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FOOD SECURITY AND DIETARY DIVERSITY: A PHENOMENOLOGICAL STUDY OF SMALLHOLDER FARMERS IN RURAL COMMUNITIES, CENTRAL REGION

BY

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DECLARATION

I, Nana Akua Awotwe Vandyck, declare that this dissertation is my original research work conducted at the University of Ghana, Legon, Ghana, under the supervision of Prof. Angelina Opoku Danquah and Prof. Christina A. Nti. No part of this thesis has been presented for another degree elsewhere. References to the work of other researchers are duly acknowledged.

18/12/2022

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ABSTRACT

Food insecurity, poverty, limited diet quality and diversity are significant global problems. Several households rely on crops and livestock to meet their dietary needs. Smallholder farmers are primary producers of food consumed in rural areas. However, when it comes to food insecurity, they are the most vulnerable group. This study was conducted to investigate the perspectives of smallholder farmers on food security and dietary diversity in rural areas in the Central Region of Ghana. The study employed a qualitative approach using a phenomenological study design. The study location was three (3) rural communities; Atonkwa, Abbina and Kuful, all located within the Elmina township. A total of thirty (30) smallholder household heads were selected through a multi-stage sampling method. Thematic content analysis was used to analyse the data collected. The predetermined themes were organised food availability and access, causes of food insecurity, determinants of dietary diversity and coping strategies. Twelve (12) sub-themes emerged from the interviews conducted. The findings indicated that the perceived causes of food insecurity were based on socioeconomic factors and climate variability, affecting the availability and access to food. The diversity of food consumed within the household was determined by household food production, socio-economic factors, and information access and use. The study concluded that challenges with food availability and accessibility among smallholder farmers affect the food security status and the dietary diversity of the household. Based on the results, it was suggested that to help fix the social and economic problems that lead to food insecurity, the government should implement a comprehensive and multi-faceted approach. This approach should include; strengthening social safety nets, investing in agricultural development and improving rural infrastructure.

Keywords: food security, dietary diversity, Central Region, experiences, coping strategies.

DEDICATION

To my family… two and half decades of caring, helping and love.

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TABLE OF CONTENTS

DECLARATION I

ABSTRACT II

DEDICATION III

ACKNOWLEDGEMENTS IV

TABLE OF CONTENTS V

LIST OF FIGURES X

LIST OF TABLES XI

LIST OF ABBREVIATIONS XII

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background Information 1

1.2 Statement of the Problem 4

1.3 Aim of the study 4

1.4 Research objectives 4

1.5 Research questions 5

1.6 Justification of study 5

CHAPTER TWO 7

LITERATURE REVIEW 7

2.0 Introduction 7

2.1 The concept of food security 7

2.2 Dimensions of food security 9

2.2.1 Availability 9

2.2.2 Access 10

2.2.3 Utilization 11

2.2.4 Sustainability 11

2.3 Food insecurity 12

2.3.1 Causes of food insecurity 12

2.4 Trends in global food security 14

2.4.1 Trends in Africa 15

2.4.2 Trends in Ghana 16

2.4.3 Food security situation in Central Region 18

2.5 Smallholder farmers and food insecurity 19

2.6 Determinants of food security 19

2.6.1 Socioeconomic determinants 20

2.6.2 Farm Characteristics 23

2.7 Household dietary diversity 24

2.8 Determinants of dietary diversity 26

2.9 Food insecurity Coping strategies 28

2.10 Conceptual Framework 29

2.11 Conceptual Framework explained 31

CHAPTER THREE 33

RESEARCH DESIGN AND METHODOLOGY 33

3.0 Introduction 33

3.1 Study design. 33

3.2 Study location 33

3.3 Target population 34

3.3.1 Inclusion criteria 34

3.3.2 Exclusion criteria 34

3.4 Sample size 35

3.5 Sampling technique 35

3.6 Instrument for data collection 37

3.7 Pre-test 38

3.8 Ethical consideration 38

3.9 Procedure for data collection 38

3.10 Data analysis 39

3.11 Limitation of the study 39

CHAPTER FOUR 40

RESULTS AND DISCUSSION 40

4.1 Introduction 40

4.2 Demographic characteristics 40

4.2.1 Gender of household head 42

4.2.2 Age of smallholder farmers 42

4.2.3 Level of education 43

4.2.4 Off-farm activities 43

4.2.5 Household Size 44

4.3 Farm Characteristics 44

4.3.1 Land ownership 45

4.3.2 Farm type 46

4.3.3 Farm labour 46

4.3.4 Crops cultivated and livestock reared 47

4.4 Pre-determined themes and sub-themes 47

4.5 Food availability and access 48

4.5.1 Household food consumption 49

4.5.2. Source of food 53

4.5.3 Market accessibility 55

4.5.4 Perceptions of Dietary Adequacy 58

4.6 Perceptions and Causes of Food Insecurity 61

4.6.1 Socio-Economic causes 61

4.6.2 Climatic Variability 64

4.7 Determinants of dietary diversity 67

4.7.1 Farm Production Diversity 67

4.7.2 Socioeconomic status 69

4.7.3 Information Access and Use 71

4.8 Household Coping strategies for food shortage 74

4.8.1 Rationing 75

4.8.2 Dietary changes 76

4.8.3 Increasing short-term household availability of funds 77

CHAPTER FIVE 79

SUMMARY, CONCLUSION AND RECOMMENDATIONS 79

5.1 Introduction 79

5.2 Summary 79

5.3 Key findings 80

5.4 Contribution of this study to the knowledge gap 81

5.5 Conclusion 82

5.6 Recommendations 82

REFERENCES 85

Appendix I 98

Appendix II 101

Appendix III 106

Appendix IV 107

LIST OF FIGURES

Figure 1. Conceptual framework…….. 29

LIST OF TABLES

Table 1. Number of smallholder households…… 35

Table 2. Calculated sample size of each community ……..35

Table 3. Demographic characteristics of Participants……40

Table 4. Farm characteristics……...44

Table 5. Predetermined themes and corresponding sub-themes……..…47

LIST OF ABBREVIATIONS

FAO- Food and Agriculture Organization

GSS- Ghana Statistical Service

GHS- Ghana Health Service

HDD- Household Dietary Diversity

IRCS- International Federation of Red Cross and Red Crescent Societies

IFAD- International Fund for Agriculture Development

LEAP- Livelihood Empowerment Against Poverty

LMIC-Lower Middle-Income Countries

MoFA- Ministry of Food and Agriculture

NHIS- National Health Insurance Scheme

UNICEF-United Nations Children's Fund

UN- United Nations

WFP-World Food Programme

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND INFORMATION

The World Food Summit of 1996 defines food security as "all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life." (FAO, 2005). In contrast, food insecurity characterizes the limited availability of nutritious and safe meals and the inability to get food in socially acceptable ways (Saaka, 2016).

Availability, access, and utilization of a high-quality diet are essential to promote health, reduce malnutrition and eliminate hunger. A high-quality diet comprises various nutrients concerning; age, sex, disease state, and physical activity of an individual. Unfortunately, such diets are unavailable to many, given that 811 million individuals globally are food insecure and have possibly experienced hunger. Out of these individuals, approximately 282 million are found in Africa (FAO *et al.*, 2021). The regional distribution reveals that around 23.6 million people in Western Africa are severely food insecure (WFP, 2020). Regarding Ghana, 3.6 million individuals are food insecure, and 2.8 million are in rural areas (GSS & GHS, 2020).

Significant efforts have been undertaken over the years to reduce the prevalence of food insecurity. However, these attempts are hampered by climate variability, conflict, urbanization, and economic slowdowns, with these problems developing progressively in the shadow of the COVID-19 pandemic and associated containment measures (FAO *et al.*, 2021). Prolonged inadequate intake and lack of a diversified diet result in nutritional deficiencies, which increase an individual's susceptibility to diseases and may lead to impaired physical and mental human

development (Sibhatu *et al*., 2015). Women and children are the most at-risk for poor health and economic outcomes. The burden of undernutrition and micronutrient deficiencies in Ghana remains staggering, with 19% of children under five stunted.

Regarding anaemia, 66% of children under five and 42% of women are anaemic, respectively (GSS *et al*., 2014). According to the National Demographic Health Survey, just 13% of children aged 6 to 23 months had minimally acceptable eating behaviours regarding dietary diversity and frequency. Approximately 67% of these infants consumed iron- and vitamin A-rich meals (GSS *et al*., 2014). The average caloric intake of rural dwellers is 2611 Kcal (Galbete *et al*., 2017). In southern Ghana, the highest prevalence of stunting and anaemia was in the Central Region, with 8.6% of the children under the age of five (5) stunted and 46.7% of women anaemic, respectively.

The majority of malnourished Africans reside in rural areas. , and many are smallholder farmers (Sibhatu *et al*., 2015). In Ghana, about 75% of rural dwellers engage in smallholder agriculture. Smallholder farmers contribute up to 80 % of the total food production; on the contrary, this contribution does reflect the food sufficiency situation of smallholder households (MoFA, 2019). Poor dietary quality and diversity, malnutrition, and various production obstacles are challenges smallholder households face (Nabuuma *et al*., 2021a). Literature indicates that food insecurity is more prevalent among rural smallholder farmers compared to other livelihoods, due to limited household resources and socioeconomic factors that significantly impact their food security (Ajani *et al*., 2006; Alpízar *et al*., 2020). Studies conducted in Ghana show that smallholder farming households experience the highest rates of food insecurity (Entsiwah, 2018; Namaa, 2017). For example, among 120 smallholder farming households in Ghana's Central Region, 67.9% exhibited inadequate food consumption patterns, including eating less than three different food categories daily, eating only one meal a day and having no food stockpiles (Demi & Kuwornu, 2013). Demi & Kuwornu (2013) stated that during April and

May, when food was scarce, each household member needed an extra 26% of calories to meet their daily caloric demands.

A variety of quantitative research on smallholder farmers focused on the determinants that affect food insecurity and dietary diversity (Acheampong *et al*., 2022; Harris-Fry *et al*., 2015; Mango *et al*., 2014; Nabuuma *et al*., 2021b; Sibhatu *et al*., 2015). Socioeconomic factors such as gender, level of education, ethnicity, income, nutrition training or knowledge, household size, allocation of income to food, land ownership, size of land, production diversity, and access to markets were determinants (Harris-Fry *et al*., 2015; Nabuuma *et al*., 2021b). However, knowledge of food security and dietary diversity can be improved by examining farmers' experiences and perceptions of how these drivers affect food security and dietary diversity through qualitative research (Nabuuma *et al*., 2021b). An unpublished quantitative preliminary study conducted in 2014 among 285 caregivers and their child pairs in 3 rural communities in Central Region showed that about 92.3% of participants were moderately food insecure, and the remaining 7.7% were classified as severely food insecure. Socioeconomic determinants such as; the caregiver's education level, gender of the household head, and monthly income were notably associated with the study (Vandyck, 2019).

Qualitative research is needed to explore the variables that promote and inhibit dietary diversity and food security. Thus, this research investigates the perspectives on food security and dietary diversity and their respective determinants among rural smallholder farming households in the Central Region of Ghana.

1.2 STATEMENT OF THE PROBLEM

Having enough food to eat is essential for healthy growth. Several households rely on crops and livestock to meet their needs. Smallholder farmers produce the majority of food consumed in Ghana, yet, they are the most susceptible to food insecurity. Issues such as climate variability, conflict, urbanization and economic slowdowns affect food production resulting in poverty, chronic malnutrition and food insecurity. The most vulnerable to poor health and economic outcomes are women and children. According to quantitative studies, most smallholder households in the Central Region of Ghana had low meal frequency, minimum dietary diversity, and no food stocks. Approximately 8.6% of the children under the age of five (5) are stunted, and 46.7% of women are anaemic, which is the highest prevalence compared to other regions in the southern part of Ghana. The lived experiences and coping strategies of smallholder farmers in response to food insecurity and dietary diversity at the household level can be explored using a qualitative approach; to further enhance data. This study used a qualitative approach to identify the perspectives on food security, determinants of dietary diversity and coping strategies among rural smallholder farming households.

