



DEBRE MARKOS UNIVERSITY
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**Determinants of Food Insecurity among Small -holder Farmers: The case
of Gishe Woreda, North Shewa Zone, Amhara Region, Ethiopia**

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Economics, Debre Markos University, in Partial Fulfillment of the Requirements
of MSc. Degree in Project Planning and Management**

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STATEMENT OF DECLARATION

I, Kelem Tilaneh, hereby declare that this thesis titled "Determinants of Food Insecurity among Smallholder Farmers: The Case of Gishe Woreda, North Shewa Zone, Amhara Region, Ethiopia" is my original work and has not been submitted for the award of any degree or diploma in any other university or institution. All sources of information used in the preparation of this thesis have been acknowledged and referenced appropriately.

I also declare that this research work was conducted under the guidance of my advisor, Dr. Aynalem Shita, and I have adhered to the ethical standards required for conducting research.

Any errors or omissions in this thesis are entirely my responsibility.

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STATEMENT OF CERTIFICATION

This is to certify that the thesis titled "Determinants of Food Insecurity among Smallholder Farmers: The Case of Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia" was carried out by Kelem Tilaneh, under my supervision, for the partial fulfillment of the requirements for the award of the MSc. Degree in Project Planning and Management at Debre Markos University.

I have reviewed the work and found it to be the original work of the candidate. I hereby recommend it for submission to the Department of Economics, College of Business and Economics, Debre Markos University.

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APPROVAL SHEET

This thesis titled "Determinants of Food Insecurity among Smallholder Farmers: The Case of Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia" has been prepared by Kelem Tilaneh under the supervision of Dr. Aynalem Shita (PhD), in partial fulfillment of the requirements for the award of the MSc. Degree in Project Planning and Management at Debre Markos University.

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TABLE OF CONTENTS

Contents	Page
ACKNOWLEDGEMENTS.....	i
LIST OF TABLES.....	iii
LIST OF FIGURES.....	iii
LIST OF ACRONYMS AND ABBREVIATIONS.....	iv
ABSTRACT.....	v
CHAPTER ONE.....	1
1. INTRODUCTION.....	1
1.1 Background of the Study.....	1
1.2. Statement of the Problem.....	2
1.3. Research Questions.....	4
1.4. Objectives of the Study.....	4
1.4.1. General objective.....	4
1.4.2. Specific objectives.....	4
1.5. Significance of the Study.....	4
1.6. Scope of the Study.....	4
1.7. Limitation of the Study.....	5
1.8. Organization of the Study.....	5
CHAPTER TWO.....	6
2. REVIEW OF RELATED LITERATURE.....	6
2.1 Theoretical Literature Review.....	6
2.1.1 The Concept of Food Insecurity.....	6
2.1.2. Theories of Food Insecurity.....	6
2.1.3. Food insecurity in Ethiopia.....	7
2.1.4. Food Insecurity in the Amhara Region.....	7
2.1.5. Determinants of Food Insecurity in Small -holder Farmers.....	8
2.1.6 Measuring the Indicators of Food Security.....	9
2.2 Empirical Literature Review.....	11
2.3. Literature Gap and Studies.....	12
2.4. Conceptual Framework.....	13
CHAPTER THREE.....	15
3. RESEARCH METHODOLOGY.....	15

3.1. Description Study Area	15
3.2. Research Approach and Design	16
3.3. Source of Data	16
3.4. Target Population	16
3.5. Sampling Technique and Sample Size	17
3.5.1. Sampling Technique	17
3.5.2. Sample Size	17
3.6. Data Collection Instruments.....	18
3.6.1. Questionnaires	18
3.6.2. Interviews	18
3.7. Data Analysis Methods	19
3.7.1 Model Specification.....	19
3.8. Validity and Reliability	23
3.9. Ethical Considerations.....	23
CHAPTER FOUR.....	24
4. RESULTS AND DISCUSSIONS.....	24
4.1. Introduction	24
4.2. Demographic and Socioeconomic Characteristics.....	24
4.3. Agricultural Practices and Environmental Factors.....	25
4.4: Institutional Factors, Coping Strategies, and Government Support.....	27
4.5: Food Insecurity Measurement (HFIAS, HDDS, rCSI).....	30
4.6 Results of Ordered Logistic Regression Model	33
4.6.1. Determinants of rCSI (reduced Coping Strategies Index).....	33
4.6.2 Determinants of HDDS (Household Dietary Diversity Score)	35
4.6.3 Determinants of HFIAS (Household Food Insecurity Access Scale).....	37
4.6.4 Correlation among Food Security Indicators.....	41
4.7. Qualitative Data Analysis (Integrated with Quantitative Findings)	42
CHAPTER FIVE	46
5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	46
5.1 Summary	46
5.3 Recommendations	48
References	49
Appendix	52

LIST OF TABLES

Table 4. 1: Demographic and Socioeconomic Characteristics of Respondents.....	24
Table 4. 2: Demographic and Socioeconomic in continuous variables	25
Table 4. 3: Agricultural Practices and Environmental Factors	26
Table 4. 4: Institutional Factors, Coping Strategies, and Government Support	28
Table 4. 5: Food Insecurity Measurement (HFIAS, HDDS, rCSI).....	30
Table 4. 6: Ordered Logistic Regression Results for rCSI	34
Table 4. 7: Determinants of HDDS Using Ordered Logistic Regression	36
Table 4. 8: Determinants of HFIAS Using Ordered Logistic Regression	38
Table 4. 9: Marginal Effects	40
Table 4. 10: The Spearman correlation Matrix between food security indicators.....	41

LIST OF FIGURES

Figure 3. 1: Map of the Study Area	15
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LIST OF ACRONYMS AND ABBREVIATIONS

CLTS	Community-Led Total Sanitation
DHS	Demographic and Health Survey
FAO	Food and Agriculture Organization
FI-	Food Insecurity
GDP	Gross Domestic Product
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
ICT	Information and Communication Technology
IMF	International Monetary Fund
M&E	Monitoring and Evaluation
NGO	Non-Governmental Organization
PSNP	Productive Safety Net Program
PSNP	Productive Safety Net Program
R&D	Research and Development
rCSI	reduced Coping Strategy Index
SDGs	Sustainable Development Goals
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WFP	World Food Programme

ABSTRACT

Food insecurity remains a critical development challenge in Ethiopia, particularly among smallholder farmers in rural areas. This study investigates the determinants of food insecurity among smallholder farmers in Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia. The primary objectives were to assess the level of food insecurity and, identify its key determinants. A mixed-method research approach was employed; integrating quantitative data from 265 respondents selected using stratified random sampling and qualitative insights from key informant interviews.

Food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS), Household Dietary Diversity Score (HDDS), and the reduced Coping Strategy Index (rCSI). Descriptive statistics showed that 52.8% of households had skipped meals due to food shortages, and 39.6% frequently relied on less preferred or inexpensive food. The average household size was 5.4, with a mean annual income of 24,200 ETB and a dietary diversity score of 3.12. Ordered logistic regression revealed that household size ($p = 0.001$), income ($p = 0.000$), education ($p = 0.075$), access to agricultural inputs ($p = 0.021$), and PSNP participation ($p = 0.029$) significantly influenced HFIAS. Spearman correlation results showed a strong positive relationship between HFIAS and rCSI ($r = 0.681$), and a negative correlation between HFIAS and HDDS ($r = -0.622$).

The study concludes that food insecurity in Giske Woreda is driven by household demographics, economic status, access to agricultural inputs, and institutional support. It recommends enhancing access to inputs, promoting irrigation, and strengthening social protection programs. Future research should explore the gendered dimensions of food insecurity and the long-term impact of climate change on agricultural resilience in similar rural settings.

Keywords: *Food insecurity, smallholder farmers, HFIAS, HDDS, rCSI, PSNP, Giske Woreda, Ethiopia, household income, coping strategies.*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Food insecurity is a pressing issue worldwide, affecting millions of people, especially in developing countries where poverty, inequality, and limited access to resources are significant challenges. According to the UN Food and Agriculture Organization (FAO) (2021), nearly 10% of the global population remains food insecure, with an estimated 2.37 billion people lacking access to adequate food in 2020. Climate change, particularly changes in rainfall patterns and the frequency of extreme weather events, has made food production more unpredictable, exacerbating the vulnerability of populations in regions that depend heavily on agriculture (IPCC, 2022; FAO, 2020). In Africa, food insecurity is particularly acute, driven by rapid population growth, climate change, political instability, and widespread poverty. Sub-Saharan Africa is home to the highest proportion of undernourished populations globally, with nearly 20% of the population experiencing severe food insecurity (FAO, 2021). This region's agricultural sector is largely dependent on smallholder farmers who often face multiple challenges that hinder food production and access. Smallholders are particularly vulnerable to climate shocks, such as prolonged droughts and floods, which disrupt crop production and contribute to food shortages (IFAD, 2020; FAO, 2021). Furthermore, limited access to agricultural inputs such as seeds, fertilizers, and technology, compounded by inadequate infrastructure and poor market access, prevents farmers from increasing productivity and generating income to afford food (Tadesse et al., 2021; IFAD, 2020). Ethiopia faces significant food insecurity, with about 33% of the population experiencing moderate to severe hunger (World Bank, 2021). The country's agriculture is highly dependent on smallholder farmers who account for 85% of production, but they face challenges such as land degradation, limited access to modern farming technologies, and insufficient financial resources (WFP, 2020; Alemu et al., 2021). Climate change, including irregular rainfall, droughts, and floods, further exacerbates food insecurity, as seen during the 2015–2016 drought (Alemu et al., 2021). Despite initiatives like the Productive Safety Net Program (PSNP) and the Sustainable Land Management Program (SLMP), the effectiveness of these programs is hindered by poor coordination and inadequate funding (Alemu et al., 2021). Consequently, food insecurity remains a persistent issue, particularly in rural areas (World Bank, 2021; WFP, 2020).

The Amhara Region in northern Ethiopia is highly vulnerable to food insecurity, caused by a combination of environmental, socio-economic, and institutional factors. Extreme weather events such as droughts, floods, and erratic rainfall significantly reduce agricultural productivity (FAO,

2022). Smallholder farmers in the region also face challenges like limited access to irrigation, improved seeds, and fertilizers, which hinder their ability to produce adequate food. Poor infrastructure, including inadequate road networks and storage facilities, further exacerbates the problem by limiting market access, increasing transportation costs, and reducing the profitability of crops (WFP, 2021). Financial constraints, coupled with limited access to credit and insurance, prevent farmers from adopting modern farming techniques (FAO, 2022; WFP, 2021). Although government programs aim to address food insecurity, they have had mixed results due to poor coordination and insufficient resources, leaving many farmers without adequate support during crises (WFP, 2021; Alemu et al., 2021). Gish Woreda in North Shewa Zone is particularly affected by fluctuating crop yields and limited food access during lean seasons, contributing to ongoing food insecurity (WFP, 2021).

This study aims to explore the determinants of food insecurity among smallholder farmers in Giske Woreda, North Shewa Zone, Ethiopia, given the region's vulnerability to climate change, limited agricultural resources, and socio-economic challenges. Understanding these factors is crucial for developing targeted interventions that can improve food security in the area. By examining the role of socio-economic, agricultural, environmental, and institutional factors, the study aims to provide insights that can guide policy and practical solutions to reduce food insecurity. The findings will contribute to the existing body of knowledge and support efforts to enhance resilience in rural farming communities.

1.2. Statement of the Problem

Food insecurity remains a major challenge in Ethiopia, disproportionately affecting female-headed households (FHHs) in urban areas. Studies indicate that FHHs experience higher levels of food insecurity due to limited income opportunities, lack of access to productive resources, and the dual burden of managing both household and economic responsibilities (Gebre & Wondimu, 2021). Despite growing urbanization, research on food insecurity has primarily focused on rural areas, leaving a gap in understanding the vulnerabilities and coping strategies of urban FHHs (Tadesse et al., 2022).

The increasing prevalence of female-headed households in Ethiopia is largely attributed to factors such as migration, conflict, and the loss of male household heads due to economic hardship or displacement (Abebe & Tesfaye, 2023). These households often face significant socioeconomic disadvantages, including lower income levels, lack of employment opportunities, and inadequate access to financial and social support systems (Hailemariam & Getachew, 2024). Consequently,

urban FHHs struggle to meet their basic food needs, making them highly vulnerable to economic shocks and inflation.

Although female-headed households employ various coping strategies such as engaging in informal labor, borrowing food, and relying on remittances from relatives, these mechanisms are often unsustainable in the long term (Mekonnen, 2020). Moreover, urban food insecurity is exacerbated by rising food prices, unstable income sources, and the absence of targeted social protection policies for vulnerable groups (Tesfaye & Yohannes, 2025). However, limited empirical studies have explored the effectiveness of these coping mechanisms in urban settings, particularly among FHHs.

Studies have also shown that food insecurity among FHHs is not only an economic issue but also a multidimensional problem influenced by gender-based social and cultural norms (Alemu & Assefa, 2023). Discriminatory practices in access to land, credit, and employment further marginalize female heads of households, making it difficult for them to achieve food security (Kebede et al., 2021). In urban areas, where the cost of living is high and economic opportunities are often constrained, FHHs are more likely to experience severe and chronic food insecurity (Woldemariam, 2024).

Furthermore, while rural food insecurity has been extensively studied, urban food insecurity especially among FHHs has received little attention from policymakers and researchers (Demissie, 2023). Most studies rely on conventional food security indicators that fail to capture the multidimensional nature of food insecurity, such as dietary diversity, food affordability, and social vulnerabilities (Adane & Mesfin, 2022). Therefore, there is a need for an in-depth analysis using a Multidimensional Food Security Index (MFSI) to assess the severity and determinants of food insecurity among urban FHHs in Ethiopia.

Given the lack of comprehensive data and targeted interventions, urban FHHs continue to struggle with food insecurity despite their efforts to adapt and cope with economic difficulties (Tsegaye & Bekele, 2025). Addressing this issue requires empirical evidence to inform policies that promote gender-sensitive social protection programs and economic empowerment strategies for female heads of households (Yimer & Worku, 2024).

This study aimed to bridge this research gap by investigating the determinants, severity, and coping mechanisms of food insecurity among urban female-headed households in Ethiopia. It provided empirical evidence to guide policies that enhanced the resilience and food security of FHHs in urban settings.

1.3. Research Questions

This study addressed the following research questions:

- What is the level of food insecurity among smallholder farmers in Giske Woreda?
- What are the main factors affecting food insecurity in Giske Woreda?

1.4. Objectives of the Study

1.4.1. General objective

The general objective of this study is to analyze the determinants of food insecurity among smallholder farmers in Giske Woreda, North Shewa Zone, Amhara Region.

1.4.2. Specific objectives

- To assess the level of food insecurity among smallholder farmers in Giske Woreda.
- To identify the key factors influencing food insecurity in the study area.

1.5. Significance of the Study

This study provided critical insights into the factors contributing to food insecurity among smallholder farmers in Giske Woreda, North Shewa Zone, Amhara Region. It helped policymakers, local authorities, and development organizations better understand the unique challenges faced by farmers in the area. By identifying key determinants of food insecurity such as household characteristics, access to agricultural inputs, and climate-related factors the study informed targeted interventions aimed at improving food security.

It also highlighted the role of government programs, such as the Productive Safety Net Program (PSNP), in addressing food insecurity and suggested ways to enhance their effectiveness. Furthermore, the research emphasized the need for gender-sensitive approaches in tackling food insecurity, particularly for female-headed households.

