problems regarding credit institutions if there are any? ----------
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I	Frequency of Extension contact	
A	How often do you visit the extension workers In this season?	☐ 1. Weekly ☐ 2. Monthly ☐ 3. Quarterly ☐ 4. Fortunately ☐ E) Other specify
B	How many days did he/she come to see you (starting from January, 2018?	…….
C	Have you got any practical training over the last three years	☐ A) Yes ☐ B) No
D	If yes, what type of training	

J	Market access	
A	Do you have market access to sell or buy the product?	☐ A) Yes ☐ B) No
B	Have you been selling	☐ A) Yes B☐ b
C	If yes, Where did you sell it?	☐ A) Village market ☐ B) District market ☐ C) Others specify ----------
D	If you are selling your products how long will it take to reach market (man walk minutes)	----------

K. Food Consumption

How much of the following items consumed in the last seven days?

Food items consumed for the last 7 days	Unit	Quantity	Unit market price	Total value	Source 1. Own 2. Gift 3. Purchased 4. Loan 5.Aid
Cereal Crops					
Barley					
Maize					
Wheat					
Teff					
Legumes					
Broad Bean					
Haricot Bean					
Pea					
Animal Products					

Milk					
Egg					
Meat					
Vegetables					
Cabbage					
Carrot					
Garlic					
Fruits					
Banana					
Avocado					
Mango					
Root and Tuber crops					
Kocho					
Potato					
Sweet potato					
Behevarege Crops					
Coffee					
Fats and Oil					
Oil					
Butter					
Other specify					

General Questions concerning the main elements of food security

Availability; there is enough food availability in your farm land to feed the family member.

1) Strongly disagree 2) disagree 3) Neutral 4) Agree 5) Strongly agree

Accessibility; The family members have good physical and economic access to food through the year.

1) Strongly disagree 2) disagree 3) Neutral 4) Agree 5) Strongly agree

Utilization; All the family members in your farm land use their food in ways that amount to a healthy diet.

1) Strongly disagree 2) disagree 3) Neutral 4) Agree 5) Strongly agree

Capacity; All the family members have a capacity to access enough food for their diet throughout the year.

1) Strongly disagree 2) disagree 3) Neutral 4) Agree 5) Strongly agree

Thank you for your cooperation!