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INSTITUTE**

**SCHOOL OF POST GRADUATE STUDIES
MASTERS OF DEVELOPMENT STUDIES SPECIALIZED IN DISASTER RISK
MANAGEMENT AND FOOD SECURITY**

**FACTORS AFFECTING THE FOOD INSECURITY STATUS OF RURAL
HOUSEHOLDS IN ITANG WOREDA, GAMBELLA REGIONAL STATE, ETHIOPIA**

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FOOD SECURITY**

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DECLARATION

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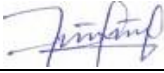
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DEDICATION

This Thesis is dedicated to Gambella University and Green Research and Development Institute department of Development Studies, Itang woreda Next, to my two kids (Hidassie Seyoum and Tinbit Seyoum) and indeed to my lovely wife (Denklesh Mesfin) as well as my brother Tessema Abay , for their love, supports, unbreakable-care and encouragement. They bestowed me during my studies. Moreover, I am very grateful that you have all stood firm by me during this difficult journey, your actions sound nice to me greatly.

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ACRONYMS AND ABBREVIATIONS

AE	Adult Equivalent
AFI	Harvest help-Africa Food Issue
BoFED	Bureau of Finance Economy Development
COC	Cost of Calorie
CSA	Central Statistical Agency
DFID	Department for International Development
ENI	Ethiopian Nutrition Institute
FAD	Food Available Decline
FAO	Food and Agricultural Organization
FGD	Focus group discussion
FSIN	Food Security Information Network
Ha	Hectare
IFAD,	International Fund for Agricultural Development
Masl	Meter above sea level
MDG	Millennium Development Goals
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development
OPHI	Oxford Poverty and Human Development Initiative -
SNNPRS	South Nations, Nationalities , and Peoples’ Region (SNNPR)
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa (SSA)
TLU	Tropical livestock units
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USD	United States dollar
WFP	World Food Program
WFS	World Food Submit
WHO	World Health Organization

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ABSTRACT

Food insecurity is one of the global problems which need an intervention to mitigate the problems. This study was intended to assess the factor affecting food insecurity in the Itang special district of Gambella regional state of Ethiopia with the specific objectives of estimating the extent of food insecurity, identifying factors affecting food insecurity, and assessing coping mechanisms used by rural households in the study area during a food shortage. Three stage sampling procedure was followed to select 140 samples of rural households in the study area. The data used for this study was collected from sampled rural households by using structured questionnaires. Besides, key informant interview was also used to collect general information regarding food security in the study area. Descriptive statistics, inferential statistics, and logit models of econometrics were used to analyze the data. Foster Grier Thorbecke index was used to estimate the extent of food insecurity in the sampled household. The result indicates that 60% of sampled households were food insecure which implies that they fail to meet the recommended 2200kcal/adult/day consumption. The FGT index used to estimate the extent of food insecurity showed that food insecurity head count, food insecurity gap, and food insecurity severity were found to be 0.60, 0.3037, and 0.1146, respectively. The result of binary logistic regression reveals that food insecurity was significantly five variables out of ten hypothesized explanatory variables. Accordingly, the family size of the household and distance from the market positively affected food insecurity, whereas the age of the household head, off-farm income, and credit access negatively affected the food insecurity of rural households. Therefore, government, NGOs, and other concerned bodies should work on the identified variables to extricate the rural household from food insecurity status.

Keywords: *food insecurity, FGT index, binary logistic regression, Itang Woreda, Rural households*

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The latest FAO estimates indicate that global hunger 828 million people are estimated to be that chronically undernourished in developing countries. The number of undernourished persons has risen sharply over the past two years, with up to 828 million people in the world facing hunger in 2021. After remaining virtually unchanged for five years, FAO estimates of the prevalence of undernourishment in the world increased from 8 percent in 2019 to around 9.3 percent in 2020, and then further to 9.8 percent in 2021. Given current estimates of the world population, this implies that up to 828 million people may have faced hunger in 2021 globally. FAO or the same source indicates that millions of people in developing countries were estimated to be chronically hungry. Despite this overall progress in developing countries as a whole, there is still considerable room to reduce undernourishment and improve food security. (Of, T. H. E. S. (2022).

For instance, in 2017, almost 124 million people across 51 countries and territories faced “crisis” levels of acute food insecurity or worse, requiring immediate emergency action to safeguard their lives and preserve their livelihoods. This represents an increase compared to 2015 and 2016, when 80 and 108 million people, respectively, faced crisis levels. (FAO, IFAD, UNICEF, WFP, & WHO. 2018).

Africa, sub-Saharan Africa (SSA) faces challenges such as rapid population growth, persistent economic inequality, climate change threats, droughts, youth unemployment, undernourishment, and food insecurity. Despite the available resources and the efforts made by governments in SSA, food insecurity remained one of the most crucial issues. Cheng, Y.-L., Lee, *et al.*, (2016).

According to a recent report (FSIN, 2020) also Conflict/insecurity was still the main driver of food crises in 2019, likewise, weather extremes and economic shocks became increasingly significant. Even if, Ethiopia has made development gains over the last two decades (FSIN, 2020), 27% of the population, or 30.2 million people, were still living below the poverty line (USD 1.90 a day). Over 70 percent of rural Ethiopians are severely poor according to the Multidimensional Poverty Index

(OPHI, September 2019). Frequent and severe droughts have eroded the resilience of rural households that have lost productive assets and have had little time for recovery between drought events (FSIN, 2020).

It was true that Ethiopia's 80 million people live in rural areas and are heavily dependent on rain-fed agriculture which makes them extremely vulnerable to changes in weather conditions. Over the last four decades, there have been several severe famines due to droughts in Ethiopia. Even in years with normal rainfall, food shortages and hunger are recurrent problems for millions of people. More recently, this problem has been exacerbated by increases in food prices. Andersson, C., Mekonnen, A., & Stage, J. (2009).

Ethiopia is among the Sub-Saharan African countries repeatedly mentioned in connection with the food insecurity problem. Specifically, the daily calorie consumption in Ethiopia is below 2,100 kcal/person/day (Shishay and Messay, 2014). The review of the emergency food security assessment done by Haan *et al.* (2006) showed that the recurrent rainfall failure has caused food shortage since 1983 and the consequent need for food assistance was observed for millions of people in Ethiopia. Similarly, Ethiopia's poverty and vulnerability to food insecurity make it a place of recurrent emergencies. An estimated 5–6m people are considered chronically food insecure.

The food insecurity problem greatly differs among households residing in the same country. Although there have been efforts to achieve food security at the household level in Ethiopia, nearly 25 percent of the population still lives below the nationally defined poverty line. In Ethiopia, the household-level food insecurity problem is mainly related to poor institutional forms and dependency on rain-fed agriculture which is highly susceptible to drought (Mohamed, A. A. (2017).

Generally, different factors contributed to the increasing food insecurity condition in Ethiopia. Among others, high population growth, fragmentation, and size of land holding, environmental degradations are factors that caused lower productivity and food insecurity among smallholders (Tinsaye Tamirat, 2016). Combining these aforementioned challenges with recurring droughts

over the years has substantially eroded the productive resources of households where by affecting community assets such as forests and pasture leading to increasing rates of environmental degradation and high pressure on farmland. Similarly, smallholder farmers in our country are unable to cope with seasonal shortages because of less accumulation of savings and assets such as food and livestock holdings even during good days of the year.

To ensure sustainable food security in the country; rural development policies and strategies were also formulated. This includes the rural development policy, the Rural Employment Credit Program, and the Social Safety Net Program. These policies emphasized targeted intervention for drought-prone and food insecurity areas such as the Gambella region which is characterized by erratic rainfall, recurrent flash flood hazard, and a high incidence of diseases, pests, and weeds that causes food insecurity in the region (BoFED, 2005). Therefore, this study has focused on factors affecting the food insecurity/ security status of rural farm households in Itang woreda, Gambella regional state, Ethiopia

1.2.Statements of the Problem

Africa, Sub-Saharan Africa (SSA) faces challenges such as rapid population growth and inappropriate government intervention in the economy as well as the prolonged civil war, persistent economic inequality, climate change threats, droughts, youth unemployment, undernourishment, and food insecurity in addition to the challenge with inadequate growth of food production,. Rural households are vulnerable to food insecurity not simply because they do not produce enough, but either they hold little in reserve or they usually have scant savings and few other possible sources of income to obtain adequate food to meet their daily subsistence food energy requirements Cheng, Y.-L., Lee, *et al.*, (2016).

Ethiopia lies within one of the most food-insecure countries in the world, which is Africa's second most populous country after Nigeria (Andersson *et al.*, 2009). The same author contended as over 80 percent of the Ethiopian population lives in rural areas and is heavily dependent on rain-fed agriculture; this makes them highly vulnerable to severe droughts and extremely vulnerable changes in weather conditions. Both transitory and chronic food insecurity are severe in Ethiopia. Moreover, food insecurity is one of the defining features of rural poverty affecting millions of

people, particularly in moisture deficit and pastoral areas. Even in years of adequate rainfall and good harvests, these people remain in need of food assistance (FDRE, 2015).

The combination of natural and man-made factors has resulted in this serious and growing food insecurity problem in many parts of the country. The immediate causes of food insecurity 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 reasons of food insecurity and widespread poverty in the country (MoARD., 2007).

Gambella National Regional State is one of the least developed regions in all development activities of the country; however, it is rich in natural resources. It is known that the region has diverse natural resources; due to a lack of proper utilization of the resources and traditional farming systems, the majority of the population suffers from food insecurity. According to the research conducted in Lare woreda, 66.25 % of sampled rural households were found food insecure. (Ruach, 2019).

Floods and food insecurity are the two often linked phenomena to the people of Gambella. They are, rather, recurrent threats occurring almost every year. The floods of 1997 were associated with food shortages as well as the repeated overflowing of the Baro River from July to October which was expressive of what has become an increasingly common occurrence of food insecurity (UNDP, 1999).

Likewise, the study areas are found within Itang woreda called Puldang, Itang-kier, and Watgach kebeles. Itang-Kier kebele is closely located in the Baro River flow and has a very poor status of infrastructure to access the market; however, it is one of the adjacent kebele of Itang towns. On the other hand, the research conducted at Puldang which is far from Itan town with having poor basic infrastructure and market access. But Watgach kebele is found nearby two refugee camps and a well-structured road. Therefore the research has identified the prevailing factors affecting the food insecurity status of rural households in such study areas.

According to the Itang woreda administration Itang Kirr and Puldang kebeles are very challenged to address services due to a lack of road access and other physical infrastructures like; highways, and bridges, as well as relief assistance to rural households, even if Itang Kier kebele is nearby the capital city of Itang woreda. It is very difficult to run relief assistance that comes through the organizations. The government sectors like agriculture, education, health, and others like NGO sectors are obliged to use the road from Itang town to Gambella town crossing to Elea kebele and reaching Itang Kier and Puldang kebeles which are more than 100 to 150 -kilometer distance from Itang town while they are somehow nearby to Itang town. This impresses me to do my MSc. research on the factors affecting food insecurity in rural farm households.

Therefore, in this's study areas, the author have shown the following explanatory variables to assess the aim of the study between Food secure and Food Insecure rural household relationship to meet the specific objective settled. The explanatory variables are gender, age, education, family size, market distance, off-farm activities, credit access, irrigation, livestock owned , land size and the coping mechanisms of during food shortage.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study is to assess the most important factors affecting the food insecurity status of rural households in Itang woreda, Gambella regional state, Ethiopia,

1.3.2. Specific objectives

The specific objectives of the study were the following.