1.3 AIM OF THE STUDY

This study investigated the perspectives on food security and the determinants of dietary diversity among rural smallholder farming households using a qualitative approach.

1.4 RESEARCH OBJECTIVES

The specific research objectives were to;

1. Explore the challenges smallholder households have with household food availability and access.
2. Find out the causes of food insecurity based on the lived experience of smallholder farmers.
3. Discover the determinants of dietary diversity among smallholder households.
4. Investigate the coping strategies adopted by households on the challenges they faced.

1.5 RESEARCH QUESTIONS

1. What are the barriers to food access and availability for smallholder households?
2. What factors contribute to food insecurity in the study area?
3. What are the determinants of household dietary diversity?
4. What coping techniques do smallholder households employ in the face of adversity?

1.6 JUSTIFICATION OF STUDY

1. The study's qualitative approach will provide a deeper understanding of the lived experiences and perspectives of smallholder farming households in the Central Region, going beyond data enhancement to uncover the underlying causes of food insecurity and dietary diversity challenges.
2. The findings will offer valuable insights for policymakers to develop targeted interventions that address the specific needs and constraints faced by smallholder farmers in the region. By identifying factors influencing food access, agricultural practices, and dietary choices, policymakers can design context-specific solutions.

3. The study's focus on women and children, who are most vulnerable to food insecurity and malnutrition, will facilitate the implementation of gender-sensitive and nutrition-focused programs to improve the health and well-being of these groups.
4. The research can serve as a model for similar regions facing food insecurity issues, providing valuable lessons and strategies that can be adapted and applied in other areas with similar agricultural and socio-economic context.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

Food insecurity, dietary diversity, and coping mechanisms are topics covered in this chapter's discussion of the related literature. To better answer the research objectives, this study does a thorough evaluation of the strengths of prior studies and a thorough evaluation of the limitations of these studies.

2.1 THE CONCEPT OF FOOD SECURITY

The idea of "food security" is not new, but it has evolved over the years. The concept is often credited to the mid-1970s (Young *et al.*, 2001). The United Nations (UN) established the definition of food security in 1974 as the "availability at all times of adequate world food supply of basic foodstuffs to maintain a steady expansion of food consumption and to offset variations in production and pricing" (Nkegbe *et al.*, 2017). This definition of food security focuses on a country's ability to provide for its existing and projected populations (Abegaz, 2017). Through its development and expansion over time, the notion fully captures the intricacy of food's place in human society. However, the idea of "food entitlement," or the view that food is a human right, prompted a change in perspective on food security at the beginning of the 1980s.

Consequently, the concept of stability or assured access to food began to feature prominently in studies. The World Bank defined the term further, ensuring "access by all people at all times to enough food for an active and healthy life" (World Bank, 1986). This shift in perspective reflects the view that the needs of society transcend beyond what can be met by domestic food production and foreign food imports. As a benchmark for future definitions, the term also

tackles questions of food access, distribution, and consumption in the context of healthy lifestyles.

According to the FAO (Food and Agriculture Organization) in 2000, "food security, at the individual, household, national, regional, and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life." This definition comes from the United Nations (UN) World Food Summit, which took place in 1996. Previous definitions were inadequate; thus, the idea expanded to include and represent the numerous, intricate debates surrounding nutrition and human rights (Nkegbe *et al*., 2017). This working definition helps isolate four distinct aspects of food security; food availability, economic and physical access to food, food use, and food stability through time. However, the multiple facets of food insecurity show how intricate and far-reaching this idea truly is. In Ghana, the MoFA in 2007 operationally defined food security as "high-quality, nutritious food hygienically packaged, aesthetically presented, available in sufficient quantities all year round and located at the correct place at affordable rates (MoFA, 2007)." Including "safe and nutritious" expands the definition of food security beyond simply having access to enough food to having access to the food that is wanted (Pinstrup-Andersen, 2009).

There are several different ways to define food security. In the context of this thesis, "food security" at the household level means that all household members have access to enough healthy food throughout the year, either through farm production or through purchases, to maintain an appropriate diet. When discussing food security in the context of Elmina, the most crucial factor to consider is the availability and accessibility of food.

2.2 DIMENSIONS OF FOOD SECURITY

In 1996, the World Food Summit identified four facets of food security: availability of nutritionally sufficient food, access to food, stability, and biological utilization of food (Alemseged *et al.*, 2018). Food availability exists when there is always sufficient food for everyone in a country. Food availability refers to its real presence (supply) (Kabubo-Mariara & Kabara, 2018; Kirilenko & Sedjo, 2007). If individuals and families cannot afford healthy food, they will not be able to eat well. Easy access to high-quality food necessitates the financial means to constantly stock up on nourishing foods, thereby addressing the problem of food shortage. In order to attain food security, households and individuals must always have access to sufficient food. Regular income, ready access to markets, and the availability of infrastructure such as railroads and paved roads enhance access to food (Abegaz, 2017; Darfour & Rosentrater, 2016). In addition, the ability to meet one's physiological needs with a healthy diet, clean water, adequate sanitation, and medical care is a measure of food consumption. For food to be deemed sustainable, supply, accessibility, and consumption must always be sufficient (FAO, 2006). Therefore, both the availability and accessibility aspects of food security contribute to stability. Food insecurity can jeopardize the food supply of a nation, a community, or a family when any of the four elements is unstable (FAO, 2008).

2.2.1 AVAILABILITY

Food security is determined in part by its availability. Food availability refers to the quantity and quality of food in any given area across a country due to domestic production, industrial processing, and international trade (IRCS, 2006; Swaminathan & Bhavani, 2013). Food availability at the national level is determined by domestic production, commercial food imports, and food aid (Lioba, 2004). Food production, distribution, and trading are all

components of food availability (Kabubo-Mariara & Kabara, 2018). Crop output, natural disasters, energy prices, domestic prices, arable land, and the currency rate all influence the food supply (Adom, 2015). Food balance sheets are the primary source of information on food availability (FAO, 2014). These documents include information on the daily energy and protein available per person at the national level.

2.2.2 ACCESS

There are a multitude of ways for individuals to obtain the available food. Food can be produced at home, stored, purchased, bartered, gifted, borrowed, or received as food aid (IRCS, 2006). Regarding food accessibility, it is implied that all individuals can quickly and reasonably obtain food that fits their dietary needs (Kuwornu *et al*., 2015). Food accessibility depends on economic, social, and political conditions (Lioba, 2004). In deciding whether a person has access to food, factors such as food prices, food entitlements, and the availability of appropriate resources, such as money, also play a role (Swaminathan & Bhavani, 2013). Markets and shops within walking distance, dependable public transportation, secure pedestrian pathways, train lines, and asphalt roads contribute to increased food accessibility, regardless of economic status (FAO, 2014; Siauw, 2008). Food accessibility comprises affordability, distribution, and individual choice (Kabubo-Mariara & Kabara, 2018). Decreasing salaries, escalating energy costs, depreciating local currencies, and armed conflict disrupt sustainable food availability (Adom, 2015).

2.2.3 UTILIZATION

Food utilization refers to an individual's degree of physical and mental health as a result of their ability to meet their nutritional needs, which includes having access to nutritious foods, safe drinking water, sufficient sanitation, and medical treatment (FAO, 2006). The ability to obtain the necessary nutrients and energy from food is central to this idea. A variety of factors must be in place for adequate food utilization, including a diet with adequate energy and nutritional value, proper childcare practices, safe drinking water, adequate sanitation, knowledge of food storage and processing, general health, and essential nutrition (WFP, 2012). How individuals use food depends on several factors, including the food's quality, how it is prepared and stored, the consumer's level of understanding about nutrition, and the consumer's current state of health (IRCS, 2006; Kabubo-Mariara & Kabara, 2018). Barriers to food utilization include endemic diseases, poor sanitation, and a lack of appropriate nutrition knowledge (IRCS, 2006).

2.2.4 SUSTAINABILITY

Food security has three physical components that are all influenced by sustainability, a temporal aspect of food security (Lioba, 2004). For food to be considered sustainable, it must always be available, easily accessible, and safe to consume. The three conditions of food availability, accessibility, and use must be met continuously for sustainability to be realized (Abegaz, 2017; Darfour & Rosentrater, 2016). For households to be considered food secure, they must have constant access to food and not be at risk of becoming food insecure due to factors like extreme weather, energy shortages, socioeconomic turmoil, or poorly functioning global markets (Darfour & Rosentrater, 2016; IRCS, 2006). Having measures in place to

ensure a steady supply of food and ready access to food throughout the year is crucial to maintaining stability (Kuwornu *et al*., 2015).

2.3 FOOD INSECURITY

A person or household is at risk of food insecurity if they are missing in one or more of the FAO's identified dimensions of food security. McKay *et al*. 2019 contend that the term "food insecurity" encompasses more than the absence of food; it also includes situations in which people's expectations regarding their future access to food influence them to alter their current eating habits. Although a person may be eating enough to sustain life, they may worry about access to the next meal. Depending on the period in question, most publications devoted to studying food insecurity proposed a temporal dimension into two categories: chronic and transient (Jones *et al*., 2013). Chronic food insecurity makes it difficult for a household to obtain enough nutritious food to meet its nutritional demands. As a result, it affects households that consistently cannot afford to buy food or pay their other expenditures. Transitory food insecurity is the absence of adequate food resources for a brief period. An intermediate category occurs over cyclical periods, such as poor crop seasons (Gundersen & Ziliak, 2015; Jones *et al*., 2013).

2.3.1 CAUSES OF FOOD INSECURITY

According to studies, food insecurity is too nuanced and multifaceted to be explained by a single factor (Nkegbe *et al*., 2017; Young *et al*., 2001). Due to this, several explanations regarding the causes of food insecurity have been established. Historical environment and societal norms have significantly impacted food security and related aspects. The reasons for

an inadequate or bountiful food supply are debatable, as they appear to fluctuate through time and vary according to geographical location. Other opinions have emerged from this argument; the following crucial issues will still be examined in this literature study: increasing population, a changing climate, and other socioeconomic factors.

In response to this premise, two contradictory theories, the Malthusian and Boseruprian, have evolved, with distinct predictions regarding the influence of population growth on food security. As Malthus warned in 1798, population growth will inevitably outpace productive resources (Weil & Wilde, 2010). According to Malthusian theory, there are more mouths to feed as the population rises at a geometric rate, but the food supply can only expand at an arithmetic rate. Consequently, food production may decline, leading to famine or household-level malnutrition if population growth is not reduced. To explain this phenomenon, Malthus hypothesised that a fast-rising population was responsible for food scarcity and famine. Those who argued that Malthus's theory ignored the potential of agricultural technology to boost productivity contested his theory (Ahmad & Ali, 2016; Tomiyama *et al*., 2020). In 1965, Esther Boserup presented an alternative argument, contending that a growing population would increase the number of individuals available to work in agricultural and food production.

The hypothesis asserted that population growth increases productivity, contrary to the Malthusian viewpoint. Increasing populations in a specific area can strain the area's resources, forcing imaginative problem-solvers to emerge. Increased agricultural output is directly attributable to the consequences of population growth on farm size, which leads to widespread land fragmentation and the development of small farms (Tomiyama *et al*., 2020).

Since most of Africa's agriculture relies on rainwater, it may be badly harmed by global warming. According to the research, documented changes in the atmospheric component of the global climate could have detrimental effects on food production. Droughts and floods are both

events that can be caused by climate change (Jones *et al*., 2013). The erosion of topsoil induced by the formation of impermeable caps during floods reduces agricultural yield, particularly in small-scale agriculture. Agricultural land may be lost to desertification and other forms of land degradation due to climate change. As the global population is projected to reach 9.2 billion by 2050, these trends may have catastrophic consequences for addressing future food demands (Evans, 2009). However, it is anticipated that agricultural output in less developed nations will decline by 10 to 20 per cent (Gallop, 2022).

According to Lukwa *et al*. (2020), pervasive poverty is one of the primary socioeconomic drivers of food insecurity in most developing nations. Uneven distribution of resources, low earnings, and significant unemployment are the causes of poverty. The poor lack access to essential resources such as food, sanitation, shelter, and medical care (Govender *et al*., 2017).