The findings contributed to the broader academic literature on food security, especially in rural Ethiopian contexts, and supported the development of sustainable agricultural practices and policies to improve food security outcomes in the region. Ultimately, the study played a significant role in guiding future research, policy formulation, and community-based solutions to combat food insecurity in Giske Woreda and similar rural areas.

1.6. Scope of the Study

The study focused on smallholder farmers in Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia. It examined the determinants of food insecurity, considering factors such as household characteristics, agricultural practices, access to resources, and government interventions. The scope

covered a range of variables, including gender, household size, and income, land size, livestock ownership, and participation in the Productive Safety Net Program (PSNP).

The study assessed food insecurity through indicators such as the Household Food Insecurity Access Scale (HFIAS), the Household Dietary Diversity Score (HDDS), and the Reduced Coping Strategy Index (rCSI). The focus was specifically on smallholder farmers, who were heavily dependent on agriculture for their livelihoods. Data collection involved surveys and interviews with farmers, local government officials, and agricultural extension workers.

The study also considered the role of climate change and land degradation in exacerbating food insecurity. Geographically, the study was limited to Giske Woreda, ensuring a focused analysis of this specific area. The study contributed valuable insights to inform policy interventions aimed at reducing food insecurity in the Giske Woreda.

1.7. Limitation of the Study

This study has several limitations, including its focus on Giske Woreda, which may not be representative of other regions. The use of self-reported data could introduce response biases, affecting the accuracy of the findings. Additionally, the study relied primarily on quantitative methods, limiting insights into the deeper, qualitative aspects of food insecurity. Seasonal variations in food security were not accounted for, and the cross-sectional design prevents causal inferences. Furthermore, the research focused only on smallholder farmers, excluding other population groups. Lastly, the study did not explore all potential institutional interventions beyond the Productive Safety Net Program.

1.8. Organization of the Study

The thesis was organized into five chapters. Chapter One introduced the study by outlining the research problem, objectives, research questions, and the significance of the study. Chapter Two reviewed relevant literature, focusing on the key determinants of food insecurity, with emphasis on socioeconomic, agricultural, environmental, and institutional factors. Chapter Three described the research methodology, including the study area, research design, data collection methods, and analysis techniques. Chapter Four presented the results of the study, providing a detailed analysis of the factors contributing to food insecurity in Giske Woreda. Finally, Chapter Five concluded the thesis by summarizing the key findings, offering recommendations to improve food security in the area, and suggesting directions for future research.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical Literature Review

2.1.1 The Concept of Food Insecurity

Food insecurity is the inability to access sufficient, nutritious, and safe food necessary for a healthy life, encompassing three key dimensions: availability, access, and utilization (FAO, 2021; Maxwell & Smith, 1992). Availability refers to food's physical presence, while access focuses on households' ability to obtain food through purchase, production, or social networks (Girma et al., 2020). Utilization addresses how well food is processed within the body, influenced by nutrition and health factors (Tadesse et al., 2022). These interconnected dimensions highlight the complexity of food insecurity, where challenges in one area, such as limited income, can exacerbate others (Kassahun et al., 2021). Tools like the Household Food Insecurity Access Scale (HFIAS) and Food Insecurity Experience Scale (FIES) are commonly used to assess and monitor food insecurity in Ethiopia (Alemu et al., 2021; FAO, 2020). The impacts of food insecurity are far-reaching, affecting nutrition, mental health, productivity, and societal stability, often perpetuating poverty cycles and migration (Tadesse et al., 2021; Girma et al., 2020; Sileshi et al., 2021).

2.1.2. Theories of Food Insecurity

Recent developments in food insecurity theories continue to emphasize the complex interplay of socio-economic, environmental, and political factors. Sen's Entitlement Theory (1981) remains a cornerstone, focusing on the lack of entitlement to food due to economic inequalities and legal barriers (Sen, 2020). The Livelihoods Framework (Chambers & Conway, 1992) has been expanded to incorporate resilience in the face of climate change, highlighting how smallholder households adapt to food insecurity through diverse strategies (Béné et al., 2021). Maxwell and Smith's (1992) three-dimensional model of food availability, access, and utilization has been revisited in recent literature, with a focus on the role of food systems and market dynamics in shaping access, especially in rural areas (Girma et al., 2022). The Capability Approach, revisited by Alkire (2020), reinforces that food insecurity is not merely a lack of food but the inability to convert resources into health and well-being, emphasizing the importance of access to education, healthcare, and social protection. Additionally, recent theories emphasize climate-induced food insecurity, recognizing the growing vulnerability of communities to environmental stressors such as droughts and floods, which disrupt both food production and livelihoods (Tadesse et al., 2023). These evolving frameworks reflect a broader understanding of food insecurity as a multifaceted issue influenced by global change, local contexts, and systemic inequalities.

2.1.3. Food insecurity in Ethiopia

Food insecurity remains a significant issue in Ethiopia, affecting approximately 20% of the population, especially rural households (FAO, 2021). Factors such as frequent droughts, unstable weather patterns, and reliance on rain-fed agriculture make food production vulnerable to climate change (Tadesse et al., 2023). Despite progress in reducing poverty, food insecurity persists, primarily due to low agricultural productivity in rural areas and rapid population growth outpacing local food production (Girma & Abay, 2021). The main causes of food insecurity include climate change, soil degradation, and poverty, alongside limited access to agricultural inputs and modern technologies (Alemu et al., 2021; Kassahun et al., 2020). Political instability and conflict further exacerbate food insecurity by disrupting production and distribution systems (Sileshi et al., 2021). In response, Ethiopia has implemented national programs like the Productive Safety Net Program (PSNP) and the Food Security Program (FSP), aimed at providing food aid and improving agricultural productivity (Berhane et al., 2014). These programs have helped reduce hunger and improve livelihoods, particularly through public works and infrastructure projects (Tadesse et al., 2023). The government has also focused on increasing agricultural output through the Agricultural Growth Program (AGP), which supports smallholder farmers with improved seeds and irrigation (Kassahun et al., 2021). Despite these efforts, challenges remain, particularly in remote regions where infrastructure and services are limited, hindering the full impact of these interventions (Sileshi et al., 2020).

2.1.4. Food Insecurity in the Amhara Region

The Amhara region, located in northern Ethiopia, is among the most food-insecure areas in the country, plagued by high poverty rates, limited access to markets, and frequent climatic shocks (CSA, 2020). The region's heavy reliance on rain-fed agriculture makes it highly vulnerable to climate change, with erratic rainfall patterns and droughts leading to seasonal food shortages, particularly for rural households (Tadesse et al., 2021). Despite some improvements in food security, especially in urban areas, the region continues to face challenges, particularly during lean seasons when many families struggle to access enough food (Sileshi et al., 2020). Key contributors to food insecurity in the region include land fragmentation, soil degradation, and limited access to modern agricultural inputs, all of which hinder agricultural productivity (Girma & Abay, 2021). Additionally, the lack of off-farm income opportunities exacerbates the situation, making rural households more susceptible to food insecurity (Sileshi et al., 2020).

Efforts to address food insecurity in Amhara have included national and regional programs such as the Productive Safety Net Program (PSNP) and the Food Security Program (FSP). These programs provide food aid, improve agricultural productivity, and promote livelihoods through infrastructure development projects (Berhane et al., 2014). However, their implementation remains challenging, particularly in remote areas where infrastructure is inadequate and access to services is limited (Tadesse et al., 2021). Local coordination efforts by Woreda Food Security Committees (WFSC) aim to improve intervention effectiveness, but capacity and resource allocation issues continue to limit the reach and impact of these initiatives (Alemu et al., 2021).

Smallholder farmers, who are vital to Ethiopia's agricultural economy, also face significant food insecurity challenges. These farmers, who typically cultivate less than 2 hectares of land, rely on family labor and seasonal rainfall for their livelihoods, yet they often struggle with low productivity and poverty due to climate variability and limited access to agricultural resources (Devereux & Taye, 2020). Despite producing most of the country's food, smallholders face challenges such as land degradation, insecure land tenure, and limited access to modern agricultural inputs, which further reduce productivity and food production (Moges et al., 2018; Bezabih et al., 2020). Gender dynamics also play a critical role, as women; though central to agricultural production, often have less access to land, credit, and agricultural inputs than men, resulting in lower productivity and increased food insecurity (Woldehanna and Shively, 2020). Empowering women through improved access to resources and decision-making could enhance food security outcomes at the household level (Alemu et al., 2021).

2.1.5. Determinants of Food Insecurity in Small -holder Farmers

Poverty is a key determinant of food insecurity, particularly in developing countries like Ethiopia. Households below the poverty line struggle to access sufficient food, especially during economic shocks such as price hikes or income loss (Tadesse et al., 2022). Income inequality further exacerbates food insecurity, with wealth disparities leaving large portions of the population in vulnerable conditions (Kassahun et al., 2020). In rural areas, the poverty-food insecurity cycle is particularly entrenched, as low-income households often lack the resources to purchase food or invest in agricultural inputs, further hindering their ability to escape poverty (Girma et al., 2021). Studies in Ethiopia show that rural households are disproportionately affected by food insecurity due to lower income and limited access to resources (Sileshi et al., 2020).

Agricultural productivity, which heavily influences food security, is limited by factors such as land size, access to inputs, and environmental conditions. Smallholder farmers in Ethiopia often have fragmented land holdings, which reduce their ability to produce sufficient food (Girma & Abay,

2021). Limited access to modern inputs like improved seeds, fertilizers, and irrigation technologies further restricts productivity and increases vulnerability to food insecurity (Tadesse et al., 2023). Additionally, soil degradation and lack of irrigation infrastructure exacerbate agricultural challenges, leading to lower yields and less stable food supplies (Kassahun et al., 2022). These factors are particularly prevalent in rural areas where farmers rely on outdated agricultural practices and face difficulty accessing necessary resources (Alemu et al., 2021).

Environmental stressors, especially climate change, significantly impact food security in rural regions. Erratic rainfall, prolonged droughts, and rising temperatures contribute to crop failures and reduce food availability (Sileshi et al., 2021). Soil degradation, including erosion and nutrient depletion, further diminishes land productivity, particularly in regions like Gish Woreda (Girma et al., 2020). The combined effects of climate change and poor soil conditions make food production less predictable and more susceptible to shocks, exacerbating food insecurity (Tadesse et al., 2022). Political and institutional factors, such as inadequate infrastructure and limited access to markets, also play a critical role in shaping food security outcomes. Poor implementation of policies and limited access to financial services and agricultural extension programs hinder efforts to improve food security (Girma, 2022; Sileshi et al., 2021). Thus, addressing food insecurity requires an integrated approach that tackles poverty, agricultural productivity, and environmental sustainability, while enhancing institutional support and access to markets.

2.1.6 Measuring the Indicators of Food Security

Food security is a multi-dimensional issue, and its measurement requires a set of indicators that address various components of food availability, access, utilization, and stability. These indicators are crucial for understanding the level of food insecurity in households and regions, especially in contexts where food security is a pressing challenge. In the past few years, researchers and development organizations have focused on refining measurement tools to assess food insecurity more accurately and efficiently. Some of the widely used indicators include the Household Dietary Diversity Score (HDDS), the Household Food Insecurity Access Scale (HFIAS), and the Reduced Coping Strategy Index (rCSI) (Mekonen et al., 2023).

The Household Dietary Diversity Score (HDDS) is an indicator that measures the number of different food groups consumed by a household over a specified period, typically 24 hours. A greater dietary diversity is often associated with better nutritional outcomes and food security. According to recent studies, households that consume a greater number of food groups are generally more food-secure than those with limited food diversity (Mekonen et al., 2023). For example, households consuming fewer than three food groups are often considered food insecure, whereas those

consuming five or more food groups are considered food-secure (Hoddinott & Yohannes, 2002). The HDDS remains a critical indicator for measuring food security in both rural and urban areas, especially as food security continues to be a concern in developing countries like Ethiopia (Ayenew et al., 2020).

The Household Food Insecurity Access Scale (HFIAS) measures food insecurity from an access perspective. The HFIAS consists of two types of questions: occurrence questions and frequency-of-occurrence questions. Respondents are asked about the occurrence of food insecurity-related events in the past 30 days, followed by how often these events occurred. These questions are essential in capturing the short-term fluctuations in food insecurity (Coates et al., 2007). Studies have shown that the HFIAS is particularly useful for monitoring food insecurity in emergency and development contexts, as it provides a clear understanding of households' access to food. Recent findings have highlighted its relevance in both rural and urban food insecurity assessments (Mccordic et al., 2023). In line with these indicators, the Reduced Coping Strategy Index (rCSI) has gained prominence as a tool to measure the severity of food insecurity. The rCSI is a simplified version of the full Coping Strategy Index (CSI), focusing on a subset of five food-related coping strategies. These strategies include reducing meal sizes, consuming less preferred foods, and relying on food assistance or borrowing food. Recent research indicates that the rCSI effectively captures the severity of food insecurity by combining the frequency and severity of these coping strategies (USAID, 2020). The rCSI has proven to be a practical tool, especially in regions where time and resources for data collection are limited. Higher rCSI scores are indicative of greater food insecurity, and the tool helps classify households into different levels of food insecurity based on their coping behaviors (Hoddinott & Yohannes, 2002).

The use of these indicators has become more critical in the context of the COVID-19 pandemic, which disrupted food systems globally. Several studies have found that the pandemic exacerbated food insecurity, especially in low-income households. As a result, many international organizations and researchers have adapted these indicators to better assess the impacts of COVID-19 on food access, consumption, and coping strategies (Coates et al., 2020). These measurements have been vital in designing targeted interventions to mitigate food insecurity in the wake of the pandemic. In Ethiopia, for instance, the implementation of these indicators helped identify vulnerable populations and assess the need for emergency food assistance (Mekonen et al., 2023).

Overall, the development and use of food security indicators have been crucial in improving our understanding of food insecurity and guiding interventions. As the global food crisis continues to evolve, especially in regions facing conflict, climate change, and economic instability, it is essential to continue refining these measurement tools. The indicators like HDDS, HFIAS, and rCSI provide

valuable data that can guide policymakers, humanitarian organizations, and researchers in tackling food insecurity more effectively. They offer a comprehensive view of the food security situation, enabling more focused and context-specific responses to improve food access, nutrition, and stability in vulnerable communities (Hoddinott & Yohannes, 2002; Mekonen et al., 2023).

2.2 Empirical Literature Review

Food insecurity remains a significant global challenge, particularly in sub-Saharan Africa, where approximately 690 million people suffer from hunger (FAO, 2023). Factors such as climate change, political instability, and economic crises have worsened food insecurity, especially in regions dependent on rain-fed agriculture. Maxwell & Smith (2022) note that the increased frequency of climate-induced events, including droughts and floods, severely disrupt food production and distribution networks. Similarly, FAO (2021) emphasizes the need for coordinated global strategies that promote climate resilience, sustainable agricultural practices, and improved governance to mitigate food insecurity. In this context, Lund et al. (2022) highlight that food systems must adapt to both short-term shocks and long-term challenges posed by climate change, while Kassahun et al. (2022) argue that enhancing food system stability is crucial for tackling hunger on a global scale.

In Africa, food insecurity continues to be a widespread issue, particularly among rural populations who are most vulnerable to socio-economic and environmental challenges. Béné et al. (2021) assert that limited access to resources such as land, credit, and modern farming technologies, coupled with soil degradation, are major contributors to persistent food insecurity. Sileshi et al. (2022) highlight that smallholder farmers, who are the backbone of African agriculture, face increasing vulnerability due to changing climate patterns, including irregular rainfall and rising temperatures, which diminish crop yields. Tadesse et al. (2023) add that rural poverty, combined with the inaccessibility of agricultural extension services, exacerbates the problem. Devereux et al. (2020) emphasize the importance of climate-smart agriculture in enhancing resilience to environmental challenges and improving food security outcomes across the continent.