1. To estimating the extent of food insecurity status of rural household in study area.
2. To identifying the factors affecting the food insecurity status of rural households.
3. To evaluate in percentages of the coping mechanisms adopted by the rural households during food shortage.

1.4. Research Questions

1. How to estimate the extent of food insecurity status in the study area?
2. What are the factors affecting the food insecurity status of rural households?
3. What are the coping mechanisms adopted by rural households during food shortage?

1.5. Scope and limitation of the study

The study was conducted in Itang special woreda of Gambella regional state, Ethiopia rural household. It covers three specific objectives, namely, examining the extent of food insecurity, factors affecting food insecurity, and the coping mechanism used by rural households during food shortages. On the other hand, it depends only on data collected from three kebeles, namely, Itangkier, Puldang, and Watgach kebele. Regarding methodological scope, the FGT index and logit model was used to estimate the extent of poverty and determinants of food insecurity of rural households in the study area. However, this study selects any outcome variable to describe the impacts of food insecurity. Besides, this study used cross-sectional data which is collected at one time. Therefore it does not indicate a long-time food insecurity status which requires time series data and it was not possible due to budget limitations.

1.6. Significance of the study

This study is about factors affecting rural household's food insecurity in the Itang special district of Gambella regional state of Ethiopia. It tried to provide the extent of food insecurity, factors affecting food security, and coping mechanisms by rural households during the shortage of in the study area. Having clear information on the status of food security and its determinants in the study areas can provide the basis for a detailed analysis of food security status and information that has enabled effective measures to be undertaken to improve food security status and bring the success of food security development programs. A better understanding of factors affecting the status of food security is required by organizations concerned with community development, researchers, and development policy makers. Hence such studies also provide directions for further research, extension, and development schemes that would benefit the farming population.

CHAPTER TWO: LITERATURE REVIEW

2.1. Food Security

2.1.1. Concepts of Food Security

The dynamic nature of food security makes it have different definitions that evolved (Hoddinott, 1999; FAO, 2003). The comparison of these definitions shows the considerable rethinking and reconstruction of officials thinking on food security over the past three decades (FAO, 2003). Food security as a concept emerged in the mid-1970s, in the discussions of the global food crisis (Maxwell and Wiebe, 1999). The initial focus of food security was the one given by the UN in 1974, which focused on food supply and price stability of basic consumable foodstuffs.

The above definition stated food security as “availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices. According to FAO, food security is ensuring that all people at all times have both physical and economic access to the food they needed (FAO, 2003). World Bank also defined food security as access by all people at all times to sufficient and enough food for an active and healthy life (World Bank, 1986). Von Braun *et al.* (1992) defined food security as access by all people at all times to the food needed for a healthy life.

During the 1996 debate held by World Food Summit (WFS) in Rome, it was concluded that "There is food security when all people at all times have sufficient physical and economic access to safe and nutritious food to fulfill their dietary needs including food preferences to have a healthy and active life"(USAID, 2008). Although there were agreements on some aspects of food security, controversies also existed. When an individual or population lacks or is potentially vulnerable due to the absence of one or more factors outlined above, and then it suffers from or is at risk of food insecurity (WFS, 1996).

Like food security, food insecurity is defined in different ways by international organizations and researchers without much difference in their basic concepts. According to FAO (2005), the problem of food insecurity exists when people lack access to an adequate and safe supply of food on a stable basis. Also, the food insecurity problem occurs when people are unable to get access to food at all times to enough food (nutritionally of good quality) to sustain an active and healthy life. Food insecurity mainly includes lack of access to enough food, non-availability of food, and improper utilization of food. Therefore, factors that determine household food security are

associated with the factors that determine each component of food security. Generally, the determinants of household food security status are different at different levels i.e., individuals, household, regional, national, and global levels (Khan *et al.*, 2015).

2.1.2. Concepts of Food insecurity

According to a World Bank report, food insecurity is defined as a „lack of ability to produce food and to provide access to all people at all times to adequate and enough food for an active and healthy life" (World Bank, 1986). Food insecurity is limited or uncertain availability of nutritionally adequate and safe foods or unable to acquire enough foods in socially desired and acceptable ways (Bickel G. *et al*, 2000).

Household food insecurity can be traced to inadequate and unsustainable access to income and resources to meet basic needs. These needs include adequate food, health, shelter, minimal levels of income, basic education, and community participation (Devereux *et al*, 2004). Household livelihoods are insecure when they lack ownership security, or access to resources and income-earning activities, including reserves and assets, to offset risks, ease shocks and meet contingencies. More narrowly, livelihood strategies are undertaken essentially to facilitate food security. People enjoy food security when they have access to sufficient, nutritious food for an active and healthy life. Food insecurity exists if one or more of these conditions are not fulfilled. Further, different levels of household asset building must be considered if the underlying causes are to be effectively understood (Drimie *et al.*, 2006).

Food insecurity is a situation in which individuals have lower physical and economic access to their dietary needs. It could be a seasonal or transitory need. The parameter for categorizing transitory and chronic food insecurity differs from country to country. Generally, chronically food-insecure households are not resilient to shocks and are continuously vulnerable. Sometimes there exists confusion among the terms famine, hunger, food insecurity, and malnutrition. Food security on the one hand and the above four terms on the other hand are inversely related concepts. Famine and hunger are the results of food insecurity.

- A. **Undernourishment:** the condition of people whose level of food consumption is consistently not sufficient in terms of calories consumed about their requirements. Chronic food insecurity

is also known as undernourishment (FAO, 2000). The recommended daily allowance for nourishment is 2100 kcal per day per adult/AE. When we consider this amount in Ethiopia it is very low. Famine and hunger are both rooted in food insecurity. Therefore, in conditions of chronic food insecurity, there is always an impending famine.

- B. **Hunger:** it is not a famine. It is similar to undernourishment and is related to poverty. In this case, people do not have adequate food for days. Usually in poor countries, this exists just before the coming harvest. When it exists for a long period, covering a large population and resulting in mass migration and death, it becomes a famine.
- C. **Famine:** an absolute lack of food affecting a large population for a long period to such an extent that they cannot subsist without external assistance.

Food insecurity; - is a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food required for normal growth and development and active and healthy life (WFP, 2004). It is a dynamic phenomenon: its impact varies depending on its duration, its severity, and the local socioeconomic and environmental conditions (EC, 2009).

Chronic (permanent) food insecurity refers to a continuously inadequate diet resulting from a lack of resources to produce or acquire food (Reutlinger, 1987). It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world.

Transitory food insecurity refers to a temporary decline in the households' access to enough food. It results from the instability of food prices, production, or incomes. The worst form of transitory food insecurity is famine. Hence, transitory food insecurity faced by farm households should be understood in the study as a seasonal food shortage of any magnitude ranging from mild to severe. We should also note here the concepts of transitory food insecurity and seasonal food shortage are synonymous and will be used interchangeably.

2.1.3. Food Security Dimensions

Food security is a broad concept, encompassing issues related to the nature, quality, and security of food supply as well as issues of food access. Jrad *et al.* (2010) elaborated on the four dimensions of food security food availability, food accessibility, food utilization, and stability.

Food availability: - Refers to the physical presence of food which may come from own production, purchases from the internal market, or imports from overseas. Similarly, WFS, (1996) explained that food availability refers to the physical existence of food stocks for consumption be it from own production or on the markets. At the national level, food availability is a function of the combination of domestic food stocks, commercial food imports, food aid, and domestic food production, as well as the underlying determinants of each of these factors.

Food access: - Household food access is the ability to obtain sufficient food of guaranteed quality and quantity to meet the nutritional requirements of all household members. Here, the food should be in the right place at the right time and people should have economic freedom or purchasing power to buy adequate and nutritious food (Jrad *et al.*, 2010). On the other hand, Kuwornu *et al.* (2011) explained that food access is determined by physical and financial resources as well as by social and political factors. Access depends normally on; income available to the household, the distribution of income within the household, the price of food, and other factors worth mentioning are an individual's access to the market, social and institutional entitlement/rights, (OXFAM, 2007).

Food Utilization: - Refers to ingestion and digestion of adequate and quality food for maintenance of good health. This means proper biological use of food, requiring a diet that contains sufficient energy and essential nutrients as well as knowledge of food storage, processing, basic nutrition, child care, and illness management (Jrad *et al.*, 2010).

Stability of Food: - Refers to the continuous supply of adequate food all year round without shortages (Jrad *et al.*, 2010). To be food secure a population, household, or individual must have access to adequate food at all times. They should not be at risk of losing access to food as a consequence of a shock (e.g., an economic or climatic crisis), or cyclically (e.g., during a particular period of the year, seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

2.1.4. Factors affecting Food Security/ Insecurity

Food security is a broad and complex phenomenon, which varies across households, regions, and countries (Kumar A. et al., 2017, Sharma P. and Singh A. 2017, Singh A. et al., 2017). The food security of a nation is significantly gets affected due to variations in agricultural production. Agriculture is a crucial factor to sustain food security as it can at least feed the population ever in an adverse economy (Gahukar R. 2011, Yu B. et al., 2013). Nevertheless, in the era of globalization, food security may not be defined by agricultural production only since food security is a multidimensional, multi-processing, and multiple interacting components of an economy (Schmidhuber J. and Tubiello F. 2007), and Burke M. and Lobell D. (2010).

The researchers have articulated several factors that play a significant role to sustain food security or a factor of increasing food insecurity at the individual/household/national/global level. Food security is significantly associated with age, sex, occupation, employment, vegetarian and non-vegetarian diet, poverty, per capita income, income inequalities, the demand for food grains, rapid population growth, fluctuation in food grains and oil prices, poor market accessibility, low irrigation facilities, application of fertilizer, credit accessibility, cost of cultivation, application of traditional technologies in cultivation, literacy of farmers, declining land productivity and soil quality, the decline in arable land due to urbanization and industrialization, diminishing groundwater availability due to over-exploitation of water, geographical location, government policies, government expenditure on agriculture and rural development, public spending on rural development, natural resource management, and environmental protection policies, trade policies, and climate change. Kumar A. et al., (2017) ,Sharma P, Singh A. (2017) and Singh A. et al., 2017; Gahukar R, 2011. As high-income inequalities increase people's involvement in illegal activities outside the market which contribute to political and social instability. Income inequality is a major driver of food insecurity in society (Kumar A. et al., 2017, Karmakar S. 2014). Consequently, food-price inflation has a high tendency to be increased food insecurity. (Karmakar S. 2014).

Besides the above-mentioned causes, there are several factors affecting food security. They differ from country to country and from region to region. There have been debates concerning the identification of major factors of food insecurity since the 1994 World Food Conference. Food

insecurity in general is induced by natural and human factors and political as well as economic crises FAO. (2014).

According to Mwanki (2005), the main causes of food insecurity in developing countries include unstable social and political environments that hinder sustainable economic growth, war and civil strife, macro-economic imbalances in trade, natural resource constraints, poor human resource base, gender inequality, lack of access to adequate education, poor health condition, natural disasters such as floods and locust infestation, and the lack of good governance. All of these factors contribute to either insufficient national food availability or insufficient access to food by different households and individuals. That is true also the major cause of food insecurity in Ethiopia today is the inability of people to get access to food due to the prevalence of poverty (Von Braun et al., 1992).