2.4 TRENDS IN GLOBAL FOOD SECURITY

A staggering 828 million people were hungry in 2021, despite predictions that the world would recover more swiftly from the COVID-19 pandemic and food insecurity. By the end of 2020, 150 million more people worldwide were suffering from hunger compared to the end of 2019. (before the COVID-19 pandemic) (FAO *et al*., 2021). Acute food insecurity affects 11.7% of the world's population, a rise over the previous year. The number of those unable to buy healthy food has increased by 112 million, reaching over 3.1 billion individuals (FAO *et al*., 2022).

In addition, the findings reveal persistent regional disparities, with Africa suffering the brunt of the crisis. In 2021, one-fifth of the African population, or 20.2%, was at risk of starvation, compared to 9.1 per cent in Asia, 8.6 per cent in Latin America and the Caribbean, 5.9 per cent in Oceania, and less than 2.5 per cent in North America and Europe. Since 2015, undernutrition

rates have remained relatively steady, but they spiked from 8.4 per cent in 2019 to 9.2 per cent in 2020 and then increased gradually to 10.4 per cent in 2021 across the majority of Africa, Asia, Latin America and the Caribbean (FAO *et al*., 2022).

From a different angle, food insecurity is an issue that has gained prominence all over the world; however, despite increased coverage in international media and increased aid efforts by numerous organizations, the situation for many households around the world remains dire, with people facing hunger and famine daily (Zhu *et al*., 2022). Domestic food price inflation remains high over the world, which may be a contributing factor to the rising global food security trends. According to the World Bank, high inflation was present in nearly all low-income and middle-income nations between July and October 2022; this included 83.3% of low-income countries, 90.7 % of lower-middle-income countries, and 95 % of upper-middle-income countries (FAO *et al*., 2022). As a result of export interruptions from Russia and Ukraine and continued increases in energy prices, the cost of staple foods like grains and vegetable oils has risen to all-time highs. Inflation and rising interest rates threatened the rising labour cost and resources utilized in commodity production, storage, and transportation. Unfavourable weather patterns have also hampered farming, significantly limiting food supplies (Panghal *et al*., 2022).

2.4.1 TRENDS IN AFRICA

Africa's most fundamental challenges continue to be tied to food and nutrition security when viewed as a whole. The Food and Agriculture Organization of the United Nations (2022) reports that the number of undernourished Africans has been rising due to a lack of economic and physical access to food for decades. In several Sub-Saharan nations, the increasing number of people living below the poverty line harms the population's ability to receive adequate food for a healthy existence. Several African nations, such as Somalia, the Democratic Republic of

the Congo, Burkina Faso, Cameroon, Ethiopia, Nigeria, and Sudan, have experienced the devastating effects of household food insecurity, similar to the situation in less developed nations. The World Food Programme (WFP) classifies Cameroon as a food-insecure nation, and current research indicates that domestic food consumption has decreased since the 1980s; This has increased the child mortality rate and the proportion of underweight children in the country (19%) (WFP, 2022a). Egypt supplies fifty per cent of the country's wheat requirements. Despite the country's average food production, it must import wheat, leaving it subject to rising food prices. The nation is the world's largest importer of this fruit or vegetable (Amin & Madrid, 2015). In addition, the country's population is growing at a rate of 2 per cent yearly.

Additionally, the parched Saharan terrain significantly limits agricultural production (Fikire & Zegeye, 2022). Ethiopia suffers from severe household food insecurity. Approximately 20.4% of Ethiopia's total population of 76.9 million are deemed food insecure, while 4.5% reside in areas in danger of drought (WFP, 2022b). Food insecurity is compounded by the rapid population increase in the country (Hirvonen *et al*., 2017).

2.4.2 TRENDS IN GHANA

In 2013, despite the catastrophic food shortage across Africa, Ghana was one of four countries (together with Malawi, Angola, and Rwanda) that claimed to have met the MDG1 objective. Food and Agriculture Organization and others reported this in 2015. The success of Ghana's food production programmes, such as FASDEP (Food and Agriculture Sector Development Program), is likely due to the country's unified effort (MoFA, 2007). The country's ongoing democracy and implementation of sustainable food production and livelihood measures have led to moderate economic growth, high purchasing power, and a decline in the proportion of undernourished people (Rapsomanikis, 2015).

The 2017 Ghana Zero Hunger Strategic Review Report reviewed the nation's efforts to eradicate hunger and food insecurity from 2014 to 2016. Specifically, the review period mentioned in the report demonstrates that substantial progress was made in the country (Cooke *et al*., 2016; Steiner-Asiedu *et al*., 2017). The authors assert that Ghana is the first African nation to meet MDG1, which required halving poverty and hunger and reducing the number of malnourished people from approximately 7 million in the 1990s to less than 1 million in 2017. 2017 saw the publication of the findings Steiner-Asiedu *et al*. (2017). Despite these increases, Nkegbe *et al*. (2017) discovered that food insecurity persisted at the household level and among vulnerable groups across the nation. The World Food Programme (WFP) has undertaken comprehensive food security and vulnerability analysis and determined that of the 3.6 million food insecure individuals in the country, 1.6 million (5.2%) are severely food insecure, and 2 million (6.5%) are moderately food insecure (WFP, 2020). There may also be a rising gap between the sexes, the north and south, rural and urban locations, and urban and rural populations. The Ghanaian government has neglected the country's northern and southern regions for decades, resulting in an increasing development gap between them (Songsore, 2011).

Although food production and physical food availability have been the focus of food security programmes for decades, it is evident from the preceding examination of Ghana's food security status that additional factors contribute to food security. Both permanent and temporary food insecurity are feasible circumstances. Researchers have emphasised the need to understand food insecurity's history, experiences, and effects on people's health and nutrition.

2.4.3 FOOD SECURITY SITUATION IN CENTRAL REGION

The northern regions of Ghana, specifically the Upper East and Upper West regions, have been subjected to significant levels of climatic variability over the past three decades, resulting in the occurrence of floods, droughts, bushfires, high winds, and rain storms, according to the World Food Programme's (WFP) comprehensive food security and vulnerability analysis. Examples include the 1970s and 1980s Great Sahelian Drought and the 2007 and 2008 floods (Rademacher-Schulz *et al*., 2014). Although pervasive throughout Ghana, food insecurity is concentrated in the Guinea Savannah and Deciduous Forest regions. According to the report, 18.1% of the population resides in the Upper East, 17.1% in the Northern, and 13.3% in the Ashanti. Upper East has the country's most significant percentage of food insecurity, at 49%.

Although the highest prevalence of food insecurity was observed in the three northern regions of Ghana, almost 1.5 million individuals in other regions of Ghana are highly vulnerable to food insecurity. In 2010, urbanization in Ghana's central region reached 42.4%, making it the country's fourth most urbanized and fifth poorest area (GSS, 2013). Since more and more people rely on less productive farms in the region, this poses a current hazard to regional food security. Demi and Kuwornu (2013) report that smallholder families in the region's core area are, on average, calorie-deficient and food-insecure. Researchers discovered that 60% of agricultural households were food insecure in a sample of 120 households interviewed; this means that over 60 per cent of households could not feed their members with the suggested minimum number of calories for optimal health.

2.5 SMALLHOLDER FARMERS AND FOOD INSECURITY

Due to the country's dependence on rain-fed agriculture, farmers in southern Ghana often only grow crops during the two rainy seasons. Smallholders or small-scale farmers are frequently used to describe farmers with small parcels of land (Manda *et al*., 2020). Farmers face climate change, low pricing, poor road infrastructure, lack of access to financing, inadequate markets, post-harvest losses, inadequate education and expertise, unsustainable agricultural techniques, rural-to-urban migration, ineffective policies, and a lack of technological advancement. These conditions have limited farmers' incentive to invest and improve output, which has impeded the expansion of the agricultural industry (MoFA, 2019). Many rural households, particularly those headed by farmers, experience food insecurity and hunger despite raising crops and even selling these products in markets. According to Acheampong *et al*. (2022), ineffective traditional postharvest management causes crop loss.

Consequently, agricultural households in Ghana experience severe food insecurity ranging from three to seven months. As these losses mount, food prices rise, making it harder for families to afford to eat. In addition, some studies indicate that food insecurity and malnutrition are persistent and growing issues in rural communities (Demi & Kuwornu, 2013; Nkegbe *et al*., 2017). For instance, Armah *et al*. (2019) discovered that 94 per cent of 210 farming households in the Bibiani Ahwiaso rural farming community in Ghana's Western region faced the risk of food insecurity.

2.6 DETERMINANTS OF FOOD SECURITY

The food security status of households is predominantly influenced by their socioeconomic characteristics. Poverty is identified as the leading cause of food insecurity, and vice versa;

food insecurity is the leading cause of poverty. Consequently, food insecurity and poverty share the same negative category; anything that affects a household's income may affect its food security status (El Bilali *et al*., 2019). In their analyses of poverty and food insecurity, Abegaz (2017) and Awoke *et al*. (2022a) investigated the socioeconomic behaviours of households. The level of education, gender, age of the household head, and household size was among the variables analyzed (Drammeh *et al*., 2019; Feleke *et al*., 2005; Sarkar *et al*., 2021). Their studies on smallholder households, food crop production and income from non-farm activities were evaluated (Acheampong *et al*., 2022; Mohammed *et al*., 2021). There are farm features that impact the food security status of smallholder farmers, according to the research; land ownership, type of labour available, type and proportion of crops cultivated, scale and size of a farm system, household expenditures, mechanization, capital intensity, and the number of ties to larger economic systems influence the food security status of the household (Makate *et al*., 2016).

2.6.1 SOCIOECONOMIC DETERMINANTS

The availability of labour for food production in the household is affected by the age of the household heads (Guo *et al*., 2015). In a 2006 study, Tang & MacLeod found that a family's ability to diversify its income depends on the breadwinner's age; younger breadwinners could boost food production by growing farm areas. Instead, Gebissa & Geremew (2022) found that older household heads were more likely to have a reliable food source than their younger counterparts. Families own most land; thus, younger household heads would only have access to a portion of the property that has already been divided up; this means that older household heads tend to have more options when it comes to land quality and size for agricultural purposes

(Agidew & Singh, 2018). Therefore, age may help or hurt their ability to secure adequate nutrition.

The gender of the household head influences the economic well-being of a family. Considering that the head of the family is responsible for resource consumption and distribution inside the household and how households are networked for resource exchange with other families (Muchenje & Mushunje, 2013). Even though men predominate in the head of the household, there are several exceptions where women assume this position. According to Demi & Kuwornu (2013), many wives in the central region stay at home to raise children while their men take on the role of the breadwinner. Other studies by Deschênes *et al*. (2020), Doss & Meinzen-Dick (2015), stated that women are disadvantaged when accessing economic resources and opportunities in society; this assumes that men have higher levels of achievement and success in the workplace than women do. In addition, the dependency ratio is higher in female-headed households than in male-headed ones, which has been established in studies (Maxwell, 1996). Maxwell *et al*. (2000) affirms this by stating that women are more likely to have to juggle multiple responsibilities at once, such as caring for children and working, which limits the efficiency with which female-headed households can divide their time and effort between farming and other revenue streams (off-farm). Gender may have a role in determining whether a person can maintain good nutrition (Poczta-Wajda *et al*., 2020).

Primary education lays the groundwork for learning and comprehension; educated heads of households are in a better position to absorb and use the information necessary to improve their families' food security, nutritional status, and overall well-being (Hashmiu *et al*., 2022). In addition to pursuing great employment possibilities, educated heads of households can also seek to diversify their income streams through entrepreneurship. An educated head of household also has more options for earning money, pooling resources, and acquiring information about different diets to improve food and nutrition security (Hoddinott &

Yohannes, 2000). Concerning smallholder farmers, a recent study found that education can have two distinct effects on the labour market: the worker effect and the allocative effect. The worker effect and the allocative impact illustrate how education can make farmers more productive with the resources they already have, while the allocative impact describes how education can improve farmers' capacity to use and distribute resources more effectively (Ferreira, 2015).