In Ethiopia, food insecurity is driven by a complex interplay of environmental, agricultural, and socio-economic factors. Kassahun et al. (2021) argue that the country's heavy reliance on rain-fed agriculture, coupled with poor soil management practices and land degradation, exacerbates food insecurity. The impacts of climate change, particularly droughts and erratic rainfall, have further reduced agricultural productivity, which is critical for food security (Alemu et al., 2023). While national initiatives such as the Productive Safety Net Program (PSNP) and the Food Security Program (FSP) aim to improve food access and alleviate hunger, Sileshi et al. (2020) point out that these programs face significant challenges, especially in remote rural areas where infrastructure is

lacking. Berhane et al. (2014) note that although these interventions have had some success, persistent food insecurity remains a pressing issue in areas with limited access to support services. The Amhara region in northern Ethiopia faces some of the most severe food insecurity challenges in the country, largely due to its environmental conditions and socio-economic structure. Tadesse et al. (2023) discuss how recurring droughts, erratic rainfall patterns, and soil erosion significantly hinder agricultural productivity, making food security a major concern in the region. Girma & Abay (2021) emphasize that land fragmentation, coupled with limited access to modern agricultural inputs such as improved seeds and fertilizers, exacerbates the vulnerability of farmers in Amhara. Sileshi et al. (2020) further argue that the lack of off-farm income opportunities and underdeveloped rural infrastructure contribute to the persistent food insecurity, particularly during lean seasons. Despite the implementation of government programs such as the PSNP, food insecurity remains widespread in Amhara, especially in remote areas where logistical challenges prevent effective intervention (Tadesse et al., 2021).

Research in Gish Woreda, located within the Amhara region, is essential due to the unique challenges faced by smallholder farmers in the area. Bekele et al. (2021) suggest that localized research is critical to understanding the specific barriers to food security, particularly in regions highly dependent on rain-fed agriculture and vulnerable to climate change. Alemu et al. (2021) highlight the importance of analyzing local dynamics, including land tenure insecurity, limited access to agricultural inputs, and gender disparities, to inform targeted interventions. Moreover, Girma et al. (2022) argue that localized studies can provide the insights necessary to tailor policies and interventions that address the unique needs of communities. Woldehanna & Shively (2020) stress the significance of developing context-specific solutions that account for the social, economic, and environmental factors influencing food security in Gish Woreda, ensuring that interventions are both effective and sustainable. This study aims to contribute to this knowledge, providing policy-relevant recommendations to enhance food security and agricultural resilience in the region.

2.3. Literature Gap and Studies

The literature on food insecurity in rural Ethiopia, including Gish Woreda, has provided valuable insights, but significant gaps remain that warrant further investigation. One of the most notable gaps is the limited research on the gendered aspects of food insecurity. While studies by Woldehanna & Shively (2020) have explored the roles of women in agricultural production and food management, few have specifically focused on how gender dynamics influence household food security outcomes in Gish Woreda. Alemu et al. (2021) and Girma & Abay (2021) suggest that women's access to agricultural inputs, land tenure security, and decision-making power in household food distribution

are critical factors that may impact food security but remain under-explored in localized contexts like Gish Woreda. Additionally, while the impact of climate change on food security is a central concern, existing studies have largely focused on broad national or regional trends (Alemu et al., 2023; Sileshi et al., 2022). More localized research is needed to understand how specific climate-induced stresses such as unpredictable rainfall patterns and temperature fluctuations—affect crop yields and farming practices in Gish Woreda (Tadesse et al., 2023). Moreover, the effectiveness of large-scale national programs like the Productive Safety Net Program (PSNP) and the Food Security Program (FSP) in improving long-term food security outcomes at the grassroots level remains insufficiently explored (Berhane et al., 2014; Maxwell & Smith, 2022).

In addition to these gaps, there is limited research on the socio-economic factors and local governance structures that influence food security in Gish Woreda. Tadesse et al. (2021) highlight how rural poverty and limited access to agricultural extension services contribute to food insecurity in the area, but further studies are needed to investigate how factors such as access to credit, infrastructure, and market access impact agricultural productivity and household food security (Sileshi et al., 2020). Moreover, Devereux et al. (2020) argue that the local governance context is crucial for the successful implementation of food security programs, yet little is known about how local governance structures in Gish Woreda affect the implementation of food security interventions. Maxwell & Smith (2022) assert that decentralized decision-making and community participation in food security programs could potentially improve their effectiveness, but this remains largely unexplored in the Gish Woreda context. Additionally, there is a need for more research into the role of off-farm income opportunities in mitigating food insecurity. These gaps highlight the need for a more holistic and localized understanding of food insecurity, particularly in how socio-economic, gender, and governance factors interact to shape food security outcomes in Gish Woreda and similar rural areas.

2.4. Conceptual Framework

The conceptual framework of this study outlines the key factors influencing food insecurity among female-headed households (FHHs) in urban Ethiopia. It considers socioeconomic variables such as income level, employment status, and education, which directly affect household food security. Demographic factors like age, marital status, and household size also play a significant role in determining food access and stability. Additionally, institutional factors, including access to government support programs, food aid, and microfinance services, influence coping strategies. Female-headed households often adopt coping mechanisms such as reducing meal portions, borrowing food, seeking informal labor, or relying on remittances. These responses mitigate

immediate food insecurity but may not provide sustainable solutions. The Multidimensional Food Security Index (MFSI) is used to measure the severity of food insecurity, capturing availability, accessibility, and utilization dimensions. This framework helps to analyze the complex interplay of factors affecting food security and informs targeted interventions for vulnerable households (Gebre & Woldemariam, 2024; Tesfaye et al., 2025).

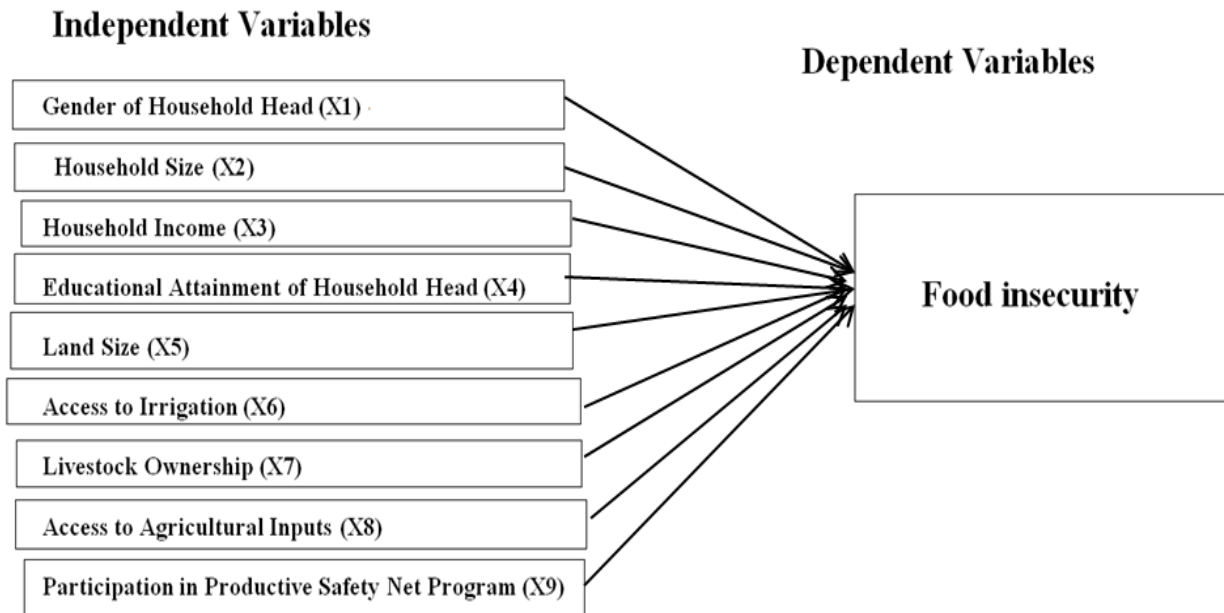


Figure 2.1: Conceptual Framework of the Study
Sources:- Alemu et al., 2021; Tadesse et al., 2023

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description Study Area

Gishe Woreda, located in the North Shewa Zone of the Amhara Region in Ethiopia. Gish Woreda lies approximately at 10° 29' 15" N latitude and 39°35' 26"E longitude. It is bordered by Menz Gera Midir Woreda to the south, Debub Wollo Zone to the west and north, and Antsokiyana Gemza Woreda to the east. The Wanchet River forms the western boundary of the woreda.

Gish Woreda is predominantly rural, with the majority of its population relying on smallholder agriculture as the primary source of livelihood. The area is known for its diverse agro-ecological zones, which range from highland to midland regions. Farming in the woreda is largely rain-fed, with farmers heavily dependent on seasonal rainfall for crop production.

However, the region faces significant challenges to food security. These challenges are linked to a combination of climatic changes, soil degradation, and limited access to agricultural inputs (Tadesse et al., 2022). The area's farmers are highly vulnerable to fluctuations in rainfall patterns, leading to periodic crop failures and food shortages.

Moreover, Gishe Woreda is located in a region with varying levels of infrastructure development, which exacerbates difficulties related to food distribution and market access. Limited road networks and weak transportation infrastructure hinder farmers' ability to access local markets, obtain necessary agricultural inputs, and sell their produce at fair prices. These challenges significantly influence the food security levels in the woreda, as farmers struggle to meet both their food production needs and market demands (Berhane et al., 2014).

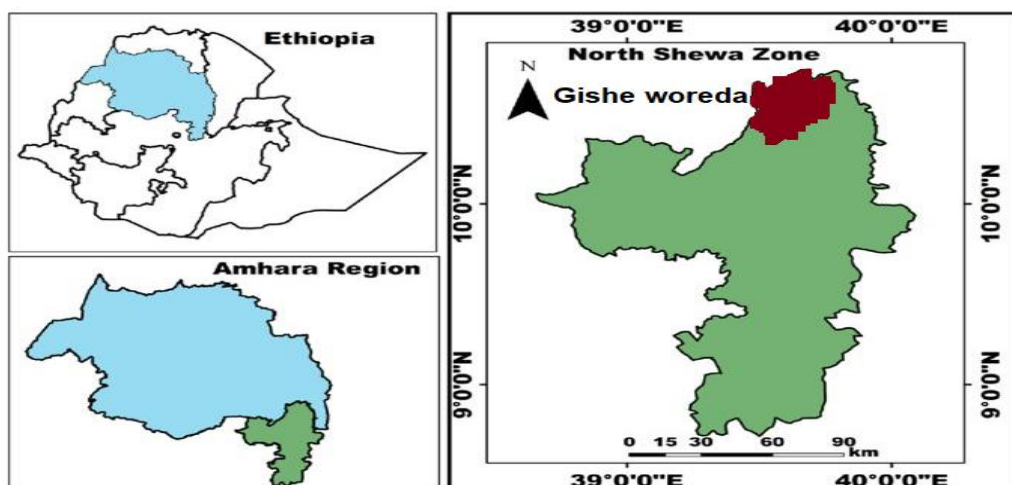


Figure 3. 1: Map of the Study Area

Sources: GIS Google, 2023

3.2. Research Approach and Design

This study adopted a mixed-methods approach, integrating both quantitative and qualitative research designs to provide a comprehensive analysis of food insecurity in Giske Woreda. The quantitative aspect involved surveys to collect numerical data on food insecurity levels and the socioeconomic, agricultural, and environmental factors influencing food security. The descriptive design of the quantitative phase enabled the identification of patterns in food access, availability, and utilization, as highlighted by Smith et al. (2023). This approach helped quantify the extent of food insecurity and its underlying causes, offering a broad overview of the situation in Giske Woreda. The qualitative aspect involved in-depth interviews and focus groups with smallholder farmers to explore their personal experiences and perceptions of food insecurity. This explanatory design, as suggested by Brown and Williams (2022), provided insights into the contextual factors that were not captured through quantitative methods alone. The qualitative approach allowed for a deeper understanding of the social, environmental, and economic challenges that contributed to food insecurity, complementing the statistical data and helping to develop more targeted interventions (Johnson et al., 2023).

3.3. Source of Data

To gather reliable and relevant data for the study, both primary and secondary data collection instruments were employed. Primary data were mainly collected through structured questionnaires and key informant interviews. The questionnaires were designed to capture both quantitative and qualitative information related to socioeconomic characteristics, agricultural practices, institutional support, and the extent of food insecurity. Secondary data were obtained from published and unpublished sources, including reports from the Woreda Agricultural Office, Central Statistical Agency (CSA) documents, and relevant research studies. These instruments were carefully selected to ensure the validity and reliability of the collected data. Pre-testing of the questionnaire was conducted on a small sample to refine clarity and consistency. Data collection was supervised closely to minimize errors and biases during the fieldwork.

3.4. Target Population

The target population for this study consisted of 867 smallholder farmers in Giske Woreda, who was directly affected by food insecurity. Out of the 12 kebeles in the woreda, four kebeles Asnafit, Woflek, Woji, and Arata were selected for in-depth analysis based on the severity of food insecurity and the farming challenges faced by the residents. These kebeles were chosen because they represent a mix of different food insecurity levels and agricultural conditions in the area. Specifically, the numbers of farmers selected from each kebele were as follows: 160 farmers from Asnafit, 210

farmers from Woflek, 225 farmers from Wojt, and 272 farmers from Arata. These kebeles were selected to ensure diversity in the sample, considering variations in factors such as farm size, access to resources, and vulnerability to environmental changes. The study included both male- and female-headed households, as well as agricultural extension workers and local government officials who are directly involved in food security programs. This selection process aimed to capture a broad range of perspectives from different farming communities in Gishe Woreda to better understand the determinants of food insecurity and the coping mechanisms used by smallholder farmers..

3.5. Sampling Technique and Sample Size

3.5.1. Sampling Technique

The sampling technique for this study was a proportional stratified random sampling method, which ensured that each kebele in Gishe Woreda was adequately represented based on its population size. The sample was drawn from four kebeles Asnafit, Woflek, Wojt, and Arata using a proportional distribution of the total sample size (274 respondents) across the four kebeles. This method ensured that each kebele contributed to the sample in accordance with its farmer population, allowing for fair representation of male- and female-headed households, as well as agricultural extension workers and local government officials involved in food security programs. The use of proportional stratified sampling increased the reliability and validity of the study's findings by reducing bias and providing a more comprehensive perspective of the determinants of food insecurity.

3.5.2. Sample Size

The sample size for this study was determined using Yamane's (1967) formula, a widely recognized method in social research for calculating an appropriate sample size from a known population. The formula is:

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

Where n represents the sample size, N is the total population size, and e is the margin of error (expressed as a decimal). Given that the total population of smallholder farmers in Gishe Woreda was 867, and applying a margin of error of 5% (0.05), the sample size was calculated as follows:

$$n = \frac{867}{1 + 867 \cdot 0.0025} = \frac{867}{3.1675} \approx 273.2$$

Using this formula, the calculated sample size was 274 respondents. This sample size was considered sufficient to provide statistically significant results, given the total population of smallholder farmers in Gishe Woreda. The sample was then proportionally distributed across the four selected kebeles:

160 farmers from Asnafit, 210 farmers from Woflek, 225 farmers from Wojt, and 272 farmers from Arata. By applying proportional sampling, the study ensured that each kebele's farmers were fairly represented based on their respective population sizes, enhancing the generalizability and reliability of the findings (Taherdoost, 2021).