According to the research done by Sewnet Yenesew(2015), the major causes of food insecurity in the rural part of Ethiopia are natural disasters such as drought and climate change, population growth, land fragmentation, and degradation, absence of secured land tenure, poor infrastructure, absence of functional multi-party political system, and armed conflict with neighboring countries, especially Eritrea and Somalia. Generally, the main causes of food insecurity in Ethiopia are prolonged drought, conflict, insecurity, crop disease, etc. Endalew Birara et al. (2015) have reviewed different studies that have been done on the deteriorating situation of food insecurity in Ethiopia. Consequently, among others, population pressure, drought, shortage of farmland, soil erosion, lack of oxen, less food production capacity, poor soil fertility, a chronic shortage of cash income, lack of new farm technologies, weak extension services, high labor wastage, poor social and infrastructural facility, and pre and post-harvest crop loss are the major causes of the persistent food insecurity. The households' „coop-up mechanism for the problems caused by seasonal and disaster-related food insecurity includes the sale of livestock, agricultural employment, migration to better areas, finding grain loans, sales of wood or charcoal, small scale trading, and limiting size and frequency of meal.

Ethiopia has experienced unprecedented inflation in food prices, particularly concerning cereal prices, which have been among the highest in Sub-Saharan Africa. Rising food prices hit especially

poor people living in the rural parts of the country because they have to spend a higher share of their income on food items. Rising food prices, therefore, decrease their real income substantially, often with negative consequences on their food and nutritional status (Hadji Jemal and Fikadu Gelaw, 2012).

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

Specifically, multiple factors such as environmental degradation, rapid population pressure, and conflict are deteriorating the 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). Different researchers agreed that the source of food insecurity in Ethiopia is multifaceted factors. Meanwhile, food insecurity is a multi-dimensional subject that cannot be captured by a single/specific indicator, it is important to understand the essential components of food security which are widely accepted components of food security are food availability, food access, food utilization, and stability (FAO, 2005).

2.1.5. Coping Mechanisms during Food shortage

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

and crop residues, reduction of food consumption, consumption of meat from their livestock, consumption of wild plants, reliance on relief assistance, relying on remittance from relatives, selling of clothes, and dismantling of parts of their houses for sale. Some of them are likely to be implemented only after the possibilities of certain other options have been pursued. In addition, households that have a diversified source of income are often able to cope with crises more than others Nigatu Regassa. (2011).

Households that spend a high portion of their income on food (i.e., more than 70 percent) are very likely to be food insecure. Thus, the percent of total household expenditure spent on food is used to show household vulnerability. To the extent that households rely on market purchases as an important source of food, cash incomes (or expenditure levels) are likely to be a more or less important indicator of their food security status (Agency, U. S., & Washington, I. D. (2008). Food aid, today, is mainly considered an instrument in addressing both transitory and chronic types of food insecurity in a low-income country.

2.1.6. Measurement of Food Security

Measurement is necessary at the outset of any development project to identify the food insecure, assess the severity of their food shortfall, and characterize the nature of their insecurity (Hoddinot, 2001). At the national level, food security can be measured in terms of food demand (requirement) and supply indicators; that is, the quantities of available food versus needs. The supply of food at this stage may be from current production and stocks to the previous production whereas the needs can be determined based on the biological or nutritional requirement of a given society for a certain period usually a year or a day. The recommended minimum nutritional requirement for an adult person has been set at 2100 kcal per person /day and is usually used as a yardstick (von Braun *et al.*, 1992).

Tesfaye and Debebe (1995) attempted to apply an alternative approach to food security measurement by employing the food insecurity index, which is constructed using the UNDP human development index (HDI). The index measures shortfall in food security indicators from acceptable levels by focusing on three important variables: adequacy, stability, and access to

food supply and ranking of regions based on their food insecurity index. This approach has been used to identify vulnerable regions and households to provide early warning information for decision-makers to make timely decisions about a coping mechanism to avoid disaster and protect the food-insecure segment of the population.

The household's food security status can be measured by a direct survey of income, expenditure, and consumption. In this study, households' food or calorie acquisition/consumption per adult per day will be used to identify the food secure and food insecure households. The calorie consumed by the household is compared with the minimum recommended calorie of 2100 kcal per adult per day. If the consumption/acquisition is less than the recommended amount then, the household is categorized as food insecure, and if greater than that, as food secure (MoFED, 2012)

Measurements are also taken at the individual level. This information indicates food insecurity after the household was undergone the disaster (Von Braun *et al.*, 1992). The basic aim of choosing household-level analysis is to identify those households that are food insecure and those whose food security is at risk, to identify the factors that affect food security, and to attempt to quantify the underlying relationships (Riely and Mock, 1995). Even though it is possible to examine relative levels of food insecurity or rank orders defined by specific indicators, it is sometimes important to define cut-off points to establish some understanding of absolute levels of food insecurity.

According to (Bouis, 1993), as cited by (Maxwell, 1996). The researchers can apply two major approaches that have been measuring food consumption, and both are subject to measurement problems:-

- ☞ The first is the "expenditure technique" used by economists whereby gross household production and purchases over time are estimated, that of the growth or depletion of food stock held over time is made and the balance is considered as consumed.
- ☞ The second method, which is utilized by the nutritionist, measures the amount of food consumed by the family members during 24 hrs. recall. It enables generating information necessary to determine the extent of undernourishment, malnutrition, and under nutrition.

This method results in more reliable consumption data and captures intra-household distribution differences. Although both of these methods result in consumption figures, which can be used as

a proxy for household food security, neither provides a full assessment of food security because neither measures vulnerability nor sustainability. For both methods, the conversion of gross household food consumption into calories, and dividing the calories by the number of adult equivalents in the household results in a concise figure for average calories consumed per adult equivalent per day, which is then compared with an estimate of caloric requirements (Maxwell, 1996).

The frequently used cut-off point for analytical purposes is considered as a household that provides less than 80% of the caloric requirements for its total number of adult equivalents as food insecure for the recall period. This approach, however, requires a considerable amount of resources in terms of money, time, and personnel and neither method has been accepted as the "gold standard" for the analysis of household food security (Maxwell, 1996).

Eele *et al.* (1993) identified food insecure households through the analysis of the food consumption characteristics of households below the poverty line and by comparing variables associated with the symptoms of food insecurity. They examine household expenditure patterns and classify households by the budget share devoted to food commodities (usually households who spend more than 70 percent of their expenditures on food can be expected to be food-insecure).

In summary, the reason why the total household expenditure/AE employed in this study is justified by the fact that in a survey of this kind, the income statistics reported by the households usually tend to underestimate the actual income level of households due to various reasons. In addition, household consumption expenditure is a direct method to obtain information from the household. Since the income of the household is not known with certainty, household expenditure is usually taken as a proxy for income (CSA, 1997). Other studies by Tesfaye and Debebe, (1995) further indicate that total household expenditure reflects the purchasing power of the household and has been employed as a proxy of total household income.

In general, methods of analysis to identify the food insecurity and indicators to be selected should be relevant, timely, and cost-effective. To this effect, in this study, the minimum level of

expenses which should at least be met or required per adult equivalent per annum will be computed based on the amount of food required by an adult person, and the minimum expenses needed for food expenses. The value of food required (2100 kcal per day per AE or 225 kg of cereal per AE per year plus the sum of an estimated minimum amount of money needed to cover the above-mentioned expenses per AE per annum will be used as a threshold (cut-off point) beyond which the household is said to be food secure or insecure in the study area.

2.2. Theoretical Orientations of Food Security

There exist two broad methodological approaches to the analysis of famine. The first approach is the "general explanation". In this regard, several environmental and socio-economic attributes assumed to explain famine have been pointed out. The principal ones include rapid population growth, war and civil strife, drought, ecological degradation, government mismanagement, unequal access to resources and unequal exchange, and socio-economic and political dislocation (Getachew 1995). This approach argues that one or a combination of these can disrupt food production. However, production failure may or may not result in famine. Due to this fact, the attributes (factors) are not precise explanations of the causation of the process of famine. It is in response to this major weakness that specific models of famine emerged (Degafa, 2002). The second approach comprises models of famine as the Food Availability Decline (FAD) model and the Food Entitlement Decline (FED) model.

2.2.1. Food Availability Decline (FAD) approach

The Food Availability Decline Approach had been a dominant theoretical explanatory framework for food crises from the eighteenth century until the year 1980. As quoted in Getachew (1995), Sen (1980) defined FAD as "The availability declines per capita of food for consuming unit". This approach conceived famine as shortages of food supplies per capita, motivated by natural factors; e.g., drought, floods, and other calamities that undermine crops; or demographic factors, i.e., vegetative growth that goes beyond supply (Diana, 2007).

The central argument of this model is that "anything which disrupts food production such as drought, flood or war can cause famine, the logic being that a drought, flood or war causes crop failure and cattle death, reducing the availability of food in the affected region and that such a food availability decline for an extended period by definition constitutes famine" (Devereux 1988). The model demonstrates the situation of subsistence farmers, such as the farmers under investigation, and reveals how a failure of production during one growing season would lead to a food shortage. Nevertheless, the model is criticized because it overemphasizes food supply and undermines the demand for available food. This criticism over FAD ended up in the alternative model of „Entitlement“ proposed by the economist Amartya Sen in 1981.

2.2.2. Food Entitlement Decline (FED) approach

Amartya Sen's influential book "Poverty and Famine" (1981) decisively shifted the focus of famine analysis from the supply side to the demand side. The entitlement approach emphasizes access to food, or people's relationship to the food, rather than the availability of food (Devereux and Maxwell, 2003). The main argument of this model is the mere presence of food in the economy or the market does not entitle a person to consume it and thus starvation can set in without any obvious aggregate available fall (Getachew, 1995).

Some catastrophic famines have occurred without FAD. For example, the Bengal famine of 1943, the Ethiopian famine of 1973 and 1984, and the Bangladesh famine of 1974 occurred due to a lack of entitlement rather than due to a lack of availability shortfall (Fasil, 2005). Among many positive features of the FED approach over FAD, the following are very important (Devereux and Maxwell, 2003):-

- First, it has emphasized demand rather than supply.
- Second, it allows vulnerable groups to be identified.
- Finally, it suggests more appropriate policy intervention.

Although this approach has the above-mentioned strength of FAD, it has also its limitations. Generally, food security signifies the combination of the above two approaches and food utilization because enough food must be available, and households must have the capabilities to acquire it (Degafa, 2002).

The framework of the study is described by mixing the premises of the 'general explanations to famine' and the famine models briefly highlighted above. It consists of five major variables adversely affecting the farmers' food production, which in turn determines the situation of the households' food security. These are environmental crises, population pressure, poor asset base, social (cultural) issues, and poor rural infrastructure.

2.3. Empirical Reviews

2.3.1. Factor affecting rural Household Food insecurity

Mebratu, N. F. (2018). , researched the determinants of food insecurity in Woliso district, South Western Ethiopia. And the researcher applied the logit model the result showed that the household's education level, dependency ratio, amount of land, and amount of fertilization have significantly influenced the level of food insecurity. According to this research, the results of the descriptive analysis show that about 25.4 % and 74.6 % of the sample households were found to be food insecure and food secure, respectively.

The study was carryout in Lare woreda of Gambella regional state by Ruach Bayak. (2019) collected the necessary data from primary sources of sampled rural households. In this regard, the researcher follow a two-stage probability proportional to size sampling procedure employed to select 160 sample households from 4 kebeles out of 28 kebeles of the study areas to able to investigate the determinants of food insecurity status of farming rural households and to identify factors influencing rural households' food insecurity status and to find out the coping mechanism. The researcher applied Descriptive statistics and the econometric model/binary logistic regression model was employed for data analysis using SPSS. A binary logistic model was applied to identify the determinants of food insecurity that resulted in 66.25 % of sampled rural households in the study area being food insecure whereas 33.75% of the sampled rural household was food secure. A total of thirteen explanatory variables, 8 continuous and 5 discrete, were included in the empirical model. Out of these, six were found to be statistically significant. These variables include Household size, Age of Household head, Dependency ratio, cultivated land, Remittance, and off-farm income. On the other hand, the sale of livestock, the sale of milk and milky product, fishing,

selling of firewood, borrowing grain/cash, and gathering wild fruit, were found to be more frequently practiced as the mean of coping mechanism used by people in the study area.

