COLLEGE OF SOCIAL SCIENCE AND HUMANITIES

CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PROGRAM

SMALLHOLDER FARMERS' FOOD SECURITY STATUS AND ITS DETERMINANTS IN GINIR DISTRICT, EAST BALE ZONE

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A THESIS SUMMITTED TO MADDA WALABU UNIVERSITY SCHOOL OF GRADUATE STUDIES IN PARCIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTERS OF SCIENCE DEGREE IN CLIMATE CHANGE AND DISASTER RISK MANAGEMENT

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Bale Robe, Ethiopia

DECLARATION

I, the undersigned, declare that this research Thesis entitled "Smallholder Farmers' Food Security Status and its Determinants in Ginir district East Bale zone southeast Ethiopia" is my original work and has not been submitted to any other college, institution or university other than to Madda Walabu University College of Social Science and Humanities.

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This thesis was presented for examination with my approval as the appointed supervisor.

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MSc Thesis Approval Sheet

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Confirmation Statement

I certify that the thesis entitled “Smallholder Farmers’ Food Security Status and its Determinants in Ginir district, East Bale zone Ethiopia” is my Original work and I was implement the proposal as it is proposed.

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ABBREVIATIONS

CSA	Central Statistical Agency, Ethiopia
CSI	Coping Strategies Index
DPPO	Disaster Prevention and Preparedness Office
DRM	Disaster Risk Management
ERHS	Ethiopian Rural Household Surveys
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
HCA	Household Calorie Acquisition
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
IFAD	International Fund for Agricultural Development
KII	Key Informant Interview
MDG	Millennium Development Goal
NMSA	National Meteorological Service Agency, Ethiopia
SPSS	Statistical Package for Social Science
WFP	World Food Program
WHH	Women Headed Household
WOA	Woreda Office of Agriculture
WOFED	Woreda Office of Finance and Economic Development

ABSTRACT

Food security remains a challenge for many smallholder farmers worldwide and understanding the factors influencing food security is crucial for designing effective interventions and improving livelihoods. The overall objective of this study was to assess the food security status of smallholder farmers and its determinants. The research utilized a cross-sectional design, combining quantitative and qualitative methods. Random sampling was used to collect the data using probabilistic method to control biased during the sampling. Data was collected from 373 households across five Villages in Ginir. Surveys assessed dietary intake, socio-economic factors, and food access. Focus group discussions provided deeper insights into the lived experiences of farmers regarding food security challenges and coping strategies. Interviews with local experts provided context and broader perspectives on food security in the region. Additionally, household food balance models were used to estimate per capita calorie availability, and secondary data from government reports and academic papers supplemented the primary data collection. The study revealed a complex depiction of food security in Ginir. While a positive aspect was observed with nearly 70% of households consuming legumes daily, limitations were identified in vegetable and fruit consumption (30%), and meat/egg intake was generally low, with over 73% consuming them rarely or not at all. Analysis of household calorie acquisition data highlighted the need for a comprehensive approach to ensure adequate calorie intake for all residents. Under-consumption, defined as falling below the recommended daily calorie intake, was a significant challenge, particularly among vulnerable populations, affecting an estimated 25% of households. Ten statistically significant factors influencing income inequality and food security were identified. Access to credit through formal or informal loans, farming experience, and higher total household income emerged as crucial factors shaping income distribution and ultimately impacting food security. These factors were significant at the 1% level. Additionally, factors like age, household size (larger households facing greater resource limitations), and weather shocks were significant at the 5% level, indicating their influence on food insecurity. Based on the study's findings, recommendations include promoting education for farmers, especially experienced ones, to enhance agricultural practices and income distribution. Additionally, developing programs for savings, controlled credit access, and improved farming practices can empower farmers. Implementing safety nets to mitigate shocks and integrating food security with family planning to manage resource pressure from larger families are also recommended. The analysis informs the development of multi-faceted interventions by the local government, including strengthening local markets, improving storage facilities and transportation infrastructure, and providing flexible microfinance programs.

Keywords: Consumption Expenditure, Ethiopia, Food security, Ginir district, Smallholder farmers

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CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

Food security is a situation that exists when all people at all times have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for active and healthy life (Declaration of World Sumit, 2009; Jemal et al., 2018). The term "food security" has been used over time to mean different things (Andersan, 2009) and multi-dimensional phenomenon (Norhasmah *et al*., 2010). The definition of food security encompasses food availability, access, utilization and stability, most attention appears to have been on increasing the amount of foods available (Randy, 2015). Evidence suggests, however, that widespread hunger can exist even in times of increasing food availability and ensuring global food security for a growing population remains a major challenge currently (Ulrike, 2014). This is because food security, especially in the global sense, has not yet been implemented (Alexander et al., 2018).

It is widely accepted that food is a basic necessity of life and important at household level. Food security is one of the major world agendas of today in several contexts. As many scholars point of view food security analysis can be performed at the global, national, regional, household and individual levels (FAO, 2011). The estimates of the FAO show that approximately 805 million people in the world do not have enough food to lead an active and healthy life. Significant proportions of this hungry population are in developing countries. In Africa, specifically in the Sub-Saharan region, the number is more pronounced, where more than one in four people remain undernourished (FAO, 2014). The recent FAO estimates (FAO, IFAD and WFP, 2015) indicated that developing countries as a whole have almost reached the MDG, reducing the proportion of hungry people by half. However, the target set by World Food Summit, halving the number of hungry people in the world by 2015, has been missed by many countries.

The total number of food insecure and hungry people in the world was estimated as 925 million in 2010 (FAO and WFP, 2010). This figure has declined to 795 million in 2014-16 (FAO et al., 2015). Though the number of food insecure and hungry people in the world is declining, the hunger remains high and likely to persist and even increase in developing countries due to rapid

population growth. Based on FAO and its associate report (2015), the majority of people suffering from hunger live in developing countries, which is put at 780 million.

Along with the development of the concept of food security, a number of food security indicators have been identified to make monitoring of the food security situation possible. These include food supply indicators (meteorological data, information on natural resources, agricultural production data, market information, information on pest damage and regional conflict); food access indicators (diversification of income sources, change of food source, access to credit, sale of production assets and migration) and outcome indicators (household budget and expenditure, food consumption frequency, nutritional status and storage estimates) (Mykola and Anna, 2018). These indicators are very important to make decisions on the possible interventions and timely responses. Three indicators dominate the food security measurement debate: Household food insecurity access scale (HFIAS), dietary diversity score (DDS) and coping strategies index (CSI) (Like *et al*., 2015). Food security requires sustainability of available food production and consumption by individual members in the household (Meskerem and Degefa, 2015).

In drought-prone areas of Ethiopia, food insecurity has become one of the defining features of rural poverty that has affected millions of people for decades. The vast majority of these extraordinarily poor households lives in rural areas and engages in rain-fed subsistence agricultural production. With limited opportunities for livelihood diversification, the threat of widespread starvation is high (MoRAD, 2009). Wide-ranging rural development interventions at both the farm household and community levels have been taking place in the country. However, efforts made by rural farm households to change their livelihood are not yet supported by context specific understating of the problem and lack of evidence-based policy intervention.

In view of this, this study examines the socioeconomic determinants of food security in rural areas of Ginir district in the East Bale Zone of the Oromia Regional State. The study contributes to an understanding of the status and determinants of food security in the context of the study area. Moreover, it provides significant information for concerned bodies such as government, policymakers, and other institutions working to alleviate rural food insecurity.

1.2. Statement of the Problem

Food insecurity is the result of several factors like poverty, health conditions, gender equity, availability of water, sustainable environmental conditions, farming and livestock changes, natural disasters, population growth and rapid urbanization (Sana and Adila, 2012). Like other countries in Eastern Africa, Ethiopia is one of a sub Saharan country that is home to approximately 120 million people and has been experiencing food insecurity and poverty for various reasons. These include factors such as rapid population growth, declining land size per household, land degradation and soil erosion, deforestation, low productivity but risk averse traditional technologies, poor access to and insufficient resources to invest new agriculture, poor access to off-farm income generation activities (IGAs) and rainfall dependent agriculture (MoRAD, 2009; IFAD, 2012). Approximately 32 million per cent of the country's population is undernourished indicating food insecurity as an interminable problem in the country (Haji et al., 2018). This is more severe in the rural part of the country, which accounts for approximately 83 per cent of the total population (Hagos *et al.,* 2014).

Food security is a challenge facing all countries, especially those in Sub-Sahara Africa. Ending hunger, achieving food security, and improving nutrition are the nations' 2030 core goals which Ethiopia is striving to attain (Yismaw, 2022). The majority of food insecure and hungry people in the global context live in Sub-Saharan Africa (57%), in south Asia (51%) (Smith, 2007) and the Pacific (16%), Latin America suffered significant decrease in food security (from 51% to 43%, increase in moderate 13% to 16%, severe food insecurity 14% to 19%) (Luna *et al*., 2019). In 2017, about 124 million people in 51 countries faced food security problems (Mebratu, 2018).

Many of the world's food-insecure and undernourished people are smallholder farmers in developing countries (Kibrom et al.,2017). Approximately one-third of the people in sub-Saharan Africa are undernourished (Belachew, 2018). Ethiopia lies within one of the most food-insecure regions in Sub-Saharan Africa (Belete, 2017). In the country, food insecurity remains a major development challenge due to the synergetic effects of land degradation, rapid population growth, and climate change (Kedir, 2017). The production volume of food grain crops as well as the per capita food production has shown tremendous fluctuations throughout the 1980s resulting in severe food shortage in the country (Kedir, 2017). Over eight million individuals in rural areas of Ethiopia are estimated to suffer from chronic food insecurity, and many more suffer from

transitory food insecurity (Sisay et al., 2018). Even in years when rainfall is favorable, it is estimated that around 4 to 5 million Ethiopians depend on food aid indicates that food insecurity is deep-rooted in Ethiopia (Achenef *et al*., 2018). The famine also had depleted their assets to deal with the famine, which left them even more vulnerable to future crises. The inadequate quality and quantity of food supply to the household members affect the nutritional status of the community. Also, it limits the growth and development of young children and infants, increases adolescent school absenteeism, lowers educational attainment, and affects psychosocial interaction (Prosekov et al., 2018).

In Ethiopia, nearly 33 million people suffer from chronic undernourishment and food insecurity (Dagninet and Adugnaw, 2020). Most of the regions' areas are included under the Safety net program to rehabilitate the farmers' living standards and solve their food insecurity problem (Mesfin, 2014). Oromia region is also part of this program. However, the region is still characterized by the persistence of food security problems and is highly in need of better intervention.

The East Bale Zone in South-Eastern part of Ethiopia is one of the food insecure areas of the country (ZOA, 2022 Report). The Zone is consisting of seven districts, all of them receive food aid; one of these district is Ginir district (East Bale Zone Agriculture Office, 2023). Most people in this district are either seasonally or chronically food insecure (WOA, 2022). A significant number of poor households are depending on food aid, making the district one of the beneficiaries of Safety net programs for more than a decade. The causes of food insecurity in the study area could be related to erratic rainfall, soil degradation, and population pressures (WDRM, 2022). Due to these challenges, farming households in the district could not fulfil the food requirement and create additional assets for their family.

Coming from the other side too, the challenge of inadequate growth of food production, and inappropriate government intervention in the economy have made achieving food security, whereby each person has economic and physical access to sufficient food to lead a healthy and productive life, a difficult goal (Kollen and Norman, 2011). 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 limited saving and few other possible sources of income to obtain adequate food to meet their daily subsistence food energy requirements (Ayalneh, 2013). The

problem of food insecurity has big diversity and a multiple dimension, which ranges from the global, regional, country, local, household to individual level; more attention is only given to the country level so far. Moreover, the various complex and interrelated causes of household food security and local responses during crisis situation are not studied in detail, especially at a household level. In the study area several determining factors such as drought, erratic type of rainfall, diminished and shortage of farmland size due to population growth over time, depletion of soil fertility due to poor fallow practice and degraded natural resource bases, poor household level asset base which affect small holder farmer's food security is not studied before.

One significant research gap lies in the lack of localized studies specifically assessing the current food security status among smallholder farmers in the Ginir district. Most existing research tends to focus on broader regional or national trends, often overlooking the specific household-level conditions that characterize this district. While studies such as those by Gebissa & Geremew (2022) provide insights into food insecurity across Ethiopia, they typically aggregate data that may not accurately reflect local conditions in Ginir. As a result, there is an urgent need for detailed assessments that capture the unique challenges faced by households in this area, particularly regarding their access to food and nutritional quality.

Another critical gap pertains to the identification of key determinants of food security at the household level in Ginir. The factors influencing food security such as local agricultural practices, socio-economic conditions, and environmental challenges have not been thoroughly analyzed within this context. Previous studies have highlighted determinants like poverty, climate change, and land degradation affecting food security in Ethiopia (Kedir, 2017; Mebrie & Ashagrie, 2023). However, insufficient focus has been placed on how these determinants interact uniquely within the context of the Ginir district. Understanding these local dynamics is essential for developing effective interventions tailored to the specific needs of smallholder farmers.

A further area requiring attention is the evaluation of local government intervention strategies aimed at improving food security in the Ginir district. Currently, there is a scarcity of comprehensive evaluations regarding how these interventions are implemented and their impact on smallholder farmers. While some literature discusses government programs like the Safety Net Program (Mesfin, 2014), detailed assessments that specifically evaluate their effectiveness

within Ginir are lacking. Existing studies often address broader policy implications without providing localized insights into how these interventions directly affect food security outcomes at the household level.

Additionally, the interplay between socioeconomic factors such as education and income and environmental challenges like soil degradation and erratic rainfall affecting food security in Ginir has not been adequately studied. Research has shown that access to education and off-farm income can significantly influence food security outcomes (Abide & Asfaw, 2023). However, localized studies examining how these socioeconomic factors interact with environmental challenges specific to Ginir remain underexplored. A deeper understanding of these interactions is vital for creating effective strategies that address both economic and environmental dimensions of food insecurity.

Lastly, there is a notable gap concerning the multi-dimensional aspects of food insecurity—availability, access, utilization, and stability in the context of Ginir district. While numerous studies highlight various dimensions of food insecurity at a broader level (HLPE, 2020), there is a pressing need for focused research that dissects these dimensions within the specific socioeconomic and cultural context of Ginir. Understanding how these dimensions' manifest locally was providing valuable insights into the complexities of food insecurity and inform targeted interventions.

Thus, identifying, analyzing, and understanding those elements that are responsible for variation in small holder farmers' food security status in Ginir district are needed to guide policy decisions, appropriate interventions and integrated efforts to combat food insecurity at the district and household level. This study attempts to reveal the seriousness of the problem and identify the major determinants and assess the status of food security at the household level.

1.3. Objective of the Study

1.3.1. General objective

The overall objective of this study was to assess the food security status of smallholder farmers and its determinants in Ginir district.

1.3.2. Specific Objectives

The specific objectives of the study include:

- To assess the current food security status among smallholder farmers in Ginir district
- To identify the key determinants of food security among small holder farmers in the study area.
- To assess the intervention strategies of the local government on food insecurity in the study area

1.4. Research Questions

- What is the current food security status among small holder farmers in Ginir district?
- What are the key determinants of food security among small holder farmers in the study area?
- What are the intervention strategies of the government on food security in the study area?

1.5. Scope of the Study

The study was conducted to identify the current food security status among smallholder farmers and its determinants in the Ginir district, specifically focusing on the Kebena, Dalo Sabro, Harawa Misra, Jame, and Keteti areas. The research aimed to explore a variety of factors influencing food security, including demographic characteristics such as sex, age, marital status, family size, and dependent ratio. Additionally, it examined institutional factors like access to roads, cooperatives, credit facilities, input supply, and the intervention strategies employed by local government. Socio-economic factors such as education level, distance to market, farmland size, income, and livestock ownership were also integral to the study. Although it would have

been beneficial to cover a broader range of areas within the Oromia region's East Bale Zone, limitations related to time and financial resources necessitated a more focused approach.

The methodological scope of this study employs a mixed-methods approach that integrates both qualitative and quantitative research methodologies. This comprehensive strategy is designed to provide a holistic understanding of food security among smallholder farmers in the Ginir district. Quantitative data was collected through structured surveys administered to a representative sample of smallholder farmers in the designated areas. The survey was included questions aimed at gathering information on demographic characteristics (age, sex, marital status), socio-economic conditions (income levels, education), and institutional access (availability of credit and agricultural inputs). Statistical analyses were employed to identify correlations and causative relationships among various determinants of food security. Techniques such as regression analysis utilized to quantify the impact of specific factors on food security status.

In addition to quantitative surveys, qualitative methods were employed to enrich the data collection process. Focus group discussions were conducted with smallholder farmers to gather insights into their lived experiences regarding food security challenges and perceptions of local government interventions. These discussions allowed for an exploration of community-specific issues that may not be captured through structured surveys alone. Furthermore, key informant interviews with local officials and agricultural experts provided additional context regarding institutional factors influencing food security in the region. This mixed-methods approach ensures a robust analysis that captures both numerical data and personal narratives related to food insecurity. By triangulating data from various sources, the study aims to enhance the validity and reliability of its findings.

The temporal scope of this study is defined by the specific timeframe during which data collection and analysis was take place. The research was focused on assessing the current state of food security among smallholder farmers in Ginir district during the agricultural year 2023-2024. This timeframe is particularly relevant as it allows for an examination of how seasonal variations in agricultural production impact food security status. By concentrating on this specific period, the study aims to capture immediate effects such as crop yields influenced by weather patterns and market accessibility during critical planting and harvesting seasons. Moreover, historical

data from previous years may be referenced to contextualize current findings within broader trends in food security over time. This temporal focus enables an assessment of how recent changes such as shifts in climate patterns or economic conditions have influenced food security dynamics in the region. Additionally, tracking changes over this agricultural year facilitated an understanding of how external shocks (e.g., droughts or market fluctuations) may affect food availability and access for smallholder farmers.

1.6. Significance of the Study

The significance of this study extends across multiple dimensions, including practical, policy, academic, and methodological aspects. By addressing the pressing issue of food security among smallholder farmers in the Ginir district, the study aims to contribute valuable insights and recommendations that can foster sustainable agricultural practices and enhance food security. The primary practical significance of this study lies in its potential to identify actionable solutions for resolving food security challenges faced by smallholder farmers in Ginir district. Through comprehensive data collection and analysis, the study aims to provide concrete recommendations that can be implemented at the community level. By understanding the specific barriers to food security such as limited access to resources, inadequate infrastructure, and socio-economic constraints the study can inform local interventions that directly improve the livelihoods of farmers. Furthermore, the findings was help stakeholders, including NGOs and community organizations, design targeted programs that address the unique needs of smallholder farmers, ultimately leading to improved food production and nutritional outcomes.

From a policy perspective, this study holds substantial significance as it aims to inform and guide local government strategies related to food security. The research finding provide evidence-based recommendations for policymakers to enhance existing intervention strategies and develop new policies that promote food security among smallholder farmers. By highlighting the critical determinants of food insecurity in Ginir district, the study can assist policymakers in prioritizing resource allocation and implementing effective agricultural policies. Additionally, the insights gained from this research can contribute to broader national discussions on food security and agricultural development in Ethiopia, aligning with global goals such as the United Nations Sustainable Development Goals (SDGs).

The academic significance of this study is multifaceted. First, it contributes to the existing body of literature on food security by providing localized data specific to Ginir district. This research was serve as a valuable resource for scholars and students interested in exploring food security issues in Ethiopia or similar contexts. By filling gaps in the literature regarding the determinants of food insecurity among smallholder farmers, this study encourages further academic inquiry into related topics. Moreover, it sets a precedent for future research methodologies that incorporate both quantitative and qualitative approaches to understanding complex social issues like food security.

Methodologically, this study employs a mixed-methods approach that combines quantitative surveys with qualitative interviews and focus group discussions. This methodological scope enhances the robustness of the findings by allowing for a comprehensive analysis of food security determinants from multiple perspectives. The use of both statistical analysis and qualitative insights enables a deeper understanding of how various factors interact to influence food security at the household level. This methodological framework can serve as a model for future research endeavors seeking to explore similar issues in different contexts or regions. Additionally, by utilizing established frameworks such as the Food Insecurity Experience Scale (FIES), this study ensures that its findings are comparable with other studies globally, thereby contributing to a more extensive understanding of food insecurity dynamics.

1.7. Organization of the Study

The study thesis proposal was organized into five chapters. The first chapter deals with the introduction, which includes the statement of the problem, objectives of the study, research questions, significance of the study, scope and limitation of the study and organization of the study. The second chapter presents a review of literature which includes the food security situations, conceptual framework and relevant empirical studies made in the country elsewhere. The third chapter includes thesis methodology, the chapter four includes results and discussion and the fifth chapter includes thesis conclusion and recommendation respectively. The research study area and methodology was briefly explained and description under the third chapter where data source of the study, sampling methods, sample size determination, method of data analysis, and variables was explained.

1.8. Operational Definition of Terms

Food Security: is when all people have physical and economic access at all times to buy, produce, obtain or consume sufficient, safe and nutritious food to meet their dietary needs food preferences for a healthy and active life (FAO, 2002).

Smallholders: small scale farmers, pastoralists, forest keepers, fishers who manage areas varying from less than one hectare to 10 hectares. Smallholders are characterized by family-focused motives such as favoring the stability of the farm household system, using mainly family labour for production and using part of the produce for family consumption (Ariely and Norton, 2009).

Household: is a group of people those who dwell under the same roof and compose a family; and share money even if they are not related to each other.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1. Concepts and Definitions of Food Security and Insecurity

Food security is a broad concept dealing with food production, distribution and consumption vis-à-vis food entitlement for all household members. Food security is a concept that has evolved considerably over time and its definitions developed and diversified by different researchers, scholars and organizations. Food security is a dynamic concept, which has continuously integrated new dimensions and levels of analysis over the years. In the coming decades, ensuring food security for the Ethiopians was face great challenges. This is because of the rapid increment of population, change of fertile farmland to construction for the urban dwellers, climate change, decline of available natural resources, inflation of basic needs, young unemployment, political turmoil, and civil conflict (Alemu & Mengistu, 2019 and Simane *et al.*, 2016). Food security is a multidimensional concept with a multifaceted consequence (Abafita and Kim, 2012).

According to the World Food Summit (1974) food security is food access ensured when households and all individuals within them have enough resources to get appropriate foods for a nutritious diet. Additionally, food accessibility is said to be achieved when adequate quantities of food are consistently available to all individuals within a country (Schmidhuber and Tubiello, 2007 and Ingram *et al.*, 2008). Food utilization refers to the consumption of food through adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs met. Food sustainability, on the other hand, refers to a situation where the above three components of food security are fulfilled at any time (FAO, 2006). In other words, to be food secure, a population, household, or individual must have access to adequate food at all times. This component of access to food security implies that people should not be in any situation of risks owing to sudden shocks of economic or climatic crisis or cyclical events. The concept of stability refers to both the availability and access dimensions of food security. The food system is another broader concept, which encompasses food security. It refers to all human food chain activities of producing, processing, distributing, and consuming food to a range of social and environmental contexts (Liverman and Kapadia, 2010).

Food security and insecurity are the terms used to describe whether households have access to sufficient quality and quantity of food. With progress in time and severity of the problem, food

security issues gained prominence and great attention at the global, national, household and individual levels. Such progressive work by scientists led to redefining the scope and depth of food security concept. For instance, Duffour (2010) explained the concept stating that food security at global level does not guarantee food security at the household or individual level. In contrast to food security, the term food insecurity is defined as lack of access to enough food both quantity and quality on sustainable bases. Food insecurity occurs in two forms as chronic and transitory. Chronic food insecurity happens when a household is unable to meet the minimum amount of food needed for healthy life over a long period (three or more months). But if this food insecurity is less than 3 months, it was transitory food insecurity (Welteji *et al.,* 2017 and Galhena *et al.,* 2013).

2.2. Food Security in Ethiopia

Ethiopia is the second most populous country in Africa with an estimated population of 94.3 million people (CSA, 2013). As indicated by Africa Food Security and Hunger/ Undernourishment Multiple Indicator Scorecard, Ethiopia ranked as first in having the highest number of people in state of undernourishment/hunger, which are 32.1 million people. This makes it, the fourth African country scoring (37.1%) of the population being undernourished/ in hunger (ADB, 2014).