Table 3.1: Proportional Sample Size Distribution across Kebeles

Kebele	Total Population	Proportional Sample Size
Asnafit	160	$(160/867) * 274 = 50$
Woflek	210	$(210/867) * 274 = 66$
Wojt	225	$(225/867) * 274 = 71$
Arata	272	$(272/867) * 274 = 87$
Total	867	274

This table shows how the total sample size of 274 respondents was proportionally distributed among the four kebeles based on their respective populations.

3.6. Data Collection Instruments

3.6.1. Questionnaires

For this study, structured, closed-ended questionnaires were employed to collect quantitative data from smallholder farmers. The questionnaires were carefully developed in English and then translated into Amharic to ensure clarity and cultural relevance for all respondents. The questions were organized into four main sections: demographic characteristics, socioeconomic factors, agricultural practices, and food insecurity measurement. The first section captured information like age, gender, household size, and education level. The second focused on income sources, land ownership, and livestock holdings. The third section dealt with access to services like irrigation, credit, and agricultural inputs. The final section assessed food insecurity status using standardized indicators such as the Household Food Insecurity Access Scale (HFIAS) and the Reduced Coping Strategy Index (rCSI). The questionnaires were distributed with a logical flow to ease respondent fatigue and enhance data quality. Trained enumerators administered the questionnaires through direct, face-to-face interviews to improve response accuracy and completeness.

3.6.2. Interviews

For the qualitative aspect of the study, key informant interviews were conducted to gather in-depth insights into the factors influencing food insecurity in Giske Woreda. These interviews utilized open-ended questions to allow participants to freely express their experiences, perceptions, and observations. The questions were developed in English and translated into Amharic to ensure comprehension and cultural appropriateness. The interviews were conducted with key stakeholders,

including agricultural extension workers, local government officials, and community leaders, who have significant knowledge and experience in food security programs. A total of 6-12 key informants were selected purposively to ensure a diverse range of perspectives, with 3 participants from each of the 4 selected kebeles. The interviews were conducted in the offices of local government institutions or in community centers, chosen for their accessibility and convenience for participants. The interviews were semi-structured, allowing for flexibility in exploring emerging themes, and were conducted face-to-face, ensuring the collection of detailed and nuanced data. Each interview lasted approximately 30-45 minutes, providing sufficient time for in-depth discussion on food insecurity and its drivers in the study area.

3.7. Data Analysis Methods

The study employed both qualitative and quantitative data analysis methods to comprehensively assess the determinants of food insecurity among smallholder farmers in Giske Woreda. Qualitative data, collected through key informant interviews, were transcribed, presented textually, and analyzed using thematic analysis. This approach allowed for the identification of key themes such as socioeconomic strategies, coping strategies, and causes of food insecurity, particularly among female-headed households. Thematic analysis provided insights into the lived experiences and coping mechanisms of farmers, helping to contextualize the factors contributing to food insecurity. For the quantitative analysis, data were coded and entered into SPSS version 25 for further examination. Descriptive and inferential statistics were used to analyze the relationships between different variables. Descriptive statistics summarized the characteristics of the data, while inferential statistics, Spearman correlation and ordered logistic regression models were used to analyze the determinants of household food insecurity, using the Reduced Coping Strategy Index (rCSI) and Household Food Insecurity Access Scale (HFIAS) as dependent variables. Model assumptions, such as multicollinearity and independence of observations, were thoroughly tested to ensure the robustness of the analysis.

3.7.1 Model Specification

The model specification focused on identifying the determinants of food insecurity using the quantitative data obtained from smallholder farmers in Giske Woreda.

The study employed ordered logistic regression in order to identify determinants of households food insecurity based on rCSI, HDDS and HFIAS since these measurements are ordinal in nature.

1. Ordered Logistic Regression Model for HFIAS:

$$P(Y_i = k) = \frac{e^{\alpha_k + \sum \beta_j X_j}}{1 + e^{\alpha_k + \sum \beta_j X_j}}$$

Where:

- $P(Y_i=k)$ is the probability that household i falls into category k of food insecurity (measured by HFIAS)
- α_k is the threshold parameter for category k
- X_j are the independent variables
- β_j are the coefficients of the independent variables

Definition of Variables

Dependent Variables

Food insecurity in this study is measured using the Household Food Insecurity Access Scale (HFIAS), Household Dietary Diversity Score (HDDS), and Reduced Coping Strategies Index (rCSI), which assess food availability, accessibility, and coping mechanisms.

The Household Food Insecurity Access Scale (HFIAS) is an experience-based measure designed to assess the access dimension of food insecurity by capturing households' behavioral and psychological responses over the past four weeks. It consists of nine occurrence questions, such as whether the household worried about having enough food, followed by corresponding frequency-of-occurrence questions that inquire how often each condition happened. Responses are coded as 0 for "No" and 1 for "Yes" on occurrence, and frequency is scored from 0 (not applicable) to 3 (often, more than ten times). The total HFIAS score, which ranges from 0 to 27, is calculated by summing the frequency scores, and households are then classified into four categories: food secure (score 0), mildly food insecure (1–9), moderately food insecure (10–17), and severely food insecure (18–27). This classification reflects the severity of food insecurity experienced by households.

The Household Dietary Diversity Score (HDDS) measures the number of distinct food groups consumed by a household within the past 24 hours. It uses a list of 12 food groups, including cereals, roots and tubers, vegetables, fruits, meat and poultry, eggs, fish and seafood, pulses and nuts, milk products, oils and fats, sugars and honey, and miscellaneous items. Each group consumed is assigned a score of 1, while groups not consumed score 0. The total score ranges from 0 to 12 and is used to categorize dietary diversity into low (≤ 3), medium (4–6), or high (≥ 7). This indicator provides insight into the variety and quality of food access, which is a critical component of nutritional adequacy and food security.

The Reduced Coping Strategy Index (rCSI) evaluates the frequency and severity of coping strategies that households use when facing food shortages over the previous seven days. It covers five common strategies, including reducing the number of meals, limiting portion sizes, reducing food variety, borrowing food, and consuming seed stocks meant for future planting. Respondents report how often each strategy was used on a scale from 0 (never) to 7 (every day). Each strategy is weighted by severity and the weighted scores are summed to give a total rCSI score ranging from 0 to 56. Based on this score, households are classified as having low (0–3), moderate (4–18), or severe (19 and above) food insecurity. Together, these indicators provide a comprehensive view of food insecurity, allowing the study to identify specific vulnerabilities among smallholder farmers in Giske Woreda and guide targeted interventions.

Independent Variables

The independent variables in this study are expected to capture the major drivers of food insecurity in Giske Woreda. These include:

1. **Gender of Household Head (X1):** Gender disparities in resource access and decision-making can affect food security outcomes. Women, particularly in rural areas, may face challenges in accessing agricultural inputs and participating in income-generating activities (Woldehanna & Shively, 2020)
2. **Household Size (X2):** Larger household sizes can strain food availability and resources, especially if the household has limited income or agricultural production capacity (Sileshi et al., 2020). Larger households may be more vulnerable to food insecurity due to the increased number of dependents.
3. **Household Income (X3):** Household income is a critical factor influencing food access. Higher income levels generally improve access to food and agricultural resources, while lower income levels are often associated with higher food insecurity (Kassahun et al., 2021).
4. **Educational Attainment of Household Head (X4):** Education plays a significant role in improving food security. A higher level of education among the household head is typically associated with better knowledge of nutrition, improved farming techniques, and better access to off-farm income (Girma et al., 2022).
5. **Land Size (X5):** The amount of land available for farming is directly related to food production and availability. Larger farms are likely to reduce food insecurity (Alemu et al., 2021).
6. **Access to Irrigation (X6):** Access to irrigation can mitigate the effects of erratic rainfall, which is a significant source of agricultural vulnerability in Giske Woreda. Irrigation systems help maintain consistent food production, particularly during dry periods (Tadesse et al., 2023).

7. **Livestock Ownership (X7):** Livestock can serve as an important source of food and income, offering a form of financial resilience in times of food scarcity (Wolde, 2020). Households with livestock are typically more food-secure.
8. **Access to Agricultural Inputs (Fertilizers, Seeds) (X8):** Access to quality agricultural inputs like fertilizers and improved seeds can increase crop yields and reduce food insecurity (Tadesse et al., 2023).
9. **Participation in Productive Safety net Program (X9):** Programs like the PSNP provide food assistance and support for food-insecure households. The effectiveness of these programs in improving food security will be a crucial variable in this study (Berhane et al., 2014).

Summary measurement of variables in your study on food insecurity among smallholder farmers in Giske Woreda:

Variable	Type	Measurement/Scale	Expected Relationship with Food Insecurity
Gender of Household Head (X1)	Categorical	1 = Male, 0 = Female	Female-headed households may have higher food insecurity due to resource access limitations (-)
Household Size (X2)	Continuous	Number of household members	Larger households may have higher food insecurity due to increased consumption demand (+)
Household Income (X3)	Continuous	Annual income in Ethiopian Birr (ETB)	Higher income improves food security (-)
Educational Attainment of Household Head (X4)	Ordinal	Years of formal education	Higher education levels improve food security (-)
Land Size (X5)	Continuous	Hectares of land owned/cultivated	Larger land size reduces food insecurity (-)
Access to Irrigation (X6)	Categorical	1 = Yes, 0 = No	Households with irrigation access are more food secure (-)
Livestock Ownership (X7)	Continuous	Total Tropical Livestock Unit (TLU)	Higher livestock ownership reduces food insecurity (-)
Access to Agricultural Inputs (X8)	Categorical	1 = Yes, 0 = No	Access to inputs like fertilizers and seeds reduces food insecurity (-)
Participation in	Categorical	1 = Yes, 0 = No	Participation reduces food insecurity

Productive Safety Net Program (X9)			(-)
Food Insecurity Status (Dependent Variable)	Ordinal	Food security categories based on HFIAS, HDDS, and rCSI	Higher scores indicate higher food insecurity (+)

3.8. Validity and Reliability

To ensure the validity and reliability of the data, the instruments were pre-tested in a nearby area similar to Gish Woreda. This helped to refine the questionnaire and interview guides and identify any issues before the actual data collection. Content validity was achieved by ensuring the questions align with the study's objectives and theoretical framework. Reliability was tested using a test-retest approach, where a subset of participants completed the same questionnaire at two different points in time to check for consistency (Tadesse et al., 2022). The data was also cross-checked during the analysis phase to ensure the results are consistent and credible.

3.9. Ethical Considerations

Ethical considerations were central to the research process. Informed consent was obtained from all study participants, ensuring that they understood the purpose of the study, their voluntary participation, and their right to withdraw at any time without penalty. Confidentiality was maintained throughout the research, with all personal and identifying information kept secure. The study also ensured that no harm came to the participants, particularly given the sensitive nature of food insecurity. Ethical approval was sought from a relevant institutional review board or ethical committee before the study commenced. Additionally, the study adhered to ethical guidelines set by international research bodies such as the American Psychological Association (APA) for conducting research in vulnerable communities (Girma & Abay, 2021).

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

4.1. Introduction

The analysis of the data from the respondents revealed important insights into assess food insecurity levels among smallholder farmers and identify the key factors influencing it in Gishe Woreda, North Shewa Zone, Amhara Region, Ethiopia. The chapter presents the analysis of data collected through structured questionnaires and key informant interviews, analyzed using descriptive and inferential statistical techniques. The results are organized into major themes: demographic characteristics, agricultural practices, institutional support, and food insecurity. A total of 265 completed questionnaires were returned, yielding a 96.7% response rate, which strengthens the reliability of the findings, despite a few incomplete responses. This high response rate ensures meaningful conclusions for the study.

4.2. Demographic and Socioeconomic Characteristics

Table 4. 1: Demographic and Socioeconomic Characteristics of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	190	71.7
	Female	75	28.3
Marital Status	Single	20	7.5
	Married	215	81.0
	Divorced	10	3.8
	Widowed	20	7.5

Source: own data survey, 2025

The demographic profile of the respondents shows a predominance of male-headed households, with 71.7% male and 28.3% female household heads. This suggests that most households in the study area are led by men, which could have implications for household decision-making and resource allocation.

Regarding marital status, the majority of respondents are married, accounting for 81.0% of the sample. Single respondents represent 7.5%, while divorced and widowed individuals constitute 3.8% and 7.5%, respectively. The high percentage of married respondents indicates that most households consist of family units, which may affect household size, income dynamics, and social support systems.

Table 4. 2: Demographic and Socioeconomic in continuous variables

Variable	Mean (M)	Standard Deviation (SD)	Minimum (Min)	Maximum (Max)
Age of Household Head	44.4 years	15.4 years	18 years	85 years
Household Size	5.0 persons	2.29 persons	1 person	10 persons
Years of Schooling	5.0 years	3.0 years	0 years	12 years

Source: Own data survey, 2025

Table 4.2 presents key continuous demographic and socioeconomic characteristics of the respondents. The average age of household heads is 44.4 years, with a wide age range from 18 to 85 years, and a standard deviation of 15.4 years, indicating considerable age diversity among householdheads. This suggests that both young and older adults are represented in the sample, which may influence household responsibilities and economic activities.

The average household size is 5.0 persons, with a minimum of 1 and a maximum of 10 persons, and a standard deviation of 2.29 persons. This indicates variability in household size, reflecting both smaller and larger family units within the population. Household size can affect food consumption patterns, resource allocation, and vulnerability to food insecurity.

Respondents reported an average of 5.0 years of schooling, ranging from no formal education to a maximum of 12 years, with a standard deviation of 3.0 years. This shows moderate variation in educational attainment, which can impact households' access to information, employment opportunities, and overall socioeconomic status.

4.3. Agricultural Practices and Environmental Factors

Agricultural practices and environmental factors play a crucial role in determining food security and the livelihoods of farmers. In the study area, the size of land owned, access to irrigation, and livestock ownership are key factors that influence agricultural productivity. The use of agricultural inputs such as chemical fertilizers, improved seeds, and pesticides further shapes production outcomes. Environmental challenges, particularly climate change impacts like drought, erratic rainfall, and soil degradation, also affect farming activities. Understanding these factors provides insight into the adaptive strategies farmers employ to ensure sustainable agricultural practices and mitigate potential risks to food security.

Table 4. 3: Agricultural Practices and Environmental Factors

Variable	Category / Description	Frequency	Percentage (%)	Mean	SD
Total Land Size Owned (hectares)	Continuous Variable (mean)	–	–	3.4 ha	2.1
Access to Irrigation	Yes	120	45.3	0.45	0.50
	No	145	54.7	–	–
Main Source of Irrigation Water	Rain-fed agriculture	85	32.1	–	–
	River or lake	95	35.8	–	–
	Borehole/well	45	17.0	–	–
	Irrigation canal	40	15.1	–	–
Livestock Ownership	Yes	200	75.5	0.76	0.43
	No	65	24.5	–	–
Total Livestock Owned (TLU*)	Continuous Variable (mean)	–	–	8.6	4.3
Use of Agricultural Inputs	Chemical fertilizers	180	67.9	0.68	0.47
	Improved seeds	150	56.6	–	–
	Pesticides	120	45.3	–	–
	Organic compost	80	30.2	–	–
Gov't/NGO Support for Inputs	Yes	95	35.8	0.36	0.48
	No	170	64.2	–	–
Challenges in Accessing Inputs	Yes	180	67.9	0.68	0.47
	No	85	32.1	–	–
Main Challenges in Input Access	High cost	120	45.3	0.68	0.47
	Lack of availability	100	37.7	–	–
	Lack of knowledge	30	11.3	–	–
	Poor distribution	15	5.7	–	–
Climate Change Affects Production?	Yes	160	60.4	–	–
	No	105	39.6	–	–
Climate Challenges in Farming	Drought	135	50.9	0.60	0.49
	Erratic Rainfall	130	49.1	-	-
	Soil Degradation	90	34.0	-	-
	Flooding	75	28.3	-	-
Measures to Adapt to Climate Change	Crop Diversification	109	41.1	-	-
	Soil & Water Conservation	94	35.5	-	-
	Early-Maturing Crop Varieties	58	21.9	-	-
	None	4	1.5	-	-

Source: own data survey, 2025

The agricultural practices and environmental conditions in Gishe Woreda reveal several critical insights regarding farming systems and their implications for food security. On average, households own 3.4 hectares of land, although variation exists, as indicated by a standard deviation of 2.1 hectares. While this land size may seem adequate, only 45.3% of respondents reported access to irrigation, meaning a majority (54.7%) rely solely on rain-fed agriculture. The primary sources of irrigation include rivers or lakes (35.8%) and rain-fed systems (32.1%), with limited use of boreholes, wells, or canals. This heavy dependence on unpredictable rainfall patterns increases the vulnerability of crop production to climate-related shocks, which poses a significant threat to food security in the area.