Ahmed, K. D., Jema, H., & Lemma, Z. (2018), conducted research in Shalla District, West Arsi Zone, Oromia Region, Ethiopia to estimate the situation, extent, and severity of food insecurity, identifying factors influencing food insecurity and the traditional coping mechanisms used by farm households in fighting food shortage in the study area of Oromo a region. Food security at the household level in the rural areas of Ethiopia has remained a challenging goal until today. The design and implementation of effective measures to reduce household food insecurity need an in-depth understanding of its covariates. As a result, this study will conduct with a specific to achieve these objectives, the researcher collected the data from 150 randomly selected households in three randomly selected kebeles of the district and was analyzed using both descriptive statistics and econometric methods. The results from descriptive statistics showed that of the total surveyed households, 62% were food insecure. In addition, results revealed that there was a statistically significant difference between food insecure and food secure households about different demographic, economic, and institutional factors. The results of the binary logit model showed that family size in Adult equivalent (AE), age, and dependency ratio had a significant and positive effect on food insecurity, while gender, cultivated land, livestock ownership in Tropical livestock units (TLU), oxen ownership, fertilizer use and income from safety net had a significant and negative effect on food insecurity.

(Ogunniyi, A. I., et al., (2021) conducted research in Nigeria at targeted farming households to assess the food availability, accessibility/affordability, and food utilization sustainably The researcher Used 250 maize farming households and used Foster–Greer–Thorbecke as well as the probit regression model to investigate the factors determining household's food security. The food insecurity measure shows that 23.2% points of the households express the incidence of food insecurity while 5.5% points and 1.8% points were found to have depth and severity of food insecurity, respectively. After controlling for households' socio-economic and demographic characteristics, the probit regression model suggested that, among others, the value of output sold, education, credit access, and participation in government safety net programs significantly influenced food security among the maize farmers in the study area.

The other researches were carryout at both districts, of Ethiopia (Moroda, G. T., Tolossa, D., & Semie, N. (2018), to examine the food insecurity situation and identify the determinants among the rural households in the area. The sampled data were 397 household heads that were selected through a systematic sampling technique from six sample kebeles. The results revealed that 26.5%, 21.7%, and 41.3% of respondents were highly food insecure through Months of Adequate Household Food Provisioning, Household Food Insecurity Access Scale, and Household Dietary Diversity Score, respectively. On top of these, 56.9%, 46.1%, and 64.0% of the respondents did not have access to a water supply, not owned a latrine, and disposed of waste in an unsafe way, respectively. Furthermore, results from the inferential statistics showed that educational status, farmland size, total annual income, distance from health facilities, and the availability of supporting organizations were positively associated with the household food security situation, while access to irrigable land, frequent drought, distance to input/output markets, and distance to road transport was negatively associated. The researchers concluded that from the study findings, it can be observed that all the dimensions of food (in) security should be focused on for effective intervention.

Agidew-Singh, (2018), evaluated the determinants of food insecurity in the rural farm households of the Teleyayen sub-watershed in Ethiopia. The researcher used a multistage sampling procedure to select 215 sample households involving a combination of purposive and random sampling. The researcher applied an independent sample t-test, chi-square, percentage, mean, and standard deviation were employed to analyze the data. It was found that 20.9 and 79.1% of the sample households are food secure and food insecure, respectively. The majority of the food insecure households were younger household heads, who own less than 1 ha of farmlands. On average, male-headed households were more food secure than female-headed households. The result of the binary logistic regression revealed that shortage of farmland, poverty, recurrent drought, and climate change, shortage of rainfall, and land degradation are determining factors for such food insecurity.

According to Sisha, T. A. (2020), the article's research assessed the prevalence of food insecurity and the major household-level determinants of food insecurity at the national level and ranks the coping strategies households used. During the assessment over 500 households were analyzed through applied of the logit model, Anthropometric indicators generally show an improvement

over time, however, malnutrition is still one of the highest in the world. Child nutritional status in rural areas is worse compared to urban areas. Also, it appears that a higher percentage of boys suffer from malnutrition than girls. The result of logistic regression revealed that the average years of schooling of members of the household, proximity to service centers, assets, and availability of credit services positively affect household food security, whereas dependency ratio and shocks increase the odds of a household being food insecure. Households choose to reduce the variety of food eaten as a primary strategy to reduce the impacts of food insecurity.

Bedeke, S. B. (2012), indicated in his study entitled food insecurity and coping strategies: a perspective from Kersa District, East Hararghe Ethiopia using the binary logit model found that out of eleven explanatory variables, six significant variables were thought to influence the food security status. Those variables that showed significance in the model were: age of the household head, sex of the household head, household size in adult equivalent, total cropping land in a hectare, oxen owned, and remittances in Birr. From these variables, household size in adult equivalent and the age of the household head affect food security negatively.

Welderufael, M. (2015). tried to examine the extent of household's vulnerability to food insecurity in urban and rural areas of Amhara regional state of Ethiopia and revealed that about 48% of households were able to meet 2100 kcal per day per adult recommended calorie requirement in 2011, with a higher prevalence in rural households than urban households. The binary logistic model showed that these households with male heads, lower consumption expenditure, large family sizes, old age households, and unemployed were more food insecure in urban areas, while farm inputs, farm size, livestock ownership, and shocks such as illness and drought were the determinants of rural household food insecurity.

Belete Debebe (2017) researched the determinants of food insecurity in northwest Ethiopia. The binary logistic regression model was applied in the study and found that seven out of twelve explanatory variables: age of household heads, educational level, TLU, cultivated land size, access to credit, applying chemical fertilizer, and improved seeds were found to be statistically significant determinants of household food insecurity.

In a study done by Alemseged G. et al. (2018) at Werie Leke District on determinants of rural household food insecurity in northern Ethiopia by using a binary logit regression model, among eighteen explanatory variables used in binary regression analysis, five variables were statistically

significant while the rest were not. These variables include the age of the household head, family size, irrigated land holding, market information, and credit utilization. From these significant variables, the age of the household head and credit utilization influence food security negatively.

Sani, S., & Kemaw, B. (2019), Carried out a study on the analysis of food security in western Ethiopia. The binary logistic regression model was applied in the study and found that the sex of the household head and access to irrigation affect food security positively and significantly whereas, the age of the head of the household, cultivated land size, off-farm and non-farm income, and access to credit affects household food security status negatively and significantly.

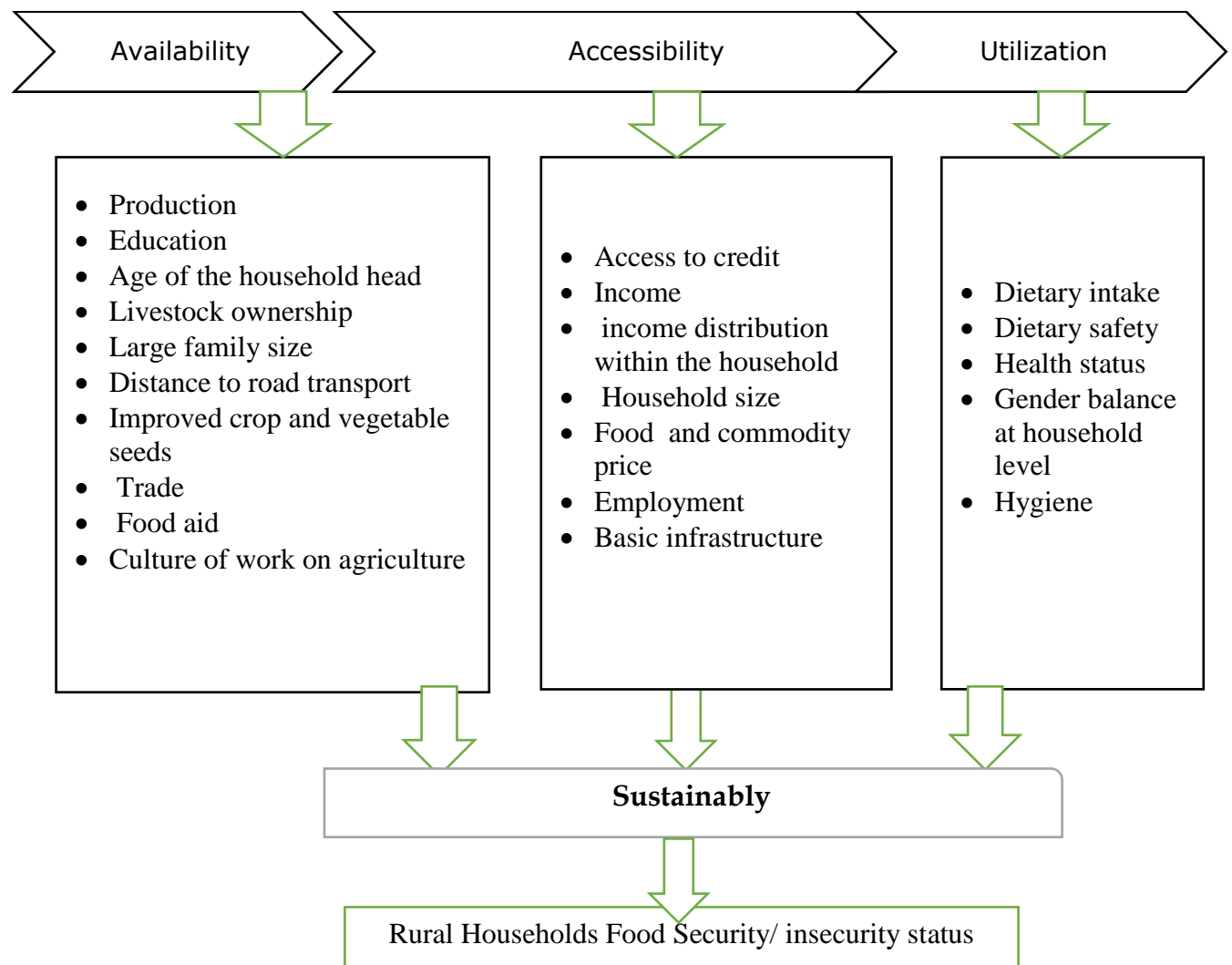
Drammeh, W., Hamid, N. A., & Rohana, A. J. (2019) that Food insecurity is a global public health challenge. They said that Household food insecurity is the leading risk factor for malnutrition, claiming approximately 300,000 deaths each year. Surely, whether directly or indirectly due to inadequate food consumption and poor diet quality, it is accountable for over half of all deaths among children in Sub-Saharan Africa. It was estimated that the prevalence of food-insecure individuals in the area reached 17 million by the year 2021. Inadequate nutrition may result in low immunity, impaired physical and mental development, and reduced productivity among children under five years and throughout the life course. In This review article, the researchers are attempts to discuss the various household food insecurity determinants and their association with child malnutrition in a Sub-Saharan African context.

2.4. Conceptual Framework

The identification of factor affecting related to food insecurity among rural households is subject to the application of a research conceptual framework. Based on the empirical review presented the Conceptual Framework helps to understand the well-being of household food security is influenced by various factors like demographic, socioeconomic, and institutional factors.

In most of the studies, the researchers identified that the factors of food insecurity require exploration of the contributing factors for the main features of food security. It is essential to investigate the factors of rural household food insecurity based on the dimensions of food security like availability, accessibility, and utilization of food. Food insecurity at the household level is related to several factors, including poverty, low income, level of education, household family size, employment status, age, the type of household head (gender), climate change that may cause drought and flood, crop and livestock disease, conflict, poor or no infrastructure as well as the

private and governmental institution and food price. Based on this the researcher develop the following conceptual framework.