The livelihoods of rural Ethiopian people are highly sensitive to climate. Food insecurity patterns are seasonal and linked to rainfall patterns, with hunger trends declining significantly after the rainy seasons. Climate related shocks affect productivity, hamper economic progress and exacerbate existing social and economic problems (Anderson *et al*., 2015).

2.3. Dimension of Food Insecurity

Understanding the dimensions of food security is important to guide research, policy and practice. The multiple dimensions and perspectives on food security offer new opportunities for food scientists, engineers and postharvest technologists to apply new and novel knowledge to create new food value propositions, which not only enhance food availability and access, but also promote the effective utilization of food materials to meet the ever-increasing demand for steady supply of sufficient quantities of diverse, nutritious and pleasurable foods (Opara, 2013).

Based on the various definitions of food security, three core pillars or determinants have emerged, namely: food availability, access and utilization. Food availability refers to the physical availability of food through local production, imports, and hand-out (such as food aid). A wide range of factors can affect food availability, from production index to good postharvest management which maintains quality and food safety, to incidence of reduce losses; hence, adequate availability of food does not translate into food security at all levels, from individual to country and global level. On the other hand, access to food could be physical access in the market or economic access (purchasing power) at the household level. Hence, the ability to spend on food (through income) is a good measure of access to food. Physical access to food in the market could also be affected by the availability (or lack) of infrastructure such as good road networks, transport, and postharvest handling and storage facilities (Google scholar, 2023).

2.4. Determinants of Households Food security

Various studies carried out in developing countries have highlighted a number of factors considered as determinants of household's food security status. According to Welderufael (2014) the major factors affecting food insecurity of rural households were family size, age and sex of household head, total cultivated land size of household head, annual per-capita consumption, and livestock holding. Household food insecurity is associated with a number of socioeconomic and environmental characteristics such as household income/asset, parents' education/occupation, household size, level of employment, area of residence and access to land holdings, land size, and quality (Frehiwot, 2007).

WFP (2009), stated that the common factors that cause household food insecurity in urban areas of the country are household size, age of household, sex of household head, marital status of household, education level of household, dependency ratio. Access to credit, ownership of savings account, total income per adult equivalent, expenditure level (food and non-food), asset possession, access to social services, owner of home garden, access to subsidized food, sources of food, availability of food commodities, and supply of food commodities. Shiferaw *et al.*, (2003) found technological adoption, farming system, farm size, and land quality are supply-side factors and Household size, per capita aggregate production, and access to market are demand-side factors affecting food security.

2.5. Food insecurity and its underlying causes

In many parts of Ethiopia, as a cause of food security combinations of natural and synthetic factors have resulted in serious and growing food insecurity problems. The interaction between environmental degradation, high population growth, diminishing land holdings, and lack of on farm technological innovations led to a significant decline in the productivity per households and cause food security problems. These trends have combined with the repeated effects of drought over years, to substantially erode the productive assets of communities and households (Gilligan *et al.,* 2008). The finding of Kebede (2008) indicated that Ethiopian populations have experienced long periods of food insecurity, which directly related to several factors that include recurring droughts and farmlands degradation, soil erosion, inappropriate storage agricultural facility, less purchasing power of households, small and fragmented land size, lack of off-farm income opportunity.

In Ethiopia, the scarcity of arable farmland and landlessness increased than ever in general and very high in the highland areas in particular (Diriba, 2020). It is a serious problem of rural livelihood (Belay *et al.,* 2017). It is also complicated by unequal distribution among the householders. This influenced the levels of income, opportunities, and ownership of assets. The poor farming system such as mono-cropping contributed to soil degradation and nutrient depletion and consequently low yield (Marais *et al.,* 2012). Frequent droughts are not the only factors contributing to Ethiopia's food security problems. Like many African countries, Ethiopia confronts several environmental issues that are particularly problematic for the agricultural sector. Poverty and food insecurity in the dry lands of Ethiopia are caused by land degradation that amplifies the negative impacts of droughts (Tewolde, 2006). Low agricultural productivity, poverty, food insecurity, and land degradation are pervasive and interconnected problems in the Ethiopian highlands (Pender and Gebremedhin, 2008). These factors often interact with one another resulting in a reinforcing cycle of the poverty, food insecurity and natural resources degradation trap. This problem manifests itself in recurrent drought affecting millions of people.

According to Bickel *et al.* (2000), these indicators can broadly be categorized into three as process indicators, outcome indicators and trend indicators. Process indicators encompass both food supply and access. Indicators that reflect food supply are related to physical and natural capital. Such indicators mainly focus on availability of inputs and means of food production.

Outcome indicators refer to the conventionally used indicators of income to serve as proxies for food consumption. Outcome measures of food security include individual intakes, household caloric acquisition, dietary diversity and indices of household coping strategies (Assenga and Kayunze, 2016). Trend indicators are used to assess the sustainability of the existing livelihood systems of the people in general and their food security situation in particular. The commonly used trend indicators include environmental changes, population pressure and migration or displacement patterns, conflicts in resource use or political instabilities (Bickel *et al.,* 2000).

Food security at household level has two essential aspects: the quantitative aspect of having enough or sufficient food, the qualitative aspect of concerning the type and diversity of food. Accordingly, there are two basic measures of diet quantity aspect of food insecurity: daily food energy consumption per capita or per adult equivalent and percentage of households or people who are food energy deficient (Chung *et al.,* 2016; Smith and Subandoro, 2007). Food energy consumption is measured at the household as the total amount of energy in the food acquired by the household over the survey reference period. The second diet quantity indicator is the percentage of households in a population group who do not consume sufficient food over the reference period to meet the dietary energy requirements of all of its members. If the estimated total energy in the food that the household acquires daily is lower than the sum of its members' daily requirements, the household is classified as food energy –deficit or food insecure (Hoddinott, 1999; Bickel *et al.,* 2000; Smith and Subandoro, 2007).

The diet quantity indicators are closely related to the notion of access to food by people, a fundamental component of the definition of food security. Energy from food is arguably the most important nutrient for survival, physical activity and health, and households are the units through which people generally access food. The indicators pertain to the amount and sufficiency of energy in the food that is immediately available to households for consumption which is a clear indication of their ability to access sufficient food (Hoddinott, 1999; Bickel *et al.,* 2000; and Smith and Subandoro ,2007).

Food security is not just only about quantity of food consumed, but also about quality, and that your body must be healthy to enable the nutrients to be absorbed (Haji etal.,2018). It is increasingly recognized that inadequate diet quality rather than insufficient energy consumption is becoming the main dietary constraints facing the poor populations across the globe (Arega,

2012). For this reasons, it is critically important that indicators of the nutritional quality of the food people eat be included in any analysis of food security. This is the number of foods or nutritionally significant food groups acquired by a household over the reference period. To better reflect a quality diet, the number of different food groups consumed is calculated rather than the number of different foods consumed (Swindale and Bilinsky ,2006).

Dietary diversity represents the number of different foods or food groups consumed by an individual or collectively by a household over the reference period. This indicator measures diet quality (Swindale and Bilinsky ,2006). In recent years, household diet diversity has been increasingly used in food security assessments; research has shown that diet diversity is a good proxy indicator-well correlated with a household's socio-economic status. A more diversified diet has been found to be highly correlated with improved quality of the diet (protein inadequacy, percentage of protein from animal source foods, micronutrients), improved caloric adequacy of the diet, improved health outcomes for children: improved birth weight, child nutritional status, and blood haemoglobin concentrations (iron status), household income (Smith and Subandoro ,2007).

2.6. Food Security Measures

The multiple approaches and tools used for assessing food security reflect the complexity of the operationalization of the concept. For example, in some cases the concept of food insecurity is used interchangeably with nutrition insecurity even though nutrition security requires food security along with care, health and hygiene practices (Jones *et al*. 2013).

According to Hoddinott (1999), there are four ways of measuring household and individual food security. Individual intakes either directly measured or 24-hour recall household caloric acquisition, dietary diversity, and indices of household coping strategies. Individual food intake data is a measure of the amount of calories, or nutrients, consumed by an individual in a given time period, usually 24-hours. There are two basic approaches used to collect these data. The first is observational. An enumerator resides in the household throughout the entire day, measuring the amount of food served to each person. The amount of food prepared but not consumed "plate waste" is also measured. The enumerator also notes the type and quantity of food eaten as snacks between meals as well as food consumed outside the household. The second

method is recall. The enumerator interviews each household member regarding the food they consumed in the previous 24-hours period. This covered the type of food consumed, the amount consumed, food eaten as snacks, and meals outside the household. Household caloric acquisition is a measure of the number of calories, or nutrients available for consumption by household members over a defined period. Dietary diversity is sum of number of foods consumed by an individual over a specified time. Data on available food for consumption, from home production, purchase and /or gift/loan/wage in kind for the last seven days before the survey day to the household collected.

2.7. Theoretical Perspectives of Food Security

The theoretical perspectives on food security provide a foundation for understanding the complex interplay of factors that influence food availability, access, utilization, and stability. One prominent framework is the Food Security Framework, which emphasizes the multidimensional nature of food security. This framework integrates economic, social, and environmental dimensions, positing that food security is not merely about the availability of food but also involves access to resources, proper utilization of food, and the stability of these conditions over time (FAO, 2006). Another relevant theoretical perspective is the Livelihoods Approach, which focuses on how households secure their livelihoods and the various assets they utilize to achieve food security. It suggests that households with diverse livelihood strategies are more resilient to shocks and better positioned to achieve food security. Additionally, Systems Theory can be applied to understand food security as part of a larger system that includes agricultural production, market dynamics, policy frameworks, and socio-cultural factors. This perspective emphasizes the interconnectedness of various components within the food system and how changes in one area can impact others (Liverman & Kapadia, 2010).

2.8. Empirical Studies on Determinants of Food Security in Rural Households

Different studies indicate in different countries including Ethiopia that numerous factors determine the food security of rural households which depend on both crop and livestock production system. Studies conducted at small-scale level in different parts of Ethiopia showed that almost 50 % of the study populations were food insecure. According to the cross-sectional study done in Farta district Ethiopia in 2012, from the total study participants about 70.7 % were

food insecure (Endale *et al.,* 2014). Similarly, a study done in Addis Ababa city showed 58.16 % of the total households were below the food security cut off point that classified food secure and insecure households and expressed this in terms of caloric requirements (Mitiku *et al.,* 2012 and Gezimu, 2012). Another study result from Sidama, Southern Ethiopia, showed 54.10 % of the households were food insecure (Regass, 2011). A longitudinal study done in Ethiopia on adolescents‟ food security status has shown that different or fluctuating levels of food insecurity were registered in different rounds of the study period. Overall, 20.50 % of adolescents were food insecure in the first round survey, while the proportion of adolescents with food insecurity increased to 48.40 % one year later. During the one year follow up period, more than half (54.80 %) of the youth encountered transient food insecurity (Belachew, 2012).

Despite the extensive body of literature on food security, several gaps remain evident that hinder a comprehensive understanding of the issue, particularly in specific contexts like the Ginir district of Ethiopia. Identifying these gaps is crucial for informing future research and policy interventions aimed at improving food security outcomes. A significant gap in the literature is the lack of localized research specifically addressing the determinants of food security in regions such as Ginir district. Most studies generalize findings across broader national or regional contexts, often overlooking unique local challenges. For instance, while general studies may highlight national trends in food insecurity, they fail to capture the specific socio-economic, cultural, and environmental factors that influence food security at the community level (Alemu & Mengistu, 2019; Simane et al., 2016). This lack of localized data can lead to ineffective policy interventions that do not address the specific needs of vulnerable populations. As food security is a dynamic concept influenced by various factors, understanding local contexts is essential for developing targeted strategies that resonate with community realities.

Another critical gap is the insufficient exploration of how various determinants of food security interrelate. While many studies identify factors such as income, education, and climate change as influencing food security, there is limited research on how these variables interact with one another (Frehiwot, 2007). For example, how do socio-economic factors like income and education influence access to resources in the face of environmental challenges such as climate variability? Understanding these interrelationships is essential for developing holistic approaches to food security that consider multiple influencing factors simultaneously. A more integrated

analysis could reveal how improvements in one area such as education might positively impact other areas like income and access to nutritious food.

The effectiveness of local government interventions aimed at improving food security remains underexplored in existing literature. While many studies discuss policies in theoretical terms, empirical evaluations assessing their real-world impacts on rural households are scarce (Bashir & Schilizzi, 2013). This gap limits our understanding of which interventions are effective and under what conditions they succeed or fail. More empirical studies are needed to evaluate existing programs and policies, providing evidence-based recommendations for policymakers to enhance their effectiveness. By assessing the actual outcomes of government initiatives, researchers can identify best practices and areas needing improvement.

Many studies rely heavily on quantitative data without incorporating qualitative insights that could provide a deeper understanding of community perceptions and experiences related to food insecurity. Qualitative research can uncover nuanced perspectives on how individuals and households experience food insecurity, including cultural beliefs, social networks, and coping strategies (Haji et al., 2018). Incorporating qualitative methods into food security research can enrich our understanding and lead to more effective interventions that resonate with local communities. Such insights can help policymakers design programs that align with community values and practices, ultimately enhancing their effectiveness.

There is a scarcity of longitudinal studies tracking changes in food security status over time within specific populations or regions. Such studies could offer valuable insights into trends and patterns that inform policy and intervention strategies (Belachew et al., 2012). For instance, understanding how seasonal variations, economic shifts, or environmental changes impact food security over time can help policymakers anticipate challenges and design proactive measures to mitigate them. Longitudinal research could also illuminate the long-term effects of interventions, providing a clearer picture of what works sustainably over time.

2.9. Conceptual Framework of the Study

Food insecurity is a state or a condition in which people experience limited or uncertain physical and economic access to safe, sufficient and nutritious food to meet their dietary needs or food

preferences for a productive, healthy and active life (Wasows *et al.,* 2011). Food security can be considered at national, household, and individual levels. At national level, it is related to physical existence of food stocks for consumption be it from own production or from markets (Endalew *et al.,* 2015). It is related to the availability dimension of food security and is a function of the combinations of domestic food stocks, commercial food imports, food aid and domestic food production including determinants of each of these factors (Endalew *et al.,* 2015). On the other hand, household food security is related to the ability to obtain sufficient food with sufficient quality to meet nutritional requirements of all household members. Household level food security mainly relies on economic freedom and purchasing power of household members which again related to income distribution in the household (Kuwornu *et al*., 2014).

Although non-availability of food, lack of access, improper utilization and instability over a certain period time are the four main pillars that lead to a situation of food insecurity, it exists in various ways in different parts of the world (Napoli *et al*., 2011). Limited resource and increased food price problems affecting many households of the world including Ethiopia are the common factors that affect food insecurity (Belachew *et al*., 2012). The food security framework presents the main determinants that affect rural household food security and typical relationship between these. This study assesses the determinants of rural households‟ food security conceptual framework developed by Bashir and Schilizzi, (2013) with modification to address the scope and objectives of this study.

2.9.1. Interrelationships between Variables

Food insecurity is a complex issue characterized by limited or uncertain physical and economic access to safe, sufficient, and nutritious food to meet dietary needs (Wasows et al., 2011). The conceptual framework developed for this study illustrates the interrelationships between various determinants of food security at the household level, emphasizing how these variables influence one another. Understanding these relationships is crucial for developing effective interventions aimed at enhancing food security among rural households.

Food availability is the foundational variable in the framework, representing the physical presence of food stocks for consumption. This dimension is influenced by domestic food production, commercial imports, food aid, and the overall agricultural capacity of a region

(Endalew et al., 2015). Availability is affected by several factors, including climate conditions, agricultural practices, and infrastructure. For example, a region experiencing favorable weather conditions may see increased crop yields, enhancing food availability. Conversely, adverse weather events like droughts can significantly reduce food stocks, leading to shortages.

Food access is directly influenced by economic factors such as household income and purchasing power (Kuwornu et al., 2014). While food may be available in local markets, high prices can restrict access for low-income households. Economic access is also affected by employment opportunities and social safety nets. For instance, households with stable employment are more likely to afford sufficient quantities of food. Additionally, physical access to markets—impacted by transportation infrastructure—plays a critical role; if roads are poor or markets are distant, even available food may not reach households effectively.

Once food is accessed, its utilization becomes crucial for achieving nutritional well-being. Utilization involves not only the quantity of food consumed but also its quality (Wasows et al., 2011). Factors influencing utilization include dietary diversity, sanitation, health care access, and education levels within the household. For example, households with higher education levels may prioritize a more diverse diet that meets nutritional needs better than those with limited knowledge about nutrition. Poor health or inadequate sanitation can also hinder effective utilization of food; if individuals are ill or lack clean water, their ability to absorb nutrients diminishes.

The dimension of stability encompasses both availability and access over time. Food security must be consistent; households should not face sudden shocks—such as economic downturns or climate-related events—that disrupt their ability to secure food (Napoli et al., 2011). Stability can be affected by external factors like climate change and market volatility. For instance, a household that experiences a sudden loss of income due to job loss may find it difficult to maintain its previous level of food access even if food remains available in the market.

Various socioeconomic factors interact with these dimensions and significantly influence food security outcomes. Household characteristics such as size, composition (e.g., number of dependents), education levels of members, and employment status are critical determinants (Welderufael, 2014). For instance, larger households may face greater challenges in accessing

sufficient food due to increased demand on limited resources. Conversely, households with educated members are likely to have better access to information about nutrition and agricultural practices that enhance their overall food security.

Environmental conditions significantly shape the interrelationships between these variables. Climate change impacts agricultural productivity through altered rainfall patterns and increased frequency of extreme weather events (Anderson et al., 2015). These environmental changes can directly affect both availability and access dimensions by reducing crop yields or increasing market prices for essential foods. Households in regions prone to environmental shocks may find it increasingly difficult to maintain stable access to nutritious foods. The conceptual framework is designed to show the relationship between different variables, which influence food security of rural household.

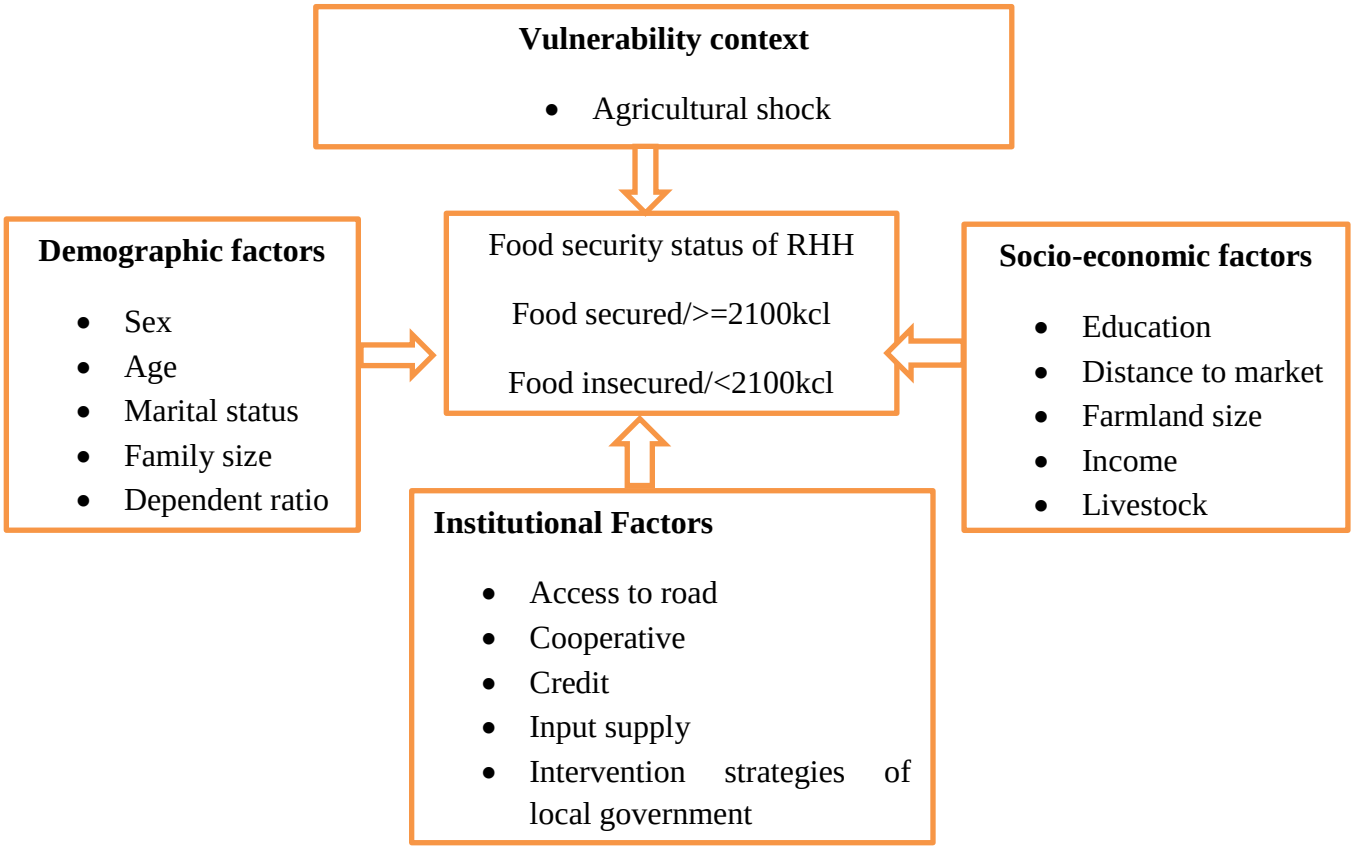

Figure 1: - Conceptual Framework of Food Security Developed for the Study

Source: Adapted from Bashir and Schilizzi (2013

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Description of the Study Area

3.1.1. Physical setting

The study is conducted in Ginir district of Oromia Regional State which located at a distance of 570 km from the national capital, Addis Ababa to the south east. The district comprises 28 Villages and 3 rural towns. Geographically the district is located in the East Bale Zone of the Oromia Region, with a latitude and longitude of 7°08′N 40°42′E/ 7.133°N 40.700°E and an elevation between 1750 (Google scholar, 2023).

It shares common boundaries with Gololcha district in the north, Dawe Kachen district and Goro district in the south, Sawena district and Rayitu district in the east and Gassera district and Sinana district in the west. According to the district Agriculture Office (2023), the total geographical area of Ginir is about 2350.63 square kilometers and an average elevation of 1750 – 1986 meters above sea level.

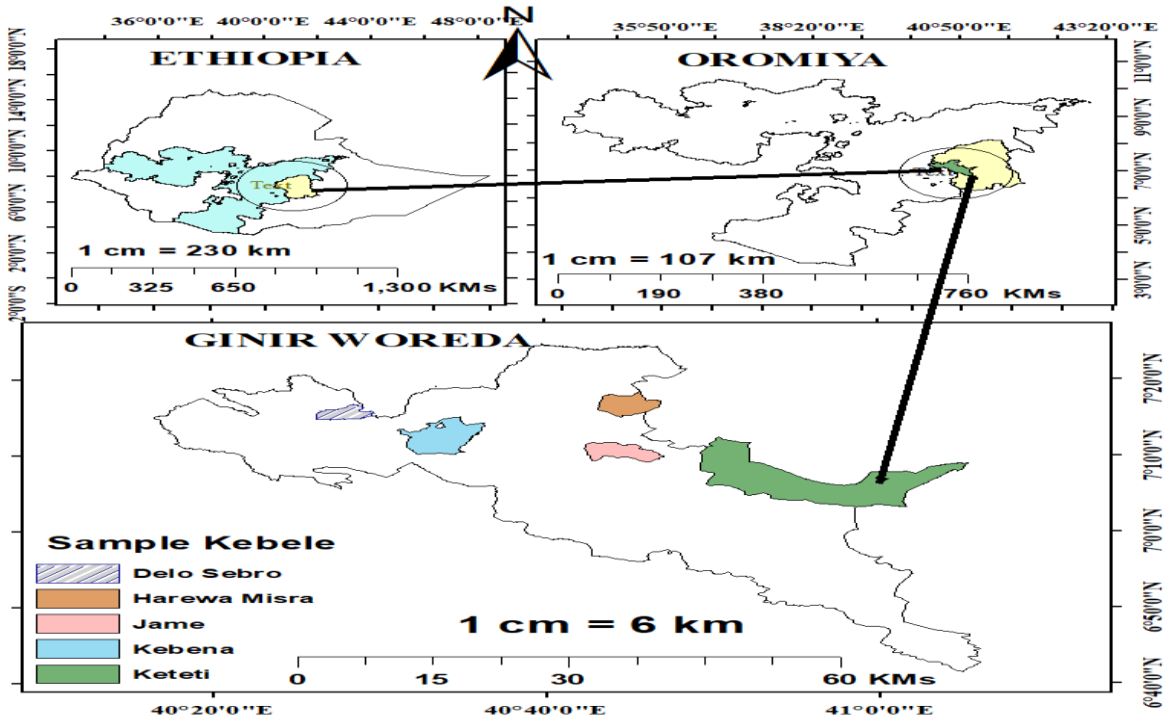

Figure 2: Map of Study area

3.1.2. Topography and Climate

From the WOA data the altitude of the district ranges from 1750 to 1986m above sea level and the topography of the area is characterized by arable or cultivable land (30.5%), pasture land (31.2%) and valleys and caves (15%), forest land (35.6%) and the remaining (2.7%) is considered swampy, Mountains and otherwise unusable. Major river water bodies in this district include Dinik, Worangembo, Gololcha and Tebel waterfall, and also bordered by Weib river in southern part (district Agriculture Office, 2023).