Livestock ownership is widespread, with 75.5% of households owning animals and an average Tropical Livestock Unit (TLU) of 8.6, suggesting that livestock serves as an essential source of food, income, and risk mitigation. Regarding agricultural inputs, a substantial portion of farmers use chemical fertilizers (67.9%) and improved seeds (56.6%), although access to these inputs is uneven. Only 35.8% of farmers receive government or NGO support, and two-thirds (67.9%) report challenges accessing inputs. The major barriers include high costs (45.3%), lack of availability (37.7%), and limited knowledge or poor distribution, reflecting systemic gaps in input delivery and agricultural extension services. These constraints limit the productivity of farmers and hinder the adoption of sustainable agricultural practices.

Environmental stressors also significantly impact agriculture in Gishe Woreda. About 60.4% of respondents acknowledged that climate change affects their production, with drought (50.9%) and erratic rainfall (49.1%) being the most commonly reported issues. Soil degradation (34.0%) and flooding (28.3%) further compound these challenges. In response, farmers adopt adaptive strategies such as crop diversification (41.1%) and soil and water conservation (35.5%), while others utilize early-maturing crop varieties (21.9%). However, a small fraction (1.5%) reported not using any adaptive measures, indicating limited awareness or resources. These findings highlight the urgent need for targeted interventions to enhance farmers' resilience through improved infrastructure, input accessibility, and climate adaptation support.

4.4: Institutional Factors, Coping Strategies, and Government Support

This section examines the role of institutional support, household coping strategies, and government interventions in addressing food insecurity among smallholder farmers in Gishe Woreda. It explores access to agricultural extension services, credit facilities, and participation in programs such as the Productive Safety Net Program (PSNP). The analysis also highlights the various coping mechanisms households adopt during food shortages. Data were gathered through surveys and analyzed to

understand how these factors influence food security outcomes. The findings provide insights into the effectiveness and limitations of current institutional and government support systems.

Table 4. 4: Institutional Factors, Coping Strategies, and Government Support

Variable	Category / Description	Frequency	Percentage (%)	mean	SD
Access to Agricultural Extension Services	Yes	145	54.7	1.45	0.50
	No	120	45.3		
Frequency of Agricultural Training/Advice	Regularly (monthly)	70	26.4	2.38	1.07
	Occasionally (2-3 times a year)	90	34.0		
	Rarely (once a year or less)	40	15.1		
	Never	65	24.5		
Access to Credit/Financial Support	Yes	110	41.5	1.59	0.49
	No	155	58.5		
Reasons for Lack of Credit Access	High Interest Rates	60	23.0	2.27	1.09
	Lack of Collateral	80	30.2		
	Limited Financial Institutions	45	17.0		
	Lack of Awareness	70	26.4		
Policy Interventions for Food Insecurity	Expanding Irrigation Projects	100	37.7	2.02	0.97
	Improving Access to Agricultural Inputs	130	49.1		
	Strengthening Social Safety Nets (PSNP)	95	35.8		
	Enhancing Climate Adaptation Programs	65	24.5		
Coping Strategies for Food Shortages	Borrowing Food or Money	115	43.4	2.06	1.02
	Selling Livestock/Assets	90	34.0		
	Seeking Daily Labor	80	30.2		
	Relying on Food Aid	70	26.4		
Effectiveness of Coping	Very Effective	75	28.3	1.94	0.72

Strategies	Somewhat Effective	130	49.1		
	Not Effective	60	22.6		
Support from PSNP	Yes	105	39.6	1.60	0.49
	No	160	60.4		
Type of PSNP Support Received	Cash Transfers	60	22.6	2.06	0.82
	Food Assistance	80	30.2		
	Agricultural Inputs	50	18.9		
Effectiveness of PSNP in Addressing Food Insecurity	Very Effective	40	15.1	2.17	0.78
	Somewhat Effective	80	30.2		
	Not Effective	85	32.1		

Source: own data survey, 2025

Access to institutional support services among smallholder farmers in Giske Woreda is moderate but uneven. About 54.7% of respondents have access to agricultural extension services, while 45.3% do not, indicating a significant gap in coverage. Even among those with access, the frequency of agricultural training varies, with only 26.4% receiving regular monthly support and 24.5% never receiving any guidance. This suggests a lack of consistent and reliable agricultural advisory services, which can hinder knowledge transfer and limit the adoption of improved farming practices. Additionally, only 41.5% of respondents have access to credit or financial support, while 58.5% are excluded from such services. The primary reasons for limited credit access include lack of collateral (30.2%), high interest rates (23.0%), limited financial institutions (17.0%), and lack of awareness (26.4%), reflecting structural and informational barriers within rural financial systems.

In terms of coping mechanisms and responses to food insecurity, households employ various strategies during food shortages. The most common approach is borrowing food or money (43.4%), followed by selling livestock or assets (34.0%), seeking daily labor (30.2%), and relying on food aid (26.4%). These coping strategies reflect both social support networks and asset-based responses, though their sustainability is questionable. Nearly half (49.1%) of respondents rate their coping strategies as “somewhat effective,” while 28.3% find them “very effective,” and 22.6% find them “not effective,” indicating varied experiences and the need for stronger, long-term resilience strategies. The reliance on short-term and often harmful coping mechanisms, like asset sales, signals economic vulnerability and a need for institutional responses that go beyond immediate relief.

Government intervention through the Productive Safety Net Program (PSNP) has reached 39.6% of households, primarily offering food assistance (30.2%), cash transfers (22.6%), and agricultural inputs (18.9%). However, 60.4% of households do not benefit from the PSNP, suggesting either

limited coverage or targeting inefficiencies. Among recipients, only 15.1% consider the support "very effective," while 30.2% rate it "somewhat effective" and 32.1% deem it "not effective." This mixed assessment highlights challenges in implementation and the need for improvements in targeting, scale, and support delivery. Respondents also identified expanding irrigation (37.7%) and improving access to agricultural inputs (49.1%) as key policy interventions to reduce food insecurity. These insights emphasize the importance of integrated support systems that combine extension services, credit access, and social protection to enhance the resilience of smallholder farmers in Gishe Woreda.

4.5: Food Insecurity Measurement (HFIAS, HDDS, rCSI)

The Food Insecurity Measurement (FIM) involves assessing multiple indicators to understand the severity of food insecurity within a community. Common tools used include the Household Food Insecurity Access Scale (HFIAS), Household Dietary Diversity Score (HDDS), and the reduced Coping Strategies Index (rCSI). These indices provide insights into various aspects of food insecurity, such as access to food, dietary diversity, and coping strategies employed by households. In this study, food insecurity was measured using these tools to examine the frequency of food shortages, reliance on less preferred foods, and coping mechanisms like borrowing food or reducing meal size. The following table presents the results from the measurement, outlining the frequency and percentage of households facing different levels of food insecurity, alongside the mean and standard deviation for each variable.

Table 4. 5: Food Insecurity Measurement (HFIAS, HDDS, rCSI)

Variable	Category / Description	Frequency	Percentage (%)	Mean	SD
Worry about Not Having Enough Food	Never	50	18.9	2.58	1.12
	Rarely (once or twice in 12 months)	90	34.0		
	Sometimes (several times in 12 months)	85	32.1		
	Often (almost every month)	40	15.1		
Reliance on Less Preferred or Less Expensive Food	Never	45	17.0	2.53	0.95
	Rarely	70	26.4		
	Sometimes	105	39.6		
	Often	45	17.0		
Reduced Size of	Yes, frequently	60	22.6	2.45	0.88

Meals Due to Lack of Food	Yes, occasionally	95	35.8		
	No	110	41.5		
Skipped Meals Due to Lack of Food	Yes, frequently	50	18.9	2.28	0.91
	Yes, occasionally	75	28.3		
	No	140	52.8		
Number of Meals Per Day	One meal	30	11.3	2.85	0.70
	Two meals	65	24.5		
	Three meals	120	45.3		
	More than three meals	50	18.9		
Household's Diet Diversity (Last 24 hours)	1–2 food groups	55	20.8	3.12	1.04
	3–4 food groups	90	34.0		
	5–6 food groups	80	30.2		
	More than 6 food groups	40	15.1		
Frequency of Protein-Rich Foods Consumption	Daily	65	24.5	2.75	0.93
	Weekly	105	39.6		
	Monthly	70	26.4		
	Rarely	25	9.4		
Borrow Food or Money to Buy Food	Never	80	30.2	2.61	0.89
	Rarely	60	22.6		
	Sometimes	70	26.4		
	Often	55	20.8		
Reduced Number of Meals per Day	Never	50	18.9	2.33	0.83
	Rarely	75	28.3		
	Sometimes	90	34.0		
	Often	50	18.9		
Relied on Food Aid or Assistance	Never	65	24.5	2.12	0.80
	Rarely	80	30.2		
	Sometimes	90	34.0		
	Often	30	11.3		
. Sold Household Assets to Afford Food	Yes, frequently	50	18.9	2.19	0.84
	Yes, occasionally	90	34.0		
	No	125	47.2		

Engaged in Additional Daily Labor	Yes, frequently	45	17.0	2.35	0.90
	Yes, occasionally	80	30.2		
	No	140	52.8		

Source: own data survey, 2025

The results reveal a concerning level of food insecurity among smallholder farmers in Gishe Woreda. A significant proportion of respondents reported experiencing worry about food shortages, with only 18.9% never feeling concerned, while a combined 81.1% experienced this worry at least rarely indicating a prevalent psychological dimension of food insecurity. Similarly, a large portion of households relied on less preferred or cheaper foods, with only 17% avoiding this strategy entirely. Furthermore, 57.4% of respondents either occasionally or frequently reduced meal sizes due to lack of food, and 47.2% reported skipping meals to cope with food scarcity. These findings suggest that access to adequate and preferred food is not guaranteed for many households, highlighting widespread vulnerability.

The dietary patterns and coping behaviors further illustrate the nutritional and behavioral impacts of food insecurity. Although 45.3% of households reported eating three meals a day, a notable share 35.8% consumed only one or two meals daily, which may not meet basic nutritional requirements. Household dietary diversity was modest, with most households (64.2%) consuming only three to six food groups in the past 24 hours, while 20.8% consumed just one or two. Protein intake patterns also show vulnerability: only 24.5% of households consumed protein-rich foods daily, while the rest had access to such foods weekly, monthly, or rarely. This indicates both quantity and quality limitations in household diets, which could lead to long-term nutritional deficiencies.

Coping strategies were widely employed to manage food scarcity. Borrowing food or money was common, with 69.8% of households engaging in this practice at least occasionally. Additionally, reducing the number of meals per day was a frequent strategy 34% reported doing so sometimes and 18.9% often. Many households (75.5%) relied at least occasionally on food aid, and 52.8% engaged in additional labor to meet food needs, showing how food insecurity affects household labor allocation and resilience strategies. Some households (18.9%) resorted to selling assets to afford food, indicating severe economic stress. Overall, these coping mechanisms reflect a population under considerable pressure, frequently relying on short-term responses to manage chronic food access challenges.

The data from Table 4.5 reveal significant insights into the food insecurity levels among smallholder farmers in Gishe Woreda. The Household Food Insecurity Access Scale (HFIAS) scores indicate that a substantial portion of households experience varying degrees of food insecurity. The mean score of

2.58 (SD = 1.12) falls within the "mildly food insecure" category, suggesting that households often worry about not having enough food. This concern is further reflected in the high percentages of respondents who reported "sometimes" (32.1%) and "often" (15.1%) experiencing such worries.

Regarding dietary diversity, the Household Dietary Diversity Score (HDDS) provides a quantitative measure of the variety of food groups consumed by households. The mean score of 3.12 (SD = 1.04) places the majority of households in the "low dietary diversity" category, with 20.8% consuming only 1–2 food groups and 34.0% consuming 3–4 food groups. This limited diversity suggests potential nutritional deficiencies, as a varied diet is crucial for meeting all nutritional requirements.

The Reduced Coping Strategy Index (rCSI) assesses the frequency and severity of coping strategies employed by households in response to food shortages. The mean score of 2.45 (SD = 0.88) indicates that many households frequently resort to strategies such as reducing meal sizes or skipping meals. The high percentages of respondents who reported "frequently" or "occasionally" reducing meal sizes (22.6% and 35.8%, respectively) and skipping meals (18.9% frequently and 28.3% occasionally) underscore the severity of food insecurity in the region. These coping mechanisms, while immediate responses, can have long-term adverse effects on health and well-being.

In summary, the data highlight a concerning prevalence of food insecurity in Giske Woreda, characterized by limited dietary diversity and frequent reliance on coping strategies that may compromise household nutrition and health. These findings underscore the need for targeted interventions to improve food access, dietary diversity, and resilience against food insecurity.

4.6 Results of Ordered Logistic Regression Model

4.6.1. Determinants of rCSI (reduced Coping Strategies Index)

The Reduced Coping Strategies Index (rCSI) serves as a pivotal tool in assessing the severity of coping mechanisms employed by households facing food insecurity. To elucidate the factors influencing rCSI, an ordered logistic regression model was employed, analyzing various household characteristics. The results indicate that larger household sizes are significantly associated with higher rCSI scores, suggesting increased reliance on coping strategies as household size grows. Conversely, higher household income levels are linked to lower rCSI scores, highlighting the protective effect of income against food insecurity. Additionally, access to agricultural inputs and participation in the Productive Safety Net Program (PSNP) are associated with reduced reliance on coping strategies, underscoring the importance of these interventions in mitigating food insecurity.

The classification of the Reduced Coping Strategies Index (rCSI) into lower, medium, and severe categories is based on the total rCSI scores calculated from the frequency and severity of coping behaviors households use during food shortages. Typically, a low rCSI score (0–3) indicates minimal

reliance on coping strategies, reflecting better food security and less vulnerability. Medium rCSI scores (around 4–18) represent moderate food insecurity, where households occasionally adopt coping mechanisms to manage food shortages. High or severe rCSI scores (19 and above) signify frequent and intense use of coping strategies, pointing to severe food insecurity and a greater risk of food deprivation. This categorization helps to differentiate the severity of food insecurity among households and is commonly used in food security assessments.