Source: Developed by the researcher

Figure 1: Conceptual framework of factor affecting food insecurity

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter constitutes description of study area, research design, method of data collection, sampling method and method of data analysis

3.1.Description of the Study Area

Gambella regional state is one of the states in the current Federal Democratic Republic of Ethiopia (FDRE). The regional state is divided again into three administrative zones and one special woreda which is Itang especial Woreda the place where the research is going to be conducted. Itang especial woreda by itself has divided into 23 kebele administrations. Gambella Regional State covers a total land area of 25,521 km².

The region shares a long border with South Sudan and two other Ethiopian regions: Oromia to the north and east and the newly formed regional state called Southern Western Ethiopia (South Nations, Nationalities and Peoples' Regional State [SNNPRS]) to the south. The region lies within the hot to warm humid lowland agro-ecological zone. Its climate is classified as tropical savannah (Aw) by Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006) with an average temperature of 27.6°C and in the lower altitudes, the annual rainfall varies from 900–1,500mm while at higher altitudes it ranges from 1,900–2,100mm (G, D. (2018). The rainy season starts at the end of April and lasts until October that with the maximum rainfall in July.

Livestock and crop production are the main means of livelihood for the majority of the residents and to some extent fishing and beekeeping. Flood recession agriculture is common, maize and sorghum are their common crop production and are widely practiced by local people along the rivers Degife, A. W., & Mauser, W. (2017). The major rivers are the Baro, Akobo, Alwero, and Gillo. All these rivers have major tributaries and are large enough for the local population who depend on them. Despite its huge natural resource potential and opportunities are the characters of the region while the region is one of the poorest in the country.

Maize and sorghum are important cereal crops, widely farmed by the local people (Degife, A. W. (2020), and these two crops supply over 70% of the average daily caloric intake in the region (Graham, J., Rashid, S., & Malek, M. (2013). According to the 2017 Ethiopian population projection, the total population of the region is approximately 436,000 (CSA 2018). According to a CSA (2018) report, based on a Household Income, Consumption and Expenditure (HICE) Survey, around 23% of the total population of the region was below the poverty line in 2015/16.

Itang town is the capital city of Itang especially woreda which is located at a latitude and longitude of 08°12'N 34°16'E with an elevation of 480 meters above sea level. The driving distance between Gambella towns to Itang town is about 45.94km and its estimated duration is minutes if the average speed is 72km/hr. The demographic backgrounds of the study area described as conferring with the Central Statistical Agency of Ethiopia (CSA), 2007 that the Census conducted Itang especial woreda had a total population of 35,686, an increase of 190.14% over the 1994 census, of whom 17,955 are men and 17,731 women; with an area of 2,188.34 square kilometers, Itang has a population density of 16.31. While 5,958 or 16.7% are urban inhabitants, a further 278, or 0.78% are pastoralists.

A total of 6,578 households were counted in this woreda, which results in an average of 5.4 persons per household, and 6,248 housing units. The main ethnicities of the study are Nuer (63.96%), Anuak (25.17%), and foreigners from Sudan (4.62%), Shita (2.66%), and all other ethnic groups 3.59%. Languages spoken in the area are Nuer (68.72%), Anuak (25.75%), and Opuuo (2.66%). The religion with the largest number of believers is Protestant with 81.63% of the population, while other groups with sizable followers are traditional beliefs (7.54%), Orthodox Christian 6.27%, and Roman Catholic 2.62%.

The following Map is a map of Ethiopia as according to the current administrative location which governs into sub-regional state. Then the map has Ethiopia → Gambella regional state → and Itang woreda within this the map shows each study areas (kebeles).

questionnaires were prepared and distributed to the intended sample of households. To do so, enumerators who have acquaintance with the local language and the culture of the local people were selected, and trained on data collection techniques and the content of the questionnaires. Besides the structured questionnaires which are source of data collection and key informant interviews were used to supplement the data collected by enumerators through questionnaires of the primary data. Therefore, data regarding the age of the household, sex of household, family size, educational level of head of household, cultivated land size of the household, number of livestock owned by the farm household, improved seed usage, off-farm income in AE (Adult Equivalent), distance from the market center, use of farm credit, total food consumed during seven days of the non-fasting season were collected from sampled households.

Secondary data were collected from different offices of governmental and non-governmental sources located in the study area. Moreover, regular and statistical reports of the MoARD, CSA, FAO, MoFED, and others were used. Furthermore, the relevant secondary data were collected from world wide web (www) sources, the woreda office of the Agriculture and Food Security and Disaster Prevention and Preparedness Office, Various texts, and research findings dealing with food security and related matters in Ethiopia and other countries as well as published documents of CSA were consulted that implement different projects to support the effective implementation of the study. Generally, secondary data were collected from published documents, official websites, unpublished documents, and also related literature that were deeply reviewed.

3.3. Sampling Techniques and Sample Size Determination

The target populations of this study were rural households in the Itang special district of Gambella regional state. Itang special district was purposively selected. The two-stage random sampling procedure was followed to draw representative samples of rural households. Accordingly, in the first stage, a simple random sampling method was employed to select three kebeles namely; Watgash, Puldang, and Itang Kier from a total of 23 kebeles in the district.

In the second stage, from the selected three kebeles, 140 samples of the targeted rural farm households were selected randomly based on probability proportionate to the size of targeted households in the selected kebeles. Then, sample sizes were determined by following the simplified formula provided by Yamane (1967). The required sample size was at a 95% confidence level;

and considering the homogeneity of the population, a level of precision equal to 7% was used to determine the sample size required to represent the population.

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

$$n = \frac{1352}{1 + 1352(0.07)^2} \approx 140 \quad (3.1)$$

Where, N- Total number of households (1352)

e- Denoted the desired precision level (taking 7%),

n- Denoted sample size

Table 1: Sample size determination

<i>Kebeles</i>	Household size	Sample proportion	Sample
Itang Kierr	525	39	54
Watgach	652	48	68
Puldang	175	13	18
Total	1,352	100	140

Source: Own calculation from each kebele administration offices (2022)

3.4. Methods of Data Analysis

The collected data was analyzed using statistical tools such as Statistical Package for Social Sciences (SPSS) version 20 for data entry and analysis of the collected data. Besides, Microsoft Excel was used to compute the conversion of some variables into their appropriate figures. Accordingly, the Tropical livestock unit (TLU), adult equivalent, food insecurity extent, and kilo calories of food consumption were computed by using Microsoft Excel. Moreover, two types of methods of data analysis, namely descriptive statistics and econometric models were used to analyze the data collected from sampled households.

3.4.1. Descriptive Statistics

Descriptive statistics are important tools to present research results clearly and concisely. One can compare different categories of sample units concerning the desired characters to draw some important conclusions by applying descriptive statistics such as **mean, standard deviation, frequency, and percentages**. In this study, descriptive statistics were calculated and arranged in

a way that permits one to quickly understand their meanings. Furthermore, inferential statistics like **t-test** and **chi-square** were employed along with descriptive statistical tools to compare the statistical significance of the mean difference between food-insecure and food-secured rural households concerning **dummy** and **continuous explanatory variables**.

Data analysis techniques are used to analyze data collected through data collection instruments and to derive meaningful results for the research. These results are then used to draw conclusions for the research and to answer the research question(s). The questionnaire data were checked for completeness and accuracy and pretested in advance. The questionnaires were coded according to each variable to ensure that the error margin is minimized and to assure accuracy during analysis. Data analyses were carried out through descriptive analysis involves a procedure of transforming raw data into charts, and tables, with frequency distribution and percentages, which are a crucial part of interpreting *and* making sense of the data.

3.4.2. Foster, Greer Thorbecke Index

To attain the first objective, which was related to the measurement of the status of food security among rural households, the **FGT** food security measurement was used (Ogunniyi, A. I., et al., (2021). This method of food security measurement was used by the researcher to assess the food availability, accessibility/affordability, and food utilization sustainably the rural farm household food security status where they are.

Household caloric acquisition is a measure of the number of calories, or nutrients available for consumption by household members over a defined period. Data on available food for consumption including all sources; own farm production, purchase, and /or gift/loan/wage in kind were collected for the last seven days before the survey day from the household. The most used recall period for measuring household food security status is two weeks or less. A one-week period may have an advantage over two weeks in that it is easier for households to remember what has happened since the same day last week. The day of the week can help to setup a specific memory post of the beginning of the recall period in respondents' minds, bounding the period (Smith, L. C., & Subandoro, A. (n.d.).

After the data were collected using seven days recall period, the data were converted to kilocalories using the food composition table manual (Ethiopian Health and Nutrition Research

Institute/EHNRI, 1997). Then the converted data were divided into household Adult Equivalent (AE) to identify whether the household is food secure or insecure. Then the results were compared with the minimum subsistence requirement per AE per day (that is, 2200 kcal). Households who consume below this minimum requirement (2200 kcal per AE per day) were categorized as food insecure and those households who consume above the threshold were considered as food secure.

Once food-secured and food-insecure households were identified by using the cut-off level, 2200kcal/adult equiv./day, the extent and intensity of rural household food poverty were estimated by using the FGT index.

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^q \left(\frac{Z - Y_i}{Z} \right)^{\alpha} \text{ And } P(\alpha) \geq 0 \text{ for } y_i < z$$

Where,

Z= the minimum requirements per day per adult equivalent (2200Kcal/day/AE)

Yi= the calorie intake of each food insecure households

N= total sample size

α =weight attached to food insecurity (if $\alpha=0$, head count food insecurity, $\alpha=1$, food insecurity gap and $\alpha=2$, it refers to the severity of food insecurity).

The household is food secure when $Y_i > Z$ for this model. Within this FGT index, we compute the three most commonly employed indices: headcount ratio, food insecurity gap, and squared food insecurity gap. The headcount ratio indicated the number of households whose caloric intake is less than the minimum requirements. On the other hand, the food insecurity gap measures, on average, how far the food insecure households are below the cut-off value; and the square food insecurity gap is a measure closely related to the severity of the food insecurity gap but gives those further away from the minimum level a higher weight in aggregation than those closer to the subsistence level

3.4.3. Econometric Model

A binary logistic regression model is a proper model when the dependent variable is a dummy one consisting of 0 and 1 (Gujarati, 2004). It is commonly argued that logit and probit models are usually used to establish the relationship between household characteristics and dichotomous response variables (food-insecure and food-secured rural households). The advantage of these models over the linear probability model is that the probabilities are bound between zero and one.

Moreover, they best fit the non-linear relationships between the response and the explanatory variables.