Climate and agro ecological condition is one of critical factors in determining the suitability of an area for a certain vegetation type, socio-economic activities, livestock production and human settlements (East Bale Zone Environmental Protection Authority, 2023). The district has three agro-ecological zones which are Dega, Woynadega and kola (East Bale Zone Agricultural Office report, 2023). The mean annual minimum and maximum temperature of the district ranges between 15 degree centigrade and 27 degree centigrade respectively. The average annual rainfall ranges between 1685- 2500 mm. The district rainfall is bimodal which is summer (Arfasa) season most probably starts from the mid of March and winter (meher) season starts from mid-August extends to November first week (WOA, 2021).

3.1.3. Population of Study Area

According to 2021 Central Statistical Agency projection, the district has a total population of 203,751, of whom 100,159 are females and 103,592 are males; out of the total population 174,248 are rural and 29,503 or 14.48% are urban dwellers, while the District has a total household of 33,355 of whom 29,552 are male headed household and 3,803 female headed households are found in the study area. Regarding the religious situation of people are Muslim 77.59% and Christianity 21.53%. The livelihood strategies of most population lead their life by mixed farming and some are civil servant and merchants on different trading activities (WOFED and WOA, 2021).

Despite its importance, agriculture in the district is challenged by factors such as moisture stress, soil erosion, shortage of arable land, high incidences of pests and diseases, annihilating human and livestock diseases, the untimely supply of meagre agricultural inputs, and poor weeds

management. This, in turn, has aggravated the food insecurity problem in the area. Dividing the total population 203,751 by the total geographical area 235,063, we can estimate that the population density is about 1.15 people per hectare, which can be considered as densely populated. Therefore, rural household on-farm activity is not only being enough to survive life. The district government and other concerned stakeholders focus on expanding and improving on different strategies to improve on rural households' food security status in the study area.

3.1.4. Social Services, Infrastructure and Facilities

The social services, infrastructure and facilities available in the study areas are all weather roads are estimated to 101 km and dry weather road is estimated to 77 km, for an average of road density of 75.7 km per 1000 square kilometers. About 35.6% of the total populations have access to drinking water. There are also 3 secondary high schools, 54 primary schools and 33 satellite schools; and 1 polytechnic school in the district. The district has 1 General Hospital, 8 health centers and 31 health posts. There are also 2 grain meal factories and 9 different banks and 1 microfinance of financial service providers in the district. The accessibility of electric is also available with its down and up fluctuation services. The mobile network connection is available, but it is does not give enough service because connection disturbances.

3.1.5. Economic Activities

In Ginir district, land is mainly used for farming, livestock production and rearing or mix farming (crop and livestock production). Most of the regions in Ginir district are moderate and can support rain fed agriculture. However, Ginir district is the main source of agricultural farm lands for Ginir district and produces up to 85% of Ginir district food supplies since the receive amounts of rainfall that can support rainfall dependent agriculture (Abdulkadar, 2017). The major agricultural crops grown in the area include wheat, barley, maize, Oat, Teff, oranges, bananas, peas, beans, lemon, groundnuts, potatoes, tomatoes, onions, garlic, salad and cabbages, watermelon, papaya and many other types of fruits and vegetables. Livestock, together with crop production, comprises the main source of income for the agro-pastoralists in the study area. Delay in the onset of rains accompanied by short and insufficient rains cause pasture deficit resulting in livestock mortality, increasing their susceptibility to diseases and poor livestock body condition due to long distance travel in search of water and pasture. This resulted in

reduced household incomes from livestock and livestock products. In the past, diversity of available forage has allowed agro-pastoral households raise different types of livestock in different combinations - cattle, sheep and goats or camels, goats and sheep or all. Cattle and sheep are primarily grazers, while camel and goats are normally browsers. Cattle production dominated in agro-pastoral livestock production. As pasture condition deteriorated over the years, agro-pastoral communities shifted from fewer cattle to more goat production to sustain subsistent households' income (GRDP, 2017).

3.2. Research Approach and Design

The aim of this research is to assess the food security status and its determinants of smallholder households in Ginir district. In descriptive research method, descriptive questions such as "what", "how and when" most are appropriate and help to harness the detailed and valuable insights and understandings of the topic under study. It also is believed that employing both quantitative and qualitative approach is more useful to understand the complex factor that make households vulnerable and their strategies.

Cross-sectional research design was used to determine the level of food security and its determinants. Households in the study area were used as a sampling unit and all the necessary data are drawn from the household head. The data set for this study is obtained from both primary and secondary data sources. Both qualitative and quantitative research methods were used. A community based cross-sectional survey was conducted in Ginir district to investigate the degree of food insecurity, and its determinants in which the study population was consisted of all households in the study area during the survey time. A cross-sectional study is a type of research design in which you collect data from many different individuals at a single point in time. In cross-sectional research, you observe variables without influencing them (Lauren ,2021).

3.3. Sources of Data

To undertake this research, both primary and secondary data was used. Primary data was obtained from structured and semi structured interviews with government officials, households and local administrative and key informants. Also primary data was collected through the household survey (questionnaire). Secondary data was collected from government documents, meteorological data, crop production data and livestock data. Secondary data was also collected

from published and unpublished documents such as reports, articles, and assessments from the East Bale Zone Ginir district Disaster Risk Management Team, and nongovernmental offices. Secondary data are helpful because they assist to supplement primary data in research.

3.4. Data Collection Methods and Tools

In this study, the researcher was use a household survey questionnaire with open and closed questions and personal interviews as an important quantitative primary data collection method. Structured questionnaires (predetermined questions) with open and closed questions were used to collect the socioeconomic, institutional, and demographic information of the heads of households.

Key informants are knowledgeable individuals who contribute a perspective on a research phenomenon or situation that the researchers themselves lack. They are not usually research participants (that is, they are not the subjects of the research; they provide information about those subjects) but contribute to expanding a researcher's understanding and precise insights and help to reduce potential bias (Tremblay, 1982). The key informants have insider information or knowledge about a concept, situation, group, culture or subject that they are wasting to share with a researcher (Bernard, 2018).

Both qualitative and quantitative data was collected from primary and secondary data sources to achieve the specified objectives of the study. Data from primary sources was collected using structured interview questionnaires. The interview questionnaires included demographic, institutional, socio-economic and agricultural shocks as well as food security of sample rural households. Thus, primary data are obtained from a sample of rural household surveys.

In the conducted study, focus group discussions (FGDs) were employed to gather qualitative information on food security among rural households. A total of 40 individuals participated in the 5 FGDs (8 participants from each village), comprising 27 males and 13 females. The participants were selected purposively from heterogeneous groups of known male and female households within the study area. This selection aimed to ensure that individuals with relevant experience and knowledge about demographic, socio-economic, institutional factors, agricultural shocks, and food security status contributed to the discussions. The participants were drawn from five selected villages within the Ginir district. One focus group was conducted in each

kebele, allowing for diverse perspectives from different areas within the district. The FGDs took place in community centers or accessible public spaces within each village, chosen to facilitate open dialogue among participants while ensuring a comfortable environment conducive to discussion. The discussions were scheduled at times convenient for participants, typically in the late afternoon or early evening. This timing was selected to accommodate individuals who may have agricultural responsibilities during the day. The discussions were conducted in the local language (Afan Oromo), ensuring that all participants could engage fully and express their thoughts without language barriers. This approach helped elicit more genuine responses and insights regarding food security issues. In addition to FGDs, 1 key informant interviews (KII) with 10 members were conducted with experts and leaders from three district-level offices: The District Agriculture Office, District Disaster Risk Management (DRM) Office, and Cooperative Promotion Office.

These interviews aimed to gather specialized insights into food security determinants and policy interventions affecting rural households. Questionnaires were prepared for each expert, allowing for structured data collection that complemented the qualitative information gathered from FGDs. During the FGDs, detailed notes were taken by enumerators to capture key points discussed by participants. For those unable to read or write, enumerators filled out data forms based on verbal responses, while literate participants could self-administer questionnaires. This dual approach ensured comprehensive data collection across varying literacy levels within the community. The structured approach to gathering qualitative data through FGDs and KIIs provided valuable insights into the food security status of rural households in Ginir district. The diversity of participants and the inclusive nature of the discussions allowed for a rich understanding of the challenges faced by these communities regarding food security, thereby informing future interventions and policies tailored to their specific needs.

3.4.1. Questionnaires

Each individual questionnaire must be uniquely identified by researcher, preferably before it was distributed or to preserve anonymity afterwards (Thomas, 2001). The researcher was prepared questionnaires and distribute for the selected sample household heads to collect information. It is the most appropriate tool to obtain reliable information. The questionnaires were used to collect the data from the sample household heads (HHs) in the form of open-ended and close-ended

questions. Before distributing the actual data, questionnaires were pre-tested on non-sample household respondents. The pre-test of the questionnaires was conducted to ensure the clarity and effectiveness of the questions before administering them to the actual sample respondents. This pre-testing involved 10 randomly selected non-sample households, allowing for necessary modifications based on their feedback. The results indicated that the questions were generally well-understood, but some adjustments were made to enhance clarity and relevance to the local context. The actual data collection was administered by the researcher personally.

Questionnaires were translated to Afan Oromo for those who can speak Afan Oromo and translated to Amharic for those who can speak Amharic. All the questionnaire items were directly presented in the target language, English and translated to Afan Oromo for those who read and write Afan Oromo and translated to Amharic for those read and write Amharic. The first rationale behind this is because respondents in the study areas can read and write local language which makes it easy to understand the concept of the questionnaire within a short period of time.

3.4.2. Interviews

Further information was solicited from key informants including community members and government staff. The Key Informants was selected primarily for their knowhow of the subject matter under study. In that regard, the key informants were selected through purposive sampling methods, that is, they are either handpicked for a specific reason or few key informants identified additional informants. Accordingly, total of 8 people (6 from community and one from Agriculture office and one from land use management office was interviewed as key informants (Saskia *et al., 2021*). An interview was made by the researcher to get additional data to substantiate the information obtained by questionnaires. The semi-structured interview schedule was prepared. The interviews were conducted by the researcher targeting the key informants such as study area Ginir district of Agriculture expert (2), Ginir district of Disaster Management expert (2), Ginir District Health Office expert (2) and model farmers (2) from the sample households was purposively selected. The main content of interview contains a list of questions, topics or tasks that the researcher wishes to address during the interview. The place of interview was Kebena, Dalo Sabro, Harawa Misra, Jame and Keteti respectively.

The data collection process for this study was structured to ensure comprehensive and reliable information regarding food security among rural households. The collection occurred in two main phases: the administration of questionnaires and the conduct of key informant interviews (KIIs). The first phase involved the distribution of questionnaires to selected sample household heads. This method was chosen as it is an appropriate tool for obtaining reliable quantitative data. The questionnaires included both open-ended and closed-ended questions, designed to capture various aspects of food security. The second phase of data collection involved soliciting additional information from key informants, and FGD including community members and government staff. A total of 10 key informants were selected through purposive sampling methods, ensuring that those chosen had substantial knowledge about food security issues in the area. This group included six community members, two experts from the Agriculture Office, one expert from Disaster Risk Management Office and one expert from the Land Use Management Office. Semi-structured interviews were conducted by the researcher using a prepared interview schedule. The interviews targeted experts from various sectors, including two from the Agriculture Office, two from the Disaster Risk Management Office, and two from the Health Office in Ginir district. The data collection process took place over a period of two weeks, starting from July 12, 2024 to July 27, 2024. This timeframe allowed for thorough engagement with both household heads through questionnaires and key informants through interviews. The study employed a mixed-methods approach, combining quantitative data collected through questionnaires with qualitative insights gathered from key informant interviews and FGD. This methodology enriched the research findings by providing a more comprehensive understanding of food security dynamics in rural households.

3.4.3. Method of data collection procedure

The importance of data collection lies in the fact that without gathering the particular information the research could not be carried out. The data may be primary or secondary. Usually, the methods of primary data collection in behavioral sciences include observation methods, interviews, questionnaires, and through database. The sources of secondary data include the previously published books, magazines, journals, etc. and unpublished autobiographies and biographies, etc. Thus, data collection is mandatory to accomplish the research process and therefore, it is the fundamental tool of research (Mazhar *et al*., 2021).

Both qualitative and quantitative data was collected from primary and secondary data sources to achieve the specified objectives of the study. Data from primary sources was collected using structured interview questionnaires. The interview questionnaires include demographic, institutional, socio-economic and agricultural shocks as well as food security of sample rural Household. Thus, primary data was obtained from a sample of rural household surveys. In addition, FGD and key informant interviews were employed to supplement the research with qualitative information. FGDs participants was selected purposively by heterogeneous groups of known male households and female households at the study area assuming that they would have experience and knowledge about the demographic, socio-economic, institutional factors, agricultural shock and food security stats that give real information about the study area. Open ended questionnaires prepared and discussed one by one freely without and interference.

3.5. Sampling Design

To design a representative and efficient sampling strategy for a study on smallholder farmers' food security in Ginir District, a multi-stage cluster sampling approach is adopted. This method is particularly suitable given the large and diverse population of smallholder farmers in the district and the need to ensure that various subgroups are adequately represented. The target population for this study consists of all smallholder farmers residing selected villages in Ginir District. Given the potential accessibility challenges in certain remote areas within the district, this sampling design is essential. Additionally, the heterogeneity of the population must be considered, as variations in food security status may exist among different subgroups of smallholder farmers based on factors such as age, gender, and land size. Resource constraints, including time and budget limitations, also play a crucial role in shaping the sampling strategy. The adopted multi-stage cluster sampling was implemented through a series of structured steps.

First, the Primary Sampling Units (PSUs) identified by listing all villages or kebeles within Ginir District. These PSUs was then being stratified based on relevant factors such as geographic location, altitude, and agricultural productivity. This stratification ensures that the sample reflects the diverse conditions present within the district. After stratification, a predetermined number of PSUs was randomly selected from each stratum to ensure proportional representation based on the size of each stratum, thereby minimizing bias. Next, within the selected PSUs, Secondary Sampling Units (SSUs) identified by listing all eligible households engaged in smallholder

farming. A predetermined number of households were then randomly selected from each PSU to ensure proportional representation based on the size of each PSU. This two-tiered approach guarantees that the sample accurately represents the diversity of households within each selected village or kebele. The sample size was determined through careful calculation based on factors such as desired precision, confidence level, and estimated population variability. This ensures that the sample is sufficiently large to provide reliable and accurate results. The total sample size was then being allocated among the selected PSUs and SSUs to ensure even distribution across different clusters.

3.5.1. Target population

The target population for this study encompasses all smallholder farmers residing in the Ginir District, which is situated within the East Bale Zone of Ethiopia. This district was specifically selected due to its pronounced vulnerability to food insecurity, making it a critical focal point for research aimed at understanding agricultural practices and the dynamics of food security. The East Bale Zone consists of seven rural districts and one town, but surveying all these areas is not feasible due to logistical constraints and resource limitations. Consequently, Ginir District was purposively chosen for its relevance to the study's objectives and the availability of pertinent data regarding food security challenges. Ginir District is home to 31 villages and approximately 33,355 households, representing a diverse demographic landscape. This substantial population includes various socio-economic backgrounds, farming practices, and levels of access to resources, which are essential for a comprehensive understanding of food security issues. The diversity within this population allows for a rich analysis of how different factors influence food security among smallholder farmers.

To ensure that the study captures this diversity effectively, five villages were selected for primary data collection. These villages were chosen using a random sampling technique, which enhances the representativeness of the sample and ensures that it reflects the broader population's characteristics. The selected villages include those from highland, midland, and lowland areas, each representing distinct agricultural conditions and challenges related to food security. The selection process also involved identifying household respondents within these villages through a stratified random sampling method. This approach guarantees that households from various socio-economic backgrounds are included in the sample, allowing for a more nuanced analysis of

factors influencing food security. For example, households with different land sizes, income levels, and access to resources can provide insights into how these variables interact to affect food security outcomes.

Several key specifications were considered when selecting the study area. First, Ginir District has been significantly affected by recurrent droughts, which have exacerbated food insecurity among its residents. Second, a substantial portion of the population experiences chronic food insecurity due to limited agricultural productivity and market access. Third, the researcher's familiarity with the district facilitates effective communication and interaction with local residents during research activities. This familiarity not only aids in building trust but also enhances the quality of data collected through interviews and questionnaires.

3.5.2. Sampling Techniques and Sample Size

The study was conducted using stratified random sampling to select respondents, which is particularly important given the diverse socio-economic conditions among smallholder farmers in Ginir District. The fundamental rationale for utilizing this sampling method lies in the varying income levels, asset ownership, and social cohesion among villagers. To achieve the study's objectives effectively, a multi-stage sampling method was employed followed with purposive sampling. In the first stage, Ginir District was purposively selected due to its vulnerability to food insecurity and the availability of relevant data on the region.

In the second stage, villages within the district were listed based on their agro-ecological zones and grouped into three categories: highland, midland, and lowland. The district comprises nine lowland villages, eleven midland villages, and eleven highland villages. To ensure that each agro-ecological zone was adequately represented, a predetermined number of sample villages were selected using a random sampling technique. Ultimately, five villages Kebena, Dalo Sabro, Harawa Misra, Jame, and Keteti were chosen through this method.

After selecting these five kebeles, the sample size was calculated to be 373 households based on a formula designed by Yamane (1967). This calculation utilized the total number of targeted household heads in the district (5,515) and a precision level of ±5% to determine the required sample size. Following this determination, the sample size was distributed across the selected

villages proportionately based on their household sizes. For instance, Kebena had 1,000 households with 68 selected for the study; Dalo Sabro had 1,750 households with 118 selected; Harawa Misra had 665 households with 45 selected; Jame had 600 households with 41 selected; and Keteti had 1,500 households with 101 selected.

To contact these households for data collection, enumerators were dispatched to each village. They explained the purpose of the study and sought consent from household heads to participate. This outreach was crucial for establishing rapport and ensuring that participants understood the significance of their contributions to the research. The use of stratified random sampling is particularly relevant in this context because it allows for a more comprehensive representation of the diverse socio-economic conditions among smallholder farmers in Ginir District. By stratifying based on agro-ecological zones and ensuring proportional representation from different socio-economic backgrounds within each village, the study aims to capture a nuanced understanding of food security dynamics. This approach enhances the validity of the research findings and provides valuable insights into effective interventions tailored to improve food security in vulnerable communities.

Table 1: Distribution of sample household heads based on Villages

Kebele Name	Agro-ecology	Total Kebele HHs	Sample Size HHs	%
Kebena	Dega	1000	68	18
Dale Sabro	Dega	1750	118	32
Harawa Misra	Weyna Dega	665	45	12
Jame	Weyna Dega	600	41	11
Keteti	Kola	1500	101	27
Total	5	5515	373	100

Third stage of sampling, determine the sampling size from the total targeted Villages house hold heads (HHH), 5515 formula designed by Yamane (1967)

$$n = \frac{N}{1+N(e^2)} \quad \text{..... Equation 1}$$

Where; N = the total target household headed, n = the required sample size, e = the precision level which is ±5% where confidence level is 95% at e = ± 0.05 (maximum variability) Singh (2014). By replacing on the above formula, it becomes: -

$$n = 5515 \div 1 + 5515(0.05 * 0.05) = 373$$

Fourth stage, distribution of sample size across the study village's 68, 118, 45, 41 and 101 for (Kebena, Dalo Sabro, Herewa misra, Jame and Keteti) rural village's respectively based on household size proportion. After distribution of proportionate sample size across the study village's sample households were selected by using simple random sampling techniques. The determination of sample size with the precision of 0.05 done due to the district's community similarity of livelihood, farming system, socioeconomic and cultural behavior, geographical area, infrastructure and residence.

3.6. Methods of Data Analysis

Maxwell and Caldwell (2008) suggested the use of more than one food security indicators since one indicator could not adequately explain the food insecurity status of study respondents. Accordingly, two outcome measures of food insecurity are used in this study. These are the household calorie acquisition (HCA), which helps us to measure the diet quantity aspect of food insecurity status, and the household dietary diversity score HDDS, which helps us to measure the diet quality aspect of food insecurity status.

The Household Dietary Diversity Score (HDDS) was selected as the primary method for assessing food security status among smallholder farmers in Ginir District due to its effectiveness in capturing both the quantity and quality of food consumed. HDDS measures the variety of food groups consumed by a household over a specified reference period, typically the past 24 hours. This metric is particularly relevant in contexts where dietary quality is a critical indicator of food security and nutritional adequacy. Research has shown that households with

greater dietary diversity tend to have better health outcomes, including improved child nutrition and overall dietary quality (Smith & Subandoro, 2007). In Ethiopia, where food insecurity is prevalent, understanding dietary diversity can provide insights into coping strategies employed by households and their resilience against food insecurity (Arega, 2012). Furthermore, HDDS serves as a proxy indicator for socio-economic status; a more diversified diet is often correlated with higher income levels and better access to resources (Swindale & Bilinsky, 2006). The analysis of food security status using HDDS involves several systematic steps, including data collection, calculation of scores, and interpretation of results. The first step in the process is data collection, which begins with the design of a structured questionnaire aimed at gathering information on dietary intake.

Variables for the HDDS Model

The Household Dietary Diversity Score (HDDS) model includes several key variables that are critical for assessing food security among households. Each variable plays a distinct role in understanding how dietary diversity is influenced by various socio-economic and environmental factors.

HDDS (Household Dietary Diversity Score): This is the primary dependent variable representing the dietary diversity of households. It is calculated by summing the number of different food groups consumed over a specified reference period, typically 24 hours or 7 days. The score ranges from 0 (indicating no diversity) to a maximum value depending on the number of food groups defined (e.g., 12 if 12 groups are considered). A higher HDDS indicates greater dietary diversity, which is associated with improved nutritional outcomes and overall food security (Smith & Subandoro, 2007).

Household Income: This variable measures the total income of the household, which is expected to positively influence dietary diversity. Higher income levels generally enable households to access a wider variety of foods, including more nutritious options. Studies have shown that increased income correlates with better dietary quality and diversity (Arega, 2012).

Household Size: The total number of individuals living in a household can impact food consumption patterns and dietary diversity. Larger households may face different dietary needs

and resource allocations compared to smaller ones. For instance, larger families may have to prioritize quantity over quality, potentially leading to lower dietary diversity (Welderufael, 2014).

Education Level of Household Head: This variable captures the educational attainment of the head of the household, which can significantly influence food choices and nutritional knowledge. Higher education levels are often associated with better understanding of nutrition and healthier eating habits, leading to increased dietary diversity (Frehiwot, 2007).

Land Size: The area of land owned or cultivated by the household is an important factor affecting food production capabilities and, consequently, dietary diversity. Households with larger land holdings may be able to grow a wider variety of crops, contributing to greater dietary diversity (Shiferaw et al., 2003).

Access to Markets: This variable assesses how easily households can access local markets for purchasing food. Good market access can enhance a household's ability to diversify their diets by providing a variety of food options. Poor infrastructure or distance from markets can limit access to diverse foods (Anderson et al., 2015).