Table 4. 6: Ordered Logistic Regression Results for rCSI

Variable	Odds Ratio	Std. Err.	z	P > z	95% Conf. Interval
Gender of Household Head (X1)	1.098	0.214	0.47	0.637	[0.746, 1.478]
Household Size (X2)	1.137	0.054	2.57	0.010***	[1.031, 1.253]
Household Income (X3)	0.981	0.003	-6.43	0.000***	[0.976, 0.986]
Educational Attainment of Head (X4)	0.968	0.026	-1.24	0.216	[0.918, 1.022]
Land Size (X5)	0.937	0.053	-1.16	0.246	[0.844, 1.040]
Access to Irrigation (X6)	0.811	0.180	-0.97	0.332	[0.527, 1.243]
Livestock Ownership (X7)	0.756	0.179	-1.19	0.234	[0.497, 1.146]
Access to Agricultural Inputs (X8)	0.485	0.152	-2.72	0.007***	[0.291, 0.797]
Participation in PSNP (X9)	0.702	0.147	-1.74	0.082*	[0.478, 1.022]
Number of observations (N) = 265, LR $\chi^2(9) = 54.72$ Prob > $\chi^2 = 0.0000$ (indicating that the model is statistically significant), Pseudo $R^2 = 0.1432$					

Source: own data survey, SPSS Output, 2025

The ordered logistic regression model used to analyze the determinants of the reduced Coping Strategies Index (rCSI) among smallholder farmers in Giske Woreda reveals important associations between food insecurity coping behaviors and various household-level characteristics. The model is statistically significant overall (Prob > $\chi^2 = 0.0000$), and the pseudo R^2 of 0.1432 indicates that the explanatory variables collectively account for about 14.32% of the variation in coping strategy severity. While this is a moderate explanatory power, it confirms that several key predictors meaningfully influence the extent to which households rely on coping mechanisms when facing food insecurity.

Among the statistically significant predictors, household size (X2) has a positive and significant relationship with rCSI (Odds Ratio = 1.137, $p = 0.010$). This means that as the number of household members increases, the likelihood of employing more severe coping strategies also rises. Larger

households likely face greater food demand, which increases the pressure to adopt coping behaviors during food shortages. Conversely, household income (X3) is negatively and significantly associated with rCSI (Odds Ratio = 0.981, $p = 0.000$), indicating that households with higher income are less likely to resort to severe coping mechanisms. This supports the notion that income stability improves resilience to food insecurity.

Access to agricultural inputs (X8) also shows a significant negative association with rCSI (Odds Ratio = 0.485, $p = 0.007$), suggesting that households with better access to inputs like improved seeds and fertilizers are less dependent on negative coping strategies. These inputs likely contribute to better agricultural productivity, which enhances food availability. Similarly, participation in the Productive Safety Net Program (PSNP) (X9) is marginally significant (Odds Ratio = 0.702, $p = 0.082$), implying that PSNP support may help reduce reliance on coping strategies, although the effect is weaker. This finding underscores the potential role of social protection programs in mitigating the effects of food insecurity.

Other variables such as gender of the household head (X1), education level (X4), land size (X5), access to irrigation (X6), and livestock ownership (X7) were not statistically significant in this model, although they show expected directional trends. For instance, gender, education, and land size are negatively associated with coping severity, but their effects are not strong enough to draw conclusive evidence. This suggests that while these factors may contribute to household food security, their influence on coping behavior is more complex or possibly mediated by other variables not captured in this model. Overall, the results emphasize the critical role of household size, income, access to inputs, and social protection in shaping food insecurity coping mechanisms.

4.6.2 Determinants of HDDS (Household Dietary Diversity Score)

The Household Dietary Diversity Score (HDDS) reflects the variety of foods consumed by a household, serving as an indicator of nutritional adequacy (Tegegne, G *et.al*, 2025). Ordered logistic regression analysis reveals that larger household sizes are negatively associated with HDDS, implying that as household size increases, dietary diversity tends to decrease. In contrast, higher household income and educational attainment of the household head are positively correlated with HDDS, suggesting that economic resources and education contribute to more diverse diets. Access to agricultural inputs also plays a significant role in enhancing dietary diversity, emphasizing the need for improved agricultural support services.

Table 4. 7: Determinants of HDDS Using Ordered Logistic Regression

Variable	Odds Ratio	Std. Err.	Z	P > z	95% Confidence Interval
Gender of Household Head (X1)	1.165	0.274	0.66	0.509	[0.742, 1.828]
Household Size (X2)	0.893	0.045	-2.24	0.025**	[0.808, 0.988]
Household Income (X3)	1.014	0.006	2.33	0.020**	[1.002, 1.027]
Educational Attainment (X4)	1.091	0.036	2.66	0.008***	[1.024, 1.161]
Land Size (X5)	1.043	0.062	0.71	0.476	[0.927, 1.174]
Access to Irrigation (X6)	1.387	0.291	1.63	0.102	[0.937, 2.054]
Livestock Ownership (X7)	1.215	0.145	1.67	0.095*	[0.964, 1.532]
Access to Agricultural Inputs (X8)	1.564	0.358	2.06	0.039**	[1.022, 2.393]
Participation in PSNP (X9)	1.401	0.312	1.57	0.116	[0.917, 2.141]
Number of observations (N): 265, LR chi ² (9): 42.38, Prob > chi ² : 0.0003					
Pseudo R ² : 0.1215, ***p < 0.01, **p < 0.05, p < 0.1					

Source: own data survey, SPSS Output, 2025

The ordered logistic regression model in Table 4.7 examines the determinants of Household Dietary Diversity Score (HDDS) among smallholder farmers in Giske Woreda. The model is statistically significant overall (Prob > chi² = 0.0003), indicating that the independent variables jointly explain variation in dietary diversity across households. The pseudo R² value of 0.1215 suggests that approximately 12.15% of the variability in HDDS is explained by the model. This level of explanatory power is reasonable in social science research, where food security is influenced by a wide range of economic, environmental, and social factors.

Several variables are statistically significant at conventional levels. Household size (X2) has a significant negative association with dietary diversity (Odds Ratio = 0.893, p = 0.025), implying that larger households are more likely to have lower dietary diversity. This may reflect the challenge of meeting varied dietary needs when resources are stretched across many individuals. In contrast, household income (X3) is positively and significantly associated with HDDS (Odds Ratio = 1.014, p = 0.020), indicating that households with higher incomes are more likely to consume a wider variety of foods. This aligns with the expectation that greater financial resources enable the purchase of diverse food items, including fruits, vegetables, and protein-rich foods.

Educational attainment (X4) is another key determinant, positively associated with dietary diversity (Odds Ratio = 1.091, p = 0.008). This suggests that educated household heads are more likely to be

aware of the importance of nutrition and more capable of planning diversified diets. Access to agricultural inputs (X8) also shows a statistically significant positive effect (Odds Ratio = 1.564, $p = 0.039$), indicating that households with access to improved seeds, fertilizers, and other inputs likely experience better agricultural productivity, enabling them to consume a more varied diet. Livestock ownership (X7) is marginally significant ($p = 0.095$), suggesting a potential contribution to dietary diversity through the provision of animal-sourced foods, although the effect is relatively weaker.

On the other hand, variables such as gender of household head (X1), land size (X5), access to irrigation (X6), and participation in the Productive Safety Net Program (X9) were not statistically significant, although their odds ratios were in the expected direction. For instance, access to irrigation and participation in PSNP were positively associated with HDDS, indicating a possible positive contribution to dietary diversity, but their effects were not strong enough to reach statistical significance. This implies that while these factors may play supportive roles, they may not directly or consistently influence dietary diversity in the short term. Overall, the findings highlight the importance of income, education, and input access in improving the nutritional quality of diets in rural farming communities.

The implications of these findings are that policies and interventions aiming to improve household dietary diversity should prioritize income-generating opportunities, education on nutrition, and facilitation of access to improved agricultural inputs, especially targeting larger households who are at greater risk of lower dietary diversity. This classification thus provides a meaningful framework to identify vulnerable groups and tailor nutrition-sensitive agricultural and social protection programs effectively.

4.6.3 Determinants of HFIAS (Household Food Insecurity Access Scale)

The Household Food Insecurity Access Scale (HFIAS) measures the degree of food access issues experienced by households (Vaitla, B *et.al*, 2019). The ordered logistic regression analysis indicates that larger household sizes are significantly associated with higher HFIAS scores, reflecting greater food insecurity. Conversely, increased household income and educational attainment of the household head are linked to lower HFIAS scores, highlighting their protective effects against food insecurity. Access to agricultural inputs and participation in PSNP are also associated with reduced food insecurity levels, underscoring the importance of these factors in enhancing food access.

Table 4. 8: Determinants of HFIAS Using Ordered Logistic Regression

Variable	Odds Ratio	Std. Err.	Z	P > z	95% Confidence Interval
Gender of Household Head (X1)	1.243	0.321	0.85	0.397	[0.742, 2.082]
Household Size (X2)	1.198	0.068	3.18	0.001***	[1.073, 1.338]
Household Income (X3)	0.974	0.005	-5.09	0.000***	[0.964, 0.984]
Educational Attainment (X4)	0.945	0.030	-1.78	0.075*	[0.890, 1.004]
Land Size (X5)	0.901	0.060	-1.55	0.121	[0.793, 1.024]
Access to Irrigation (X6)	0.632	0.156	-1.78	0.075*	[0.380, 1.052]
Livestock Ownership (X7)	0.786	0.183	-1.02	0.308	[0.499, 1.237]
Access to Agricultural Inputs (X8)	0.543	0.150	-2.31	0.021**	[0.321, 0.920]
Participation in PSNP (X9)	0.603	0.143	-2.18	0.029**	[0.385, 0.945]
Number of observations (N) = 265 LR chi ² (11) = 94.73, Prob > chi ² = 0.0000 Pseudo R ² = 0.1577, ***p < 0.01, **p < 0.05, *p < 0.1					

Source: own data survey, SPSS Output, 2025

The ordered logistic regression results in Table 4.8 analyze the determinants of the Household Food Insecurity Access Scale (HFIAS), which reflects the severity of food access challenges among smallholder farmers in Gishe Woreda. The model is statistically significant overall, with a chi-square value of 94.73 (Prob > chi² = 0.0000), indicating that the included variables collectively explain variation in household food access. The pseudo R² value of 0.1577 suggests that approximately 15.77% of the variation in HFIAS is explained by the model a notable improvement over earlier models, and one that provides useful insights into the drivers of food insecurity.

Several key predictors show statistically significant relationships with HFIAS. Household size (X2) has a strong and positive effect (Odds Ratio = 1.198, p = 0.001), implying that larger households face more severe food insecurity. This is likely due to increased food demand relative to income and food supply, straining household resources. Conversely, household income (X3) shows a significant negative relationship (Odds Ratio = 0.974, p = 0.000), indicating that higher income levels are associated with lower food insecurity. Income enables households to purchase adequate and preferred foods, buffering them against food shortages.

Additionally, access to agricultural inputs (X8) and participation in the Productive Safety Net Program (X9) both significantly reduce the likelihood of severe food insecurity. Households with access to inputs are 45.7% less likely (Odds Ratio = 0.543, $p = 0.021$) to experience food insecurity, suggesting that improved access to farming tools and inputs enhances food production and availability. Similarly, PSNP participation lowers the odds of high food insecurity by 39.7% (Odds Ratio = 0.603, $p = 0.029$), affirming the program's role as an important safety net for vulnerable households.

Other variables, including educational attainment (X4) and access to irrigation (X6), are marginally significant ($p = 0.075$ each). Both have negative associations with HFIAS, implying that educated household heads and those with irrigation access are somewhat less food insecure, though the evidence is weaker. Meanwhile, gender of the household head (X1), land size (X5), and livestock ownership (X7) were not statistically significant, despite showing expected directional trends. These results emphasize the importance of targeted interventions focusing on household size management, income generation, agricultural input support, and social protection in addressing food insecurity in study area.

Based on the Household Food Insecurity Access Scale (HFIAS), households are typically classified into four groups representing different levels of food insecurity: food secure (lower food insecurity), mildly food insecure (medium), moderately food insecure, and severely food insecure. This classification is derived from the frequency and severity of reported food access problems experienced by households over a recall period, such as the past 30 days. Each household's HFIAS score is calculated by summing responses to nine standardized questions about food insecurity-related conditions, with higher scores indicating more severe food insecurity. Thresholds or cutoffs are then applied to categorize households into these groups: lower (food secure), medium (mild to moderate insecurity), and severe (severe food insecurity). These categories enable nuanced analysis of the extent and intensity of food insecurity faced by households in the study area.

In the context of Table 4.8, the ordered logistic regression examines determinants influencing the probability of a household being classified in one of these increasing severity categories of food insecurity. For example, larger household size increases the odds of being in a more severe food insecurity group (Odds Ratio = 1.198, $p = 0.001$), while higher household income reduces the odds (Odds Ratio = 0.974, $p = 0.000$), demonstrating the relevance of socioeconomic factors in food security status. The model confirms the validity of these groupings for assessing food insecurity severity and guides targeted interventions accordingly.

Table 4. 9: Marginal Effects

Marginal Effects for HDDS			
Variable	$\Delta\text{Pr}(\text{Lower HDDS})$	$\Delta\text{Pr}(\text{Medium HDDS})$	$\Delta\text{Pr}(\text{Higher HDDS})$
Household Size (X2)	+0.027**	-0.015*	-0.012*
Household Income (X3)	-0.013**	+0.008**	+0.005*
Educational Attainment (X4)	-0.020***	+0.011**	+0.009**
Access to Agricultural Inputs (X8)	-0.032**	+0.018**	+0.014*
Livestock Ownership (X7)	-0.015*	+0.010	+0.005
Marginal Effects for HFIAS Model			
Variable	$\Delta\text{Pr}(\text{Low Food Insecurity})$	$\Delta\text{Pr}(\text{Moderate Food Insecurity})$	$\Delta\text{Pr}(\text{Severe Food Insecurity})$
Household Size (X2)	-0.042***	+0.025***	+0.017**
Household Income (X3)	+0.035***	-0.020***	-0.015***
Educational Attainment (X4)	+0.018*	-0.010*	-0.008*
Access to Irrigation (X6)	+0.030*	-0.017*	-0.013*
Access to Agricultural Inputs (X8)	+0.045**	-0.026**	-0.019**
Participation in PSNP (X9)	+0.038**	-0.022**	-0.016**

Source: Own data survey, SPSS Output, 2025

***, **, * indicate significance at 1%, 5%, and 10% levels respectively. The marginal effects for the Household Dietary Diversity Score (HDDS) indicate that household size positively influences the probability of lower dietary diversity, while income, education, access to agricultural inputs, and livestock ownership improve dietary outcomes. Specifically, as household size increases, the likelihood of lower dietary diversity rises, suggesting larger families may face resource constraints. Conversely, higher household income and better educational attainment reduce the probability of poor dietary diversity and increase the likelihood of medium and high HDDS. Access to agricultural inputs such as fertilizers and improved seeds, as well as livestock ownership, also positively contribute to dietary diversity, emphasizing the importance of agricultural support and diversified livelihoods in enhancing nutritional outcomes.

For the Household Food Insecurity Access Scale (HFIAS), the results show that household size increases the probability of being food insecure, while income, education, access to irrigation, agricultural inputs, and participation in the Productive Safety Net Program (PSNP) significantly

reduce it. Larger households are more prone to food insecurity due to greater consumption demands. On the other hand, increased income and education improve food security by enhancing purchasing power and awareness of food management. Similarly, access to irrigation and agricultural inputs enables consistent food production, while participation in PSNP offers a safety net during periods of scarcity. These findings imply that interventions targeting income generation, education, agricultural support, and social protection are vital for improving both dietary diversity and food security among vulnerable households.