The models specify a functional relationship between the probabilities of being a credit user to various explanatory variables. In principle, one can substitute the probit model for the logistic model, as their formulations are quite comparable; the main difference is that the logistic model has slightly flatter tails than the cumulative normal distribution; i.e. the probit curve approaches the axes more quickly than the logistic curve (Gujarati, 2004). Hence, a binary logistic model is selected for this study.

$$P_i = \Pr(Y=1/X_i) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}} \dots \dots \dots (1)$$

In the logistic distribution equation, P_i is the independent variable; X_i is the data that is the possibility of a preference by an individual (option of having 1 and 0 values). When $\beta_1 + \beta_2 X_i$ in Equation 1 is replaced by Z_i , Equation 2 is obtained:

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

Z_i is between $-\infty$ and $+\infty$, and P_i is between 1 and 0. When P_i shows the possibility food insecure households, the possibility of food secured rural households is $1 - P_i$. Then, the possibility of food secured households can be explained as in Equation 3 as follows:

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

Equation 4 is obtained by dividing the food insecure by food secured households:

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

When the natural logarithm of both sides of the equation is written, Equation 1 is obtained

$$L_i = \ln \left(\frac{P_i}{1 - P_i} \right) = Z_i = \beta_1 + \beta_2 X_i \dots \dots \dots (5)$$

Thus, non-linear logistic regression model is liberalized based on both its parameters and variables. “L” is called “logit” and models such as this called “logit models” (Gujarati, 2003). In these situations, Equation 1 is used for proper transformations:

$$P_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_1 + \beta_3 X_2 + \dots + \beta_k X_k)}} \dots\dots\dots (6)$$

Odds and odds ratio are significant terms in logit model. Odds are defined as the ratio of the number of events that occurred to number of events that did not occur. “Odds ratio” on the other hand, is the ratio of two odds, in other words, the ratio of likelihood to another.

In Equation 4, two probabilities, food insecure and food secured households probability of an event are proportioned and this is the odds of proportion (Menard, 2002).

3.5. Variable Description and Hypothesis

Dependent Variable

The household food security status, which is the dependent variable for the binary logistic regression model is a dichotomous variable representing the status of household food security. It was represented in the model by 1 for food insecure and 0 for food secure households depending on the minimum calorie requirement cutting point of 2200 kcal/adult equivalent per day.

Independent Variables

In this study, household food insecurity status was taken as the independent variable which is explained by different demographic, socio-economic, and institutional factors. Variables definition and hypothesis are given as follows.

Family size: It is an important variable, which determines the household food insecurity status in the study area. As the family size increases, the number of mouths to be fed increases which shares the available food in the household. Therefore, it is hypothesized to have a positive effect on food insecurity in rural households.

Age of household head: Age matters in any occupation. Rural households mostly devote their lifetime or base their livelihoods on agriculture. The older the household head, the more experience he has in farming and weather forecasting. And mostly they intensify and diversify their production activities. Therefore, it is hypothesized to harm food insecurity in rural households.

Education household head: Education household head is a dummy variable taking value 1 if the household head is literate, 0 otherwise. Education equips individuals with the necessary knowledge

of how to make a living. Literate individuals are very ambitious to get information and use it. Therefore it is hypothesized that the educations of household heads and food insecurity have negative relationships.

Land size: Production output is increased either by intensification or escalation. As the cultivated land size increases, provided other associated production factors remain normal, the likelihood that the holder gets more output is high. In the study area average land holding per household or adult is very low so it could not support the household for an average of six months. Therefore it is hypothesized that the land sizes of households and food insecurity have negative relationships.

Sex of the household head: It is a dummy variable taking a value of 1 if the household head is male and 0 otherwise. The sex of the household head is an important determinant of food insecurity. This is because; male-headed households are in a better position to pull the labor force than female-headed ones. Therefore, it hypothesized that male-headed households have less likely to be food insecure than female-headed ones.

Credit use: This refers to the amount of money borrowed from different sources. According to Abebaw (2003), credit for consumption or purchase of agricultural inputs like improved seed, chemical fertilizers, etc. improves the food security status (reduces the risk of food insecurity) of the households. Consequently, it is expected that households who are getting the amount of credit they required were expected to have more probability of being food secure than others in this study.

Livestock owned: It refers to the number of livestock owned by the household in terms of tropical livestock unit (TLU). Livestock contributes to a household's economy in different ways: as a source of pulling power, a source of cash income, a source of supplementary food, and means of transport. In addition, livestock is considered a means of security and means of coping strategy during crop failure and other catastrophes. Thus, households with more livestock have a better chance to be food secure and thus, have less risk of food insecurity. Therefore it is hypothesized that livestock holding harms food insecurity in the intended study area.

Proximity to market center: This refers to the distance between the farmers' home and the nearest market where the household usually made transactions which are measured in kilometers. This is included because proximity to the market center creates access to additional income by providing non-farm employment opportunities and easy access to inputs, extension, and transportation. It is

therefore hypothesized, in this study that the nearer the household to the market center, the less would be the probability of being food insecure. The same result was also obtained by Lewin and Fisher (2010). Therefore, in this study, it is hypothesized that proximity to the market center is positively related to food insecurity.

Using irrigation: may have positive factors for crop production and it is one of independent variable for this research. **Off-farm activities:** and it may have derives their livelihoods. It is known that if the rural households have participated on these activities. And the rural households become able to diversify their income source.

Ethical Consideration

Before starting the work, the study design was explained to Officials of the government Itang Woreda administration Agriculture Department and Administrative of Itang Woreda for their permission and support. The nature of the study has been fully explained to respondents to obtain their consent. No false promises such as remuneration and or per diem, food, and financial aid are to be given. The information has been collected after securing their consent from the study area of the participant. Data obtained from each study participant have been kept confidential, and all people who participated in the study have been acknowledged.

CHAPTER FOUR: RESULT AND DISCUSSIONS

4.1.Descriptive Statistics of the Dummy Variables

The survey result indicated that, out of the total sample households, 28 of food secured and 38 of food insecure household were female headed, whereas 28 and 46 of the sampled households were male headed. The result of chi-square test shows that there is no statistically significant difference between food secured and food insecure households regarding sex of households.

Educational level of household can be grouped into those able to read and write, and those who don't. Accordingly, those who are able to read and write are 14 and 23 sampled households for

food secured and food insecure households, respectively. Regarding those who are not able to read and write, food secured and food insecure are found to be 42 and 61 households, respectively. The chi-square test result showed that there is no association between educational status of food secured and food insecure households.

The educational level of household can be expressed in terms of illiterate, primary and secondary. Accordingly, the result shows that 75.7% of sampled households were illiterate which means they cannot read and write. About 22.2% attended primary school and about 2.1% or three households were those attended secondary school. It is known that high percentage of sampled households have no any educational level at all.

The result revealed that, 48 foods secured and 68 foods insecure rural sampled households have **credit access**. Among the food insecure households, 68 and 16 were found to be users and non-users of credit access from local lenders; and 48 and 8 of food secure households were users and non-users of credit access, furthermore as chi-square test result, there is no statistically significant association between food secured and food insecure households regarding borrowing.

Using irrigation for crop production is also one variable in this study. The table below shows that out of total food insecure households, 26 and 58 household use irrigation and do not use irrigation, respectively. The study also shows 12 household use irrigation and 44 households do not use irrigation out of total food secured households. However, it was found that there is no significant association between food secured and food insecure in terms of irrigation use for crop production.

It is known that when the rural households are participating in **off-farm** activities and may have derives their livelihoods. The study shows that majority of sampled households; about 89.3% have not participated in off farm activities and only about 10.7% have participated in off farm income generating activities. From the total sample, only eight are food secured and seven are food insecure households have participated in off farm income generating activities. It was also found that the association between off farm income of food secured and food insecure were statistically insignificant.

Table 2: Descriptive statistics of dummy variables

Characteristics	Food secured	Food insecure	χ^2/t -test	Total sample
Dummy variables	Frequency	Frequency	χ^2 value	Frequency

Gender of HH	Female	28	38	0.31	66
	Male	28	46		74
Education	yes	14	23	0.098	37
	No	42	61		103
Off farm income	Yes	8	7	1.24	15
	No	48	77		125
Credit access	Yes	48	68	0.54	116
	No	8	16		24
Irrigation	Yes	12	26	1.54	38
	No	44	58		102

Source: SPSS output from own survey data, 2023

4.2. Descriptive Statistics of the Continuous Variables

The Age of the total sample rural households ranged from 24 to 67 years. The average age of sample respondents was 44.14 years with the standard deviation of 13.09. The average age of food secured household was 48.93 years and that of food insecure was 40.94 years. It is expected that aged households are more experienced than their counterparts since there is no so much difference between age of households and their respective experience. Accordingly, the result from independent sample t-test shown in the table 3 below showed that the mean difference between food secured and food insecure household in terms of their age was found statistically significant at 1% level of significance.

Total family size of sample respondent was converted into adult equivalent in order to consider the effects of age and sex of each family member. Accordingly, the family size of sample households which was measured in adult equivalent ranged from 3 to 10.75 with an average of 7.88 and standard deviation of 2.77. As shown in the table 3 below, the mean family size of food secured and food insecure households were 5.75 and 9.30 in adult equivalent, respectively. The statistical analysis from t-test showed that the difference between average family size of food secured and food insecure households were found statistically significant at less than 5% significance level or ($P < 0.01$).

The distance from home to the nearest market place was an average of 2.11 hours of walk with standard deviations of 0.84. The minimum and maximum distance that rural household travel to

the nearest market was 0.1 and 3.5 hours, respectively. The mean difference between distance to the nearest market among food secured and food insecure households were statistically significant at 5% significance level.

From the total land operated, the average area of land allocated with minimum and maximum of 0.5 and 2 hectares, respectively. The result indicated that, land allocated for cropping by food secured and food insecure households were 0.76 and 0.75 hectares on average. Statistically, the difference between the two groups in terms of land allocated for cropping was found in significant.

In the district, mixed crop and livestock farming system is dominantly used by rural households. Livestock are very important resources in the livelihoods of smallholders in the study area. Storck *et al.* (1991) standard conversion factor was employed to convert the livestock population number obtained from survey data into Tropical Livestock Unit (TLU) for the sake of making interpretation easy. The minimum and maximum livestock owned by food secured sample of rural households were 4.3 and 21.7 TLU. The average livestock owned by sample rural households were 10.63 TLU with a standard deviation of 4.3. The statistical analysis from t-test in the table 3 shown below indicated that the average number of livestock owned by sample rural household in TLU was found insignificant which meanings that there was no substantial difference between average livestock in TLU owned.

Table 3: Descriptive statistics result of continuous variables

Characteristics	Food secured (56)		Food insecure (84)		t-value	Total sample (140)	
	Mean	SD	Mean	SD		Mean	SD
Age of HH	48.93	13.59	40.94	11.78	3.69***	44.14	13.09
Family size	5.75	2.074	9.30	2.21	-9.54**	7.88	2.77
Distance from M.	1.92	0.85	2.28	0.81	-2.13**	2.11	0.84
Land size	0.76	0.30	0.75	0.28	0.059	0.76	0.29
Livestock	10.65	4.48	10.61	4.26	0.0474	10.63	4.33

*The sign *** and ** refers to significant at 1% and 5% level of significance*

Source: SPSS output from own survey data (2023).

4.3. Major source of food and source of income of sample households

As the means of livelihood of sampled households are crop and livestock production and the respondents were assuring that are their main source of income. Accordingly, about 37.1%, 14.3% and 48.6% of sampled respondents answered that their major source of income were crop production only, livestock rearing and both crop and livestock production, respectively.

Regarding the food for consumption, about 70.7 % of sampled household utilize home produced food and the rest 29.3% of them responded that they get food for consumption from both home production (non-purchased) and from the market (purchased). In this case, form the 56 food secured households, the main source of food of 37 were from home produced only, whereas the source of food for 19 food secured households were from both home production and market. Similarly, the source of food for 66 and 22 sampled households were home produced and both home produced and marketed one, respectively.

4.4. Food Security Status of Rural households

Based on the food security cut-off point, i.e., 2200-kcal threshold point as a benchmark, 84 (60%) sample households were found to be food insecure. Of the total study participants, 56 (40%) were food secure households. In order to combat the seasonal food shortage, households have used different coping mechanisms and borrowing money from their relatives as well as friends are the highest. The mean kilocalorie of food consumed per adult equivalent per day for food secured, food insecure and total sampled households were found to be 3278.10 Kcal/adult equiv. /day, 1531.79 Kcal/adult equiv. /day and 2230.32 Kcal/adult equiv. /day, respectively. The table 4 below shows the food security status of sampled rural households in the study area.