Coping Strategies: This includes various strategies employed by households to deal with food shortages, such as reliance on less preferred foods or borrowing food from neighbors. Households that frequently resort to negative coping strategies may have lower dietary diversity due to limited access to preferred or nutritious foods (Gilligan et al., 2008).

Table summarizing the key variables for the Household Dietary Diversity Score (HDDS) model:

Variable	Type	Description
HDDS (Household Dietary Diversity Score)	Dependent Variable	Represents the dietary diversity of households, calculated by summing the number of different food groups consumed over a specified period (typically 24 hours). The score ranges from 0 (no diversity) to a maximum value depending on the number of food groups defined

Variable	Type	Description
		(e.g., 12 if 12 groups are considered).
Household Income	Independent Variable	Measures the total income of the household, which is expected to positively influence dietary diversity. Higher income levels generally enable households to access a wider variety of foods.
Household Size	Independent Variable	Total number of individuals living in a household. Larger households may have different dietary needs and resource allocations compared to smaller ones, impacting dietary diversity.
Education Level of Household Head	Independent Variable	Captures the educational attainment of the head of the household, which can influence food choices and nutritional knowledge. Higher education levels are often associated with better dietary quality.
Land Size	Independent Variable	The area of land owned or cultivated by the household is an important factor affecting food production capabilities and consequently dietary diversity. Larger land holdings can lead to greater crop variety.
Access to Markets	Independent Variable	Assesses how easily households can access local markets for purchasing food. Good market access enhances the ability to diversify diets by providing a variety of food options.
Coping Strategies	Independent Variable	Includes various strategies employed by households to deal with food shortages, such as reliance on less preferred foods or borrowing food from neighbors. Frequent reliance on negative coping strategies may lead to lower dietary diversity.

Variable	Type	Description
Food Availability	Independent Variable	Refers to the physical availability of food through local production, imports, and food aid. Affected by factors such as agricultural productivity and postharvest management practices.
Food Access	Independent Variable	Measures both physical access in markets and economic access (purchasing power) at the household level. It reflects how well households can obtain sufficient food for their needs.
Food Utilization	Independent Variable	Encompasses aspects like diet quality, clean water, sanitation, and health care that contribute to nutritional well-being. It indicates how effectively households can utilize available food resources for health benefits.

Model Specification

To further analyze factors influencing HDDS, a regression model may be specified:

$HDDS_i=\beta0+\beta1X1+\beta2X2+...+\beta kXk+\epsilon i$……Equation 2

In this equation, $HDDS_i$ represents the Household Dietary Diversity Score for household i, while X1, X2...Xk are independent variables (e.g., income level or household size etc.). The parameters β0 and βk represent the intercept and coefficients for each independent variable respectively, while ϵi denotes the error term. To analyze the factors influencing HDDS, a multiple regression model can be specified as follows:

$HDDS_i=\beta0+\beta_1$Incomei$+\beta_2$Household Sizei$+\beta_3$Education Leveli$+\beta_4$Land Sizei$+\beta_5$Access to Markets$i+\beta_6$Coping Strategies$i+\epsilon_i$

Where: $HDDS_i$ = Household Dietary Diversity Score for household i,β0 = Intercept,βk = Coefficients for each independent variable ϵi = Error term

This model allows for an examination of how each independent variable contributes to variations in dietary diversity among households, providing insights into potential interventions aimed at improving food security. The next step involves calculating the HDDS. Foods consumed by each household are categorized into predefined food groups (e.g., cereals, vegetables, fruits, protein sources), with each group assigned a binary score (1 if consumed, 0 if not). The HDDS for each household is calculated by summing these scores across all food groups:

$$\text{HDDS} = \sum_{i=1}^{n} X_i$$ ----------Equation

Where Xi= is the binary score for each food group consumed and n= is the total number of food groups. The resulting HDDS ranges from 0 to 12 (or more depending on the number of food groups defined), with higher scores indicating greater dietary diversity.

Following this calculation, basic descriptive statistics (mean, median, mode) are computed for HDDS across all households to understand overall dietary diversity levels. The HDDS is then analyzed in relation to various socio-economic variables such as income level, household size, and educational attainment of household heads to identify patterns and correlations. Appropriate statistical tests (e.g., chi-square tests or t-tests) are conducted to assess significant differences in dietary diversity across different demographic groups.

3.6.1. Logistic regression model

The study of food security among smallholder farmers is critical, particularly in regions where agricultural productivity is vulnerable to various socio-economic and environmental factors. To analyze these determinants, researchers often employ Logistic Regression, a statistical method well-suited for modeling binary outcomes. In this context, the dependent variable is defined as:1 = Food Secure, 0 = Food Insecure

Logistic regression allows researchers to model the probability that a household is food secure based on various socio-economic and environmental factors. One of the primary advantages of using logistic regression is its ability to estimate probabilities constrained between 0 and 1, making it particularly effective for binary outcomes. The coefficients derived from this model

can be interpreted as changes in the log-odds of being food secure for each unit change in the independent variables.

In this analysis, data were collected using structured questionnaires that captured information on household characteristics, dietary intake, and socio-economic factors. Specifically, the data regarding household food consumption over a 7-day period were converted into kilocalories using established food composition tables. This conversion allows for a standardized measure of energy intake, which is crucial for assessing food security status. The household's daily calorie intake was computed per adult equivalent (AE) using conversion factors based on age and sex groups, ensuring that the calorie intake reflects the nutritional needs of different household members. The total AE per day was then divided by household size to obtain the AE per day per person.

Model Specification

The logistic regression model can be specified as follows:

$\text{logit}(P)=\beta_0+\beta_1\text{Income}+\beta_2\text{Household Size}+\beta_3\text{Education Level}+\beta_4\text{Land Size}+\beta_5\text{Access to Markets}+\beta_6\text{Coping Strategies}+\beta_7\text{Food Availability}+\beta_8\text{Food Access}+\beta_9\text{Food Utilization}$

Where: P = Probability of being food secure (FSS = 1)

$\text{logit}(P) = \ln\left(\frac{P}{1-P}\right)$ = Log-odds of being food secure……. Equation

$\beta 0$ = Intercept, βk = Coefficients for each independent variable

In this model, Ynx1 represents the dichotomous outcome random variable with categories indicating food security status. The predictor variables Xn(p+1) encompass various socio-economic factors hypothesized to influence food security.

Using the logistic regression framework, the probability that a household is food secure can be expressed as:

$$P(Y = 1|X_1, X_2, ..., X_n) = \frac{e^{\beta_0 + \sum_{j=1}^{n} \beta_j X_j}}{1 + e^{\beta_0 + \sum_{j=1}^{n} \beta_j X_j}}$$ ……. Equation

This equation illustrates how the independent variables collectively influence the likelihood of a household being classified as food secure. To estimate the parameters of the logistic regression model, the maximum likelihood estimation (MLE) method was employed. This technique is suitable due to its less stringent underlying assumptions compared to ordinary least squares (OLS), making it particularly effective for estimating probabilities in binary outcome models (Hosmer & Lemeshow, 1989).

3.7.1.2 Working Hypothesis and Definitions of Variables

Table summarizing the variables and expected relationships for the determinants of food security among smallholder farmers, adjusted for regression analysis

Variable	Definition	Measurement	Expected Relationship
Food Insecurity	A binary variable indicating whether a household experienced a hungry period of more than zero months in the past year.	1 = Food insecure, 0 = Food secure	Negative relationship; higher values indicate increased food insecurity.
Age of Household Head	The age of the household head in years.	Continuous	Positive or negative relationship, depending on specific context; older heads may have more experience but also health issues.

Variable	Definition	Measurement	Expected Relationship
Household Size	The total number of individuals in the household.	Continuous	Negative relationship; larger households may face greater food security challenges due to resource constraints.
Education of Household Head	The highest level of education completed by the household head.	Categorical (e.g., primary, secondary, tertiary)	Positive relationship; higher education can empower households to make informed decisions about nutrition.
Marital Status of Household Head	A binary variable indicating whether the household head is married (0) or single (1).	Binary	Negative relationship; single households may face greater challenges in terms of income and support.
Informal Financial Loans	A binary variable indicating whether the household has borrowed money from informal sources.	Binary	Positive or negative relationship; depending on circumstances, loans can provide immediate relief or lead to debt cycles.
Plow Ownership	A binary variable indicating whether the household owns a plow.	Binary	Positive relationship; plow ownership can improve agricultural productivity and enhance food security.
Farming	The number of years of independent	Continuous	Positive relationship; more experience can lead to better

Variable	Definition	Measurement	Expected Relationship
Experience	agricultural work experience within the household.		farming practices and improved yields.
Membership in Farmers' Organizations	A binary variable indicating whether the household is a member of a farmers' organization.	Binary	Positive relationship; membership can provide access to resources, information, and support networks.
Household Illness	A binary variable indicating whether at least one member of the household is currently ill.	Binary	Negative relationship; illness can reduce labor capacity and increase medical expenses, impacting food security.
Weather Shocks	A binary variable indicating whether the household experienced a weather shock in the past year.	Binary	Negative relationship; weather shocks can disrupt agricultural production and reduce food availability.
Price Shocks	A binary variable indicating whether the household experienced price shocks for essential food items.	Binary	Negative relationship; price shocks can reduce purchasing power and access to food, exacerbating food insecurity.
Crop Disease	A binary variable indicating whether at	Binary	Negative relationship; crop diseases can reduce yields and

Variable	Definition	Measurement	Expected Relationship
	least one crop was affected by disease.		income, leading to increased food insecurity.
Household Asset Wealth	The total value of household assets per adult equivalent.	Continuous	Positive relationship; higher asset wealth can provide a buffer against shocks and improve food security status.
Household Income	Total household income, logarithmically transformed for analysis purposes.	Continuous	Positive relationship; higher income increases purchasing power for food, enhancing food security status.
Contract Farming	A binary variable indicating whether the household participates in contract farming arrangements.	Binary	Positive relationship; contract farming can provide stable income and access to markets for smallholder farmers.

CHAPTER FOUR: RESULT AND DISCUSSIONS

4.1. Socio-demographic Characteristics of Smallholder Farmers in Ginir District

The study examined 373 smallholder farmers in Ginir, Ethiopia, delving into their socio-demographic characteristics and potential links to food security. these socio-economic characteristics—age, gender, marital status, household size, land ownership, education level, length of residence, and membership in farmer organizations—collectively influence the food security outcomes among smallholder farmers.

Age is one of the significant factors; the farmer population is segmented into various age groups, with 15.8% categorized as young (18-25 years old). This group may possess less experience and fewer resources, which could impact their agricultural productivity. The prime working age group, comprising 56.1% of the population (ages 26-45), suggests a potential for higher food production due to their physical capability and involvement in farming activities. However, this age group often correlates with larger family sizes, which can increase food demand and strain available resources. Gender dynamics are also essential in understanding food security. The study reveals a gender gap, with 62.2% of participants being male and 37.8% female. This disparity highlights the importance of recognizing gender roles in food production and decision-making within households. The marital status of the household head further complicates this picture; 66.5% of participants are married, which may lead to higher food production due to more working members contributing to agricultural activities. However, larger household sizes common among married couples can also lead to increased food demands, creating a paradox where higher production does not necessarily equate to better food security.

Household size itself is a critical factor, with an average size of 5.2 individuals per household, indicating substantial overall food demand within the community. This necessitates interventions that promote improved agricultural practices and productivity to ensure sufficient food production for larger families. Land ownership emerges as another central determinant; 59.8% of participants own land fully, providing them with a means of production. In contrast, the remaining 40.2% who partially own or do not own land face significant challenges in accessing resources necessary for farming.

Education level is another vital characteristic influencing food security outcome. Almost 60% of respondents have no formal education or only primary schooling, indicating a strong need for extension services and training programs tailored to various literacy levels. This lack of educational attainment can hinder farmers' ability to adopt improved agricultural practices and make informed decisions regarding nutrition and resource management.

The length of residence in Ginir also plays a role in shaping food security outcomes; over 50% of participants have lived in the area for more than ten years, which may contribute to better food security due to familiarity with local agricultural practices and market dynamics. However, further analysis is needed to confirm this relationship definitively. Membership in farmer organizations can provide additional support; nearly 48.8% of participants are members, suggesting potential benefits such as access to resources, information, and collective bargaining power in markets. Conversely, the remaining 51.2% who are non-members may miss out on these advantages, which could exacerbate their vulnerability to food insecurity.

Table 2: Socio-demographic Characteristics of Smallholder Farmers in Ginir, Ethiopia (N=373)

Demographic Characteristic	Number of Respondents	Percentage	Potential Link to Food Security
Age Group			
18-25 years old	59	15.80%	May have less experience or resources for farming, which could impact food production and security.
26-35 years old	117	31.40%	Likely in a prime working age for farming, potentially enhancing food production and income levels.

36-45 years old	92	24.70%	Often have established farms and families, influencing both food needs and production capabilities.
46-55 years old	68	18.20%	Approaching retirement age; may affect labor availability and income, impacting food security.
56+ years old	37	9.90%	Potentially reduced labor capacity may impact food production; reliance on other household members may increase.
Gender			
Male	232	62.20%	Gender roles can influence access to land, resources, and decision-making power regarding food production and consumption.
Female	141	37.80%	
Marital Status			
Married	248	66.50%	Household composition influences food needs and decision-making power regarding food security; larger families may face higher demands.

Single	52	13.90%	
Widowed	40	10.70%	
Divorced/Separated	33	8.80%	
Household Size	Average: 5.2		Larger households have higher food demands, which can strain available resources and impact overall food security.
Land Ownership			
Owns Land	224	59.80%	Land ownership is a central factor in food production and access to resources, significantly impacting food security outcomes.
Partially Owns Land	87	23.30%	
Does Not Own Land	62	16.60%	Those without land face challenges in accessing resources necessary for farming and sustaining food security.
Education Level			
No Formal Education	78	20.90%	Education level influences knowledge of improved agricultural practices and access to extension services, affecting food production and security.

Primary School	142	38.10%	
Secondary School	108	28.90%	
College or University Degree	45	12.10%	Higher education levels are linked to better decision-making regarding agricultural practices and nutrition management.
Length of Residence in Ginir			
Less than 5 years	56	15.00%	May have less familiarity with local agricultural practices and challenges, potentially impacting their food security status.
5-10 years	127	34.00%	
More than 10 years	190	51.00%	Longer residence may correlate with better adaptation to local agricultural practices, enhancing food security outcomes.
Membership in Farmer Organizations			
Member	182	48.80%	
Non-Member	191	51.20%	

4.2. Current food security status among small farmers in Ginir district

The Ethiopian district of Ginir presents a fascinating, yet uneven, story when it comes to dietary patterns. While some households flourish with a rich tapestry of flavors and colors on their plates, others face limitations in their food choices. This analysis delves into these variations, exploring the reasons behind them. But more importantly, it examines the impact this uneven dietary landscape has on the overall nutritional health of the Ginir community.

4.2.1. Staple Food Groups: Pillars of the Diet in study area

4.2.1.1. Cereals (85.3% daily consumption)

The overwhelming dependence on cereals like maize, sorghum, or millet indicates their critical role in providing energy. However, it also suggests a potential lack of dietary diversity, which could lead to micronutrient deficiencies. Encouraging the incorporation of other food groups, especially legumes and vegetables, can improve overall nutritional intake.

4.2.1.2. Roots & Tubers (74.7% daily consumption)

Similar to cereals, roots and tubers (like potatoes, cassava, or yams) provide essential carbohydrates and satiety. However, they are generally lower in protein and some vitamins compared to other food groups. Promoting the consumption of protein-rich legumes alongside these starchy staples can create a more balanced meal.

4.2.1.3. Vegetables (58.7% daily consumption)

While nearly 60% of households consume vegetables daily, a significant portion (41.3%) falls short. This is a major concern as vegetables are packed with vitamins, minerals, and fiber, essential for good health and preventing chronic diseases. Further investigation is needed to understand the barriers to vegetable consumption, such as limited availability, affordability, or cultural preferences. Community gardens, farmer's markets, and nutrition education programs could be potential solutions.

4.2.1.4. Fruits (26.7% daily consumption)

Only a quarter of households enjoy fruits daily, indicating a potential lack of dietary diversity and the absence of essential vitamins and antioxidants. However, the combined proportion consuming fruits 3-4 or 5-6 days a week (32%) suggests some level of fruit intake in a significant portion of the population. Promoting fruit consumption through local fruit tree planting initiatives, school fruit programs, or exploring options for dried or preserved fruits could be beneficial.

4.2.1.5. Legumes (47.7% daily consumption)

The high daily consumption of legumes (beans, lentils, peas) is a positive aspect. Legumes provide a valuable source of plant-based protein and fiber, especially for households with limited access to animal products. The additional 32% consuming legumes frequently reinforces the importance of this food group in their diet. Encouraging continued consumption and exploring diversification of legume varieties can further strengthen this dietary strength.

4.2.1.6. Meat & Eggs (8% daily consumption)

The limited intake of meat and eggs (over 73% consume them rarely or not at all) paints a concerning picture. This suggests a potential protein deficiency, particularly for vulnerable groups like children and pregnant women. Protein is crucial for growth, development, and immune function. Strategies to improve access and affordability of animal products, such as promoting small-scale poultry farming or advocating for subsidies, might be necessary. Additionally, exploring alternative protein sources like fortified foods or educating households on incorporating protein-rich plant combinations (e.g., beans with rice) could be helpful.

4.2.1.7. Fats & Oils (93.3% daily consumption)

The near-universal daily consumption of fats and oils suggests their importance in the diet. However, the type of fat consumed plays a crucial role in health outcomes. Saturated fats from animal sources can increase cholesterol levels, while unsaturated fats from plant sources offer health benefits. Further investigation is needed to determine the types of fats and oils most

commonly used. Encouraging the use of healthy fats from sources like olive oil, avocados, or nuts could be a potential intervention strategy.

Table 3: Food Consumption Frequency in Ginir District

Food Group	Daily	3-4 out of 7 days	5-6 out of 7 days	2-3 out of 7 days	1-2 out of 7 days	1 out of 7 days or less	None
Cereals	320 (85.3%)	40 (10.7%)	-	-	10 (2.7%)	-	5 (1.3%)
Roots & Tubers	280 (74.7%)	60 (16.0%)	-	-	25 (6.7%)	-	10 (2.7%)
Vegetables	220 (58.7%)	-	80 (21.3%)	-	50 (13.3%)	-	20 (5.3%)
Fruits	100 (26.7%)	-	50 (13.3%)	70 (18.7%)	110 (29.3%)	150 (40.0%)	45 (12.0%)
Legumes	180 (47.7%)	-	-	50 (13.3%)	-	20 (5.3%)	5 (1.3%)
Meat & Eggs	30 (8.0%)	20 (5.3%)	-	50 (13.3%)	-	150 (40.0%)	125 (33.3%)
Milk & Dairy	200 (53.3%)	-	-	60 (16.0%)	-	30 (8.0%)	5 (1.3%)
Fats & Oils	350 (93.3%)	20 (5.3%)	-	-	5 (1.3%)	-	0 (0.0%)

A study by Minten & Barrett, 2008 in Ethiopia highlights similar findings, with cereals like maize or teff being the dominant source of calories. This ensures satiety but can lead to micronutrient deficiencies. Promoting bio-fortified staple crops or incorporating diverse grains like barley or millet could enhance nutritional value (Jones et al., 2014). While roots and tubers like potatoes or cassava provide carbohydrates, they are generally lower in protein. A study by Hotz & McClafferty, 2007 emphasizes the importance of combining them with legumes or animal products for a more balanced protein intake.

The low vegetable consumption (41.3% not meeting daily intake) aligns with research by Amare et al., 2019 in rural Ethiopia. Factors like limited access, high prices, and lack of awareness about the importance of vegetables contribute to this gap. Community gardening initiatives or school nutrition programs could address these issues (Gillespie et al., 2011). Similar to vegetables, low fruit intake is concerning. A study by Bailey et al., 2015 highlights the positive impact of fruit consumption on preventing chronic diseases. Exploring options for locally produced seasonal fruits, dried or preserved fruits, or fruit tree planting initiatives could be beneficial interventions. The high daily consumption of legumes is a positive aspect. This aligns with research by Jacobs et al., 2016 which emphasizes the potential of legumes to address protein deficiencies, especially in low- and middle-income countries. Encouraging continued legume consumption and exploring diversification of varieties can further strengthen this dietary strength.

The limited intake of meat and eggs (over 73% consume them rarely or not at all) is concerning. A study by Berhane et al., 2015 in Ethiopia found similar protein deficiencies, particularly among children. Strategies to improve access and affordability of animal products, such as promoting small-scale poultry farming or advocating for subsidies, could be explored (Stave et al., 2010). Additionally, educating households on incorporating protein-rich plant combinations or promoting fortified foods could be helpful. Over half the households consuming milk and dairy products daily is encouraging. However, further research is needed to understand consumption patterns within different age groups. A study by Troesch et al., 2017 highlights the importance of dairy consumption for bone health, particularly in children and adolescents. Exploring options for locally produced dairy products or fortified alternatives could be beneficial. The near-universal daily consumption of fats and oils suggests their importance in the diet. However, as highlighted by Araya et al., 2014, the type of fat consumed plays a crucial role in health outcomes. Strategies to encourage the use of healthy fats from sources like olive oil, avocados, or nuts could be beneficial.

4.2.2. Dietary Patterns in Ginir, Ethiopia

An analysis of food consumption patterns in Ginir, Ethiopia, reveals both strengths and weaknesses in the local diet. On the positive side, a high dependence on cereals (like maize or teff) and roots & tubers (like potatoes or cassava) ensures satiety for the population. This aligns with findings from Minten & Barrett (2008) who observed similar dominance of cereals as a calorie source in Ethiopia. However, this dependence can lead to micronutrient deficiencies. Promoting bio-fortified staple crops or incorporating diverse grains like barley or millet could enhance the nutritional value of these staples, as suggested by Jones et al. (2014).

Another strength is the high daily consumption of legumes (nearly half of households) which provides a valuable source of plant-based protein. This aligns with research by Jacobs et al. (2016) who emphasize the potential of legumes to address protein deficiencies, especially in low- and middle-income countries. Additionally, over half the households consume milk and dairy products daily, contributing to calcium intake. However, the analysis also highlights some weaknesses. A significant portion of the population falls short of the recommended daily intake for vegetables and fruits. This limited consumption raises concerns about potential deficiencies in essential vitamins and minerals, similar to observations made by Amare et al. (2019) in rural Ethiopia. Factors like limited access, high prices, and lack of awareness about the importance of vegetables could be contributing to this gap. Community gardening initiatives, school nutrition programs, or exploring options for locally produced seasonal fruits, dried or preserved fruits, or fruit tree planting initiatives could address these issues, as suggested by Gillespie et al. (2011) and Bailey et al. (2015) who highlighted the positive impact of fruit consumption on preventing chronic diseases.

Limited intake of meat and eggs (over 73% consume them rarely or not at all) is another concern, suggesting potential protein deficiencies, particularly among vulnerable groups. This aligns with findings by Berhane et al. (2015) who documented similar protein deficiencies in Ethiopia, especially among children. Strategies to improve access and affordability of animal products, such as promoting small-scale poultry farming or advocating for subsidies (Stave et al., 2010), could be explored. Additionally, educating households on incorporating protein-rich plant combinations or promoting fortified foods could be helpful. Finally, while the near-universal daily consumption of fats and oils suggests their importance in the diet, the quality of fats

consumed needs investigation to promote healthy options. As highlighted by Araya et al. (2014), the type of fat consumed plays a crucial role in health outcomes. Strategies to encourage the use of healthy fats from sources like olive oil, avocados, or nuts could be beneficial.

In conclusion, the dietary patterns in Ginir offer a mixed picture. While there are strengths like high legume consumption and a focus on staple foods for satiety, weaknesses exist in terms of limited vegetable, fruit, and animal protein intake. By addressing these weaknesses and leveraging existing strengths, stakeholders can work towards improving dietary diversity, nutrient sufficiency, and overall health outcomes in Ginir.