The dependency ratio compares the number of people living in a household to the number of individuals working to support that household. According to Sisha (2020), feeding the family becomes a greater burden on the working family members as the dependency ratio rises. Therefore, when resources are few, a bigger portion of the household budget must be allocated to consumption rather than production when there are more unemployed individuals. A household is a group of individuals who live in the same house or complex and make and consume their meals from a shared pot (Sharma, 2013). According to studies, the amount of food consumed in a home is directly related to the number of people living there, hence the number of people in a household has a significant impact on their food security (Govender *et al*., 2017; Namaa, 2017; Powell *et al*., 2017). Since there is insufficient food to go around, households with numerous members and a high dependency ratio are frequently malnourished (Abdullah *et al*., 2019; Olayemi, 2012).

The notion of "income" for smallholder farmers includes earnings from farming, livestock, and other assets and non-agricultural endeavours (Beveridge *et al*., 2019). Therefore, household heads who pursue employment in fields other than agriculture have a greater chance of enhancing their family's financial security. When food production is low, it is crucial to have additional sources of revenue to provide a steady diet (Frelat *et al*., 2016; Herrera *et al*., 2021; Wijk *et al*., 2018). Additionally, when families have more discretionary income owing to the

additional job outside the home, they may be able to afford a wider variety of grocery store meals (Fikire & Zegeye, 2022).

2.6.2 FARM CHARACTERISTICS

Jayne *et al*. (2016) discovered that expanding a farm's land enhanced household income and food security. Hectares are a standard unit of measurement for the size of farms. The term refers to the amount of land available to a family for agricultural uses, such as cultivating food and rearing livestock. Households with larger farms are expected to increase output and improve food security. Therefore, persons with a larger farm or arable land are more likely to have food security than those with a smaller amount.

Households, particularly those in rural areas, heavily rely on their land ownership patterns for economic security and quality of life (FAO, 2017). Farmers obtain land through various mechanisms, including purchase, inheritance, rental, and squatting. In some cases, working the property, saving money, and then purchasing it from the owners is possible (Durand-Lasserve & Payne, 2012). Land can also be leased or rented for temporary possession by individuals or organisations. Numerous rural areas use sharecropping, a kind of land renting in which the tenant farms a plot of land in exchange for a portion of the harvest or the crop's earnings (Mukhamedova & Pomfret, 2019). Therefore, it extends onto the leased property. In addition, the land is generally passed down through the family. The inheritance regulations can be dependent on familial ties. Land can be inherited matrilineally or patrilineally, depending on the practices of the society; this is especially true in Sub-Saharan Africa (Takane, 2008). Squatting on land is sometimes done informally and without authorization. Squatting is a risky method of gaining access to land when the legal owner is absent (Chileshe, 2005). Whether or not sub-Saharan Africa's poor rural farmers may legally own their land substantially impacts

how much they are willing to invest there (Muraoka *et al*., 2018). The inability of the rural poor, particularly farmers, to own land is detrimental to dietary diversity and food security (Ochieng *et al*., 2017).

Various farms can be viewed as distinct spatial units, each with a unique classification. Compound systems are primarily concerned with the residences of individual farm families (Mgbada *et al*., 2014). The surrounding area is set up using the Bush farming system. Due to the distance, households cannot walk to these farms. Instead, they must rely on other modes of transportation. Therefore, wealthy families travel to their bush properties on bicycles or motorcycles. Additionally, they are required to deliver gathered items from farms to rural homes. Riverine systems are the communities that reside beside rivers and cultivate their bank (Awen-naam, 2019).

The successful operation of agricultural systems requires human labour. Maintaining enough access throughout the growing season is essential for farm families' survival (Alpízar *et al*., 2020). Three distinct forms of labour were accessible for usage in agricultural settings in the research area. The most prevalent forms of household labour are one's labour (provided by members of the household) and community labour (supplied by a group of families that have agreed to support each other on a rotating basis).

2.7 HOUSEHOLD DIETARY DIVERSITY

Dietary diversity refers to the variety of meals consumed by family members during a specific period, generally a day or a week (Ruel, 2003). Household dietary diversity is determined by monitoring the influence it has on an individual or family's nutritional status. Nutritional diversity is an indicator of nutritional quality and a measure of a family's capacity to afford a

wide variety of healthy foods . Nutrient needs are more likely to be met when there is a greater variety of foods (Mekuria *et al*., 2017). Even if a high degree of household nutritional variety is suggestive of enhanced access to a varied diet, it is extremely difficult to determine whether or not everyone in a household has the same amount of economic access to a diversified diet. Dietary diversity is associated with dietary protein, calorie consumption, and household wealth. Individual dietary diversity indices can substitute for food quality and nutrient adequacy measurements for infants aged 6 to 23 months (Choudhury *et al*., 2019).

A diversified diet is necessary to ensure that every household member receives sufficient nutrition. Using the aforementioned food categories, surrogate household-level dietary diversity indicators were built. Both the HDDS (household dietary diversity score) and the FCS (food consumption score) measure dietary diversity in households according to an international criterion (Vellema *et al*., 2016; Validation of the World Food Programme's Food Consumption Score and Alternative Indicators of Household Food Security, 2009). A food intake score is determined using a weighting mechanism based on dietary diversity and frequency (how frequently the meal is consumed per week) (Verger *et al*., 2021).

Arimond *et al*. (2010) stated that an increase in the variety of foods consumed in a family may suggest a rise in caloric intake; therefore, individuals who consume a diverse array of meals are more likely to obtain all the necessary. It is not easy to get diverse foods into the homes of people in underdeveloped nations. Limited finances and the inability to easily obtain nutritious and varied meals are responsible for their reliance on starchy staples and comparatively low intake of fruits, vegetables, and animal products (Mekuria *et al*., 2017). The problem of numerous nutrient deficiencies may be related to the lack of diversification typically observed in underdeveloped nations where diets consist primarily of starchy staples, with few or no animal products, and may be heavy in fats and sugars (Carletto *et al*., 2013); This may be

troublesome for the young children in the households, who require a diet rich in energy and a variety of critical nutrients for quick mental and physical growth (Arimond & Ruel, 2004).

2.8 DETERMINANTS OF DIETARY DIVERSITY

Numerous factors influence dietary diversity at the household level in the family. Household dietary diversity (HDD) must be examined to adequately comprehend food availability and access determinants.

Regarding household composition, the range of crops grown on farms is one of the most influential elements. The term "farm production diversity" refers to the diverse array of plant and animal species grown and raised on the farm (Huluka & Wondimagegnhu, 2019). For many of the world's poor and malnourished who work as smallholder farmers in developing countries, crop diversification is an excellent way to enhance the range of foods available to them. According to a quantitative study conducted by Sibhatu *et al*. (2015) in four developing countries, farm production diversity is positively associated with food diversification. Among these nations are Indonesia, Kenya, Ethiopia, and Malawi. A similar conclusion was noted by Ayenew *et al*. (2018), Hefferon *et al*. (2021), Khandoker *et al*. (2022) and Wondimagegnhu *et al*. (2019). However, increasing production diversity was not beneficial for agricultural communities that already produce a wide range of goods (Sibhatu *et al*., 2015). The positive association decreased after planting, indicating that the reported effects are time-dependent (Ayenew *et al*., 2018).

The availability of fresh vegetables and other foods at local markets also influences the variety of foods consumed at home. Increased market accessibility affects household food selection, consumer spending, and nutritional security (Nandi *et al*., 2021). Market access can improve

the quality of life for smallholder farmers by raising their income, reducing their transaction costs, and reducing their impact on poverty and food insecurity (Nandi *et al*., 2021). In two Eastern African countries, researchers discovered that those who lived closer to marketplaces consumed a wider range of foods than those who lived further away (Usman & Haile, 2022). A study in Ethiopia revealed similar results, with people living far from marketplaces spending less on food (Poole et al., 2019) (Usman & Callo-Concha, 2021). According to Milner *et al*. (2022), the impact of market access on dietary diversity is contingent on agricultural characteristics. Increased market access has led to more nutritional diversity on isolated farms specialising in animal husbandry or specialised farming (Milner *et al*., 2022).

Media exposure and nutritional knowledge significantly influence family and individual food preferences (Jalata & Asefa, 2022), substantially impacting how food is utilised in households and how well health promotion programmes are comprehended (Harris-Fry *et al*., 2015). Dietary diversity among women and children is positively and significantly connected with parental nutrition education and understanding (Murendo *et al*., 2018). A study in Bangladesh indicated that women's exposure to the media and education levels increased dietary diversity (Harris-Fry *et al*., 2015).

What people eat at home is determined by the gender, income, and level of education of the breadwinner. HDD is far more prevalent in households headed by women (Ochieng *et al*., 2017). Studies by Bandyopadhyay *et al*. (2021), Kairiza *et al*. (2021) and Larson *et al*. (2019) revealed similar results, indicating the significance of women's empowerment in supporting better dietary and nutritional outcomes. Financially independent and credit-eligible women tend to prepare more diversified meals for their families (Larson *et al*., 2019). The household head's education level was similarly connected with greater dietary diversity (Bandyopadhyay *et al*., 2021). According to research, increased commercialisation of agriculture results in a more diverse diets; dietary variety increases in low-income households, not high-income ones

(Chegere *et al*., 2022; Murendo *et al*., 2018). There is a positive relationship between dietary diversity and household income, especially non-farm income, with the exact effect depending on how the money is spent (Usman & Haile, 2022). According to participants in qualitative research conducted in Uganda, most of their harvest was sold, with the money going toward debt repayment rather than feeding their families (Nabuuma *et al*., 2021b).

2.9 FOOD INSECURITY COPING STRATEGIES

The persistent fear that there will not be enough food to go around has been one of the most pervasive problems throughout human history. Nonetheless, bringing people to a place where they no longer have to worry about where their next meal will come from is a growing issue in the developing world and a key step in the fight against hunger and poverty. Several compensatory coping strategies/mechanisms can mitigate the impacts of household food insecurity (Coates *et al*., 2006; Quisumbing, 2013). Coping mechanisms are implemented to restore household food security, although not to the same degree as before. To cope with a decline in food availability, households adopt several coping strategies, which are "defined as a set of activities carried out by a household in reaction to external shocks that contribute to lower food availability" (Burchi & De Muro, 2016). The intensity of a crisis and the available resources impact how individuals choose to respond. It has been recorded that when families face food insecurity, they may resort to various coping techniques, such as selling or exchanging goods, eating cheaper meals, borrowing food or money, purchasing food on credit, or enlisting the aid of family and friends. When food is not in short supply, household members may resort to rationing strategies such as reducing serving sizes, altering food consumption priorities to prioritise the needs of younger family members, eating fewer meals per day, or even going a whole day without food (Hendriks, 2009; Maxwell *et al*., 2000). Once food

availability is once again guaranteed, these restrictions can be eliminated. According to Gundersen & Ziliak (2015) , for households to adopt the appropriate strategy to address food insecurity, they must consider the underlying cause to achieve desired results.

2.10 CONCEPTUAL FRAMEWORK

According to Green (2014), a conceptual framework is a visual representation of the key concepts explored, including the concepts, major factors, variables, and their relationships.

The conceptual framework (Figure 1) for the study was derived from the FIVIMS Framework of Food Security by FAO (2000) and the Comprehensive Food Security and Vulnerability Analysis Guidelines by WFP (2009), which were informed by the World Food Summit's (1996) definition of food security. Figure 1 illustrates the numerous facets of food security and the interdependent components. The framework focuses on all demographic subgroups, emphasising the food economy's involvement. The framework emphasises food and agriculture-based methods to boost household access and consumption of a diverse diet.

.