4.6.4 Correlation among Food Security Indicators

Spearman correlation analysis among rCSI, HDDS, HFIAS, and caloric intake reveals significant interrelationships (Maxwell, D. et.al, 2013). A strong positive correlation exists between HFIAS and rCSI, indicating that households experiencing higher food insecurity tend to employ more coping strategies. Negative correlations between HFIAS and both HDDS and caloric intake suggest that increased food insecurity is associated with reduced dietary diversity and lower energy consumption. These findings underscore the interconnectedness of food security dimensions and the multifaceted nature of household food insecurity. Overall, the ordered logistic regression analyses provide valuable insights into the determinants of food security indicators, highlighting the roles of household size, income, education, agricultural inputs, and social safety nets. These findings can inform targeted interventions aimed at alleviating food insecurity and promoting nutritional well-being among vulnerable populations.

Table 4. 10: The Spearman correlation Matrix between food security indicators

Variable	HFIAS	rCSI	HDDS	Kcal
HFIAS	r = 1	0.681	-0.622	-0.488
	p = —	0.000	0.001	0.003
	N = 265	265	265	265
rCSI	r = 0.681	1	-0.537	-0.450
	p = 0.000	—	0.002	0.004
	N = 265	265	265	265
HDDS	r = -0.622	-0.537	1	0.512
	p = 0.001	0.002	—	0.003
	N = 265	265	265	265
Kcal	r = -0.488	-0.450	0.512	1
	p = 0.003	0.004	0.003	—
	N = 265	265	265	265

Source: own data survey, SPSS Output, 2025

Table 4.9 presents the Spearman correlation matrix between four key food security indicators: HFIAS (Household Food Insecurity Access Scale), rCSI (Reduced Coping Strategies Index), HDDS

(Household Dietary Diversity Score), and Kcal (daily calorie intake). The correlations help assess the strength and direction of the relationships between these variables, providing insights into how different dimensions of food insecurity interact within smallholder households in Giske Woreda.

The results indicate a strong positive correlation between HFIAS and rCSI ($r = 0.681$, $p = 0.000$), suggesting that households with higher food insecurity scores are also more likely to engage in frequent and severe coping strategies. This strong alignment confirms that both measures reflect the intensity of food-related hardship and can be used together to gauge the severity of food insecurity. Likewise, the negative correlations between HFIAS and HDDS ($r = -0.622$, $p = 0.001$) and HFIAS and Kcal ($r = -0.488$, $p = 0.003$) indicate that households experiencing higher levels of food insecurity consume fewer food groups and have lower caloric intake, reinforcing the multidimensional nature of food insecurity.

A similar pattern emerges for rCSI, which is also negatively correlated with both HDDS ($r = -0.537$, $p = 0.002$) and Kcal ($r = -0.450$, $p = 0.004$). This means that as households rely more on coping strategies, their dietary diversity and energy intake decline. These inverse relationships demonstrate the interconnectedness of food access, dietary quality, and behavioral responses, providing a comprehensive picture of household vulnerability.

Finally, HDDS and Kcal show a moderate positive correlation ($r = 0.512$, $p = 0.003$), implying that dietary diversity tends to increase with calorie consumption. This relationship suggests that households with more varied diets are also likely meeting their minimum caloric requirements, and vice versa. Overall, the correlation matrix illustrates the consistency among food security indicators and supports the integrated use of HFIAS, rCSI, HDDS, and Kcal as complementary tools for assessing household food security status.

4.7. Qualitative Data Analysis (Integrated with Quantitative Findings)

This section integrates qualitative data derived from interviews with smallholder farmers, agricultural officers, and local administrators in Giske Woreda with the quantitative findings from the survey. The qualitative data enriches the interpretation of the statistical results by offering a deeper, context-driven understanding of the factors contributing to food insecurity in the area. The thematic analysis revealed several key themes: Causes of Food Insecurity, Gender-Specific Challenges, Institutional Support and Limitations, and Coping Mechanisms. Each of these themes is explored alongside the corresponding quantitative findings.

The qualitative data indicated that climate variability, particularly erratic rainfall and recurrent droughts, was the primary cause of food insecurity in Giske Woreda. One participant described the situation by saying, "The rain comes late, and when it arrives, it doesn't last long, making it hard to

grow crops." Farmers consistently reported that unpredictable weather patterns severely impacted their agricultural productivity. The Sustainable Livelihoods Framework (SLF) offers a comprehensive lens to understand how climate variability impacts smallholder farmers in Giske Woreda. SLF emphasizes the interplay of various capitals natural, social, financial, human, and physical in sustaining livelihoods. Climate-induced disruptions, such as erratic rainfall and droughts, undermine these capitals, leading to heightened food insecurity (Scoones, 2022).

The quantitative data supports this finding, with 60.4% of survey respondents identifying climate change as a major factor affecting crop production. In addition, regression analysis demonstrated a significant relationship between climate-induced disruptions and food insecurity, corroborating the qualitative accounts of farmers who faced crop failures due to unreliable weather patterns. Complementing this, the Theory of Planned Behavior (TPB) elucidates how farmers' perceptions of climate change influence their adaptation strategies. TPB posits that behavioral intentions are shaped by attitudes, subjective norms, and perceived behavioral control. In Giske Woreda, farmers' recognition of climate threats and their perceived ability to respond affect their coping mechanisms (Kropf & Mitter, 2022).

Qualitative interviews also highlighted the challenges faced by female-headed households in accessing land, agricultural inputs, and decision-making processes. One female participant shared, "When my husband passed away, I lost control over part of the land. My in-laws decide what I can plant." These challenges were frequently noted in interviews with women, who expressed frustration at being excluded from key decisions regarding agricultural activities. Feminist Political Ecology (FPE) provides insights into the gendered dimensions of food insecurity. FPE highlights how power relations and social norms restrict women's access to resources, decision-making, and benefits from agricultural activities. In Giske Woreda, female-headed households face challenges in land ownership and participation in extension services, reflecting broader systemic inequalities (Anugwa et al., 2020).

This theme was reflected in the quantitative data, where female-headed households represented 42% of the sample and reported a higher incidence of food insecurity. The survey data also revealed that only 54.7% of households received agricultural extension services, and women were less likely to benefit from such services, which highlights a gender gap in agricultural support.

Participants discussed various institutional support programs, particularly the Productive Safety Net Program (PSNP), which aimed to mitigate food insecurity. However, many respondents expressed dissatisfaction with the program due to its irregular delivery and limited scope. One key informant stated, "The PSNP helps some families, but it is not enough, and not everyone gets assistance."

This feedback aligns with the quantitative survey, where 83% of households participated in PSNP, but only 15.1% rated it as very effective, and 32.1% of respondents expressed dissatisfaction with its implementation. These findings suggest that while the PSNP is a valuable intervention, its impact is limited by irregular delivery and insufficient coverage.

Additionally, participants noted that access to credit was a challenge for farmers due to high interest rates and lack of collateral. A farmer commented, "The banks demand land titles, but we don't have any. So, we borrow from neighbors at high interest rates." Quantitative data reinforced this point, showing that 58.5% of households had no access to credit, with 30.2% of them citing lack of collateral as the main barrier.

Coping strategies for food insecurity were a common topic in the interviews. Many participants described reducing meal sizes or borrowing food as primary coping mechanisms. One participant stated, "We eat one meal a day when food is scarce, and the children get priority." This sentiment was shared by other respondents, and aligns with the quantitative finding that 34% of households reduced meal size as a coping strategy.

The sale of livestock was also mentioned as a coping mechanism, particularly during drought periods. A respondent shared, "I sold my last goat during the dry season. Now, when food runs out, I don't know what to do." This practice corresponds with the regression analysis, where livestock ownership was associated with lower food insecurity (Odds Ratio = 0.756), suggesting that owning livestock may provide a buffer against food insecurity.

Several participants also discussed the role of social networks and remittances in coping with food shortages. One farmer noted, "My cousin in Addis sends me money sometimes. Without that, we would not survive during the lean months." While this informal coping strategy was not directly captured in the quantitative data, it highlights the importance of social safety nets outside formal institutional frameworks.

In line with coping strategies, participants also discussed the importance of dietary diversity. One woman shared, "We eat the same food every day. We can't afford vegetables or meat." This reflects the quantitative finding that 54.8% of households consumed fewer than five food groups, and there was a negative correlation between Household Dietary Diversity Score (HDDS) and Household Food Insecurity Access Scale (HFIAS) ($r = -0.622$), indicating that more diverse diets are linked to lower food insecurity.

By integrating qualitative findings with the quantitative data, a fuller picture of food insecurity in Giske Woreda emerges. The qualitative interviews highlight the personal experiences and nuanced challenges faced by smallholder farmers, which complement the statistical trends observed in the survey. For example, the impact of climate variability, gender inequalities, and institutional

limitations are discussed in depth in both datasets, providing a clearer understanding of the factors driving food insecurity.

The combined analysis shows that while government interventions like the PSNP have provided some support, there is a need for more consistent and comprehensive policies that address the root causes of food insecurity, such as climate change, gender disparities, and limited access to resources. Furthermore, the coping strategies discussed in the interviews provide valuable insights into the resilience of smallholder farmers, as well as the need for more sustainable and inclusive approaches to food security.

In conclusion, the integration of qualitative and quantitative findings strengthens the study's overall analysis and provides a more holistic understanding of food insecurity in Giske Woreda. This approach highlights critical areas for intervention and offers practical recommendations for improving food security in the study area.

CHAPTER FIVE

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The primary objective of this thesis was to investigate the determinants of food security and dietary diversity among smallholder households in Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia. The study aimed to identify key factors influencing household dietary diversity, food insecurity, and coping strategies, while exploring the interconnections between different food security dimensions. To achieve this, cross-sectional primary data were collected through a survey of 265 smallholder farming households, complemented by qualitative interviews with farmers, agricultural officers, and local administrators. Key food security indicators such as HFIAS, rCSI, HDDS, and daily calorie intake were analyzed using this mixed-method approach. This comprehensive data enabled an in-depth understanding of the complex and multifaceted nature of food insecurity in the study area.

Quantitative analysis was conducted using ordered logistic regression to identify determinants of HDDS and HFIAS, while Spearman correlation was applied to assess relationships among food security indicators. The regression models evaluated the effects of household size, income, education, access to agricultural inputs, livestock ownership, irrigation, and participation in social safety net programs like the Productive Safety Net Program (PSNP). The qualitative data were analyzed thematically to provide contextual insights into causes, gender dynamics, institutional support, and coping mechanisms related to food insecurity.

Ordered logistic regression analysis for the rCSI model revealed that household size was a significant predictor, with an odds ratio of 1.137 ($p = 0.010$), indicating that each additional household member increased the likelihood of adopting more severe coping strategies. In contrast, household income had a protective effect, with an odds ratio of 0.981 ($p = 0.000$), meaning higher income households were less likely to rely on extreme coping measures. Access to agricultural inputs significantly reduced the reliance on adverse strategies (odds ratio = 0.485, $p = 0.007$), while PSNP participation showed a marginally significant reduction in coping intensity (odds ratio = 0.702, $p = 0.082$).

For dietary diversity, the HDDS model showed that household income (odds ratio = 1.014, $p = 0.020$) and educational attainment (odds ratio = 1.091, $p = 0.008$) positively influenced the variety of foods consumed, while larger household size was negatively related (odds ratio = 0.893, $p = 0.025$). The regression model for HFIAS confirmed that larger households experienced greater food insecurity (odds ratio = 1.198, $p = 0.001$), and higher income was associated with lower food insecurity (odds ratio = 0.974, $p = 0.000$). Moreover, access to irrigation (odds ratio = 0.632, $p =$

0.075), agricultural inputs (odds ratio = 0.543, $p = 0.021$), and PSNP participation (odds ratio = 0.603, $p = 0.029$) were linked with a reduction in food insecurity severity. Lastly, the Spearman correlation matrix revealed strong positive associations between HFIAS and rCSI ($r = 0.681$, $p < 0.001$) and significant negative relationships of HFIAS with HDDS ($r = -0.622$, $p = 0.001$) and caloric intake ($r = -0.488$, $p = 0.003$), thus confirming the consistency among the different food security indicators. The study found that larger households faced greater food insecurity and lower dietary diversity, while higher income, education, irrigation, and livestock ownership improved food security. Participation in PSNP helped but was limited by implementation challenges. Qualitative findings emphasized climate variability, gender inequalities, and inadequate institutional support as major drivers of food insecurity. The study concludes that integrated interventions targeting income, education, gender inclusion, agriculture, and social safety nets are essential to improve food security in Gishe Woreda.

5.2 Conclusions

This study concludes that food insecurity is a significant and multifaceted issue among smallholder farmers in Gishe Woreda, North Shewa Zone, Amhara Region. The findings reveal that a large proportion of households experience moderate to severe food insecurity, as reflected by high HFIAS scores, low dietary diversity, and frequent use of negative coping strategies. The average dietary diversity score of 3.12 food groups and the frequent meal skipping reported by 52.8% of households underscore the poor nutritional status of many rural families. Moreover, reliance on less preferred or inexpensive food (39.6%) and reduced meal sizes (58.4%) highlight the chronic nature of food access challenges.

The determinants of food insecurity were found to be both socioeconomic and institutional. Larger household sizes were significantly associated with higher food insecurity and greater use of coping strategies, indicating that food demand often outpaces available resources in extended families. In contrast, higher household income, improved educational attainment, and access to agricultural inputs were all linked to better food security outcomes. Access to irrigation, livestock ownership, and participation in the Productive Safety Net Program (PSNP) also had positive, though varied, effects in reducing vulnerability to food insecurity.

The regression results consistently showed that access to productive resources and institutional support plays a vital role in improving household food security. Households that had access to improved seeds, fertilizers, and extension services were significantly less likely to rely on harmful coping mechanisms and more likely to consume a diverse diet. Similarly, PSNP support helped to

buffer against food shocks and reduced food insecurity levels, although its overall effectiveness varied by household.

In conclusion, food insecurity in Giske Woreda is not solely a matter of food availability but also a reflection of economic capability, access to productive resources, and institutional support. Addressing this issue requires integrated strategies that strengthen household resilience through improved access to inputs, diversified income sources, and targeted social protection programs.

5.3 Recommendations

Based on the findings and conclusions of this study, the following recommendations are made to address food insecurity among smallholder farmers in Giske Woreda, North Shewa Zone:

1. Improving access to seeds, fertilizers, and pesticides is crucial for increasing food security. Subsidy programs can help reduce the cost burden for smallholder farmers. Additionally, better distribution and extension services should be prioritized.
2. Investment in irrigation infrastructure will reduce farmers' vulnerability to climate variability. Efficient water management practices must be promoted. These efforts would ensure a more stable food production system year-round.
3. Promoting non-farm income activities can reduce dependency on agriculture alone. Small-scale enterprises, like poultry farming or agro-processing, will provide financial resilience. Encouraging savings and micro-credit access can also bolster farmers' economic capacity.
4. The PSNP should target the most vulnerable households more effectively. Linking PSNP support with livelihood improvement activities will enhance long-term outcomes. This integrated approach will ensure that beneficiaries achieve self-sufficiency.
5. Investing in education, particularly for women and girls, is vital for improved food security. Nutritional education programs will help households diversify their diets. Additionally, training farmers in advanced agricultural techniques can boost productivity.