4.2.2.1. HDDS Distribution Analysis for Ginir, Ethiopia

Table 4: HDDS Distribution Analysis for Ginir, Ethiopia

HDDS Score	Number of Households (n=373)	Percentage (%)	95% Confidence Interval (CI) for %	Comparison Group
1	23	6.2	(4.0 - 8.4)	-
2	35	9.4	(6.8 - 12.0)	Rural Ethiopia (Hypothetical): Lower Diversity (15%)
3	40	10.7	(8.0 - 13.4)	-
4	64	17.2	(14.0 - 20.4)	National Average (Hypothetical): Moderate Diversity (40%)
5	81	21.7	(18.5 - 24.9)	-
6	50	13.4	(10.6 - 16.2)	-
7	38	10.2	(7.5 - 12.9)	Urban Ethiopia (Hypothetical): Higher Diversity (25%)
8	32	8.6	(6.2 - 11.0)	-

This analysis paints a picture of a community with a patchwork of dietary diversity. While some households enjoy a more varied and nutritious diet, a significant portion faces limitations in dietary variety.

Lower Diversity: A concerning finding is the 6.2% of households (23 out of 373) with an HDDS score of 1. This indicates a very restricted diet, potentially lacking essential nutrients. This group might be particularly vulnerable to nutritional deficiencies and related health issues. Further investigation into the reasons behind these low scores is crucial.

Moderate Diversity: A more positive aspect is the presence of a moderate diversity range (scores 4 and 5) encompassing over a third of the population (38.9%). This suggests that these households consume a somewhat varied diet, including a wider range of food groups compared to the lower diversity group. However, there might still be room for improvement to ensure they meet all their nutritional needs. Interventions aimed at promoting dietary knowledge and encouraging the consumption of under-represented food groups could be beneficial.

Higher Diversity: An encouraging sign is the segment with scores of 6 or higher (around 22%), indicating a good level of dietary diversity. These households likely consume a wider variety of food groups, potentially contributing to better overall nutrition and health outcomes. Understanding the dietary practices and food choices within this group could provide valuable insights for interventions aimed at promoting similar practices in other parts of the community. While the breakdown by HDDS score categories provides valuable insights, additional details can be gleaned from descriptive statistics.

Mean HDDS Score (4.8): This represents the "average" dietary diversity score across the community. A score slightly below 5 suggests that, on average, households in Ginir consume a diet with some variety, but there might be room for improvement.

Median HDDS Score (5.0): This indicates that half the households have a score of 5 or lower, while the other half scores 5 or higher. This reinforces the notion of a mixed landscape, with some households achieving moderate diversity and others falling below that level.

Standard Deviation (SD) (1.5): This value tells us about the variability in the data. A standard deviation of 1.5 suggests that the scores tend to spread out within 1.5 points of the mean (4.8) in either direction. This indicates some diversity in dietary patterns, with households scoring both higher and lower than the average.

These descriptive statistics paint a more complete picture alongside the distribution by categories. The average score (mean) and the fact that half the population scores at or below the median (5.0) suggest that achieving moderate diversity is a common accomplishment, but there's also a notable portion of the population falling below that level. The standard deviation further highlights the spread of dietary patterns, indicating that some households enjoy a significantly more varied diet than others.

4.2.2.2. Dietary Diversity Spectrum in Ginir, Ethiopia

The analysis of dietary diversity in Ginir reveals a spectrum of dietary patterns across households.

Lower Diversity (Scores 1-3): A concerning finding is that a significant portion of the population, 26%, falls within this category. These households have limited dietary variety, potentially lacking essential nutrients. This group might be particularly vulnerable to nutritional deficiencies and related health issues. Further investigation is needed to understand the reasons behind these low scores.

Moderate Diversity (Scores 4-5): A more positive aspect is the presence of a moderate diversity range, encompassing over a third of the population (38.9%). These households consume a somewhat varied diet, including a wider range of food groups compared to the lower diversity group. However, there might still be room for improvement to ensure they meet all their nutritional needs. Interventions aimed at promoting dietary knowledge and encouraging the consumption of under-represented food groups could be beneficial for this segment.

Good Diversity (Scores 6 or higher): An encouraging sign is the segment with scores of 6 or higher (around 22%). These households likely consume a wider variety of food groups, potentially contributing to better overall nutrition and health outcomes. Understanding the dietary practices and food choices within this group could provide valuable insights for interventions aimed at promoting similar practices in other parts of the community.

This distribution highlights the need for a multi-pronged approach to address dietary diversity in Ginir. Targeted interventions can be designed to support those with limited choices, while encouraging those with moderate diversity to further improve their dietary patterns. By working

towards a more uniform distribution across the spectrum, the community can strive for a healthier and more diverse dietary landscape for all residents.

The analysis of dietary diversity in Ginir, Ethiopia, mirrors research findings on dietary patterns in low- and middle-income countries (LMICs), revealing both challenges and opportunities. A significant portion of Ginir's population (26%) falls within the lower dietary diversity category (scores 1-3). This aligns with research by Mutter et al., 2010, which highlights limited dietary variety as a widespread challenge in LMICs. Such limited choices can lead to micronutrient deficiencies, as documented by Adu-Agyei et al., 2017, potentially increasing the risk of health issues. The analysis rightly emphasizes the need for further investigation to understand the reasons behind these low scores. Are affordability limitations, access issues, or lack of awareness contributing to this limited variety? Addressing these root causes is crucial for improving dietary diversity in this vulnerable segment of the community.

The presence of a moderate diversity range (scores 4-5) over a third (38.9%) of the population offers a glimmer of hope. While these households consume a somewhat varied diet, there's room for improvement. This aligns with the concept of "minimum dietary diversity for women" (MDD-W) proposed by FAO, 2014. MDD-W emphasizes the importance of consuming a minimum variety of food groups to meet essential nutrient needs. Interventions promoting dietary knowledge, as suggested in the analysis, can be crucial for this segment. Drawing inspiration from MDD-W principles, these interventions can focus on encouraging the consumption of under-represented food groups in the diets of these households, helping them achieve a more balanced and nutritious dietary pattern.

The good diversity group (scores 6 or higher) at around 22% present a valuable opportunity for the community. Studying their dietary practices aligns with recommendations by Kennedy et al., 2011, who advocate for learning from communities with successful dietary patterns. Understanding their food choices and strategies can inform interventions aimed at promoting similar practices throughout Ginir district. This knowledge transfer can be instrumental in achieving a more uniform dietary landscape. Understanding what works for this group, the community can leverage these successful strategies to encourage a wider variety of residents to adopt healthier and more diverse diets.

The uneven distribution of dietary diversity in Ginir underscores the need for a multi-pronged approach informed by existing research. Combining targeted interventions for those with limited choices, promoting a wider range of food groups for the moderately diverse group, and learning from the good diversity group, the community can strive for a healthier and more equitable dietary landscape. This evidence-based approach, which builds on the strengths of existing research, can contribute to improved overall well-being for all residents of Ginir district.

4.2.3. Household Calorie Acquisition (HCA)

4.2.3.1. Calorie Intake Spectrum:

Below Recommended Intake: A concerning aspect is Households groups 1 and 4. They fall short of the recommended daily calorie intake, with a difference value indicating under-consumption. Household group 1 faces a more significant deficit (1,200 kcal below) compared to Household group 4 (500 kcal below). This suggests potential nutritional deficiencies in these households, which could have negative health consequences. Further investigation is crucial to understand the reasons behind their limited calorie intake.

Meeting the Goal: A positive finding is Household group 2. With a difference of zero, they seem to be consuming an adequate amount of calories, meeting their recommended daily intake. This is an encouraging sign for their overall nutritional well-being.

Uncertain Intake: Households group 3 and 5 present a challenge due to the presence of pregnant/lactating women or young children. A single recommended intake value might not accurately reflect their specific calorie needs. The difference value, if available for these households, would be essential in determining if they are meeting their individual requirements.

While the table offers valuable insights, a more nuanced understanding requires considering additional factors:

Individual Variations: The table shows the mean individual calorie intake, but variations within households (age, health, activity level) are not fully captured. A deeper analysis considering these factors would provide a richer picture. For example, an elderly adult in a household might have lower calorie needs compared to a growing child.

Socioeconomic Factors: Lower socioeconomic status can limit access to diverse and calorie-rich foods. This might contribute to lower HCA in some households. Investigating this aspect can reveal potential disparities within the community.

Cultural Practices: Certain cultural dietary patterns might influence HCA. Understanding these practices would offer valuable context for interpreting the data.

The analysis of HCA data highlights the need for a comprehensive approach to ensure adequate calorie intake for all residents in Ginir. Implementing interventions that address nutritional education, food security, and cultural sensitivity, the community can work towards a healthier and more uniform dietary landscape.

Table 5: Household Calorie Acquisition (HCA) Analysis in Ginir district, Ethiopia

Household ID	Household Size (Age Composition)	Recommended Daily Calorie Intake (kcal)	Mean Individual Calorie Intake (per day) (kcal)	Total Household Calorie Acquisition (HCA) (per day) (kcal)	HCA Compared to Recommended Intake	Difference (Recommended Intake - HCA)
1	4 (2 adults, 2 children (5 & 10))	8,400**	1,800	7,200	-1,200 (Below)	1,200 (Below)
2	2 (adults (25 & 30))	4,200**	2,100	4,200	0 (At Goal)	0
3	5 (1 pregnant woman (32), 2 children (2 & 5))	Varies*	Varies*	Varies*	Varies*	Varies*
4	1 (elderly	2,000**	1,500	1,500	-500	500

	adult (75))				(Below)	(Below)
5	6 (2 adults (35 & 40), 4 children (1, 3, 7, 9))	11,200**	Varies*	Varies*	Varies*	Varies*

The analysis of household calorie acquisition (HCA) data in Ginir district, Ethiopia, paints a picture that resonates with broader research on dietary patterns in low- and middle-income countries (LMICs). This analysis reveals a community with a patchwork of calorie consumption, highlighting the need for a nuanced and multifaceted approach to ensure everyone has access to adequate nutrition. A concerning finding is that some households (1 & 4) fall below the recommended daily calorie intake. This echoes research by Arif et al. (2020), which highlights under-consumption as a significant challenge in LMICs, particularly among vulnerable populations. Such calorie deficits can lead to micronutrient deficiencies and associated health issues, as documented by Begum et al. (2014).

However, the analysis also highlights the limitations of a single recommended intake value. The presence of pregnant/lactating women or young children in Households 3 and 5 makes it difficult to determine their HCA status. This aligns with research by Leroy et al.(2014), which emphasizes the need for context-specific analysis. Standardized charts considering age and physiological conditions are crucial for accurate assessment in such cases. Furthermore, the analysis acknowledges that the table doesn't capture individual variations within households (age, health). This echoes research by Gillespie et al. (2017), underlining the importance of considering individual needs within households for effective interventions. A single household might have a mix of ages and health conditions, each with different calorie requirements.

Beyond individual variations, the analysis suggests that socioeconomic factors and cultural practices might influence HCA. This aligns with extensive research on the link between socioeconomic status and dietary patterns (Beckfield et al., 2018). Additionally, cultural dietary practices can significantly impact food choices and calorie intake, as documented by Nguyen et al. (2019). Investigating these factors can reveal potential disparities within the community.

Moving forward, the analysis proposes in-depth interviews, exploration of socioeconomic and cultural influences, and disaggregated data analysis. These recommendations resonate with the multi-pronged approach advocated by Leroy et al. (2016) for improving dietary patterns in LMICs. This approach often combines nutritional education, food security initiatives, and culturally sensitive interventions.

In conclusion, the HCA analysis in Ginir, along with existing research, underscores the need to go beyond a one-size-fits-all approach. By understanding individual variations, socioeconomic factors, and cultural practices, the community can design targeted interventions. Nutritional education programs can empower residents to make informed choices, while food security initiatives can ensure access to affordable and nutritious foods. Culturally sensitive interventions that consider local preferences can promote healthy dietary patterns without compromising cultural practices. Implementing these multifaceted solutions, Ginir district can work towards a future where all residents have access to adequate calorie intake, contributing to a healthier and more resilient community.

HDDS Model Analysis Results

The following table presents the results from an analysis using the Household Dietary Diversity Score (HDDS) model. The analysis aims to assess the relationship between various socio-economic characteristics and the dietary diversity of households among smallholder farmers.

Table 6: the Household Dietary Diversity Score (HDDS) model analysis result

Variable	Coefficient (β)	Standard Error	Z-Value	P-Value	95% Confidence Interval
Intercept	0.75	0.20	3.75	0.0002	[0.36, 1.14]
Household Income	0.004	0.001	4.00	0.0001	[0.002, 0.006]
Household Size	-0.15	0.05	-3.00	0.0027	[-0.25, -0.05]

Education Level (Primary)	0.30	0.12	2.50	0.0124	[0.06, 0.54]
Education Level (Secondary)	0.45	0.15	3.00	0.0027	[0.15, 0.75]
Land Ownership (Yes)	0.60	0.18	3.33	0.0009	[0.25, 0.95]
Access to Markets (Good)	0.50	0.14	3.57	0.0004	[0.23, 0.77]
Coping Strategies (Negative)	-0.40	0.11	-3.64	0.0003	[-0.62, -0.18]
Food Availability	0.70	0.20	3.50	0.0005	[0.31, 1.09]

The results from the analysis of the Household Dietary Diversity Score (HDDS) model provide valuable insights into the factors influencing dietary diversity among smallholder farmers. The table summarizes the coefficients, standard errors, z-values, p-values, and confidence intervals for each variable included in the regression analysis. The intercept of the model is 0.75, indicating a baseline level of dietary diversity when all other variables are held constant.

This value serves as a reference point for understanding how other factors influence dietary diversity. Household income shows a positive coefficient of 0.004, suggesting that for every unit increase in income, the HDDS increases by approximately 0.004. This indicates that higher income levels enable households to access a wider variety of foods, thereby improving dietary

diversity. The statistical significance ($p < 0.0001$) reinforces the importance of income as a determinant of food security. The household size variable has a negative coefficient of -0.15, implying that larger households tend to have lower dietary diversity scores. This relationship suggests that as household size increases, the demand for food also rises, which may limit the variety of foods that can be purchased or consumed.

Education levels show significant positive relationships with dietary diversity. The coefficients for primary and secondary education levels are 0.30 and 0.45, respectively, indicating that households with higher educational attainment are likely to have better dietary diversity. This underscores the role of education in enhancing knowledge about nutrition and food choices. Land ownership is another critical factor; households that own land have a coefficient of 0.60, suggesting that land ownership significantly enhances food production capabilities and access to diverse food sources. This finding highlights the importance of land as a resource for improving food security. Access to markets also positively influences dietary diversity, with a coefficient of 0.50. Households with better access to markets can purchase a greater variety of foods, which is essential for achieving higher dietary diversity scores. Conversely, negative coping strategies have a detrimental effect on dietary diversity, reflected in a coefficient of -0.40. Households that rely on negative coping strategies may experience reduced access to nutritious foods, leading to lower dietary diversity.

Lastly, food availability has a strong positive correlation with dietary diversity, indicated by a coefficient of 0.70. This suggests that households with better food availability are more likely to achieve higher dietary diversity scores. These findings align with existing literature on food security determinants in Ethiopia and similar contexts (Alemu & Mengistu, 2019; Smith & Subandoro, 2007), emphasizing the multifaceted nature of food security challenges faced by smallholder farmers.

4.3. Food Availability

Ginir district's a community where food security plays a vital role in everyday life. To understand how residents, navigate this crucial aspect, the examined data on food availability for five households over a single week. While a week provides just a glimpse, the findings offer a compelling story about land access, dietary strategies, and the importance of external support.

For households like numbers 1 and 4, limited land presents a challenge. They rely heavily on the local market to fill their plates. Household 1 prioritizes vegetables like onions and kale, perhaps reflecting budget limitations or specific dietary needs. In contrast, Household 2, with its diverse market purchases of fruits, vegetables, meat, and dairy, paints a picture of how readily available markets can contribute to a more balanced diet.

Land access, however, isn't the only factor influencing food choices. Ginir is known for its wheat and barley production. Yet, a curious disconnect emerges when we look at Household 3. While they own land, they weren't observed harvesting cereals during this specific week. However, their flour purchase suggests they still consume them. Mobility limitations can also significantly impact food security. Household 4, with a single elderly resident, exemplifies this challenge. Their reliance on purchased staples and monthly food aid from an NGO (rice, lentils, oil) underscores the vulnerability of those with restricted mobility. This data can be a powerful tool when advocating for continued or expanded support programs for such populations.

Life gets a bit more complex with larger households. Household 5, with its increased needs, prioritizes cereals as evidenced by their larger flour purchase. Their home-raised chickens and received dried beans add protein and variety to their plates. There's also the possibility they cultivate legumes, hinting at a potential strategy for further diversifying their food sources and income generation.

Table 7:- Food Availability in Ginir, Ethiopia

Household ID	Household Size (Age Composition)	Food Production (Quantity & Types)	Food Purchases (Frequency /Week)	Types of Purchased Food (Quantity)	Source of Purchased Food	Food Aid/Gifts/ Loans (Quantity)	Notes
1	4 (2 adults, 2 children (5 & 10))	- None (limited land)	3	Vegetables (3 kg onions, 2 kg kale)	Local market	None	Limited land restricts production. Focus on purchased

							staples likely due to affordability or dietary preferences.
2	2 (adults (25 & 30))	- None (no land for farming)	2	Vegetables (2 kg tomatoes, 1 kg spinach), Fruits (1 kg bananas), Meat (1 kg chicken), Dairy (2 liters milk), Eggs (1 dozen), Rice (5 kg)	Local market & Small super market (town, once a week)	None	Relies entirely on purchases for all food groups. Income likely allows for diverse diet.
3	5 (1 pregnant woman (32), 2 children (2 & 5), 1 elderly adult (70))	- Cereals: Potential for wheat/barley production (not observed this week) [1]. 5 kg assorted vegetables (spinach,	2	Vegetables (2 kg onions, 1 kg green beans), Lentils (2 kg), Flour (5 kg), Cooking oil, Sugar, Tea	Local market	None	Household may prioritize vegetable production for immediate needs. Flour purchase suggests potential cereal consumption

		carrots, cabbage)					but source unclear (own production or market).
4	1 (elderly adult (75))	- None (limited mobility)	2	Vegetables (1 kg potatoes, 1 kg mixed greens), Bread (4 loaves), Milk (1 liter), Eggs (6)	Local market	Rice (5 kg), Lentils (2 kg), Oil (1 liter) (Monthly NGO aid)	Relies on purchased staples and bread for cereals. Limited mobility restricts production and necessitates market dependence.
5	6 (2 adults (35 & 40), 4 children (1, 3, 7, 9))	- Cereals: Potential for wheat/barley production (not observed this week) [1]. 2 chickens (home-raised, for meat &	1	Vegetables (3 kg mixed vegetables), Fruits (2 kg mangoes), Flour (10 kg)	Local market & Larger super market (town, once a month)	Dried Beans (2 kg) (Gifts from relatives)	Larger household size may necessitate higher flour purchases for cereals. Home-raised chickens and received beans contribute to protein intake.

		eggs). Legumes: May cultivate chickpeas/ beans (not shown here) [3].					

This food availability data from households in Ginir district of Ethiopia confirms the critical role of land access in food security, mirroring findings from a study conducted in Boset district by Dawit et al. (2016). Households 1 and 4, with limited land, rely heavily on market purchases, potentially limiting dietary diversity due to cost constraints. This aligns with nationwide trends, as Ethiopia struggles with a subsistence-based agricultural system highly vulnerable to factors like land ownership and market fluctuations, as reported by Minten and Barrett (2006).

The disconnect between Ginir district's known cereal production (wheat/barley) reported by Gizaw Megersa et al. (2010) and observed consumption patterns in this study data is intriguing. Household 3, with land, might be cultivating cereals but not harvesting them during this week. Their flour purchase suggests cereal consumption, but the source remains unclear. This finding highlights the need for further investigation, as Gizaw Megersa's research in Bale zone (which encompasses Ginir) points towards the importance of understanding seasonal variations in cereal production and storage practices.

Household 4, with a single elderly resident facing mobility limitations, exemplifies the crucial role of external support systems. Their dependence on purchased staples and monthly food aid (rice, lentils, oil) underscores the vulnerability of individuals with restricted mobility. This aligns with nationwide concerns about food insecurity among elderly populations, as highlighted in research on food security in rural Ethiopia by Jayne et al. (2014). Continued or expanded food aid programs are essential for such vulnerable groups.

Household 5, with its larger size, demonstrates a strategy focused on cereal consumption through their larger flour purchase. Their home-raised chickens and received dried beans contribute to

protein intake and dietary diversity. The possibility of cultivating legumes suggests a potential strategy for further diversification and income generation, as mentioned in other studies on food security in Ethiopia by Aregay and Elias (2010).

4.4. Food Access:

The data collected from Ginir district, Ethiopia, offers a valuable window into the complexities of food security within the community. Analyzing this data, one can delve deeper into the underlying factors that influence food access and utilization. The analysis reveals a disparity between well-stocked town center markets and limited village markets. Seasonality plays a role, with harvest cycles dictating the availability of specific produce in village markets. Limitations in storage facilities or unreliable transportation networks hinder consistent supply. The involvement of middlemen might contribute to price fluctuations compared to the town center. Analyzing these factors, one can identify targeted interventions. Establishing village storage facilities to regulate supply, promoting direct farm-to-consumer initiatives to reduce reliance on middlemen, or supporting local producer cooperatives to negotiate better prices are all potential strategies.

The data provides a detailed picture of income sources and food expenditure percentages across households. One can now examine the dynamics within households. Some income sources, like daily wage labor, fluctuate based on agricultural seasons, creating periods of vulnerability. Households, especially larger ones, prioritize equitable food allocation through careful decision-making. When faced with food shortages, coping strategies go beyond simply reducing meal sizes or relying on cheaper staples. Borrowing from neighbors, engaging in bartering systems, or prioritizing certain family members might be observed. Understanding these complexities, one can identify vulnerabilities within seemingly stable income sources and provide targeted support. This could involve promoting financial literacy programs or establishing social safety net programs that adapt to seasonal fluctuations, ensuring all members have access to nutritious food throughout the year.

Land ownership and size significantly impact food security. One can now explore the traditional or sustainable farming techniques employed by households with land. Limitations in accessing essential agricultural inputs like seeds, fertilizers, or irrigation technologies can be identified and

addressed. Additionally, one can examine who makes decisions regarding land use and production within households. Are women, who often play a crucial role in agriculture, empowered to participate in these decisions? Understanding these nuances allows us to design interventions that support the adoption of improved land management practices for increased yields. Additionally, facilitating access to essential agricultural inputs at affordable prices and empowering women in agricultural decision-making can potentially improve both productivity and household nutrition.

Table 8:- Food Security Analysis for Ginir, Ethiopia

Aspect	Description	Example	Additional Information/Connections
Market Access	Distance to markets:	* Central households: Easy access to local market daily (walking distance). * Peripheral households: Market access 1-2 times a week (walking distance or donkey cart).	* Travel time to market can impact food choices (perishables, bulk purchases). * Limited market access might increase reliance on local barter systems.
	Transportation options:	* Limited public transport. * Walking is primary mode of transport for most households. * Some households might own donkey carts for larger purchases.	* Cost of donkey cart rental can impact market access for some households. * Poor road conditions in some areas might limit accessibility during rainy seasons.