Table 4: food secured and insecure rural households

Food security status	Frequency	percentage
Food secured	56	40
Food insecure	84	60
Total	140	100

Source: own computation from survey data, 2023

The total consumption each food item by sampled household during non-fasting season was computed and converted to kilo calorie. The table given below indicates to the mean of the total food item consumed by households.

Table 5: Kilo calorie of food items consumed by sampled households

Food consumed	Food secured (56)	Food insecure (84)	Total (140)
Maize	73.97478571	32.95997857	106.9347643
Sorghum	18.95178571	11.31152143	30.26330714
Wheat	13.59406429	3.5032	17.09726429
Beans	7.459721429	3.667471429	11.12719286
Meat	1.633712143	0.970819286	2.604531429
Fish	3.564483571	2.066345714	5.630829286
Milk	2.63969	1.662857143	4.302547143
edible oil	23.24183571	9.396935714	32.63877143
Salt	0.284121929	0.159441	0.443562929
Sugar	10.90994286	6.441749286	17.35169214
Tomato	0.607020143	0.356199571	0.963219714
Cabbage	5.771610714	3.379873571	9.151484286
Onion	1.272433571	0.713446429	1.98588
Total	163.9052078	76.58983914	240.4950469

Source: own computation from survey data, 2023

The extent of food security of the rural household is examined by using **Foster Grier Thorbecke index** method. The Foster-Greer-Thorbecke index was used to examine the three well-known categories food insecurity head count ratio, food insecurity gap, and squared food insecurity gap.

Based on the predetermined minimum consumption requirement, that is 2200kcal per adult equivalent per day, The FGT classes of food insecurity head count ratio, food insecurity gap, and squared food insecurity gap were determined to be 0.60, 0.3037, and 0.1146, respectively. The head count ratio, which is another name for the incidence of food insecure, was 0.60. Which is 60% percent of the studied rural households were unable to meet the required minimum consumption level. According to the study, the food insecurity gap index, which measures the food

insecurity, was assessed to be 0.3037. This means that food insecure households need an extra 30.37 percent of their current kilo calorie of consumption to meet their absolute minimum basic needs. The squared food insecurity gap or severity index was estimated to be 0.1146, implying that there are 11.46 percent kilo calorie per adult equivalent per day consumption inequalities among sampled food insecure households in the study area.

According to the key informant interviewer's response the people of Itang woreda rural farm household have served through different NGOs after the comings of the south Sudanese Refugee with different innervation to support their food security then after we have seen some fair improvements of rural households' of food security but not enough and they are working on it to improve more numbers of households.

Table 6: the extent of food insecurity measure of sample households

Food insecurity measure	Values	Percent
Food insecurity head count index	0.60	60
Food insecurity gap index	0.3037	30.37
Food insecurity severity index	0.1146	11.46

Source: Author computation (2023)

4.5. Coping Strategies in case of Food shortage

The coping strategies used by each household were livestock sale, sale of (fire wood, charcoal, dry grass) and collecting wild vegetable, migration to town and other areas, dependence on relief assistance, relying on remittance from relatives, making local drinking alcohol, daily casual work and participating in fishing activities.

From all coping strategies used by households during shortage of food, about 28.6 percent of sampled household use selling livestock as coping strategies. About 28.6 percent of sampled households participate in selling fire wood and charcoal, and also 21.6 percent of sampled households are participated on fishing activities. About 10 percent responded migration to town

and other areas a means of coping food shortage. The rest of the respondents lied on, 4.1%, 2.1% and 2.1% of the activities that daily casual work, relying on remittance from relative and participation on making local drinking alcohol, respectively.

In general it is known that the rural dwellers of the district derive their livelihood by participating on livestock rising. It is also justified in this research that livestock selling is one of the coping strategies responded by sampled households. The district is also well known by having fish resource. This is also described in the table below as majority of sampled household participate on fishing to survive during food shortage followed by animal sale.

Table 7: Coping strategies used during food shortage

Coping mechanisms	Frequency	Percentage
Livestock sales	30	21.4
Sale of (fire wood , charcoal, dry grass)	40	28.6
Migrate to town and other areas	14	10.0
Dependence on relief assistance	14	10
Relying on remittance from relatives,	3	2.1
make local drinking alcohol	3	2.1
daily casual work	6	4.3
Fishing	30	21.4
Total	140	100

Source: Own computation from survey data, 2023

4.6. Determinants of Food Insecurity/ Security

Factor affecting food insecurity was estimated by binary logistic regression model by using food security status dependent variable and explanatory variables. Ten (10) independent variables that were hypothesized to have influence on household food insecurity in the study area were included in the model, of which five (5) are found to be statistically significant even though the level of statistical significance for independent variables included in the model was different for individual or groups of variables and the sign of the significant parameters were as expected.

Age of Household Head (AGHH):

Age of household head was expected to have influence on food insecurity of rural household. The result of logistic regression model output shows that age of household head negatively affects rural household food insecurity in the study area at less than 1% significance level. It may also depicts that as age of household head increase by a year, the likelihood of being food insecure decrease by 0.81 factors, keeping other factor constant. This implies that, the older the household head, the more experience in farming system and weather forecasting as well as applying their indigenous knowledge as much as possible they can. And mostly they intensify and diversify their production activities. As a result, the chance for such household to be food insecure is less. In light of this, it is hypothesized that age of the household head and food insecurity are negatively related in the study area.

Family Size of Household (FZ-HH)

Family size was expected to positively affect food insecurity of the rural households of the study area. Family size is statistically significant at less than 1% significant level and exhibits a positive relationship with household food insecurity similar to the hypothesized effect. This indicated that, most of the family members are inactive age group that has no contribution for production rather than consumption. Large family size creates more pressure on household food security because more food and non-food expenditure is spent for them increases. Odd in favor of being food insecure will be increased by factors of 5.20 as family size increased by one adult equivalent.

Distance from the Market (DSTMKT)

Distance from the market was hypothesized to have positive effect on food insecurity those on rural households in the study area. As hypothesized so far, this variable affects food insecurity at less than 5% significance level. The finding again shows that for a unit increase in the distance from nearest market, the likelihood of being food insecure increased by 2.27 factors, keeping other factor constant. This means an hour walk increase in the distance that the farmer travel to the main market center leads to increase the probability of that household to be food insecure. This could be because when distance to road transport increases people may not be encouraged to diversify and produce marketable products.

Off-farm Income (OFFRMINC)

The study result revealed that access to off-farm activity was found to have significant influence at less than 5% significance level and negative relation with the food insecurity of household. This showed that, households who have access to off-farm activity have better chance to be food secure than others who have no access to off-farm activity. The output of binary logit model indicated that, holding other explanatory variables constant, the likelihood of being food insecure for household with access of household to off-farm activity was 8.9% less than those with no off farm activities. In other way, household with no off farm income has higher probability of being food insecure than those with off farm income generating activities. . This is due to the fact that income from off-farm activity increase the probability of household to use modern agricultural inputs to produce more and enables household to fulfill his/her family consumption through purchasing from market.

Credit Access (CRDTACCES)

The logit model analysis revealed that credit has a significant negative association with food insecurity status at less than 5% level of significance. This is in agreement with the prior expectations about the impact of the differential access to credit service. This is because rural households who have the opportunity of accessing farm credit would build their capacity to produce more through purchasing of agricultural inputs. The households with more access to farm credit have possibility to reduce the probability of being vulnerable to food insecurity. The odds ratio in favor of food insecurity decreases; other things remain constant, by a factor of 14.1% as farm households get access to farm credit.

Table 8: Binary logistic regression results

Variables	Coefficient	S.E.	Wald	Sig.	Odd ratio (Exp(B))
SXHH(1)	0.707	.698	1.027	0.311	2.029
AGHH	-0.205	.049	17.584	0.000	.815
FZ-HH	1.648	.321	26.319	0.000	5.199
EDUCSTAT(1)	0.315	.770	.167	0.682	1.370
DSTMKT	0.823	.428	3.694	0.055	2.278
LNDSIZE	0.211	1.375	.023	0.878	1.235

OFFRMINC(1)	-2.422	1.186	4.172	0.041	0.089
IRGTION(1)	-0.102	.915	.012	0.911	0.903
CRDTACCES(1)	-1.962	.986	3.964	0.046	0.141
LVSTK	-0.122	.094	1.688	0.194	0.885
Constant	-1.656	2.330	.505	0.477	0.191

Source: SPSS output from survey data, 2023

4.7.The main Challenges of Crop production currently

Large parts of Gambella Region are prone to Perennial River and flash flooding. The major rivers, Akobo, Alworo, Baro (Openo) and Gilo and their tributaries, often burst their banks during the rainy season and flood communities along the riverbanks, causing loss of life and livelihoods, displacing people and leading to waterborne diseases. In 2022, heavy rains from early August to October caused flooding across 12 woredas and in the regional capital. At least 185,200 people (37,040 households) were displaced (IDPs) and an additional 79,631 people (15,927 households) were affected Region, G., & Update, F. (2022). Itang Woreda is one of flood prone area and the study areas are affected Perennial River and flash flooding. The survey has found that 36.4 percent of the respondent come up with flood is their main challenge for crop production reduction. While the region is known as a flood prone but it is challenged by irregular rainfall distribution as of the survey conducted 16.4 percent of the respondent were identified that irregular rainfall distribution is one of their main challenge for their crop production failure. Due to irregular rainfall distribution and other factors 47.1 percent of the respondent were responses that Crop pest and disease are their main challenge for crop production failure.

Table 9: The main challenges of crop production

	Frequency	Percent
Irregular rainfall		
Distribution	23	16.4
Flood	51	36.4
Crop pest and disease	66	47.1

Source: SPSS output from survey data, 2023

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1.Summary

Achieving food security is among the most significant development challenges facing Ethiopia. In fact, many would say it is the most urgent task facing the country today. Realizing sustainable food security requires a complex of public and private actions. It implies reaching a number of development goals, including stimulating agricultural production, increasing incomes, and improving nutrition directly at household level. The major objective of the study was to assess factor affecting food insecurity in Itang special district of Gambella regional state of Ethiopia.

With three specific objectives, namely, estimating the extent of food insecurity status, identifying the factors affecting the food insecurity and evaluate in percentages of the coping mechanisms adopted by the rural households during food shortage. The study uses both primary and secondary data to achieve the intended objectives. Primary data was collected from sampled rural household by using structured interview. Besides this, Key informant interview was also made to supplement data collected through questionnaire. Secondary data was collected from different sources like reports of CSA, WFP, MoFED, Itang special district woreda office and others. Multistage sampling procedure was followed to select sample of 140 rural households. The data collected from sampled household was analyzed by using descriptive statistics and econometric model. The extent of food insecurity was estimated by using FGT index; the factors which affect food insecurity was analyzed by econometric model called binary logistic regression model. The result of the study shows based 2200-kcal threshold point, 40% and 60% of sampled rural households were food secured and food insecure, respectively. The result of descriptive statistics shows that there was no significant association between food secured and food insecure households with regard to dummy variables used in the model. The t-test result indicates that the difference between mean of age off household head, family size and distance from the nearest market of food secured and food insecure households. The FGT index result also indicates that food insecurity head count ratio, food insecurity gap, and squared food insecurity gap were determined to be 0.60, 0.3037, and 0.1146, respectively. The binary logistic regression model result further shows that five variables out of 10, namely, age of household head, family size, distance from the nearest market ,credit access and off farm income are found to be significantly affecting food insecurity of the rural households.