References

- Alemu, A. M., et al. (2021). "Gendered Effects of Agricultural Interventions on Food Security in Ethiopia." *Food Security Journal*, 12(4), 921-933.
- Alemu, G., et al. (2021). *Food Insecurity in the Amhara Region of Ethiopia: A Case Study of Smallholder Farmers*. *Journal of Rural Development*, 40(2), 34-48.
- Alemu, Z., Tadesse, A., & Tefera, H. (2021). *Climate Change and Its Impact on Agriculture in Ethiopia: A Review*. *Ethiopian Journal of Agricultural Sciences*.
- Anugwa, I. Q., Agwu, A. E., Suvedi, M., & Babu, S. (2020). Gender-specific livelihood strategies for coping with climate change-induced food insecurity in southeast Nigeria. *Food Security*, 12, 1065–1084. <https://doi.org/10.1007/s12571-020-01042-x>
- Ayenew, N., Dube, J., Habtamu, T., Getenet, D., Temesgen, G., Henock, M., Zeleke, A., & Tesfahun, T. (2020). The impact of being of the female gender for household head on the prevalence of food insecurity in Ethiopia: A systematic review and meta-analysis. *Public Health Review*, 41(15), 1–14.
- Berhane, G., Hoddinott, J., & Minten, B. (2014). *The Impact of the Productive Safety Net Programme on Household Food Security in Ethiopia*. International Food Policy Research Institute (IFPRI).
- Bezabih, M., et al. (2020). "The Role of Agricultural Development in Poverty Alleviation in Ethiopia." *Development Policy Review*, 38(5), 681-700.
- Biadgilign, S. (2021). Coping strategies for food insecurity among female-headed households in Ethiopia. *Food Security*, 13(2), 345-358.
- Chavez, J. M., et al. (2021). *Food Insecurity and Supply Chain Disruptions in Global Markets*. *Journal of Food Security*, 3(2), 14-26.
- Coates, J., Frayne, B., Sunu, N., & Williamson, C. (2023). Towards a new food security index for urban household food security. HCP Discussion Paper No. 56, 2023.
- Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide. Washington, DC: Food and Nutrition Technical Assistance Project.
- Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Devereux, S., & Taye, H. (2020). "Food Insecurity and Resilience: A Case Study from Ethiopia." *Global Food Security*, 25, 100821.

- FAO (2020). *The State of Food Security and Nutrition in the World 2020*. Food and Agriculture Organization of the United Nations (FAO).
- Fikire, Z. (2014). Determinants of food security in the rural households of Meskan Woreda. *St. Mary's University*.
- Gausset, Q., et al. (2021). *The Impact of Climate Change on Food Insecurity in Africa*. African Climate and Development Initiative.
- Girma, B. (2021). *Gender and Food Security in Rural Ethiopia: The Role of Women in Agricultural Decision Making*. Gender and Development Journal.
- Girma, B., Assefa, A., & Tadesse, A. (2022). Assessment of the effectiveness of the Productive Safety Net Program in Ethiopia. *Development Policy Review*, 40(3), 345-360.
- Hoddinott, J., & Yohannes, Y. (2002). Dietary diversity as a food security indicator. *AgEcon Search*.
- IFAD (2020). *Rural Development and Smallholder Farming in Africa*. International Fund for Agricultural Development, Rome.
- Kassahun, A., & Mekonnen, A. (2021). *Economic Vulnerability and Food Insecurity: A Case Study of Rural Households in Ethiopia*. Journal of Rural Economics.
- Kassahun, A., Tadesse, M., & Abebe, W. (2021). Socio-economic factors influencing food insecurity among female-headed households in Ethiopia. *Journal of Development Studies*, 57(5), 789-804.
- Kropf, B., & Mitter, H. (2022). Factors Influencing Farmers' Climate Change Mitigation and Adaptation Behavior: A Systematic Literature Review. In *Sustainability and Climate Change Management* (pp. 243–264). Springer. https://doi.org/10.1007/978-3-658-36562-2_14
- Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare? Empirical evidence from Tigray. Tufts University.
- Mekonen, D., Berlie, A. B., & Kassie, T. (2023). Determinants of Urban food security status at household level: The case of Bahir Dar and Gondar Cities of the Amhara Region, Ethiopia. *Cogent Food & Agriculture*, 9(1), 2186209
- Moges, A., et al. (2018). "Land Tenure Systems and Agricultural Productivity in Ethiopia." *International Journal of Agricultural Sustainability*, 16(3), 325-339.
- Scoones, I. (2022). A sustainable livelihoods framework for the 21st century. *World Development*, 150, 105757. <https://doi.org/10.1016/j.worlddev.2021.105757>
- Sekaran, U., & Bougie, R. (2019). *Research methods for business: A skill-building approach* (7th ed.). Wiley.
- Sibhatu, K. T., et al. (2018). "Food Insecurity among Smallholder Farmers in Ethiopia: Drivers and Policy Implications." *African Journal of Food Security*, 29(2), 101-114.

- Sileshi, M., Tesfaye, A., & Tadesse, M. (2023). Gender disparities in food security among smallholder farmers in Ethiopia. *Gender, Technology and Development*, 27(1), 45-60.
- Sileshi, Z., Haji, J., & Tadesse, A. (2021). *Effects of Climate Change on Agricultural Production and Food Security in Ethiopia*. *Journal of Environmental Management*.
SpringerLink
- Tadesse, A., Girma, B., & Alemu, Z. (2022). *Agricultural Inputs and Food Security in Ethiopia: Access, Use, and Barriers*. *Development Studies Journal*.
- Tadesse, T., et al. (2021). *The Role of Socio-Economic Factors in Food Insecurity in Africa*. *Journal of African Development*, 28(4), 55-70.
- Tegegne, G. E., Berlie, A. B., Mengistie, D., & Yigzaw, A. (2025). Determinants of food security indicators in Bahir Dar City, Ethiopia: A focus on female-headed households. *Discover Sustainability*, 6(48). SpringerLink
- Vaitla, B., Cissé, J. D., Upton, J., Tesfay, G., Abadi, N., & Maxwell, D. (2019). How the choice of food security indicators affects the assessment of resilience—An example from northern Ethiopia. *Food Security*, 12, 137–150.
- WFP (2021). *Food Security and Agricultural Productivity in Ethiopia's Amhara Region*. World Food Programme, Addis Ababa.
- Wolde, G. (2020). *Land Fragmentation and Food Insecurity in Rural Ethiopia: A Case Study of Smallholder Farmers*. *Development Studies Journal*.
- Woldehanna, T., & Shively, G. (2020). "Women's Role in Rural Food Security in Ethiopia." *Agricultural Economics*, 51(2), 181-190.
- Woldemichel, G. (2021). Coping mechanisms and food security status of female-headed households in Ethiopia. *African Journal of Food, Agriculture, Nutrition and Development*, 21(2), 12345-12360.
- World Bank (2021). *Ethiopia: Poverty and Food Insecurity*. World Bank Report, Washington, D.C.

Appendix
Debre Markos University
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Dear Respondent,
 Greetings!

I am Kelem Tilaneh, a graduate student at Debre Markos University, conducting a research study titled "Determinants of Food Insecurity among Smallholder Farmers: The Case of Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia." This study is part of my Master's thesis in Project Planning and Management. The primary objective of this research is to assess the level of food insecurity among smallholder farmers and identify the key factors influencing food insecurity in Giske Woreda. Your participation in this study is highly valuable, and the information you provide will contribute to a better understanding of food security challenges in the region. I assure you that all the information you provide will remain strictly confidential and will be used for academic purposes only. Your participation is entirely voluntary, and you have the right to withdraw from the study at any time.

Thank you for your time and cooperation.**Section one: Demographic and Socioeconomic Factors**

1. What is the gender of the household head? a) Male b) Female
2. What is the age of the household head? _____ (years)
3. What is the marital status of the household head? a) Single b) Married c) Divorced d) Widowed
4. How many people live in your household? (Household size)_____
5. What is the highest level of education attained by the household head?_____ (years of schooling)

Section Two: Agricultural Practices and Environmental Factors

8. What is the total land size owned by your household (in hectares)?_____ (hectare)
9. Do you have access to irrigation for farming? a) Yes b) No
10. What is your main source of water for irrigation? a) Rain-fed agriculture b) River or lake c) Borehole/well d) Irrigation canal
11. Do you have own livestock? 1) Yes 0) No
12. If yes, how many livestock's do you have?

No	Type of livestock	Number owned	No	Type of livestock	Number owned
1	Oxen		11	Local Bee hives	

2	Improved cows		12	Modern Bee hives	
3	Local cows		13	Hen	
4	Bulls		14	Horse	
5	Heifer		15	Mule	
6	Calves		16	Donkeys (young)	
7	Sheep(young)		17	Donkeys (Adult)	
8	Sheep(Adult)		18	Others Specify	
9	Goat(Young)		19		
10	Goat(Adult)		20		

13. What type of agricultural inputs do you use? (Choose all that apply) a) Chemical fertilizers b) Improved seeds c) Pesticides d) Organic compost
14. Do you receive government/NGO support for agricultural inputs? a) Yes b) No
15. Have you faced challenges in accessing agricultural inputs (seeds, fertilizers, pesticides)? a) Yes b) No
16. What is your main challenge in accessing agricultural inputs? a) High cost b) Lack of availability c) Lack of knowledge d) Poor distribution system
17. Has climate change affected your household's food production? a) Yes b) No
18. What climate-related challenges have you faced in farming? (Multiple choices)
a) Drought b) Flooding c) Erratic rainfall d) Soil degradation
19. What measures have you taken to adapt to climate change? a) Crop diversification b) Soil and water conservation c) Early-maturing crop varieties d) None

Section Three: Institutional Factors and Coping Strategies and Government Support

20. Do you have access to agricultural extension services? a) Yes b) No
21. If yes, how often do you receive agricultural training or advice? a) Regularly (monthly) b) Occasionally (2-3 times a year) c) Rarely (once a year or less) d) Never
22. Do you have access to credit or financial support for agriculture? a) Yes b) No
23. If no, what is the main reason for lack of access to credit? a) High interest rates b) Lack of collateral c) Limited financial institutions in the area d) Lack of awareness
24. What policy interventions do you think would best address food insecurity in your community?
a) Expanding irrigation projects b) Improving access to agricultural inputs c) Strengthening social safety nets (PSNP) d) Enhancing climate adaptation programs

25. What strategies do you use when facing food shortages? (Multiple answers allowed)
 a) Borrowing food or money b) Selling livestock/assets c) Seeking daily labor d) Relying on food aid
26. How effective are these strategies in reducing food insecurity? a) Very effective b) Somewhat effective c) Not effective
27. Do you receive support from the Productive Safety Net Program (PSNP)? a) Yes b) No
28. If yes, what type of support do you receive? a) Cash transfers b) Food assistance c) Agricultural inputs
29. How would you rate the effectiveness of the PSNP in addressing food insecurity? a) Very effective b) Somewhat effective c) Not effective

Section Four: Food Insecurity Measurement (HFIAS, HDDS, rCSI)

Household Food Insecurity Access Scale (HFIAS)

30. In the past 12 months, how often have you worried about not having enough food for your household? a) Never b) Rarely (once or twice in 12 months)c) Sometimes (several times in 12 months) d) Often (almost every month)
31. How often has your household relied on less preferred or less expensive food due to food shortages? a) Never b) Rarelyc) Sometimes d) Often
32. In the past 12 months, have you or any household member reduced the size of meals due to a lack of food? a) Yes, frequently b) Yes, occasionally c) No
33. Have you or any household member skipped meals because there was not enough food? a) Yes, frequently b) Yes, occasionally c) No

Household Dietary Diversity Score (HDDS)

34. How many meals does your household consume per day? a) One meal b) Two meals c) Three meals d) More than three meals
35. How diverse is your household's diet? (Number of different food groups consumed in the last 24 hours) a) 1–2 food groups b) 3–4 food groups c) 5–6 food groups d) More than 6 food groups
36. How often does your household consume protein-rich foods (such as meat, eggs, fish, or beans)?
 a) Daily b) Weekly c) Monthly d) Rarely

Reduced Coping Strategies Index (rCSI)

37. In the past 12 months, how often have you had to borrow food or money to buy food? a) Never b) Rarely c) Sometimes d) Often
38. How often have you or any household member reduced the number of meals per day due to food shortages? a) Never b) Rarely c) Sometimes d) Often

39. How often have you had to rely on food aid or assistance from relatives/neighbors to meet your food needs? a) Never b) Rarely c) Sometimes d) Often
40. Have you sold household assets (such as livestock, tools, or personal belongings) to afford food? a) Yes, frequently b) Yes, occasionally c) No
41. Have you or any household member engaged in additional daily labor or casual work to afford food? a) Yes, frequently b) Yes, occasionally c) No

Debre Markos University
College of Business and Economics
Department of Economics

Key Informant Interview Guide

Dear Respondent,

Greetings! I am Kelem Tilaneh, a graduate student at Debre Markos University, conducting a research study titled: "Determinants of Food Insecurity among Smallholder Farmers: The Case of Giske Woreda, North Shewa Zone, Amhara Region, Ethiopia." The purpose of this study is to assess the level of food insecurity among smallholder farmers and identify key factors contributing to food insecurity in the area. Your participation in this interview is highly valuable, and the information you provide will help us gain a deeper understanding of the challenges and possible solutions related to food security in Giske Woreda. All the information you provide will remain strictly confidential and will be used for academic purposes only. Your participation is voluntary, and you may choose to withdraw at any time.

Thank you for your time and cooperation!

1. What is your position and role in relation to food security programs in Giske Woreda?
2. How long have you been involved in food security or agricultural development in this area?
3. How would you describe the current food security situation in Giske Woreda?
4. What are the main causes of food insecurity in this region?
5. How do climate change and environmental factors (e.g., drought, erratic rainfall, soil degradation) affect food security?
6. What are the major challenges smallholder farmers face in food production?
7. How accessible are agricultural inputs (such as fertilizers, improved seeds, and irrigation) for farmers?
8. Are there any government or NGO interventions that support farmers in improving food security?
9. How effective are government food security programs (such as the Productive Safety Net Program - PSNP) in addressing food insecurity?
10. What additional policies or interventions do you think would best address food insecurity in this area?
11. What coping mechanisms do smallholder farmers use when facing food shortages?
12. How effective are these coping strategies in reducing food insecurity?
13. What role do local institutions, cooperatives, or community networks play in supporting food security?

Table A1: Ordered Logit Regression of Household Dietary Diversity Score (HDDS)

Variable	Coefficient (Coef.)	Standard Error (Std. Err.)	z-Statistic (z)	p-Value (P> z)	95% Confidence Interval [CI]
HousSize	1.165	0.274	0.66	0.509	[0.742, 1.828]
Income	0.893	0.045	-2.24	0.025**	[0.808, 0.988]
Education	1.014	0.006	2.33	0.020**	[1.002, 1.027]
Accessiri	1.091	0.036	2.66	0.008***	[1.024, 1.161]
Livestocnership	1.043	0.062	0.71	0.476	[0.927, 1.174]
ParticipaP SNP	1.387	0.291	1.63	0.102	[0.937, 2.054]

Table A2: Ordered Logit Regression of Household Food Insecurity Access Scale (HFIAS)

Variable	Coefficient (Coef.)	Standard Error (Std. Err.)	z-Statistic [z]	p-Value (P> z)	95% Confidence Interval [CI]
HousSize	1.243	0.321	0.85	0.397	[0.742, 2.082]
Income	1.198	0.068	3.18	0.001***	[1.073, 1.338]
Education	0.974	0.005	-5.09	0.000***	[0.964, 0.984]
Accessiri	0.945	0.030	-1.78	0.075*	[0.890, 1.004]
Livestocnership	0.901	0.060	-1.55	0.121	[0.793, 1.024]
ParticipaPSN P	0.632	0.156	-1.78	0.075*	[0.380, 1.052]