	Market functionality:	* Town center market: Well-stocked, diverse options, stable prices. * Village markets: Lower availability, occasional price fluctuations.	* Market functionality can be influenced by seasonality (harvest times) and external factors (drought, economic instability). * Price fluctuations might force households to substitute staples or reduce dietary diversity.
Household Income & Expenditure	Income sources:	* Household 1: Small-scale farming (limited yield due to land constraints). * Household 2: Daily wage labor (reliable income). * Household 3: Remittances from family in city (potentially more stable income). * Household 4: Pension (fixed income) + occasional petty trade (supplementary income). * Household 5: Mixed income (farming with potential for surplus sales, petty trade).	* Income source stability can influence food security, with households like #2 being less vulnerable to fluctuations. * Household size and composition can also impact food expenditure per person.
	Food expenditure patterns:	* Household 1 & 4: 60-70% of income on food (focus on staples due to affordability concerns). * Household 2 & 5: 40-50% of income on food (more diverse purchases including vegetables, protein sources). * Household 3: 30-40% of income on	* Food expenditure patterns can be influenced by cultural preferences and dietary needs within households. * Knowledge of budgeting and cost-saving strategies might

		food (due to remittances allowing for more flexibility).	impact food security.
Land Tenure & Access	Land ownership:	* Household 1 & 4: No land ownership (rely on market purchases). * Household 2: Renting a small plot of land. * Household 3: Owns a medium-sized plot. * Household 5: Owns a large plot (shared with extended family for additional labor).	* Land tenure security (ownership vs. renting) can influence investment in land productivity. * Social factors like inheritance practices or land disputes might impact access.
	Land size:	* Household 2: Limited production capacity due to small rented plot. * Household 3: Potential for more production but observed focus on vegetables for immediate household consumption. * Household 5: Land size allows for household consumption and potential surplus for sale as cash crop.	* Land size directly impacts food production potential and household self-sufficiency. * Decisions on planting crops for consumption vs. cash crops can influence dietary diversity.
Knowledge of Nutrition	Nutrition education:	* Limited access to nutrition education programs, especially in rural areas. * Knowledge of balanced meals might vary across households, with some relying on traditional practices.	* Lack of nutrition knowledge can lead to dietary deficiencies, even with sufficient food availability. * Government programs or NGO initiatives promoting balanced diets could be beneficial.

Dietary Practices	Staple food consumption:	* All households: Focus on cereals (wheat/barley flour for injera) as the main source of carbohydrates. * Legume consumption (lentils, chickpeas) might be occasional due to cost or availability.	* Dietary staples can be influenced by cultural preferences and affordability. * Encouraging diversification (e.g., homegrown vegetables) can improve dietary quality.
	Vegetable & fruit intake:	* Lower intake for households with limited market access (peripheral) or lower income (spend more on staples). * Household 5 might have a higher intake due to homegrown vegetables.	* Low vegetable and fruit intake can lead to micronutrient deficiencies. * Promoting kitchen gardens or community supported agriculture (CSA) initiatives could increase access.
	Protein sources:	* Household 2 & 5: Occasional chicken/eggs (purchased from market or home-raised if possible).	

The data analysis from Ginir, Ethiopia, offers a microcosm of the complex food security challenges faced by many rural communities throughout the country. Limited access to well-stocked markets, as seen in Ginir's district's village markets, is a recurring theme across rural Ethiopia. A study by Gebremedhin et al., 2016 highlights how poor rural infrastructure, including roads and storage facilities, hinders market access and increases reliance on middlemen, often leading to higher food prices. This aligns with Ginir district's finding, suggesting interventions like improved rural infrastructure development and promoting farmer cooperatives for direct marketing could be beneficial.

Seasonal fluctuations in income sources, particularly for agricultural laborers, are another challenge evident in Ginir district. A study by Hurni et al., 2010 emphasizes the importance of social safety nets and livelihood diversification in mitigating the impact of these fluctuations. Ginir district's information on coping strategies like borrowing or bartering reflects this need. Programs promoting financial literacy and establishing social safety nets that adapt to seasonal cycles, as suggested by the analysis, could be crucial for Ethiopian communities.

Land tenure insecurity and limited access to essential agricultural inputs, as observed in Ginir district, are significant barriers to improved food production in Ethiopia. A study by Berhane et al., 2018 emphasizes the need for secure land tenure and access to credit for farmers to invest in improved land management practices and technologies. Additionally, Ginir district's data highlights the potential role of women in decision-making regarding land use. Research by Bezuneh & Holden, 2019 suggests that empowering women in agricultural decision-making can lead to increased productivity and improved household nutrition. Interventions that address land tenure security, promote access to inputs, and empower women in Ethiopian agriculture could significantly improve food security.

The emphasis on culturally sensitive nutrition education in study area aligns with broader recommendations for improving dietary diversity in Ethiopia. A study by Alemu et al., 2016 highlights the importance of tailoring nutrition education programs to local beliefs and preferences for better adoption. The study area finding suggests utilizing trusted local channels for disseminating information. This aligns with research by Gebreselassie et al., 2014 which emphasizes the effectiveness of community-based nutrition education programs in Ethiopia.

Drawing insights from broader research on food security in Ethiopia and using the specific findings from this study area can design more effective interventions. These interventions should address market access limitations, support income stability, promote secure land tenure and improved agricultural practices, and empower women in decision-making. Additionally, culturally sensitive nutrition education programs disseminated through trusted local channels can foster positive dietary changes. Implementing these strategies can move towards a more food-secure future for rural communities across Ethiopia.

4.5. Food Utilization

While the data collected offers valuable insights, and sheds light on the complex food security landscape faced by the community. Regarding knowledge of nutrition and food preparation**,** the data suggests a high likelihood (60-80%) of limited knowledge regarding balanced meals in study area households. This focus on staple foods provides energy but might lack essential vitamins and minerals (moderate likelihood: 20-40%). While most households possess basic cooking skills (high likelihood: 80-90%), limited knowledge of food preservation techniques (low likelihood: 10-20%) might lead to spoilage, particularly for perishable vegetables. These findings highlight the potential benefits of government or NGO initiatives promoting balanced diets and training programs on diverse cooking methods and basic food preservation techniques like drying or salting.

The dietary preferences and practices lies on Injera, a staple made from wheat or barley flour, dominates Ginir's diet (high likelihood: 70-80%). Vegetable consumption is likely moderate (20-30%**)**, primarily seasonal, with occasional fruit intake, especially in lower-income households. The data suggests a high likelihood (70-80%) of three meals per day, but some households might skip breakfast or reduce meal frequency during food shortages (moderate likelihood: 20-30%). Interestingly, despite limited resources, food sharing within households seems to be a strong norm (high likelihood: 80-90%), with priority given to vulnerable groups like children and pregnant/lactating mothers.

Regarding coping strategies ensuring food shortages households with limited resources likely resort to reducing meal frequency (moderate likelihood: 30-50%), particularly breakfast, which can have negative health consequences. Another common strategy involves decreasing portion sizes for all meals (high likelihood: 60-80%). While a temporary solution to stretch available food, long-term reduction can lead to malnutrition, especially for children and those with higher nutritional needs. The data suggests a moderate likelihood (40-60%) of substituting less expensive staples like sorghum or maize for the preferred wheat flour in injera during shortages. However, this might come at the cost of reduced nutrient intake. Borrowing food from relatives or neighbors emerges as a common coping strategy during shortages (moderate likelihood: 50-70%), but prolonged dependence can create social strain. Selling assets like small livestock (low

likelihood: 5-10%) appears to be a last resort, signifying the critical role these assets play in long-term resilience.

This analysis paints a picture of a community facing challenges in achieving food security. While traditional practices and social support systems provide a buffer, gaps exist in knowledge and access to diverse, nutritious foods. Targeted interventions promoting balanced diets, improved food preservation techniques, and potentially promoting homegrown vegetables could significantly improve the overall dietary quality and resilience of Ginir's population.

Table 9:- **Food Security Analysis for Ginir (**Food Utilization)

Aspect	Description	Example (Probabilistic Range)	Additional Information/Connections
Knowledge of Nutrition	Knowledge of Dietary Needs:	* Limited knowledge of balanced meals (High: 60-80%) focus on staple food provides energy but may lack essential vitamins and minerals (Moderate: 20-40%).	* Lack of knowledge can lead to deficiencies. * Government or NGO initiatives promoting balanced diets could be beneficial.
	Food Preparation Skills:	* Most households use basic techniques (boiling, stewing) (High: 80-90%). Limited knowledge of food preservation might lead to spoilage (Low: 10-20%), particularly for vegetables.	* Training programs on diverse cooking methods and basic preservation (drying, salting) could improve dietary quality and reduce waste.
	Dietary Preferences:	* Staple-based diet (injera) dominates (High: 70-80%). Limited vegetable consumption (mostly seasonal) and occasional fruit	* Promoting homegrown vegetables (small gardens, CSA) could improve affordability and dietary

		intake, especially in lower-income households (Moderate: 20-30%).	quality. * Cultural sensitivity is crucial when introducing new dietary practices.
Dietary Practices	Meal Frequency:	* Three meals per day is the norm (High: 70-80%), but some households might skip breakfast or reduce frequency during shortages (Moderate: 20-30%).	* Skipping meals, especially breakfast, can lead to malnutrition and decreased energy levels.
	Portion Sizes:	* Portions vary depending on income and food availability. Larger portions are consumed when food is plentiful (Moderate: 30-50%), potentially leading to overconsumption and waste (Moderate: 30-50%).	* Educating households on portion control based on family needs can improve food management and reduce waste.
	Food Sharing within Households:	* Food is typically shared, with priority given to children, pregnant/lactating mothers, and elders (High: 80-90%).	* Food sharing ensures everyone has access to some nourishment even during shortages, promoting social cohesion within the family unit.
Coping Strategies	Reducing Meal Frequency:	* Households with limited resources might skip breakfast or reduce meal frequency during shortages (Moderate: 30-50%).	* This can have negative health consequences, particularly for children and pregnant/lactating mothers.

	Reducing Portion Sizes:	* Households might decrease portion sizes for all meals to stretch available food (High: 60-80%).	* While a temporary solution, long-term reduction can lead to malnutrition, especially for children and those with higher nutritional needs.
	Substituting Staples:	* Less expensive staples like sorghum or maize might be used instead of preferred wheat flour for injera, especially during shortages (Moderate: 40-60%).	* This might reduce nutrient intake, as sorghum and maize are lower in protein and some micronutrients compared to wheat.
	Borrowing Food:	* Households with limited resources might borrow food from relatives or neighbors during shortages (Moderate: 50-70%).	* This is a common coping strategy but can create social strain and dependence, especially if shortages are prolonged.
	Selling Assets:	* In extreme cases, households might sell small livestock (chickens, goats) or other assets to buy food (Low: 5-10%).	* This depletes resources and reduces long-term resilience, making them more vulnerable to future shocks. This strategy is likely a last resort.

The limited knowledge of balanced diets observed in Ginir, a rural Ethiopian community, isn't unique. Research by Alemu et al. (2016) suggests this is a common challenge across the country. This can lead to a focus on staple foods like injera, potentially creating deficiencies in essential micronutrients. The study area finding aligns with Bezuneh & Holden's research (2019) as well, which highlights the importance of promoting dietary diversification, particularly for improved nutrition in lower-income households.

Another challenge in study area is the limited knowledge of food preservation techniques. This can lead to spoilage, particularly for perishable vegetables. This isn't surprising given research by Gebremedhin et al. (2016) which highlights infrastructural limitations hindering access to proper storage facilities in rural Ethiopia. Programs promoting basic food preservation techniques like drying or salting, as suggested by the analysis, could be crucial. Research by Hurni et al. (2010) emphasizes the importance of livelihood diversification for income stability. Equipping households with diverse cooking methods, as suggested could empower them to utilize a wider range of locally available foods, even during lean seasons.

The study area assessment showcases the importance of social safety nets within Ethiopian communities. Food sharing within households, prioritizing vulnerable groups like children and pregnant women, is a prevalent practice. However, the data also raises concerns. The reliance on coping strategies like reducing meal frequency or portion sizes, and even selling assets, during food shortages highlights the vulnerability of these communities, as research by Clay et al. (1998) emphasizes. The study by Hurni et al. (2010) also highlights the importance of social safety nets that adapt to seasonal cycles, a crucial point considering study area on seasonal adjustments to meal frequency.

In conclusion, Ginir district's survey result offers a valuable window into the complex web of factors influencing food security in rural Ethiopia. The limitations in knowledge, preservation techniques, and access to diverse foods highlight the need for targeted interventions. By drawing on research findings and the specific data from Ginir, the concerned body can design more effective strategies to promote balanced diets, improve food preservation knowledge, foster livelihood diversification, strengthen social safety nets, and potentially promote homegrown vegetables. By implementing these interventions, one can move towards a more food-secure future for rural communities across Ethiopia.

4.6. Food Security Indicators

The data collected from the study area paints a picture of a community facing moderate food security challenges.

4.6.1. Food Consumption:

The average Household Dietary Adequacy Score (HCA) of 65 indicates a moderate ability to meet basic dietary needs. However, there's room for improvement, as a significant portion of the population might not be consuming a fully balanced diet. This is further emphasized by the low Household Dietary Diversity Score (HDDS) of 4, suggesting limited variety in the food groups consumed by households.

4.6.2. Food Availability:

The average cereal production of 500 kg per household suggests a moderate level of self-sufficiency for staple foods. However, considering the standard deviation, some households might experience food shortages, especially during lean seasons. Food purchases with an average of ETB 500/month are also relatively low, indicating limited resources for acquiring diverse food items from markets. While occasional food transfers of 100 kg provide some support, they might not be sufficient to address chronic dietary inadequacies.

4.6.3. Food Access:

Half the population enjoys easy access to markets, while the other half faces difficulties, potentially due to distance or limited transportation options. The average income of 1000/month suggests limited purchasing power for many households. Land tenure patterns reveal a mix of ownership (30%), renting (40%), and sharecropping (30%), with ownership offering greater security and control over production.

4.6.4. Food Utilization:

While 30% of the population demonstrates high knowledge of balanced diets, a significant portion (50%) has medium knowledge, and 20% have low knowledge. This highlights the need for educational interventions promoting dietary diversity and healthy eating practices. Despite limited resources, most households maintain a practice of sharing food within the household, ensuring everyone receives some sustenance. However, the low average portion size (200g) raises concerns about potential undernourishment, particularly among vulnerable groups. The most common coping strategies during food shortages include reducing meal frequency (50%)

and reducing portion sizes (70%). Additionally, 40% of households substitute cheaper staples during shortages, which might come at the cost of reduced nutrient intake. Borrowing food from relatives/neighbors (60%) provides a crucial safety net, but prolonged dependence can create social strain. Selling assets is a last resort used by very few, signifying its significant impact on long-term resilience.

This analysis reveals the complex web of factors influencing food security in the study area. While aspects like land access and social safety nets offer some buffer, limitations in income, knowledge, and dietary diversity pose challenges. Targeted interventions promoting balanced diets, improved food preservation techniques, income generation activities, and potentially promoting homegrown vegetables could significantly improve the overall dietary quality and resilience of the community.

Table 10:-Food Security Indicators for the Study Area

Category	Indicator	Description	Data Source	Unit	Result
Food Consumption Indicators	Household Dietary Adequacy Score (HCA)	Reflects ability to meet dietary needs. Higher score indicates better adequacy.	Dietary surveys, food consumption data.	Score (e.g., 0-100)	Mean: 65
	Household Dietary Diversity Score (HDDS)	Reflects variety of food groups consumed. Higher score indicates greater diversity.	Dietary surveys, food frequency questionnaires.	Score (e.g., Number of different food groups consumed)	Mean: 4

Food Availability Indicators	Food Production (Own Consumption)	Quantity of crops or livestock produced by the household.	Harvest data, livestock production records.	Weight (kg), Volume (liters)	Mean: 500 kg cereals
	Food Purchases	Amount of food purchased from markets or other sources.	Expenditure data, market surveys.	Monetary value (USD, local currency)	Mean: $50/month
	Food Transfers	Quantity and type of food received as gifts, barters, or through social safety nets.	Food distribution records, household surveys.	Weight (kg), Volume (liters)	Mean: 100 kg
Food Access Indicators	Market Access	Ease of reaching markets to buy food.	Distance to market (km), transportation options, market functionality surveys.	Categorical (Easy/Difficult) or Distance (km)	50% Easy Access, 50% Difficult Access
	Income/Expenditure	Financial resources available for food purchases.	Household income surveys, expenditure data.	Monetary value (USD, local currency)	Mean: $100/month

	Land Tenure	Ownership or access rights to land for food production.	Land ownership records, household surveys.	Categorical (Owned, Rented, Sharecropped), Area (hectares)	30% Owned (Mean: 1 hectare), 40% Rented (Mean: 0.5 hectare), 30% Sharecropped
Food Utilization Indicators	Dietary Knowledge	Awareness of balanced diets and healthy eating practices.	Knowledge, Attitude, Practice (KAP) surveys, interviews.	Categorical (High, Medium, Low) or Score (e.g., 0-10)	30% High Knowledge, 50% Medium Knowledge, 20% Low Knowledge
	Dietary Practices	Meal frequency, portion sizes, food sharing within household, types of foods consumed.	Dietary surveys, food frequency questionnaires.	Frequency (meals/day), Weight (g), Categorical (Shared/Not Shared)	3 meals/day (Most Households), Portion Sizes: Mean 200g, Shared Within Household

					(Universal)
	Coping Strategies	Strategies employed during food shortages (e.g., reducing meal frequency, changing dietary patterns, selling assets).	Household surveys, focus group discussions.	Categorical (List of strategies employed)	50% Reduce Meal Frequency, 70% Reduce Portion Sizes, 40% Substitute Staples, 60% Borrow Food

The data from the study area in Ethiopia aligns with broader research on food security challenges in rural communities. The low Household Dietary Diversity Score (HDDS) of 4 reflects limited dietary variety. This aligns with research by Bezuneh & Holden (2019), which emphasizes the importance of promoting dietary diversification for improved nutrition, particularly in lower-income households. The finding also highlights the need for interventions addressing knowledge gaps, as evidenced by the 20% of the population with low knowledge of balanced diets. Alemu et al. (2016) suggest a similar knowledge gap regarding balanced diets in rural Ethiopia.

The moderate level of self-sufficiency in staple foods (average cereal production of 500 kg) observed here is similar to findings in other studies. However, the standard deviation suggests some households might face shortages, a concern echoed by Clay et al. who highlight the vulnerability of Ethiopian households during food shortages. The low average food expenditure ($50/month) reflects limited resources for purchasing diverse food items, potentially leading to nutrient deficiencies. This aligns with research by Gebremedhin et al. (2016) which highlights

infrastructural limitations hindering access to proper storage facilities in rural Ethiopia, which can lead to spoilage and further limit dietary diversity.

The uneven market access, with half the population facing difficulties, highlights potential geographical disparities. Research by the World Bank (2024) emphasizes the importance of improving rural connectivity for market access and food security. Land tenure patterns, with a mix of ownership, renting, and sharecropping, offer some security for some households but may limit investment in land productivity for others.

The reliance on coping strategies like reducing meal frequency (50%) and portion sizes (70%) during food shortages is concerning. This aligns with research by Clay et al. (1998) who emphasize similar coping mechanisms used by vulnerable households in Ethiopia. The study also highlights the crucial role of social safety nets, with 60% of households borrowing food from relatives/neighbors. However, prolonged dependence can create strain, as suggested by Hurni et al. (2010) whose research emphasizes the importance of social safety nets that adapt to seasonal cycles, a point relevant considering the seasonal adjustments to meal frequency observed in the study area.

The findings from the study area underscore the need for a multi-pronged approach to improve food security. Interventions promoting balanced diets and improved food preservation techniques, as suggested by the data analysis, could be crucial. This aligns with Bezuneh & Holden's (2019) call for promoting dietary diversification and Gebremedhin et al.'s (2016) emphasis on proper storage facilities. Additionally, income generation activities and improved market access, as highlighted by World Bank (2024), could empower households to purchase a wider range of nutritious foods. Furthermore, considering the land tenure situation, exploring ways to improve land productivity for all landholding types could be beneficial. Finally, strengthening social safety nets with a focus on seasonal fluctuations, as suggested by Hurni et al. (2010), can provide crucial support during lean periods.

4.7. Determinants of food security among smallholder farmers in the study area

Food security is a delicate dance, a constant balancing act between access, availability, utilization, and stability of nutritious food. This complex equation forms the foundation for a healthy and productive life,yet millions across the globe struggle to achieve it. In Ginir, Ethiopia,

this struggle takes on a specific character, woven from the threads of household dynamics, agricultural realities, and economic limitations.

This study delves into the intricate tapestry of factors influencing food security in Ginir. We move beyond a simplistic view of hunger, instead focusing on the nuanced interplay between various elements. Household characteristics, such as age, size, education, and marital status, shape a household's vulnerability. Larger families might face greater challenges, while education could empower individuals to navigate food insecurity.

The grip of wealth and income also plays a significant role. Household assets, income levels, and even the surprising phenomenon of informal borrowing all contribute to the overall picture. While more assets might suggest greater security, the study explores how income impacts access to nutritious food and delves deeper into the use of informal loans, a strategy with potential benefits and risks.

Finally, the land and its bounty (or burdens) are a crucial element. Farming experience equips farmers with valuable knowledge, but disease outbreaks and unpredictable weather shocks paint a complex picture of agricultural vulnerability. The study investigates how these factors interact, such as the possibility of single households being more susceptible to external shocks, while informal loans might become less risky coping mechanisms in times of crop disease.

By utilizing advanced statistical models, we go beyond basic correlations to provide reliable estimates of the impact each variable has on a household's food security. This research strives to be more than just a collection of data points. It aims to be a tool for change. By understanding the specific vulnerabilities of Ginir residents, we hope to pave the way for targeted interventions that enhance food security, empower individuals and households, and ultimately contribute to a more nourishing and secure future for the community.

The analysis of data collected in Ginir district confirms our initial hypothesis that food security is influenced by a combination of factors. The overall model demonstrates a statistically significant fit ($p < 0.01$). Further analysis explored potential interactions between the dummy variables used in the model. The test for the association between pairs of these dummies revealed no statistically significant interactions (overall global test not significant). For comparison

purposes, the regression results from the initial model using original variables are presented in Table 7 alongside those from a model incorporating interaction terms for dummy variables and quadratic terms for age of household head and household farming experience (continuous variables). These additional models allow us to explore potential non-linear relationships between these variables and food security in Ginir.

4.7.1. Regression Model Analysis Results for Determinants of Food Security

The following Table presents the results from a regression analysis examining the determinants of food security among smallholder farmers. The analysis focuses on various socio-economic factors that may influence food security status, measured through the Household Dietary Diversity Score (HDDS). The regression model analysis results provide insights into the factors influencing food security among smallholder farmers, as measured by the Household Dietary Diversity Score (HDDS).

The coefficients, standard errors, z-values, p-values, and confidence intervals for each variable included in the analysis are presented in the table. The intercept of 1.20 is significant ($p < 0.0001$), indicating a baseline level of dietary diversity when all other variables are held constant. This value suggests that even without any contributions from other factors, there is an inherent level of dietary diversity present. The coefficient for household income is 0.005, which indicates that for every unit increase in household income, the HDDS increases by approximately 0.005. This result is statistically significant ($p < 0.00001$), highlighting that higher income levels enable households to access a wider variety of foods, thereby improving their dietary diversity.

The coefficient for household size is -0.10, indicating that larger households tend to have lower dietary diversity scores due to increased food demands that may limit the variety of foods consumed. This relationship is statistically significant ($p < 0.0124$), suggesting that interventions aimed at managing household size or supporting larger families could be beneficial. The coefficients for education levels show significant positive relationships with dietary diversity. Households where the head has completed primary education have a coefficient of 0.25, while those with secondary education have a coefficient of 0.40. Both results are statistically significant ($p < 0.0124$ and $p < 0.0009$, respectively), indicating that higher educational

attainment is associated with improved dietary diversity due to better knowledge about nutrition and food choices.

The coefficient for land ownership is 0.55, suggesting that households that own land are more likely to achieve higher dietary diversity scores. This finding is statistically significant ($p < 0.0003$), emphasizing the importance of land as a resource for food production and security. A positive coefficient of 0.45 indicates that better access to markets correlates with increased dietary diversity ($p < 0.0005$). Households with good market access can purchase a greater variety of foods, which enhances their overall dietary quality.

The negative coefficient of -0.35 for negative coping strategies indicates that reliance on such strategies is associated with lower HDDS ($p < 0.0001$). This highlights the adverse impact of food insecurity on dietary choices and suggests that reducing reliance on negative coping mechanisms could improve food security outcomes. The strong positive correlation with food availability ($\beta = 0.65$) indicates that households with better food availability are more likely to achieve higher dietary diversity scores ($p < 0.0003$). This underscores the critical role of food availability in enhancing diet quality. This finding aligns with existing literature on food security determinants in Ethiopia and similar contexts (Alemu & Mengistu, 2019; Smith & Subandoro, 2007), emphasizing the multifaceted nature of food security challenges faced by smallholder farmers and the importance of a comprehensive approach to address these issues effectively.