5.2.Conclusion and Recommendations

The result of this study shows majority of sampled households are food insecure, that is about 40% food secured and 60% food insecure households. The FGT index indicates the head count ratio, which is another name for the incidence of food insecurity, was 0.60. It suggests that roughly 60% percent of the studied families were unable to meet the required minimum consumption level. According to the study, the food insecurity gap index, which measures the food insecurity, was assessed to be 0.3037. This means that food insecure need an extra 30.37 percent of their current kilo calorie of consumption to meet their absolute minimum basic needs. The squared food

insecurity gap or severity index was estimated to be 0.1146 implying that there is 11.46 percent kilo calorie per adult equivalent per day consumption inequalities among sampled food insecure households in the study area.

Food insecurity of rural household was significantly affected by five variables out of ten explanatory variables hypothesized to have effect on food insecurity of rural households. Age of household was one of the significant variables which negatively affect food insecurity at 1% significance level. It depicts that as age of household head increase by a year, the likelihood of being food insecure decrease, keeping other factor constant. Therefore, government and other concerned bodies should increase the experience of the rural households by providing different training which makes them aware the problem of food insecurity and means of overcoming the problems.

Family size also significant variable and positively affect food insecurity at less than 1% significant level. This indicated that, most of the family members are inactive age group that has no contribution for production rather than consumption. Large family size creates more pressure on household food security because more food and non-food expenditure is spent for them increases.

As hypothesized so far, distance from the market was hypothesized to have positive effect on food insecurity of rural households in the study area less than 5% significance level. It implies that for a unit increase in the distance from nearest market, the likelihood of being food insecure increase, keeping other factor constant. This means an hour walk increase in the distance that the farmer travel to the main market center leads to increase the probability of that household to be food insecure.

The study result revealed that access to off-farm activity was found to have significant influence at less than 5% significance level and negative relation with the food insecurity of household. This showed that, households who have access to non-farm activity have better chance to be food secure than others who have no access to nonfarm activity.

Therefore, it is recommended that government; non-governmental organization and other concerned bodies should increase rural farm household's access to market by constructing and upgrading infrastructure like roads. In addition to this I recommended the following some points:

- ☞ Improve the access and control of strategic resources such as land, cattle, cash crops, and other household assets.
- ☞ Timely delivery of an agricultural inputs and long-term credit service facilitation are important.
- ☞ Strengthening the Grassroot organizations with ability to bring credit supply together, the resources, technology and knowledge must be supported and strengthened to enhance food shortage coping mechanisms.
- ☞ The Livestock sector development should be a priority to help alleviate food insecurity.
- ☞ Creating sufficient awareness to affect family planning in the rural farm households.
- ☞ Increase employment opportunities, particularly in rural areas, by encouraging the private sector to supplement such opportunities in agriculture, in simple industry, handicraft and other small business.
- ☞ Should Strengthening the inter-resettlement programs which shift them flood prone area to appropriately safe and productive area , in order to enhance food security through the setting aside of adequate areas of agricultural lands and other natural resources for the production of food and other sources of income.

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APPENDICES

Appendix tables

Appendix 1

Appendix Table 1: Conversion factors used to estimate Tropical Livestock Unit equivalents

Livestock Category	TLU
Ox and Cow	1
Heifer	0.75
Young Bull (Woyefen)	0.34
Calf	0.25
Sheep and Goat (Young)	0.06
Sheep and Goat (Adult)	0.13
Hen	0.013
Donkey (Young)	0.35
Donkey(Adult)	0.70
Horse and Mule	1.1

Source: Storck, et al. (1991)

Appendix Table 2: Conversion factors used to estimate Adult Equivalent

Age group	Adult equivalent	
	Male	Female
<10	0.6	0.6
10-13	0.9	0.8
14-16	1	0.75
17-50	1	0.75
>50	1	0.7

Source: Storck, et al. (1991)

Appendix Table 3: Conversion factors used to estimate kcal of food items

Teff	Gram	3.589
Wheat	Gram	3.623
Sorghum	Gram	3.805
Maize	Gram	3.751
Haricot bean	Gram	3.451
Potato	Gram	0.87
Sweet potato	Gram	1.36
Onion	Gram	0.713
Meat	Gram	1.148
Milk	Gram	0.737
Egg	Gram	0.061
Butter	Gram	7.364
Oil	Gram	8.964
Cabbages	Gram	0.37
Coffee	Gram	1.103

Pepper	Gram	0.933
Salt	Gram	1.780
Sugar	Gram	3.805
Bean	Gram	3.514

Source: EHNRI (2000)

Appendix Table 4: Food consumption of rural household for determining food insecurity

Food type	Value of mean kcal/kg/ltr/month	Value of mean kcal/kg/ltr/year
Maize	48.3194	579.8324
Sorghum	56.532475	678.3897
Lentil	7.90171	94.82052
Pea	10.57851	126.9421
Onion	5.10674	61.28086
Coffee	8.50534	102.064
Fish	12.6136	151.3637
Meat	1.69966	20.39599
Milk	7.25153	87.01836
Egg	0.246	2.952022
Butter	70.31799	843.8159
Oil	61.9352	743.2219
Salt	8.98333	107.7999
Potato	0.072846	0.87415

Food poverty line	300.064	3600.77
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Source: Survey data (2023)

Gambella University

MSc. Thesis Questionnaire for Survey

1. Survey Identification

Region	Gambella	Name of HH	
Zone	Itang special woreda	Date of interview	
District	Itang special woreda_____	Name enumerator	
Kebele			

2. Household head and its member's characteristics

No.	Household	Age (in year)	Sex (code 1)	Educational level (code 2)	Relationship to HH (code 3)	Religious (code 4)	Main occupation

1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Code 1	Code 2	Code 3		Code 4
0 if female 1 if male	0 if illiterate and grade completed if not	1 if Spouse 2 if Son 3 if Daughter 4 if step son	5 if step daughter 6 if grand child 7 if hired worker 7 specify if any _____	1-protestant 2-orthodox 3-muslim 4-specify if any....

3. Land ownership and its characteristics

3.1. Do you have your own cultivable land? Yes _____ No _____

3.2. If 'No', fill information on how did you get land for cultivation in the table given below?

Source of land	Amount in hectare
Gift	
Crop sharing agreement	
From relatives	
Other (specify)	

3.3. If you have your own land (i.e. your answer for question 1.1. is 'yes'), fill your land resource characteristics in the table provided below.

Description	Size(area) in hectare	Remark
Rented land		
Shared land		
cultivated land		

Grazing land		
Total land		

4. Livestock ownership

4.1. Do you have livestock?

Yes _____ No _____

4.2. If your answer is 'yes' fill the following based on your livestock ownership status

Livestock	Quantity (Code A)	Income received from the sale of livestock (in birr)	Purpose of keeping(Code B)
Oxen			
Cow			
Bull			
Heifer			
Calf			
Horse			
Mules			
Donkey(Young)			
Donkey (Adult)			
Sheep(young)			
Sheep (Adult)			
Goat(Young)			
Goats(Adult)			
Chicken			
Others (specify)			

Code 1: put zero if you do not have any of each and their number if you have

Code 2:

1. For trading
2. For transportation
3. For production purpose
4. For reproduction
5. Other (specify) _____

5. Crop production characteristics

Crops	Land allotted in hectare	Amount produced (Code A)	Amount sold in quintal (Code B)	Main purpose Production (Code D)
Maize				
Teff				
Sorghum				
Rice				
Khat				
Linseed				
Haricot bean				
Wheat				
Ground nut				
Sesame				
Barley				
Other fruits				
Mango				
Avocado				
Banana				
Orange				
Okra				
Potato				
Other(specify)				

6. Income gained from off-farm activity in 2014 E.C

	Lists of income	If yes, how much income did you get in birr (<i>code 1</i>)
Off-farm activity	Petty trade	
	Handicraft	
	Carpenter	
	Weaving	
	Remittance	
	Others, specify	

Code 1: write zero if you did not participated in the called off/on farm activity

7. Household consumption status

7.1. Consumption of food items

Fill the following table based on food items that were bought for consumption in the last two week.

Food items	Amount consumed in kind or cash			Remark
	Unit	Quantity	Amount of birr	
Milk	Litter			
Meat	Kg			
Teff	Kg			
Wheat	Kg			
Maize	Kg			
Sorghum	Kg			
Pasta /macaroni	Kg			
Beans	Kg			
Peas	Kg			
Onion	Kg			
Potato	Kg			
Cabbage	Kg			
Okra	Kg			
Garlic	Kg			
Oil	Liter			
Sugar	Kg			
Lentil	Kg			
Egg	Number			
Salt	Kg			
Coffee	Kg			
Tea leaf	Kg			
Shiro	Kg			
Pepper (Berbere)	Kg			
Soft drinks	Liter			
Ground nut	Kg			
Spices(Turmeric(Ird),Black	Kg			
pepper(kundoberbere),etc)	Kg			

8. Access to institutional services

8.1. Access to extension service

1. Did you get extension service during the production season?

Yes [_____] No [_____]

2. If your answer is 'yes', how frequently you contacted with extension agents during production season?

A weekly _____

B biweekly _____

C Once a month _____

D. Other specify _____

8.2. Distance to the market and means of transport

1. Fill the means of transport and distance in minutes it takes to reach the product to the market in the table below.

From and to	Distance in (<i>Minutes of hour</i>)	Means of transport (Code A)
Household house to main road		
Household house to market		
main road to market		
Household house to FTC		
Household house to Gambella microfinance branch office		
Code A:	1. <i>Animal back drawn</i> 2. <i>Vehicle</i> 3. <i>Cart (animal</i> 4. <i>Carrying by human beings</i> <i>Others (Specify) _____</i>	

8.3. Credit services and its utilization

1. Are you a member of Itang micro financial institution? : 1 Yes 0. No
2. If your answer in the question above is 'yes', how long years since your membership?

3. How much loan did you received loan from that microfinance last year? _____ETB
4. For what purpose did you borrow ((Multiple answers are possible)?
1. Petty trade
 2. To purchase agricultural input
 3. Animal fattening
 4. Consumption

5. Do you think that the amount of loan received from Gambella microfinance adequate?
Yes_____ No_____
6. What is the interest rate of the loan per thousand ETB in percent -----in birr-----?
7. What are the main constraints/ challenges to access and use credit from the institution?
(Multiple answers are possible)
1. High interest rate for loan
 2. Lack of collateral security
 3. Low amount of loan
 4. Short repayment period
 5. Delay in approval/disbursement
 6. Other, specify-----
8. Do you think that the credit you received helped you to improve your consumption? Yes
_____ No _____
9. Do you think that the credit you received helped you to improve your income?
Yes _____ No _____
10. If yes, how it contributes? -----
11. What are the main challenges for agricultural production improvement?

1. Flood	3. Drought
2. Crop affected by pest and disease	4. Disease such as malaria
	5. Price inflation (market instability)

12. Do you have coping strategic mechanism during food shortage in your household?

A. Yes

B. No

What are/ is they /it?

If you have coping strategies during food insecure, please make circle your appropriate coping strategies?

1. Livestock sales,
2. Sale of (fire wood , charcoal, dry grass) and Collecting wild vegetable
3. Migrate to town and other areas
4. Dependence on relief assistance,
5. Relying on remittance from relatives,
6. make local drinking alcohol

7. daily casual work
8. Fishing

The survey was conducted within the study areas of Itang woreda specifically in Itang kier, watgach and Puldan kebeks). The picture shows when the researcher at home to home survey.





Figure 3: During home to home survey

Thank you for your cooperation

June/2024