Figure 1. Conceptual Framework: Showing Factors that Increase Vulnerability to Food Insecurity

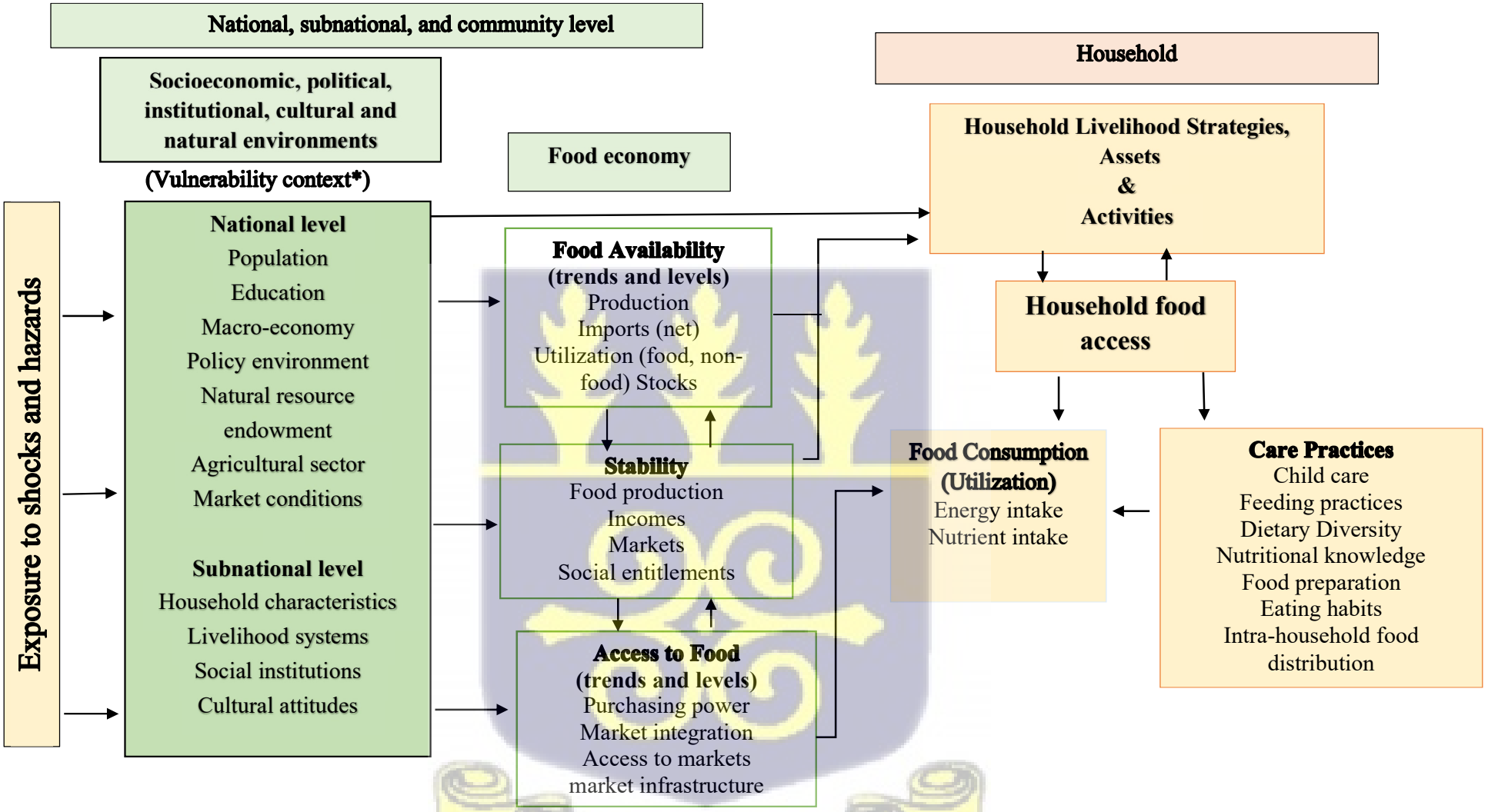


Figure 1. Conceptual Framework adopted from (FAO, 2000; WFP, 2009)

2.11 CONCEPTUAL FRAMEWORK EXPLAINED

The initial stage in analysing food security is to examine the households' susceptibility and response to shocks, their livelihood assets, the local agroecological, political, and institutional context, and the resulting livelihood strategies of the people. Vulnerability is an evaluation of the susceptibility of communities and households to possible shocks. In the end, the vulnerability of a family or group is determined by their ability to withstand the effects of hazards such as droughts, floods, crop blight or infestation, economic fluctuations, and conflict. Over time, shocks impact the macro environment, household assets and strategies, and individuals' food security. Assets, methods of support, and coping mechanisms contribute to a household's resilience in tragedy. When environmental, social, political, institutional, cultural, and economic contexts are perturbed by shocks and hazards, the susceptibility of a nation or community to food insecurity increases. Moreover, hazards can alter the demography, socioeconomics, and household composition. Modifications to these variables may influence many aspects of food safety.

A sufficient food supply is the foundation of food security. In the context of smallholder farmers, physical food supplies from home production, farm inputs, food crop and livestock output, agricultural production diversity, and production methods (traditional or modern) all play a role in influencing food availability (Hagos *et al*., 2014). Agroecological, political, and institutional factors have an impact on these variables. The availability of essential resources, such as purchasing power, market integration and access to the market through market infrastructure, and income-generating activities, all contribute to ensuring that people have consistent and enough access to food (Atanga & Tankpa, 2021; Becher *et al*., 2021). The third aspect is sustainability, which ensures that all household members have enough access to food resources, whether produced at home or obtained from outside sources. Weather, pricing,

human-caused disasters, and political and economic factors can all negatively impact food production, earnings, and markets and, therefore, on stability (Charlton, 2016). Finally, it is essential to ensure that everyone in the household receives the proper nourishment by making the most of the food they purchase (Becher *et al*., 2021). Adequate food usage relies on care behaviours such as child care, feeding practises, eating habits, the right use of food, understanding and application of nutrition, and access to health and sanitation services (FAO, 2000).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 INTRODUCTION

This chapter describes the study design, study area, target population, sample size, sampling procedure, data collection instruments and procedure, pre-test, data analysis and presentation, and ethical considerations of the study.

3.1 STUDY DESIGN.

This study employed a qualitative approach using a transcendental phenomenological study design. Transcendental phenomenology study helped the researcher explore and discover an individual's consciousness and lived experiences objectively (Neubauer *et al.*, 2019). This study design was appropriate in exploring the perceptions, experiences and coping strategies of the smallholder farmer households concerning food security and dietary diversity. Furthermore, transcendental phenomenology constantly checks the researcher's influence on the participant in order not to affect the study's objective; this is done by ensuring that the biases and preconceptions of the researcher are neutralized (Lopez & Willis, 2004).

3.2 STUDY LOCATION

The research was conducted in three (3) rural communities, namely, Atonkwa, Kuful and Abbina, all within the Elmina township in the Central Region of Ghana. The three neighboring communities were located 4 kilometers away from the center of the town. The majority of the

populace engages in farming. Most household heads engaged in agriculture activities such as crop farming, livestock rearing and fish farming. Elmina is a town in the Central Region, East of Cape Coast and bounded on the South by the Atlantic Ocean (GSS, 2013).

3.3 TARGET POPULATION

The target population consists of all entities for which data was utilized to conclude the study (Asiamah *et al*., 2017). The target population were household heads involved in smallholder agricultural activities within the study area.

3.3.1 INCLUSION CRITERIA

The selection criteria for study participants include the following:

1. Willingness to participate
2. Farmers should be involved in crop farming, livestock rearing or fish farming.
3. The participant should be a resident of the selected community for at least three (3) years.

3.3.2 EXCLUSION CRITERIA

The study excluded the following;

1. Participants unwilling to participate
2. Farmers involved in cash crop farming
3. Residents residing in the selected community for less than three (3) years

3.4 SAMPLE SIZE

A total of 30 participants were used for the study. For qualitative studies, sample size guidelines suggest a range of 20 to 30 participants (Vasileiou *et al.*, 2018). Sandelowski (1995) stated that sample sizes which are large enough bring forth a new and rich understanding of the subject areas under study, however small enough for deep details of the subjects. Moreover, thematic saturation can sometimes be achieved after completing 20 interviews (Patton, 2002).

3.5 SAMPLING TECHNIQUE

The sampling technique was a multi-stage sampling method.

First level sampling

Based on the population's characteristics and the study's objective, three communities, namely, Atonkwa, Kuful, and Abbina, were selected using the purposive sampling method.

Second level sampling

The proportionate-stratified sampling technique was used in selecting 30 smallholder households from the three communities. The three (3) communities form three (3) strata, and each stratum has a different number of smallholder households. A preliminary study shows the total number of smallholder households in each community obtained in Table 1.

Table 1. Number of smallholder households

Community	Population size
Atonkwa	54
Kuful	51
Abbina	20
Total	125

The decision to apply the proportionate random sampling is based on the need to ensure that smallholder households from the three (3) communities are adequately represented to generalise the findings for this research to cover smallholder households (Creswell, 2009). The following formula was used to obtain the number of households selected from each community, and the results are shown in Table 2.

$$\frac{\text{No.of smallholder households in each community}}{\text{Total No.of smallholder households in the three (3)communities}} \; x \; sample\ size = No.\ drawn\ from\ each\ community$$

Table 2. Calculated sample size of each community

Community	Population size	Sample size
Atonkwa	54	13
Kuful	51	12
Abbina	20	5
Total	125	30

Third level sampling

A snowball sampling method was utilised to choose the thirty (30) participants. Snowballing, also known as chain-referral sampling, enables recruiting more participants from existing participants and their acquaintances (Creswell, 2009). Utilization of this sampling procedure required the researcher to initially contact a few potential participants willing to participate in the study. The rationale for using the snowball sampling technique was to allow the researcher to establish smallholder farmers within the study area who would use their social network to refer the researcher to other farmers with the same characteristics that fit the research objective.

3.6 INSTRUMENT FOR DATA COLLECTION

A semi-structured interview guide (Appendix II) was developed and used to collect qualitative data from the smallholder farmers based on the study's objective. A semi-structured interview guide is a list of premeditated questions which help researchers explore a particular topic by asking interviewees questions for in-depth responses. The interview guide had sections on;

Section 1: Demographics

Section 2: Household food availability and access

Section 3: Determinants of dietary diversity

Section 4: Coping strategies against food insecurity

Adapted from (Awen-naam, 2019; Namaa, 2017; Tour, 2016)

3.7 PRE-TEST

The interview guide was a pre-test with five (5) heads of smallholder households in Ampeni, a community with comparable characteristics to those selected for the study. The preliminary test assisted the researcher in validating the clarity of the questions. In addition, the pre-test assisted in the practice and improvement of interview skills before data collection.

3.8 ETHICAL CONSIDERATION

Ethical approval was sought from the College of Basic and Applied Sciences Review Board's Ethics and Protocol Review Committee (Appendix III). Before deciding to participate, participants were provided with appropriate information about the study's objectives; this allowed them to make an informed decision regarding their participation. The study's consent form maintained the participants' privacy by requiring them to input a number code in place of their names. Before the interviews were conducted, all participants signed a waiver indicating that they understood the purpose of the study. At no point were participants penalised for withdrawing from the research.

3.9 PROCEDURE FOR DATA COLLECTION

After obtaining ethical approval, the Department of Family and Consumer Sciences addressed an introduction letter (Appendix IV) to the chiefs of the three (3) communities requesting permission to conduct the study. After permission was granted, community leaders helped select a few potential candidates. The initial participant was identified, and the interview time and location were arranged. Before the scheduled interview, participants were told about the

study's objective, the benefits, the confidentiality guarantee, and their ability to withdraw from the study at any time. Those who agreed to participate were required to complete consent forms (Appendix I). A face-to-face interview was conducted at the residence of each participant. Interviews were conducted in Fante and lasted thirty (30) to sixty (60) minutes. With participant agreement, interviews were taped with an audio recorder.

3.10 DATA ANALYSIS

Thematic content analysis was used to analyse data. Thematic content analysis is a descriptive presentation of qualitative data which involves transcribed data to classify themes that sum up all the views collected (Vaismoradi *et al*., 2013). Recorded audio from the interview was transcribed verbatim to ensure that data was not lost. The transcripts were read through multiple times to get familiar with the data. Tables were used to summarize data and display figures where similar appropriate codes identified were categorized and re-categorized using content analysis as the study progressed. Sub-groups were named and grouped under predetermined themes from the research objective. The predetermined themes were: food availability and access, causes of food security, determinants of dietary diversity and coping strategies. Twelve (12) sub-themes emerged from the interviews conducted. Information derived was supported with quotes to illustrate themes and meanings from the transcripts.