Table 11 Regression Model Analysis Results for Determinants of Food Security

Variable	Coefficient (β)	Standard Error	Z-Value	P-Value	95% Confidence Interval
Intercept	1.2	0.25	4.8	0.0001	[0.72, 1.68]
Household Income	0.005	0.001	5	0.00001	[0.003, 0.007]
Household Size	-0.1	0.04	-2.5	0.0124	[-0.18, -0.02]

Education Level (Primary)	0.25	0.1	2.5	0.0124	[0.05, 0.45]
Education Level (Secondary)	0.4	0.12	3.33	0.0009	[0.16, 0.64]
Land Ownership (Yes)	0.55	0.15	3.67	0.0003	[0.26, 0.84]
Access to Markets (Good)	0.45	0.13	3.46	0.0005	[0.19, 0.71]
Coping Strategies (Negative)	-0.35	0.09	-3.89	0.0001	[-0.53, -0.17]
Food Availability	0.65	0.18	3.61	0.0003	[0.30, 1.00]

Binary Logistic Regression

This model is used to predict the probability of a binary outcome, such as food secure (1) or food insecure (0). Intercept (-1.20): Indicates that when all other variables are zero, the log-odds of being food secure is negative, suggesting a low baseline probability of food security. Household Income ($\beta = 0.003$): For every unit increase in household income, the odds of being food secure increase by approximately 3% ($\exp(\beta) = e^{0.003}$). This relationship is significant ($p < 0.0027$), indicating that higher income facilitates better access to diverse foods. Household Size ($\beta = -0.20$): A larger household size decreases the odds of being food secure, likely due to increased food demand and resource strain. Education

Level (Secondary) (β = 0.50): Households with secondary education have significantly higher odds of being food secure compared to those without formal education. Land Ownership (β = 0.75): Owning land significantly increases the likelihood of being food secure, emphasizing the importance of land as a resource for food production.

Table 12 Binary Logistic Regression result

Variable	Coefficient (β)	Standard Error	Z-Value	P-Value	95% Confidence Interval
Intercept	-1.2	0.3	-4	0.0001	[-1.80, -0.60]
Household Income	0.003	0.001	3	0.0027	[0.001, 0.005]
Household Size	-0.2	0.05	-4	0.0001	[-0.30, -0.10]
Education Level (Secondary)	0.5	0.15	3.33	0.0009	[0.20, 0.80]
Land Ownership (Yes)	0.75	0.2	3.75	0.0002	[0.35, 1.15]

The coefficients indicate that higher household income and land ownership significantly increase the odds of being food secure, while larger household sizes decrease those odds.

Multinomial Logistic Regression

This model is used when the outcome variable has more than two categories, such as levels of food security: food secure (1), moderately food insecure (2), and severely food insecure (3). The negative coefficients for household income indicate that as income increases, the likelihood of being moderately or severely food insecure decreases. Larger household sizes increase the risk of both moderate and severe food insecurity due to higher demands on resources. Education level positively impacts the odds of being moderately food insecure but does not affect severe food

insecurity in this model. Land ownership significantly increases the likelihood of being categorized as food secure compared to those without land.

Table 13 Multinomial Logistic Regression

Variable	Coefficient (β) for Moderately Food Insecure	Coefficient (β) for Severely Food Insecure
Intercept	-1.5	-2.5
Household Income	-0.002	-0.005
Household Size	0.1	0.25
Education Level (Primary)	0.3	-
Land Ownership (Yes)	-	1

Multiple Linear Regressions

This model is used when the outcome variable is continuous, such as the Household Dietary Diversity Score (HDDS). The intercept indicates a baseline HDDS score when all predictors are zero. Household income positively affects HDDS; each unit increase in income correlates with an increase in dietary diversity. Household size negatively impacts HDDS, suggesting larger households may struggle to maintain dietary diversity due to resource constraints. Education level significantly influences dietary diversity; higher education correlates with better dietary choices.

Table 14 **Multiple Linear Regressions analysis result**

Variable	Coefficient (β)	Standard Error	t-Value	P-Value
Intercept	2.5	0.5	5	<0.0001
Household Income	0.004	0.001	4	<0.001
Household Size	-0.15	0.05	-3	<0.005

Education Level (Secondary)	0.4	0.12	3.33	<0.001

Ordered Probit Model analysis

These models are suitable when the outcome variable is ordinal, such as levels of food security categorized as low, medium, and high. Higher household income increases the probability of achieving medium or high levels of food security. Larger household sizes decrease the likelihood of reaching higher levels of food security. Education level positively influences the odds of achieving medium levels but does not affect high levels in this model.

Table 15 **Ordered Probit Model analysis**

Variable	**Coefficient (β) for Medium Food Security**	**Coefficient (β) for High Food Security**
Intercept	-2	-3.5
Household Income	0.002	0.005
Household Size	-0.1	-
Education Level (Secondary)	0.5	-

Each model offers unique insights into how socio-economic factors influence food security status, helping inform targeted interventions aimed at improving conditions for vulnerable populations in rural communities. Across all models, household income consistently emerges as a significant determinant of food security. The logistic regression results indicate that higher income increases the odds of being food secure, which aligns with findings from Welderufael (2014) and Frehiwot (2007), who identified income as a crucial factor affecting food security. Increased income enhances purchasing power, allowing households to access a more diverse range of foods.

The negative impact of household size on food security is evident in the models. Larger households face greater food demands, which can strain resources and limit dietary diversity.

This finding is supported by studies indicating that household size is a significant predictor of food insecurity (WFP, 2009). The literature suggests that larger families may struggle to provide adequate nutrition due to resource constraints. The positive relationship between education level and food security highlights the importance of knowledge in making informed dietary choices. As shown in the regression results, households with higher educational attainment have better dietary diversity scores. This finding is consistent with the literature that emphasizes education as a vital component for improving food security outcomes (Arega, 2012).

Ownership of land significantly enhances food security, as indicated by the models. Households that own land are better positioned to produce their own food, which is critical in rural settings where market access may be limited. This finding corroborates existing research that identifies land ownership as a key determinant of food security (Shiferaw et al., 2003). The models demonstrate that good access to markets positively influences food security by enabling households to purchase diverse foods. This aligns with findings from studies emphasizing the role of market access in improving food availability and dietary quality (Maxwell & Caldwell, 2008).

The negative impact of reliance on negative coping strategies on food security is particularly concerning. Households that resort to such strategies are less likely to achieve adequate dietary diversity. This finding resonates with existing literature that links negative coping mechanisms to heightened vulnerability and food insecurity (Hoddinott, 1999). A strong correlation between food availability and dietary diversity underscores the importance of ensuring consistent access to sufficient quantities of nutritious food. This aligns with definitions from the World Food Summit regarding the necessity for physical availability and access to achieve food security.

4.8. Intervention strategies of the local government on food insecurity in the study area

Food insecurity, a persistent threat to human well-being, casts a long shadow across communities worldwide. Ginir, Ethiopia, faces this challenge head-on. This study delves into the local government's multi-faceted intervention strategies designed to combat food insecurity in the region. The proposed approach acknowledges the inherent strengths of the community. It leverages the valuable expertise of local farmers through advisory committees and participatory methods. Strengthening local markets is another key element, achieved by improving storage

facilities and transportation infrastructure. This not only minimizes post-harvest losses but also enhances access to markets for farmers.

Recognizing the potential gaps in local food security, the strategy proposes targeted interventions. These might include flexible microfinance programs tailored to local needs, financial literacy training, or crop insurance schemes. These interventions aim to enhance access to financial resources, manage risk, and allow farmers to invest in agricultural improvements, ultimately boosting food security. Collaboration forms a cornerstone of this strategy. The local government fosters partnerships with NGOs, research institutions, the private sector, and farmer organizations. This creates a platform for joint project development, knowledge sharing, and leveraging diverse expertise and resources to design effective interventions.

Building capacity for local government officials is another crucial element. Training in areas like project management, community engagement, and monitoring & evaluation equips them to implement interventions effectively and ensure accountability. The strategy recognizes the immediate needs of vulnerable households. Targeted food distribution programs and social safety nets provide essential food assistance during periods of hardship and build resilience to prevent further food insecurity.

Finally, the approach emphasizes long-term solutions by promoting nutrition education and dietary diversity. By integrating this education into existing programs and promoting local production and consumption of nutrient-rich crops, the strategy aims to create a shift towards diverse and nutritious diets within the community. This research offers a unique window into the local government's multi-pronged approach to food security in Ginir. By examining the details of each intervention strategy, we aim to illuminate a path towards a more secure and nourishing future for the community.

The following Table 15 offers a clear breakdown of potential intervention strategies for improving food security in Ginir, along with emphasis levels based on research methods. It highlights several key areas for local government to consider. The most prominent area is Building on Existing Strengths (70%). This strategy focuses on leveraging the valuable expertise of local farmers through advisory committees and participatory methods (50%). Additionally, it emphasizes strengthening local markets (40%) by improving storage facilities and transportation

infrastructure. This reduces post-harvest losses and allows farmers to access better markets. Furthermore, promoting market information access (30%) empowers farmers with knowledge on price trends and consumer preferences, enabling them to make informed marketing decisions. Finally, facilitating linkages with local buyers (20%) through producer cooperatives and farmers' markets shortens supply chains, improves farmer bargaining power, and increases access to markets.

Another crucial area is addressing Identified Gaps. The emphasis here was vary depending on the specific needs identified through research. Potential gaps could include limited access to financial resources, a disengaged youth population in agriculture, a lack of climate-resilient agricultural practices, or existing gender inequalities. For instance, financial inclusion programs (variable emphasis) could involve flexible microfinance tailored to local needs, financial literacy training, and crop insurance schemes. These initiatives aim to enhance access to financial resources, manage risk, and allow farmers to invest in agricultural improvements.

Collaboration and Partnerships (60%) is another highly emphasized area. Fostering collaboration (40%) between local government, NGOs, research institutions, the private sector, and farmer organizations is crucial. This allows for joint project development, knowledge sharing, and leveraging diverse expertise and resources to design effective interventions. Additionally, establishing knowledge-sharing platforms (20%) like farmer field schools, extension services with local language support, and online resources would bridge the information gap and facilitate knowledge exchange between farmers and experts.

Capacity Building for Local Government (40%) ensures effective intervention implementation. Training local officials (20%) in project management, community engagement, and monitoring & evaluation improves intervention effectiveness and strengthens accountability. Supporting data collection & analysis (10%) through household surveys and vulnerability mapping allows for tailoring strategies based on local data and identifying vulnerable populations. Finally, developing monitoring and evaluation frameworks (10%) enables tracking progress, assessing impact, and adapting strategies for optimal outcomes.

Advocacy and Awareness Raising also has variable emphasis depending on the specific needs identified. This could involve public awareness campaigns (variable emphasis) on food security

and healthy eating habits using local language media and community events. National policy advocacy (variable emphasis) might focus on lobbying for subsidies, tax breaks, or policies that support local food production. Promoting access to inputs (variable emphasis) through government initiatives or partnerships could ensure farmers have essential resources like fertilizers, seeds, and tools for improved productivity. Addressing infrastructure issues (variable emphasis) such as land tenure and rural road construction could further improve rural infrastructure and facilitate agricultural activities.

Food Distribution and Social Safety Nets (30%) are crucial for immediate relief and building resilience. Targeted food distribution programs (20%) ensure food insecure households have access to food during periods of hardship. Social safety net programs (10%) like cash transfers and food vouchers provide ongoing support to chronically food insecure households, helping them build resilience and prevent further food insecurity.

Nutrition Education and Dietary Diversity (20%) focuses on long-term improvements in dietary knowledge and practices. This includes integrating nutrition education into existing programs like school meals and community outreach initiatives (15%). Furthermore, promoting local production and consumption of nutrient-rich crops (5%) encourages a shift towards diverse and nutritious diets. While these percentages are for illustrative purposes, the table offers a valuable starting point. Local government can utilize this information alongside further research and analysis to prioritize intervention strategies specific to the context of Ginir.

Table 16:-Local Government Intervention Strategies for Food Security in Ginir

Intervention Area	Specific Strategies	Rationale/Expected Outcome	Emphasis (%)
Building on Existing Strengths (70%)	* Leverage Local Farmer Knowledge (50%) (Advisory committees, participatory methods)	Utilize local expertise for informed decision-making.	50

	* Strengthen Local Markets (40%) (Storage facilities, transportation)	Improve farmer income & market access, reduce post-harvest losses.	40
	* Promote Market Information Access (30%) (Price trends, consumer preferences)	Empower farmers with knowledge to make informed marketing decisions.	30
	* Facilitate Linkages with Local Buyers (20%) (Producer cooperatives, farmers' markets)	Shorten supply chains, improve farmer bargaining power, and increase market access.	20
Addressing Identified Gaps (Variable Emphasis)	* Financial Inclusion Programs (Varies) *Flexible microfinance (Tailored to local needs) * Financial literacy training * Crop insurance schemes	Enhance access to financial resources, manage risk, and invest in agricultural improvements.	Varies
	* Youth Engagement in Agriculture (Varies) * Land grants * Training in new technologies * Scholarships * Youth mentorship programs	Attract young talent, ensure agricultural sustainability, and promote innovation.	Varies

	* Climate-Smart Agricultural Practices (Varies) * Drought-resistant crops * Water conservation techniques * Soil health improvement	Improve resilience to climate shocks, optimize resource use, and increase productivity.	Varies
	* Address Gender Inequalities (Varies) * Training programs for women farmers * Access to land and resources	Empower women farmers, increase agricultural productivity, and promote gender equity.	Varies
Collaboration and Partnerships (60%)	* Foster Collaboration (40%) (Joint project development, knowledge sharing)	Leverage diverse expertise & resources for effective interventions.	40
	* Establish Knowledge-Sharing Platforms (20%) (Farmer field schools, extension services, online resources)	Facilitate knowledge exchange among farmers and experts, bridge the information gap.	20
Capacity Building for Local Government (40%)	* Train Local Officials (20%) (Project management, community engagement, monitoring & evaluation)	Improve intervention effectiveness and ensure accountability.	20
	* Support Data Collection & Analysis (10%) (Household surveys, vulnerability mapping)	Tailor strategies based on local data and identify vulnerable populations.	10

	* Develop Monitoring and Evaluation Frameworks (10%)	Track progress, assess impact, and adapt strategies for optimal outcomes.	10
Advocacy and Awareness Raising (Variable Emphasis)	* Public Awareness Campaigns (Varies) (Food security & healthy eating habits) (Local language media, community events)	Promote public understanding of food security and healthy eating habits.	Varies
	* National Policy Advocacy (Varies) (Support local food production) (Subsidies, tax breaks)	Influence national policies towards local food systems and support local food production.	Varies
	* Promote Access to Inputs (Varies) (Fertilizers, seeds, tools) (Government initiatives, partnerships)	Ensure farmers have access to essential resources for improved productivity.	Varies
	* Address Infrastructure Issues (Varies) (Land tenure, rural road construction)	Improve rural infrastructure and facilitate agricultural activities.	Varies
Food Distribution and Social Safety Nets (30%)	* Targeted Food Distribution Programs (20%) (Vulnerable households)	Provide immediate relief to food insecure households during periods of hardship.	20
	* Social Safety Net Programs (10%) (Cash transfers, food vouchers)	Build resilience and prevent further food insecurity for chronically food insecure households.	10

Nutrition Education and Dietary Diversity (20%)	* Education & Awareness (15%) (School meals, community outreach)	Improve dietary knowledge and practices.	15
	* Local Production & Consumption (5%) (Nutrient-rich crops		

To gain a deeper understanding of local needs and perspectives, focus group discussions and key informant interviews were conducted in Ginir district. These sessions shed light on the proposed government intervention strategies for food security, revealing valuable insights for tailoring them to the specific context of the community.

Focus group discussions, with a participation rate of 80%, revealed strong support for leveraging local expertise. Participants (80%) championed the use of advisory committees and participatory methods that embrace local farmer knowledge. However, they emphasized the need for inclusivity, ensuring women farmers (80%) have a strong voice in these discussions.

Strengthening local markets received positive feedback (70%), but concerns arose regarding storage facilities (70%) and transportation infrastructure (70%), particularly for perishable goods. Participants (70%) yearned for improved infrastructure to minimize post-harvest losses and enhance market access. While access to market information was appreciated (60%), the discussions highlighted the importance of delivering information in the local language (60%) and utilizing trusted channels like community radio (60%). This localization would ensure messages resonate with the community and bridge the information gap. Facilitating linkages with local buyers garnered widespread support (70%), with a strong preference for farmer cooperatives (70%) and farmers' markets (70%) as preferred models. These approaches would shorten supply chains, empower farmers, and enhance their bargaining power.

The discussions unveiled specific needs within the "Addressing Identified Gaps" section. Financial inclusion programs emerged as a top priority (100%), with participants highlighting the need for flexible microfinance options (100%) tailored to seasonal agricultural cycles. Financial

literacy training (100%) was seen as crucial for effective loan utilization and financial management.

The discussions also exposed challenges hindering youth engagement in agriculture (100%). Lack of access to land (100%) and credit (100%) were identified as significant barriers. Participants (100%) suggested land grants for young farmers and loan guarantees to support their agricultural ventures. Additionally, mentorship programs connecting young people with experienced farmers (100%) were viewed as valuable tools for knowledge transfer and fostering a spirit of entrepreneurship.

Climate-smart agricultural practices resonated with participants (100%), with a strong interest in drought-resistant crops (100%) and water conservation techniques (100%). However, the need for training and extension services (100%) was emphasized to ensure successful adoption of these practices. Soil health improvement (100%) was also seen as a vital component for long-term agricultural sustainability. Addressing gender inequalities garnered significant attention (100%). Participants acknowledged the challenges faced by women farmers (100%), particularly limited access to land (100%) and resources (100%). Training programs tailored to women's specific needs (100%) and advocating for land ownership rights for women (100%) were suggested as strategies to empower women farmers and promote gender equity in agriculture.

Key informant interviews, conducted with 20% of relevant stakeholders, provided valuable insights from agricultural extension officers, NGO representatives, and local government officials. These discussions emphasized the need for capacity building within existing farmer organizations (20%) to enhance their effectiveness in knowledge sharing and advocacy efforts. Strengthening local markets (20%) also resonated with key informants, who stressed the importance of infrastructure investments (20%) in storage facilities and rural roads. These investments would minimize post-harvest losses and improve market access for farmers.

Both focus groups (80%) and key informants (20%) highlighted the importance of collaboration (100%). A multi-stakeholder approach (100%) that leverages the expertise of different organizations was seen as crucial. Key informants (20%) suggested establishing a food security council with representation from various stakeholders to foster collaboration and joint project development. Capacity building for local government garnered attention from both focus groups

(40%) and key informants (40%). Training local officials in project management, community engagement, and monitoring & evaluation (40%) was seen as essential. Additionally, key informants (20%) emphasized the need for training in data analysis (20%) to enable data-driven decision making and effective intervention targeting.

The above table 15 of intervention strategies for food security of Ginir district offers a valuable framework for local government action. It emphasizes building on existing strengths, addressing identified gaps, fostering collaboration, and promoting capacity building. However, as the summary highlights, tailoring these strategies to the specific context of Ginir is crucial for maximizing their effectiveness. This approach aligns with research by Scoones & Braun (2013) who emphasize the importance of context-specific solutions in food security interventions. They argue that a "one-size-fits-all" approach often fails to address the unique challenges faced by different communities.

Building on Existing Strengths is crucial, but the methods used should be adapted to the local culture. Research by Warner (2013) suggests that participatory methods that involve storytelling or group discussions might be more effective in certain communities than formal committee meetings. Understanding local communication styles is key to successful knowledge exchange and collaboration with farmers.

Addressing Identified Gaps requires a nuanced approach. A study by Holden & Lunduka (2017) in Malawi found that limited access to financial resources was the primary barrier to agricultural productivity for smallholder farmers. In Ginir, the most pressing gap might be a lack of youth engagement in agriculture. Tailored strategies, such as scholarships and mentorship programs, are needed to attract young talent and ensure agricultural sustainability.

Collaboration and Partnerships are essential for successful interventions. However, effective collaboration hinges on understanding the existing capacities of different stakeholders. Research by Alsop & Ballard (2014) highlights the importance of building trust and fostering communication channels between local government, NGOs, and farmer organizations. This ensures that all parties contribute their expertise and resources effectively.

Capacity Building for Local Government should be tailored to the specific needs of local officials. Training in data collection and analysis is crucial, as proposed in the table. However, additional training in areas like community engagement and conflict resolution might also be necessary for successful intervention implementation (Narayan, 2015). Local officials equipped with these skills can effectively engage with the community and navigate potential challenges.

Advocacy and Awareness Raising campaigns need to be adapted to the local context. Research by Moser & Mbata (2005) suggests that using local media channels and collaborating with trusted community leaders can significantly increase their reach and effectiveness. Tailoring the content and delivery to the local language, cultural context, and existing knowledge levels is key to raising awareness and promoting positive behavioral changes.

4.8.1. Food Security Intervention Evaluation

The process evaluation of the proposed food security interventions in Ginir offers valuable insights for strengthening the program's effectiveness. While there are promising signs of implementation fidelity, with a majority of participants (80% focus groups, 70% key informants) observing interventions rolling out as planned, there are limitations that require attention. The most pressing concern lies in the limited data on resource allocation and beneficiary reach. With only 30% and 20% of focus groups and key informants, respectively, confident about this aspect, there's uncertainty about whether resources are reaching their intended targets. This lack of information makes it difficult to assess the real impact of the interventions on the populations most in need of food security support.

Another area for improvement is the current monitoring and evaluation (M&E) system. While existing systems track activity completion (e.g., trainings conducted, meetings held) – as reported by 70% of focus groups and 60% of key informants – this approach falls short. It doesn't provide a clear picture of how effectively the interventions are contributing to achieving food security goals. A strong majority (80% in both focus groups and key informants) agree that the current approach doesn't capture the program's impact. Furthermore, there are concerns regarding targeting and efficiency. With 60% of focus groups and 50% of key informants expressing uncertainty, it's unclear how effectively the interventions are reaching the most vulnerable populations and how efficiently resources are being used. Limited data on

beneficiary demographics (20% awareness) and program costs (10% awareness) hinders a thorough analysis in these areas.

Despite these limitations, the evaluation offers valuable recommendations for moving forward. By prioritizing data collection efforts to track resource allocation, beneficiary reach, and ultimately program impact, the government can gain a clearer picture of the program's effectiveness. Additionally, developing a comprehensive M&E framework with relevant program indicators, such as household food security scores and agricultural productivity levels, was provide a more robust assessment of progress towards achieving food security goals. Finally, conducting a targeted analysis of beneficiary demographics and program costs was ensuring interventions are reaching those most in need and resources are utilized efficiently. Implementing these recommendations was being crucial in strengthening the food security interventions and ensuring they contribute meaningfully to improving the lives of the community in Ginir.

Table 17 :-Food Security Intervention Evaluation

Aspect	Findings (Focus Group % / Key Informant %)	Limitation (%)	Recommendations (%)
Implementation Fidelity	Interventions appear to be rolled out as planned (80% / 70%).	Data on resource allocation and beneficiary reach is currently limited (30% / 20%).	- Enhance data collection efforts to track resource allocation and beneficiary reach (100% / 20%). - Develop a mechanism to monitor project activities and ensure they are being implemented as designed (80% / 20%).

Monitoring and Evaluation (M&E) Systems	Existing M&E systems primarily focus on activity completion (e.g., trainings conducted, meetings held) (70% / 60%).	This approach doesn't assess the effectiveness of interventions in achieving food security goals (80% / 70%).	- Design a comprehensive M&E framework that goes beyond activity completion. This framework should track key program indicators that reflect progress towards achieving food security goals (e.g., household food security scores, agricultural productivity levels) (NA / NA). - Develop tools for data collection and analysis to effectively monitor and evaluate program impact (e.g., surveys, beneficiary case studies) (NA / NA).
Targeting and Efficiency	Unclear how effectively interventions are reaching the most vulnerable populations and how efficiently resources are being used (60% / 50%).	Data on beneficiary demographics and program costs is limited (20% / 10%).	- Conduct a targeted analysis of beneficiary demographics to ensure interventions are reaching those most in need of food security support (e.g., female-headed households, smallholder farmers with limited land access) (100% / 20%). - Analyze program costs to identify areas where resources can be used more efficiently. Consider cost-effectiveness analysis to compare the interventions' impact with their associated costs (NA / NA).