3.11 LIMITATION OF THE STUDY

Due to the intrinsic characteristics of qualitative research, such as sample size and sampling procedures, the generalizability of the study's findings is limited.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The findings, interpretation of findings, and discussion of data collected from thirty (30) participants are presented in this chapter. The study sought to investigate community perspectives on food security, dietary diversity and their determinants among rural smallholder farming households. The findings were discussed following these key sub-headings; demographic characteristics, farm characteristics and major themes and sub-themes that emerged from the in-depth interviews to answer the following research questions:

a) What are the challenges smallholder households face with household food availability and access?

b) What are the causes of food insecurity in the study area?

c) What are the determinants of household dietary diversity?

d) What coping strategies do smallholder households adopt in dealing with challenges?

4.2 DEMOGRAPHIC CHARACTERISTICS

Generally, concerns with food insecurity and coping mechanisms are impacted directly or indirectly by the socio-demographic characteristics of participants. Presented are the demographic features of the individuals under the following sub-headings; age, gender, educational background, marital status, number of children, and household size. Table 3. presents the demographic characteristics of 30 smallholder farmers who were interviewed.

Table 3: Demographic characteristics of participants

Demographic Characteristics	Frequency (N=30)
Gender	
Female	19
Male	11
Age	
30-39	7
40-49	11
50-59	6
60-69	4
70-79	2
Level of Education	
No formal Education	5
Primary School	2
Junior High School	13
Senior High School	8
Vocational	2
Off-farm activities	
Fulltime Farmers	13
Trader	8
Fishmonger	4
Electrician	2
Mason	1
Other Occupations*	2
Size of household	
2-4	5
5-7	13
8-10	10
>10	2

*Other occupations include businessmen and security officers

4.2.1 GENDER OF HOUSEHOLD HEAD

Smallholder household heads investigated were predominantly female, as seen in Table 3. A family's economic well-being is influenced by the gender of the household head, considering that the head of the family is responsible for resource consumption and distribution inside the household. Household heads are also responsible for how households are networked for resource exchange with other families. According to studies by Deschênes *et al.*, 2020 and Doss & Meinzen-Dick, 2015, women are disadvantaged when accessing economic resources and opportunities in society; this implies that while the head of the family must secure the home's economic viability regardless of gender, the instruments available to do so are not gender-neutral. According to studies by Kuwornu *et al.* (2015) and Maxwell *et al.* (2000), Gender also influences the likelihood of food insecurity, where households headed by women are more likely to experience food insecurity compared to households headed by men Since food insecurity is attributed to an individual's role to provide for the household, including their ability to obtain food. Moreover, females have a greater dependency ratio, which restricts their ability to allocate labour to farming and other income-generating activities due to fewer years of education, and households headed by women have lower incomes than those led by men.

4.2.2 AGE OF SMALLHOLDER FARMERS

The smallholder household heads studied were between the ages of 30 and 73 years, with an average age of 47.6 years. The age distribution of the participants suggests that the agricultural population in the research area are ageing. Older farmers may be less productive compared to younger workers. Tang & MacLeod (2006) stated that ageing agricultural labour might diminish the physical strength of the labour force and, as a result, limit the food production output and capacity. In addition, an ageing agricultural workforce poses significant challenges

for future production and adaptation to a new market and environmental conditions, primarily because older farmers may be less likely to implement new, transformative production techniques needed to increase food production (Liu *et al*., 2021).

4.2.3 LEVEL OF EDUCATION

Education is one means by which agricultural production can be boosted. In Table 3, four household heads had completed elementary education, thirteen had completed junior high school, and eight had completed senior high school. Two heads of farmer households had a vocational education, while five had no formal education. According to the literature, formal education of the household's head improves food security. Since basic education lays the groundwork for learning and comprehension, educated household heads can better comprehend and apply vital knowledge for increased production (Hashmiu *et al*., 2022). More than half of the participants can read and have completed junior high school as a result, it is expected that they should be more productive with the resources they already have and possess the capacity to use and distribute resources more effectively.

4.2.4 OFF-FARM ACTIVITIES

Sales of agricultural products were not the only source of cash revenue for farming households, and their income was generated from sources other than farming (Table 3). Only thirteen (13) out of the thirty (30) participants were active farmers, while the remaining seventeen (17) were involved in non-farming occupations such as; trading, fishmongering, masonry, and electrical work. When chances for non-farming work become available, many smallholders take advantage of them to supplement their farm income.; this is consistent with findings from other

studies, which stated that revenue from sources other than farming is crucial for maintaining a steady diet, especially during times of poor food output (Beveridge *et al*., 2019; Fikire & Zegeye, 2022; Frelat *et al*., 2016; Herrera *et al*., 2021). Perhaps when families have more disposable income due to jobs outside the home, they may afford to buy a wider variety of meals at the market.

4.2.5 HOUSEHOLD SIZE

The maximum and minimum household sizes (Table 3) were 2 and 13, respectively. The average household size was 6.80; this average differs from the GSS *et al*. (2014) figure of 3.8 for rural areas. This disparity may be because the sample size of this study was smaller than that of the demographic health survey. According to studies (Abdullah *et al*., 2019; Govender *et al*., 2017; Namaa, 2017; Olayemi, 2012; Powell *et al*., 2017), family size or the number of people in a household has a substantial impact on food security since household size influences food consumption; the higher the family size, the less food is available for each member of the household.

4.3 FARM CHARACTERISTICS

The characteristics of farms have a significant bearing on the level of food security enjoyed by smallholder households. This section provides information regarding land ownership, the type of farm, the labour available on the farm, the activities that take place off the farm, and the type of crop and livestock available. The features of the farms owned by the 30 smallholder farmers who were questioned are outlined in Table 4.

Table 4: Farm Characteristics

Farm Characteristics	Frequency
Land ownership	
Rent-free	13
Ownership	13
Rent	4
Farm type	
Compound farm	23
Bush farming	6
Riverine farming	1
Farm Labour	
Own labour	25
Communal labour	3
Hired labour	2
Crops Cultivated	
Cassava	29
Maize	22
Okro	14
Pepper	11
Tomatoes	10
Garden Eggs	9
Plantain	7
Pineapple	2
Watermelon	1
Cabbage	1
Livestock Reared	
Hen	12
Goat	8
Duck	1

4.3.1 LAND OWNERSHIP

Land ownership structures significantly determine how households, particularly those in rural areas, secure their economic viability and quality of life. In Table 4, there were three ways to access land: ownership (via inheritance or purchase), renting (including sharecropping), and not paying rent. The vast majority (17 participants) of those who lived in the study area did not

own the land they occupied; thus, they could not use it for free. They either paid the rent with money or shared the harvested crops with the landowner. The ability of poor rural farmers in sub-Saharan Africa to own their land has been shown to be crucial since it influences the extent to which they are willing to invest in that land. Dietary diversity and food security may negatively affect these farmers who cannot own land.

4.3.2 FARM TYPE

There are many distinct kinds of farms, all of which are spatial units and categorised uniquely. Most participants (23) operated compound farms that were located around their homes (Table 4); this is a result of the proximity to inhabited areas and the lack of finances to obtain motorcycles and bicycles to transport food. Six (6) participants possessed bush farms, which are often located at a greater distance from their homes and need alternative forms of travel rather than walking to these farms. One (1) of the participants ran a farm along the banks of rivers, sometimes known as riverine farms. Compared to other regions of Ghana, the research area does not have nearly as established an agricultural irrigation industry as the Ministry of Food and Agriculture noted.

4.3.3 FARM LABOUR

Labour is necessary to ensure the smooth operation of agricultural systems. The ability of farm households to maintain sufficient access throughout the growing season is essential to their continued existence. In the study area, three different types of labour were utilized for farm work. These included one's labour (25), which members of the household provided. Communal labour (3) was given by a group of the households that opted to help each other on a rotational

basis, and hired labour (2) were utilised mostly by households with adequate financial means. In the region under investigation, own labour was the most often reported type of labour.

4.3.4 CROPS CULTIVATED AND LIVESTOCK REARED

All farm households in the study area cultivated crops and maintained livestock for the goals of both subsistence and profit. The method of farming known as "mixed farming" was widely used. Cassava and maize were the two most common crops grown by farmers. The common vegetables grown were okro, pepper and garden eggs. The participants also reported that watermelons, oranges, and pineapples were among their most popular fruit crops. Goats, ducks, and chickens were examples of the types of livestock that could be found in the area. The goats and ducks served as a source of animal nutrition for the home and were sold to generate revenue. They reported that the chickens were productive in terms of meat and eggs.

4.4 PRE-DETERMINED THEMES AND SUB-THEMES

This section outlines the themes and subthemes uncovered through data analysis. Table 5 shows the sub-themes deduced from the main themes of the study, which include food availability and access, causes of food insecurity, dietary variety factors, and smallholder farmers' coping mechanisms.

Table 5: Predetermined themes and corresponding sub-themes

Themes	Sub-themes
Household Food Availability and Access	• Household food consumption • Source of food • Market accessibility • Perception of food adequacy
Causes of Food Insecurity	• Socio-economic causes • Climatic variability
Determinants of Dietary Diversity	• Farm production diversity • Socioeconomic factors • Information access and use
Coping strategies	• Rationing • Dietary changes • Availability of short-term funds

4.5 FOOD AVAILABILITY AND ACCESS

This section examines the perspectives of farmers on household food availability and access. Availability and access focus on the quantity and quality of domestically produced food that is available in sufficient amounts. The following sub-themes emerged; sources of food, household food consumption, market accessibility and perception of food adequacy.

4.5.1 HOUSEHOLD FOOD CONSUMPTION

Self-production and household spending on food are components of food consumption. Dietary consumption and nutritional status can be greatly affected by factors such as what is eaten, where it is, how much is consumed, and when it is eaten (Herforth & Ahmed, 2015). Participants reported eating a variety of meals, including starchy staples (cereals and tubers), meat and fish, vegetables and fruits. Their diets were primarily determined by what was readily accessible in the area. Cereals, root crops, and indigenous vegetables are integral to the Ghanaian diet. These are also prepared in most households across the country's urban and rural regions and comprise most of the country's food system.

4.5.1.1 STARCHY STAPLES

Cereals and tubers comprised most of the participants' consumption of starchy foods. Cassava, plantain, and yam were the tubers consumed, with cassava being the most common. Concerning the consumption of grains, maize was discovered to be the most commonly consumed. The majority of the root and tuber crops, in addition to plantain, were consumed mainly in the form of fufu (which is a mashed mixture of cooked cassava and plantain that has been pounded together, and ampesi (boiled root, tuber or plantain). Cassava was also consumed in the form of gari, kokonte (a meal made from dried cassava flour), or agbelima (a fermented dough), which was often combined with a fermented maize meal and cooked into banku. Most of the maize was consumed in the form of kenkey (cooked balls of fermented maize dough). Rice was the second most significant cereal that people consumed after maize. Rice was consumed, most often in the form of a boiled dish that was served with stew. The following are some quotes by participants:

"I like Fufu and banku. I do not really like rice, but if I am to cook rice, I eat it very hot. As for Fufu, It is my main food" (Female, Farmer 30, 27/09/22)

"I eat fufu, but the kids and their dad do not eat fufu. They eat rice and other things such as kenkey and banku" (Female, Farmer 28, 27/09/22)

These findings are consistent with the Ministry of Food and Agriculture (2019) stating that the Ghanaian diet traditionally consists of cereals, root, and tuber crops. The preponderance of foods like cereals, roots, and tubers suggests that these foods were available and easily accessible in the local communities. When it comes to nutrition, both roots and tubers have the potential to provide inexpensive sources of dietary energy in the form of carbohydrates. Research indicates that high yields of roots and tubers supply more calories per land unit per day compared to cereal grains due to the significant amount of moisture that tubers contain (Ntwenya *et al*., 2015). Consequently, the energy derived from tubers is approximately a third of what can be extracted from an equivalent weight of rice or wheat. (Chandrasekara & Josheph Kumar, 2016).

4.5.1.2 ANIMAL SOURCES

Fish was the participants' primary source of animal protein. Fish was primarily consumed in soups and stews as an accompaniment to the major staples. Participants also consumed meat, eggs, and poultry as animal protein sources. Meat and milk were consumed less frequently. Some participants asserted that:

"We eat fish often. We do not often consume meat. I have fowls, so we sometimes consume its eggs. I buy the fish from Elmina market" (Female, Farmer 29, 27/09/22)

"We often eat fish…When we do not have fish, we buy chicken or eggs and use them in our stews. I do not like meat" (Female, Farmer 24, 27/09/22)

"I particularly do not like meat, but the children like them… I often buy meat because we do not rear animals" (Male, Farmer 26, 27/09/22)

"We consume fish all the time. I add it to our banku and ground pepper… We buy our fish from Elmina beach" (Female, Farmer 25, 27/09/22)

The findings are consistent with a study by Colecraft *et al*., 2006 and Onumah *et al*., 2020 which indicated that across all income strata in Ghana, fish is the most popular animal source of protein. Income and other socioeconomic characteristics have been linked to the frequency with which people eat fish (Colecraft *et al*., 2006; Onumah *et al*., 2020). The results of this study imply that for individuals to obtain access to foods derived from animal sources, households utilize available income or sell other food products to acquire funds for purchasing animal source foods. Codjoe *et al*. (2016) also found that while most Ghanaians have a varied diet, they do not eat nearly enough items like meat and milk/dairy products, which are high in micronutrients.

4.5.1.3 FRUITS AND VEGETABLES

Almost all participants (30) stated that the major tropical fruits found in the area include oranges, pineapples, watermelons, and bananas. Most fruits are seasonal, so consumption was frequent only when they were in season. Almost all participants consumed vegetables, pepper, onion and tomato frequently, mainly in soups and stews or as hot pepper sauce accompaniment to kenkey, banku or kokonte. Similarly, garden eggs and okro were important vegetables used to prepare some stews and soups. Some participants reported;

"We eat fruits almost every day after meals… the most consumed are oranges. We alternate between watermelon and oranges." (Female, Farmer 29, 27/09/22)

"Just yesterday, I had watermelon. When I go to the markets, fruits are all over the place, so I usually consume a lot of watermelons. I also buy tomatoes, garden eggs, pepper, and onion and bring them home." (Female, Farmer 30, 27/09/22)

"I buy garden eggs, tomatoes for cooking… I do not like fruits, but my kids do, so I give them." (Female, Farmer 24, 27/09/22)

Vegetables and fruits supply relatively high amounts of vitamins and minerals to the diet and have beneficial effects on general health and well-being. A study indicated that insufficient fruit and vegetable intake had been one factor accounting for the high rates of chronic diseases (Hall *et al*., 2009). Other participants stated that vegetable and fruit consumption depends on an intermittent supply during the calendar year, a condition referred to as seasonality.

For example, a participant narrated as follows;

"Sometimes we eat fruits only when they are in season ... mostly, watermelon, orange and pineapple." (Female, Farmer 28, 27/09/22)

Participants generally reported that they made minimal effort to ensure the consumption of fruits and vegetables during dry seasons. A study by Florkowski *et al*. (2014) stated that income and purchasing power is the most influential predictor of fruit consumption when not in season. The income argument posits a relationship between income and fruit and vegetable consumption since low-income households would want to avoid hunger because fruit and vegetables are not energy proficient.

4.5.2. SOURCE OF FOOD

The majority (22) of households in the study area derive most of their income from agricultural activities. Farms are run on a small scale with the primary objective of providing household food, and surpluses are sold to meet the requirements of both the food and non-food industries. Participants explained that food was mainly sourced from farm production or bought from the market. Although own food production is the primary food source among most households, some participants lamented that their crops do not yield enough food for sustained consumption and therefore resort to buying food. Regarding buying food, the cost and availability in the market significantly influence the type and quantity of food bought.

This is expressed in the following responses;

"I grow cassava, garden eggs, watermelon, okro, and peppers. I also rear ducks and goats. We mostly consume what I grow. It is meat or fish that we buy. We sometimes buy some of the foods I grow when we do not have a lot at home.'' (Male, Farmer 1, 26/09/22)

"I mostly grow cassava... that is what I usually consume at home. I tried growing maize, but it could not mature. I recently just increased the amount of cassava I grow, but at first, I was consuming it at home.'' (Female, Farmer 26, 27/09/22)

"Okro, cassava, and tomatoes are the foods we cultivate. That is what I mainly consume at home. We pound some of the cassava, and we also steep some of the corn after drying for corn dough." (Female, Farmer 30, 27/09/22)

"As for food, we consume what is on the farm. When we have a bountiful harvest, we sell some of the excesses and save the money." (Female, Farmer 28, 27/09/22)

The above responses indicate that most smallholder farmers in the study area consume what they grow. Most farmers consume the crops grown, especially the main staples, such as cassava, maize and plantain. Although some farmers rear animals and grow fruits and vegetables, they sometimes have to purchase some fruits, vegetables and meat to supplement the supply at home and increase dietary diversity.

A farmer who often makes purchases from the market said;

"Oh, I buy foodstuff from the market or sometimes when I go and get my fish. I have a vendor at the market, so I buy from her and come and put it in my freezer" (Female, Farmer 30, 27/09/22)

The responses suggest that marketplaces are of comparable importance to the diets of smallholder households. Most households within the study area purchase food from the market to supplement the produce at home. The participants expressed that most fruits and vegetables and protein sources such as fish and meat are from the market.

Another participant mentioned;

"We go to the Elmina market. That is where we get everything we need. In seasons where the rainfall pattern is distorted, we buy cassava, tomatoes, and pepper" (Male, Farmer 2, 26/09/22)

The purchase of food from the market varies with the season. The response above indicates that farmers must purchase a portion of the consumed crops during certain seasons due to food scarcity. This study is consistent with a study conducted in Ethiopia which stated that; during the dry season, more than half of the calories consumed come from purchased meals (Sibhatu & Qaim, 2017). Another study highlighted that low crop production during periods within the year reduced the food available for consumption and exposed farmers to getting food from other sources, such as purchases (Kuwornu *et al*., 2015).

4.5.3 MARKET ACCESSIBILITY

Accessibility to markets is regarded as one of the most significant variables influencing rural food security. Local markets are relevant for sales and purchases of smaller quantities of food in order to satisfy immediate dietary needs. As producers and consumers, market access serves a dual purpose for rural farming households. On the one hand, they utilize the market to

purchase inputs or sell agricultural goods; on the other, they use it to purchase food and non-food items to maintain their living level (Ahmed *et al*., 2017). Local markets also play an important role in accessing fresh fruits, vegetables and dairy products that cannot be stored for longer periods. Long distances between farms and markets, high transportation costs, and poor road networks may all impede market access. Consequently, improved infrastructure and market access can significantly ensure local food security by decreasing travel time, distance, and expense. Proximity and the state of the roads were important considerations for the participants.

4.5.3.1 PROXIMITY

The proximity of the local market plays a major role in food access in the study area. Most participants mentioned that the proximity of the local market informs their decision to purchase food since they buy products from the market and go there to sell. Eighteen (18) out of 30 participants agreed that the market was close. One farmer expressed that;

"The distance from here to Elmina market is about 2 kilometres. The road is not good. We have spoken about it severally but to no avail." (Male, Farmer 2, 26/09/22)

Perhaps better market accessibility through shorter distances could contribute to a greater variety of foods consumed. Lowering market distance may benefit household and individual food security and dietary diversification.

4.5.3.2 STATE OF ROADS

In Ghana, road travel is the most prevalent means of transportation. Poor road infrastructure impedes transportation and restricts community movement. Twenty-five (25) of thirty (30) smallholder farmers concurred that the poor condition of the roads leading to the market hinders their mobility, particularly during the rainy season.

A farmer from Atonkwa explained the state of the roads as follows;

"The market is close enough to me. But as for our road is terrible during the rainy season. It is bad and really destroyed… so when we are returning, we have to use another route through Abbina" (Female, Farmer 11, 27/09/22)

Another farmer from Atonkwa also elaborated;

"The market is not close to us, and our road network is terrible, especially when it rains. The last time it rained, a tree fell and blocked the road… So we find it difficult to access the market". (Male, Farmer 9, 27/09/22)

A farmer from Abbina also described;

"Currently, our roads are terrible, so visitors are not able to come to our town. My wife sells fruits in front of our house in the evening, and if visitors come around, they will be able to purchase them. But because of our bad roads, visitors do not come here in their numbers" (Male, Farmer 26, 27/09/22)

Another farmer from Kuful shared a similar experience;

"Our road is very terrible. Our main market is the Elmina market. So we struggle to get our produce to the market when we do not get a motor or tricycle to carry them. It is not really accessible. Sometimes the sellers come straight to the farmers to get their produce when food is becoming scarce in the dry season". (Male, Farmer 12, 27/09/22)

Poor road conditions have been determined as one of the issues that prevent farmers in rural areas from easily accessing markets. Due to the state of the roads in the study area, participants have difficulty purchasing food from marketplaces and getting the available food in those markets. Poor roads, particularly during the rainy season, can drive up the cost of transportation due to the poor condition of the road. Simultaneously, the price of food on the market increases due to the limited availability of transportation. The seasonality of food supply, consumption, and access can all be reduced by improving consumers' capacity to access more markets, which can encourage the consistent availability of nutritious foods in those markets.

4.5.4 PERCEPTIONS OF DIETARY ADEQUACY

Beyond food access and use, dietary quality and quantity are vital in achieving food security. Dietary adequacy includes consuming sufficient amounts of energy and all vital elements, and ensuring that household members consume enough quantities and quality food is essential for promoting food security. Seasonality was cited by household heads who believed their homes lacked sufficient quality foods. This section examines the perspectives of smallholder farmers regarding the sufficiency of household food in terms of quality and quantity.

4.5.4.1 SUFFICIENT QUALITY OF FOODS

According to the opinions shared, the heads of households who believed that they had an adequate quantity of high-quality foods to fulfil the needs of their households said that their family members ate a wide variety of foods. However, the diet consisted primarily of grains and vegetables but a negligible amount of dairy products.

One participant stated;

"So I sometimes grind pepper, and then I chop onions and eat it with my banku or kenkey. On days I do not eat ground pepper, I prepare stew, and other times, I make soups. I make palm nut soups, ground nuts, and keep them for days". (Female, Farmer 30, 27/09/22)

In this view, it emerges that homemade food can only be of a particular sort; hence, eating only that type of food in a household is the only option before a new or freshly prepared meal is made. Given difficulties with market access, many homes would store stews, soups, sauces, kenkey, and banku in refrigerators for a period that could last days or weeks. As a result, other types of food must be restricted until those preserved have been consumed.

Another participant expressed:

"During the dry season, good food becomes scarce, but we just have to eat what we have available at the time." (Male, Farmer 9, 26/09/22)

This response raises an important consideration regarding dietary quality since a diet with sufficient energy and nutritional value is crucial in achieving adequate food utilization. Other

participants expressed that their households did not have access to a variety of high-quality foods and attributed it to the lack of food availability and accessibility during extended dry seasons; this is consistent with a study by Small & Raizada (2017), which stated that erosion leads to a general decline in soil fertility, affecting the quality of the food produced. Throughout the prolonged dry season, bare, fallow land produces a surface crust as moisture evaporates. Consequently, when the rainy season arrives, precipitation cannot filter through the soil crust, resulting in surface runoff and erosion (Montgomery, 2007; Small & Raizada, 2017).

4.5.4.2 SUFFICIENT QUANTITY OF FOODS

Food-secure households have sufficient quantities to adequately provide for their families by frequently consuming meals compared to those who do not have sufficient food for household members.