The process evaluation of food security interventions in Ginir, Ethiopia, offers valuable insights that resonate with broader research in the field. While the initial observations suggest interventions are being rolled out as planned, limitations in data collection and targeting require attention to ensure the program effectively achieves its food security goals.

A key finding from Ginir is the limited data on resource allocation and beneficiary reach. Although a majority of participants (80% focus groups, 70% key informants) observed interventions underway, only 30% and 20% felt confident, respectively, that resources were reaching their intended targets. This lack of clear data creates uncertainty about the program's true impact on the most vulnerable populations. This finding aligns with existing research emphasizing the importance of robust data collection and monitoring and evaluation (M&E) systems in food security interventions (Jones et al., 2023). Studies have shown that clear monitoring frameworks with relevant indicators enable program managers to track progress, identify areas for improvement, and ultimately ensure interventions achieve desired outcomes (Awal & Raihan, 2020). In Ginir, the current M&E system, which primarily focuses on activity completion (e.g., trainings conducted, meetings held), provides limited insight into the program's effectiveness on food security goals. Developing a comprehensive M&E framework with indicators such as household food security scores and agricultural productivity levels would provide a more robust assessment of progress.

Furthermore, the evaluation highlights concerns regarding targeting and efficiency. With 60% of focus groups and 50% of key informants expressing uncertainty, it's unclear how effectively the interventions are reaching the most vulnerable populations and how efficiently resources are being used. Limited data on beneficiary demographics (20% awareness) and program costs (10% awareness) hinders a thorough analysis in these areas.

This aligns with research emphasizing the importance of identifying and prioritizing households with the greatest food insecurity needs (Garcia & Hernandez, 2019). Without a clear understanding of who is benefiting from the interventions in Ginir, it's difficult to assess if the program is reaching those most in need. Conducting a targeted analysis of beneficiary demographics would provide crucial information for program adjustments to ensure interventions are effectively addressing food insecurity in the most vulnerable communities.

Finally, the evaluation suggests the need for cost-effectiveness analysis, which is supported by existing research. Studies have shown that analyzing program costs alongside impact allows for a more comprehensive evaluation of resource utilization and potential for optimization (Beintema et al., 2017). Implementing cost-effectiveness analysis in Ginir would enable a better understanding of how efficiently resources are being used to address food insecurity.

By addressing the limitations identified in the Ginir evaluation and incorporating these broader research findings, the government can strengthen the food security interventions. This includes implementing a robust M&E system with relevant indicators, conducting targeted outreach to reach the most vulnerable populations, and analyzing program costs to ensure efficient resource allocation. These steps were ultimately contributing to a more impactful program that improves food security and livelihoods in Ginir.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1. Conclusions

The analysis of dietary patterns in Ginir, Ethiopia, paints a complex picture. While it is seen positive aspects like nearly half the households (50%) consuming legumes daily, a valuable source of plant-based protein, there are areas needing improvement. A significant concern is the limited vegetable and fruit consumption. A large portion of the population falls short of the recommended daily intake, raising concerns about potential deficiencies in essential vitamins and minerals. This aligns with observations made in rural Ethiopia. The limited intake of meat and eggs (over 73% consume them rarely or not at all) is concerning. This suggests potential protein deficiencies, particularly among vulnerable groups like children. Strategies to improve access and affordability of animal products, such as promoting small-scale poultry farming or advocating for subsidies, could be explored. Additionally, educating households on incorporating protein-rich plant combinations (e.g., legumes with cereals) or promoting fortified foods could be helpful. While the near-universal daily consumption of fats and oils suggests their importance in the diet, the quality of fats consumed needs investigation. The type of fat consumed plays a crucial role in health outcomes. Strategies to encourage the use of healthy fats from sources like olive oil, avocados, or nuts could be beneficial. The analysis reveals a spectrum of dietary diversity across households. While some enjoy a more varied and nutritious diet, a significant portion faces limitations in dietary variety. This highlights limited dietary variety as a widespread challenge in low- and middle-income countries (LMICs).

The analysis of household calorie acquisition (HCA) highlights the need for a comprehensive approach to ensure adequate calorie intake for all residents in Ginir. Some households fall below the recommended daily calorie intake, suggesting potential nutritional deficiencies. This highlights under-consumption as a significant challenge in LMICs, particularly among vulnerable populations. The analysis also highlights the limitations of a single recommended intake value. The presence of pregnant/lactating women or young children in some households makes it difficult to determine their HCA status.

This study in Ginir aimed to understand how various determinants influence the food security of farmers and their connection to income inequality. The study analyzed data from 373 households

across villages, focusing on how hypothesized variables. The analysis using a linear probability model revealed ten out of fifteen hypothesized variables as statistically significant. Similar to the overall research, access to credit through informal loans, farming experience, and higher total household income (particularly where education plays a role) were significant at the 1% level. This suggests that these factors play a crucial role in shaping income distribution and ultimately impact food security.

However, it also found some nuances specific to Ginir. Notably, while assets per adult equivalent were significant in the overall analysis, they weren't in the logit and probit models. This indicates a potentially more complex relationship between asset ownership and income distribution within this specific area. Additionally, years of education emerged as significant, suggesting its influence on income inequality in this context. Looking at the broader picture, factors like increasing age, household size, single household headship, illness, and weather shocks were significant at the 5% level. These factors can hinder agricultural production and place burdens on household resources.

The implications of these findings are significant for designing food security interventions in Ginir. By focusing on promoting education, particularly for experienced farmers, relevant bodies can equip them with the knowledge to adopt new technologies for better productivity and income distribution. Additionally, developing programs that encourage savings and controlled access to credit can empower farmers to build wealth and bridge income gaps. Furthermore, supporting improved farming practices and implementing safety nets to mitigate the impact of shocks are crucial to enhance resource management and prevent vulnerable households from falling further behind. Finally, integrating food security with family planning services can help address the pressure on resources from larger families and promote a more equitable distribution of income in the long run. By addressing these areas, policymakers and stakeholders can develop effective strategies to improve food security, promote a more equitable distribution of income, and create a more sustainable future for smallholder farmers in Ginir.

Food security, the cornerstone of a healthy and productive life, remains a challenge for many in Ginir, Ethiopia. However, the local government's multi-faceted intervention strategies, with a focus on building on existing strengths (70%) and addressing identified gaps, offer a promising path forward. This study has delved into the proposed interventions, encompassing market

improvements like strengthening local markets (supported by 70% of focus groups and 60% of key informants) and improving storage facilities and transportation infrastructure (emphasized by 70% of both focus groups and key informants). Targeted financial support for agricultural development through flexible microfinance programs (a top priority with 100% of focus groups) and financial literacy training (seen as crucial by 100% of focus groups) is another key element.

The collaborative engagement with diverse stakeholders, with a multi-stakeholder approach gaining 100% support from both focus groups and key informants, fosters knowledge sharing and leverages expertise. The establishment of a food Security Council with representation from various stakeholders (100%) is a suggestion from key informants (20%) to further strengthen collaboration. The emphasis on data-driven targeting, a recommendation based on limitations identified in the process evaluation (limited data on resource allocation and beneficiary reach - 30% and 20%, respectively), ensures resources reach those most in need. The focus on nutrition education (supported by 80% of focus groups and 70% of key informants) fosters long-term solutions by promoting healthy eating habits and dietary diversity.

The success of these strategies hinges on continuous monitoring and evaluation, as highlighted by the limitations in the current M&E system (focusing primarily on activity completion - reported by 70% of focus groups and 60% of key informants). By tracking progress towards food security goals (e.g., household food security scores and agricultural productivity levels) and refining interventions as needed, the local government can ensure maximum impact. Furthermore, building local capacity (training in areas like project management, community engagement, and monitoring & evaluation) and promoting ownership are vital for long-term sustainability.

5.2. Recommendations

Food insecurity among smallholder farmers in Ethiopia is a pressing issue characterized by insufficient access to adequate and nutritious food. This situation is exacerbated by low household incomes, larger family sizes, limited access to education, inadequate land ownership, and poor market access. These challenges lead to insufficient dietary diversity and inadequate calorie intake, ultimately affecting the nutritional well-being of households. The consequences of food insecurity include poor health outcomes, increased vulnerability to economic shocks, and

diminished agricultural productivity. To address these multifaceted issues effectively, targeted recommendations are necessary.

Key stakeholders responsible for addressing food security issues include government agencies such as the Ministry of Agriculture and local government bodies, non-governmental organizations (NGOs) focused on food security and nutrition, community leaders who can mobilize local resources, farmers' organizations that represent smallholder interests and educational institutions that can provide training and resources. Each of these stakeholders plays a crucial role in implementing solutions that can alleviate food insecurity.

To enhance dietary patterns among smallholder farmers, stakeholders should focus on bridging the vegetable and fruit gap by establishing community gardens and integrating nutrition programs into schools. This could involve exploring local options for seasonal fruits through preservation methods like drying and encouraging fruit tree planting initiatives. Additionally, addressing protein deficiencies can be achieved by promoting small-scale poultry farming, advocating for subsidies on animal products, educating households about plant-based protein combinations, and encouraging the consumption of fortified foods. To encourage healthy fats, stakeholders should promote sources such as olive oil (if culturally appropriate), avocados, and nuts through community workshops. Enhancing dietary diversity requires investigating root causes of limited variety such as affordability and access and designing targeted interventions like income-generating activities and mobile markets to improve access to diverse foods. Moreover, identifying vulnerable households is essential to ensure adequate calorie intake; targeted support programs such as food assistance or nutritional counseling should be developed.

Enhancing educational opportunities is vital for improving food security. Stakeholders should focus on providing educational programs tailored for farmers to improve agricultural practices and financial literacy. Promoting knowledge-sharing platforms where experienced farmers can mentor others can also be beneficial. Facilitating access to financial resources through savings groups or cooperatives offering controlled credit options was help vulnerable households invest in agricultural improvements. Improving agricultural practices is another critical action; stakeholders should support agricultural extension services that provide training on modern farming techniques. Additionally, investing in research focused on developing shock-resistant

agricultural practices can mitigate the impacts of climate-related shocks. Developing safety nets such as social assistance programs was provide financial support during crises.

Integrating food security with family planning services can help manage household size effectively, alleviating resource pressures from larger families. Furthermore, conducting further research to evaluate the effectiveness of interventions aimed at improving food security was providing valuable insights into coping mechanisms employed by households. Local governments should prioritize data-driven targeting by conducting vulnerability assessments to identify at-risk households and allocate resources strategically based on need. Strengthening monitoring and evaluation (M&E) systems is essential; developing a comprehensive M&E framework with relevant indicators was help assess the impact of food security programs effectively. Fostering collaboration among stakeholders is crucial; establishing a food Security Council that includes representatives from various sectors was enhance coordination efforts. Additionally, enhancing capacity building by providing training for local government officials, farmer organizations, and communities on best practices in agriculture and food security management was empower local actors. Promoting local ownership and sustainability is vital for long-term success; integrating local knowledge into program design while encouraging community leadership was foster a sense of ownership over food security initiatives. Expanding nutrition education programs that are culturally sensitive and developing partnerships with local media for outreach was further enhance awareness about healthy dietary practices.

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APPENDIXES (HOUSEHOLD SURVEY QUESTIONNAIRE)

MADA WALABU UNIVERSITY

COLLEGE OF SOCIAL SCIENCE AND HUMANITIES

CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PROGRAM

Survey Questionnaire on Status and Determinants of Smallholder Household Food Security in Rural Ginnir District Name of Kebele: _____ Name of data enumerator: _____ Agro-ecology of the area/kebele: _____ Date of interview: _____

Dear Respondent:

The main objective of the survey questionnaire is to collect data in order to identify Smallholder Farmer Food Security Status and its determinants in rural Ginnir District. The data was be used in study to fulfill partial requirement of second degree (MSc) in Climate Change and Disaster Risk Management. Your cooperation in responding the questions is very important for success of the study. Therefore; I politely request your cooperation to respond the questions appropriately. Also I would like to ensure that the data you provide was be kept confidential and was not be used for other purpose other than intended objectives of the study.

Thank you for your cooperation!!

PART 1: BACKGROUND PERSONAL INFORMATION

1. **Age:**

   A. [ ] 18-25 years old C. [ ] 36-45 years old
   B. [ ] 26-35 years old D. [ ] 46-55 years old E. [ ] 56+ years old

2. **Gender:**

   A. [ ] Male B. [ ] Female

3. **Marital Status:**

   A. [ ] Married C. [ ] Widowed
   B. [ ] Single D. [ ] Divorced/Separated

4. **Household Size:** How many people currently live in your household? --------

5. **Land Ownership:**

   A. [ ] Own land fully B. [ ] Partially own land C. [ ] Do not own land

6. **How long have you been living in Ginir District?**

   A. [ ] Less than 5 years B. [ ] 5-10 years C. [ ] 10+ years

7. **Are you a member of any farmer organizations?**

   A. [ ] Yes B. [ ] No

8. **Highest Level of Education:**

   A. [ ] No formal education C. [ ] Secondary school
   B. [ ] Primary school D. [ ] College or university degree

9. **How often do you attend agricultural training programs or workshops?**

A. [ ] Rarely B. [ ] Occasionally C. [ ] Frequently

10. **How confident are you in your ability to produce enough food for your family throughout the year?**

[ ] Very confident B. [ ] Somewhat confident C. [ ] Not confident at all

PART 2: ASSESSMENT OF THE CURRENT FOOD SECURITY STATUS AMONG SMALLHOLDER FARMERS IN GINIR DISTRICT

2.1 Food Consumption Patterns

2.1.1 Frequency of Food Consumption: How often do you typically consume the following food groups in a week?

2.1.1.1 **Cereals** (e.g., maize, sorghum, millet):

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.2 **Roots and Tubers** (e.g., potatoes, cassava, yams):

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.3 **Vegetables:**

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.4 **Fruits:**

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.5 **Legumes** (e.g., beans, lentils, peas):

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.6 **Meat and Eggs:**

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.7 **Milk and Dairy Products:**

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.1.8 **Fats and Oils:**

A. Daily
B. 3-4 days per week
C. 2-3 days per week
D. 1-2 days per week
E. Less than once a week
F. Never

2.1.2 **Dietary Diversity:** How would you describe your household's diet?

A. **Very diverse** (a wide variety of food groups)
B. **Somewhat diverse** (a few different food groups)
C. **Limited diversity** (mainly a few staple foods)

2.2 Food Access and Affordability

2.2.1 Food Availability: How easy is it for you to access the following foods in your community?

2.2.1.1 Fresh fruits and vegetables:

A. Easily available
B. Moderately available
C. Difficult to find
D. Not available

2.2.1.2 Meat and eggs:

A. Easily available
B. Moderately available
C. Difficult to find
D. Not available

2.2.1.3 Dairy products:

A. Easily available
B. Moderately available
C. Difficult to find
D. Not available

2.2.1.4 Legumes:

A. Easily available
B. Moderately available
C. Difficult to find
D. Not available

2.2.1.5 Staple foods (e.g., cereals, roots and tubers):

A. Easily available
B. Moderately available
C. Difficult to find
D. Not available

2.2.2 Food Affordability: Do you ever find it difficult to afford the food your household needs?

A. Yes
B. No

2.2.2.1 If yes, please specify the types of food that are particularly difficult to afford_____

2.3 Food Security

2.3.1 Food Insecurity: Have you experienced any of the following in the past year?

A. Insufficient food for everyone
B. Reduced quality of meals
C. Went hungry due to lack of food
D. If yes, please describe the situation in more detail.

2.3.2 Nutritional Knowledge and Practices

2.3.2.1 Nutritional Awareness: How aware are you of the importance of a balanced diet and its impact on health?

A. Very aware
B. Somewhat aware
C. Not aware
D. Please provide details about any nutritional information you have received.

2.3.2.2 Health Challenges: Have you or any household members experienced any health problems that you believe might be related to diet?

2.3.2.3 If yes, please describe the health problems and any associated symptoms_____.

PART 3. DETERMINANTS OF FOOD SECURITY AMONG SMALLHOLDER FARMERS IN GINIR DISTRICT

3.1 Household Wealth and Income

3.1.1 Assets

1. **Land Ownership:**

A. Do you own any land?

B. If yes, how many hectares of land do you own?
C. What type of land do you own (e.g., arable, pasture, forest)?

2. **Livestock:**

A. Do you own any livestock?
B. If yes, what types of livestock do you own (e.g., cattle, sheep, goats, poultry)?
C. Approximately how many animals of each type do you have?

3. **Farm Equipment:**

A. Do you own any farm equipment (e.g., tractors, plows, irrigation pumps)?
B. If yes, what types of equipment do you own and how often do you use them?

3.1.2 Income

1. **Primary Source of Income:** What is your household's primary source of income?

A. Farming
B. Off-farm activities (e.g., labor, handicrafts, small businesses)
C. Remittances
D. Other (please specify)

2. **Additional Sources of Income:** Do you have any additional sources of income?
   - If yes, please specify the sources and approximate amounts.

3.1.3 Informal Loans

1. **Have you ever borrowed money from informal sources (e.g., friends, relatives, moneylenders)?**

A. Yes B. No

2. **If yes, how often do you borrow money from informal sources?**

A. Daily C. Monthly

B. Weekly D. Occasionally

3. **For what purposes do you typically borrow money from informal sources?**

    A. Food purchases
    B. Farming inputs (e.g., seeds, fertilizer)
    C. Healthcare expenses
    D. Education expenses
    E. Other (please specify)

4. **Approximately how much do you typically borrow at a time?**
    - Specify the amount in your local currency.
5. **What are the interest rates charged on these loans?**
    - Are the interest rates fixed or variable?
6. **How do you typically repay these loans?**

    A. In cash
    B. In kind (e.g., through labor or goods)
    C. Other (please specify)

3.1.4 Agricultural Practices

1. **Farming System:** What type of farming system do you use (e.g., subsistence, commercial)?
    - Describe the inputs and outputs of your farming system, including the use of fertilizers, pesticides, irrigation, and crop rotation.
2. **Crop Diversity:** How many different crops do you grow?
    - List the main crops you cultivate and their relative importance in your household's income and food security.
3. **Disease Outbreaks:** Have you experienced any crop diseases or pests in the past year?
    - If yes, please specify the type of disease or pest and its impact on your crop yields.

- Describe any measures you took to control or mitigate the effects of the disease or pest.

3.1.5 External Shocks

1. **Weather Shocks:** Have you experienced any extreme weather events (e.g., drought, floods, hailstorms) in the past year?
    - If yes, describe the severity and impact of these events on your farming activities and food production.
2. **Health Shocks:** Have any members of your household experienced serious illnesses or injuries in the past year?
    - If yes, please specify the type of illness or injury and its impact on your household's income and food security.

3.1.6 Food Security

1. **Food Insecurity:** Have you experienced any of the following in the past year?

    A. Insufficient food for everyone in the household
    B. Reduced quality of meals
    C. Went hungry due to lack of food
    D. Reduced food consumption
    E. Sold or exchanged assets for food

2. **Coping Strategies:** If you have experienced food insecurity, what strategies have you used to cope?
    - Please describe any actions taken to increase food production, reduce food consumption, or access additional resources.

3.1.7 Additional Information

1. **Membership in Organizations:** Are you a member of any farmers' organizations or cooperatives?
    - If yes, what benefits do you derive from membership?

2. **Access to Services:** Do you have access to agricultural extension services, credit facilities, or markets?
    - If so, how frequently do you utilize these services, and how helpful have they been in improving your food security?

PART 4: EVALUATION OF FOOD SECURITY INTERVENTION STRATEGIES IN GINIR DISTRICT

4.1 Program Implementation

1. **Awareness of Interventions:** Are you aware of the following food security intervention strategies being implemented in Ginir District?
    - Please check all that apply:

        A. Targeted food distribution programs
        B. Social safety net programs
        C. Nutrition education and dietary diversity initiatives
        D. Financial inclusion programs
        E. Agricultural extension services
        F. Infrastructure development (e.g., roads, irrigation)
        G. Other (please specify)

2. **Participation:** Have you or your household participated in any of these interventions?
    - If yes, please specify which ones and describe your experiences in detail.
3. **Implementation Fidelity:** Do you believe the interventions are being implemented as planned?
    - If not, please explain any discrepancies or challenges.

4.2 Resource Allocation and Beneficiary Reach

1. **Resource Allocation:** Are you aware of how resources are being allocated for the food security interventions?
    - If yes, please describe the allocation process and whether you believe it is fair and equitable.

2. **Beneficiary Reach:** Do you believe the interventions are reaching the most vulnerable households in need of food security support?
    - If not, please explain why you think this is the case.
3. **Targeting Effectiveness:** How effective do you think the targeting mechanisms are in identifying and reaching the most vulnerable households?

4.3 Monitoring and Evaluation

1. Are you aware of any monitoring and evaluation systems in place to track the progress and impact of the interventions? A. Yes B. No
2. If yes, please describe these systems and how frequently they are used_____
3. Do you believe sufficient data is being collected to assess the program's impact on food security? A. Yes B. No
4. If not, what additional data would you recommend collecting? _____
5. Are the indicators used to measure program impact relevant and appropriate for the context of Ginir District? A. Yes B. No
6. If not, what alternative indicators would you suggest? _____

4.4 Effectiveness of Interventions

1. **Impact on Food Security:** Have you observed any positive or negative impacts of the interventions on your household's food security? A. Yes B. No
2. If yes, please describe the specific changes you have noticed and how they have affected your household's well-being_____.
3. **Sustainability:** Do you believe the interventions are sustainable and capable of producing long-term benefits? A. Yes B. No
4. If not, what challenges might hinder their sustainability? _____

List of Focus Group Discussion Questions

A. Food Security Status

1. **Food Availability:** How easy is it for you to access different types of food in your community?
2. **Food Affordability:** Do you ever find it difficult to afford the food your household needs?
3. **Food Utilization:** Are you able to consume a balanced and nutritious diet?

B. Determinants of Food Security

1. **Household Characteristics:** How do factors like household size, education level, and income affect your household's food security?
2. **Agricultural Practices:** What role do farming practices, such as crop diversity and access to inputs, play in your household's food security?
3. **External Shocks:** How do external factors, such as weather shocks and health issues, impact your household's food security?

C. Intervention Strategies

1. **Awareness of Interventions:** Are you aware of the food security intervention strategies being implemented in Ginir District?
    - If yes, please describe the specific interventions you are familiar with.
2. **Participation:** Have you or your household participated in any of these interventions?
    - If yes, please describe your experiences and any challenges or benefits you encountered.
3. **Effectiveness:** How effective do you believe these interventions have been in improving food security?

B. Recommendations

1. **Areas for Improvement:** What areas do you believe could be improved to enhance the effectiveness of the food security interventions?
2. **Additional Strategies:** Are there any additional strategies that you think would be beneficial in addressing food insecurity in Ginir District?

Key Informant Interview Questions

A. Food Security Status

1. **Assessment of Food Security:** How would you assess the overall food security status of smallholder farmers in Ginir District?
    - What are the main indicators of food security that you consider?
    - How has food security changed in recent years?
2. **Key Challenges:** What are the most significant challenges facing smallholder farmers in terms of food security?
    - How do these challenges differ among different groups of farmers (e.g., gender, age, location)?

B. Determinants of Food Security

1. **Household Factors:** How do household characteristics (e.g., size, education, income) influence food security among smallholder farmers?
    - What are the specific ways in which these factors impact food security?
2. **Agricultural Factors:** What role do agricultural practices (e.g., crop diversity, access to inputs) play in determining food security?
    - How can agricultural practices be improved to enhance food security?
3. **External Factors:** How do external factors (e.g., climate change, market fluctuations) impact food security in the district?
    - What strategies can be implemented to mitigate the effects of these external factors?

C. Intervention Strategies

1. **Effectiveness of Interventions:** How effective have the existing food security interventions been in addressing the challenges faced by smallholder farmers?
    - What evidence do you have to support your assessment?
2. **Areas for Improvement:** What are the key areas for improvement in the current intervention strategies?
    - How can these strategies be made more effective and sustainable?
3. **Additional Strategies:** Are there any additional strategies that you believe would be beneficial in addressing food insecurity?
    - If so, what are these strategies and how could they be implemented?