Concerning the frequency of household meals, a participant stated:

"We consume fruits and use watermelon for our dessert. We normally eat heavy meals in the morning. We do not always have lunch, but we make up for it during supper" (Male, Farmer 1, 26/09/22)

Another participant made a statement;

"The type of food we eat mainly depends on the season we are in. During the dry season, food becomes scarce. What is available at the market becomes expensive. We do not always get to consume enough. To be honest, at the moment, there is no food at home. I am currently not in the best financial situation, so my sister-in-law is the one who has been feeding me." (Female, Farmer 30, 27/09/22)

Responses indicate that households with insufficient food for their members consumed at least one meal per day. Further investigation revealed that an insufficient number of foods for household members was ascribed to seasonal differences (such as during the dry season when certain foods are scarce), high market costs for goods, and a shortage of fresh foods such as fish and tomatoes, among other factors. Inadequate nutritional intake impairs the immune system, increasing the likelihood of contracting common diseases. Inadequate nutritional intake is also related to stress, fatigue, and the ability to work and earn money from farming activities (Silvestri *et al*., 2015).

4.6 PERCEPTIONS AND CAUSES OF FOOD INSECURITY

Food insecurity is generally caused by a lack of home food production, consumer access to food, or inability to purchase food owing to financial constraints. Most participants attributed food insecurity issues in the study area to socioeconomic and climatic factors. Socioeconomic issues included displacement of income and insufficient income. Climatic conditions characterized by the unpredictability of precipitation and floods pose a grave threat to food insecurity. Seasonal patterns make people more susceptible to food insecurity when insufficient food is produced.

4.6.1 SOCIO-ECONOMIC CAUSES

The inability to obtain enough nutrition has socioeconomic roots. Participants most frequently identified the factors that lead to their experiences of food insecurity as a lack of income and the displacement of income caused by spending on education and healthcare.

4.6.1.1 DISPLACEMENT OF INCOME

Five (5) participants indicated the burden of education and healthcare expenses as the primary issue that moved income away from food availability or livelihood investment, primarily via the cost of medicine and school fees.

One participant mentioned;

"While we provide food, we have to care for the children's education. We mainly use my salary from my job as a security officer and the proceeds from the farm for their education. My salary is what we used to provide for the family. Since my salary is not enough, we go in for loans, so after all the deductions from the bank, there is very little money left. That is why we have to add farming. We all have health insurance and, although it is subsidized, it does not cover all the expenses" (Male, Farmer 4, 26/09/22).

Another participant added;

"Most of the money we get goes into hospital bills and the children's education. The children are many, so there are times when there is hardship and food becomes an issue. Buying things for the children to take to school brings hardship. It reduces our ability to provide food" (Female, Farmer 27, 26/09/22).

In these particular instances, interviews have uncovered a fundamental cause of food insecurity, which is a constraint on the financial resources which are available to households for health care and education; this is likely to call for coordinated action or a shift in policy on

a national scale in order to alleviate this constraint to improve food security and food production. Due to a lack of insurance coverage and restricted access to public services, the majority of the financial burden of illness falls on economically poor and rural households; this is especially true for farmers, whose productivity and purchasing power are negatively impacted when they become ill.

4.6.1.2 INSUFFICIENT INCOME

In addition to the food that they produce themselves, farmers can also sell their crops for money. A high poverty and dependency ratio, combined with low income and limited access to critical resources, heightens the vulnerability and exposes smallholder agricultural households to the risk of food insecurity. Concerning the farmers in the study area, seven (7) of them mentioned how a lack of money made it difficult for them to provide food for their families.

A participant articulated;

"The children need money for books. We buy fertilizers and chemicals for the farm as well. Sometimes we have to buy chemicals (drugs) for the plants. Money is the main cause, so food is scarce in the absence of money." (Female, Farmer 29, 27/09/22)

Another participant mentioned;

"Financial difficulty makes food inaccessible in my household… if there is no money, you may get a helper who would be willing to lend you some money. If not, you have to find ways to feed the family." (Female, Farmer 19, 27/09/22)

The responses indicate that a household's ability to produce and access high-quality food increases when income rises. Although food is readily available at the market, many households may be unable to purchase any food there due to a lack of purchasing power brought on by low income and high levels of poverty. Since farming is highly dependent on weather and market pricing, farmers are often forced to take out loans to finance their operations until harvest season or until the market conditions improve. Banks often refuse to lend money to smallholder farmers while lending money to larger, more powerful farms. Because of this, the smallholder farmers and their families and communities end up starving.

4.6.2 CLIMATIC VARIABILITY

In the semi-deciduous forest agro-ecological zone of Ghana, where the majority of the country's farmers are subsistent and rely heavily on the production from their farms as their primary source of food, the impact of climatic events on agricultural productivity is felt to the greatest extent. Unpredictable rainfall patterns and flash floods are two effects of climate change that pose significant problems for the agricultural sector, particularly in less developed nations (Asare-Nuamah, 2021; Bogale, 2012). People voiced their concern that inconsistent rainfall patterns, which occurred during crucial times of the crop cycle, negatively impacted plant growth and crop output. This consequence is because the sub-region continues to emphasise rain-fed agriculture significantly. People who were interviewed expressed their dissatisfaction with the poor agricultural year, particularly the decreased yield and poor quality of the produce brought on by an unfavourable distribution and poor rainfall.

4.6.2.1 FLOODS

Floods are one of the climate dangers that has had the most significant detrimental impact on agricultural pursuits worldwide, particularly in sub-Saharan Africa (Atanga & Tankpa, 2021). Six (6) participants expressed concern that flash floods in the area could damage their crops. They reported that flood occurrences often occur during the heaviest rainfall of the season when the majority of the crops are either not yet ready to be harvested or are on the verge of being ready, which has a devastating effect on smallholder farmers' food security, particularly concerning food availability and accessibility.

One participant lamented;

"Sometimes during the rainy season, the rains wash away all the okro and other produce... when rain destroys our crops, we do not have money to buy food." (Female, Farmer 29, 27/09/22)

Even though floods in the region only last for a short period, their impact on food production is typically catastrophic. Consequently, the impacted populations had a severe lack of food, which put them in a precarious position regarding their access to food. Once more, it has also been shown that floods have ruined the road network that assists in cultivating and delivering food and other agricultural produce. These were some of the issues brought to light by the investigation. The destruction of the road network may result in post-harvest losses and generate an increase in the cost of food due to distribution bottlenecks.

4.6.2.2 UNPREDICTABLE RAINFALL PATTERN

In most cases, the predominance of drought has been the primary source of worsened problems with the production, access, and distribution of food.

These are some of the responses received;

"The main cause is climate change. It has changed our rainfall patterns. We are not able to plant at the calculated times because it does not rain during the planting season". (Male, Farmer 4, 26/09/22).

"When the sun shines so much, our crops die, it becomes difficult. The rain is the main cause of food insecurity ...When the rain does not fall in the later parts of the year, it brings difficulties" (Female, Farmer 25, 27/09/22)

The participants disclosed that a late start and an early finish of the rainfall season could substantially affect seasonal crops, especially maize and vegetables like tomatoes, peppers, and garden eggs. In addition, unpredictable rainfall exacerbates the adverse effects it already has on crops by facilitating the spread of pests and diseases, resulting in decreased productivity levels. Weevils, stem borer insects, and worms were some of the pests that the participants mentioned.

For example, one participant reported:

"the main issue is the rainfall patterns. If it does not favour us, we lose our crops. Also, we sometimes buy pesticides to get rid of pests which cause financial difficulties." (Male, Farmer 1, 26/09/22).

This response suggests that farmers are not getting strong yields from their crops and livestock, which reduces the money they receive from such endeavours. Adopting crop varieties with higher yields and implementing irrigation technology that promotes water usage efficiency are two ways agricultural systems might adapt to the effects of a changing climate.

4.7 DETERMINANTS OF DIETARY DIVERSITY

Dietary diversity is a key element of high-quality diets, based on the principle that no single food can provide the right amount of nutrients necessary to maintain optimal health. Factors such as household food production, socioeconomic characteristics and information access and use were identified for the in-depth interviews conducted in the research area. These factors have the potential to influence dietary diversity in specific contexts.

4.7.1 FARM PRODUCTION DIVERSITY

Food production for direct home consumption is part of rural household economies. Seventeen (17) participants mentioned that the diversity of foods consumed is primarily related to the diversity of crops grown and animals reared. Food production in the study area was perceived to be influenced by the seasonality of food items, the nature of the land and the cost involved with planting.

Concerning the seasonality of food items, one farmer responded;

"What we eat is mainly from the farm, and it is all about the planting season and rainfall patterns to decide what to plant." (Male, Farmer 1, 26/09/22)

Rain is usually seen as a benefit to crops and fields. The amount of rainfall in any given growing season for most crops influences the decisions made for the subsequent season rainfall pattern determines the type of crops that grows on their farm.

Another farmer enunciated how the cost of production influences production;

"Everything I eat is from my farm...for the rearing of animals, I would say you decide based on the cost involved in taking care of the animals. For the plants, it depends on the season and the harvest time." (Male, Farmer 2, 26/09/22)

Raising animals comprises various expenses, including feed, shelter, labour, breeding, and purchasing animals. Muchenje & Mushunje (2013) suggested that households who own small livestock are more likely to move from medium dietary diversity to high dietary diversity. Small livestock are easy to keep and trade and contains several food groups (eggs, meat and goat milk) that may provide micro and macronutrients.

In describing the nature of the land, a participant commented;

"It depends on the land. For example, plantain does not grow on every land. It requires lands that have enough water" (Male, Farmer 26, 27/09/22)

The soil is an important determinant in deciding the type of crop that will thrive. Montgomery (2007) stated that, it is essential to factor in the crop type to maximize crop yield since not all soils are suitable for growing crops; this is mainly because all the different types of soil have different compositions of minerals, air and water. The balanced contributions of these elements' components provide physical support for plants.

4.7.2 SOCIOECONOMIC STATUS

Socioeconomic status is one of the most important factors determining a household's dietary diversity. A study by Ochieng *et al*. (2017) revealed a correlation between socioeconomic level and general dietary patterns and the quality and diversity of diets in both low- and middle-income countries. The key socio-economic determinants that determined the diversity of foods consumed by smallholder households, according to the findings of this study, were the household head's income, followed by the gender of the household head. These factors affect how household resources are obtained and how they are used.

4.7.2.1. INCOME

The participants mentioned income as one of the primary factors determining the food consumed at home. Income development has been identified as an important technique for increasing dietary variety. Acquiring household resources, such as food, is improved with more income, leading to greater dietary diversity.

One of the participants mentioned;

"Having enough money determines what I will use to feed my family." (Female, Farmer 19, 27/09/22)

Another participant shared;

"Prices have gone up everywhere, and the salaries received are nothing to write home about. The salary finishes before the month's end, which is very disturbing. My husband is the only one who works. My mum sometimes helps with the finances." (Female, Farmer 29, 27/09/22)

It was found that wealth or income was a critical factor in determining diet and the variety of diets consumed. It was thought to influence dietary variety directly (by affecting purchasing power) and indirectly (by affecting crop and livestock diversity) by influencing crop and livestock diversity. According to Sibhatu *et al*. (2015a), farm households' participation in non-agricultural economic activities that boosted cash earnings enabled them to purchase various foods from the market. This effect was more important than that which resulted from the diversity of farm produce.

4.7.2.2 GENDER OF HOUSEHOLD HEAD

When defining the extent of nutritional variety, gender plays a significant role. In most cases, the head of the home is the one who makes decisions on the household's food purchases and the members' tastes. According to the gender makeup of the people who participated in the study, women presided over agricultural households.

The following are some of the responses about decisions made regarding the cultivation and purchasing of food:

"I am the one who mainly decides what we eat and what is bought from the market. Sometimes we consult each other. My husband has greater input because he pays for the food." (Female, Farmer 28, 27/09/22)

"What we buy from the market is mainly dependent on the woman. But when it comes to what to grow… we all decide, but mine stands out." (Male, Farmer 2, 26/09/22)

A gender-related dynamic is at play in the decision-making process within the household.; this is consistent with a study by Gebre (2012), which stated that in rural areas in low- and middle-income countries (LMICs), gendered expectations extend to the agricultural sector and dictate who does what. While men are more likely to be in charge of cash crops, women are more likely to make decisions regarding food crops, typically items consumed daily in the home. While most married women in the area of the study mention receiving support from their husbands for food purchase and production activities, a few participants suggested that their husbands' preferences for cultivating other crops reduced their capacity to produce fruits and vegetables at home. While this is true, most married women mentioned receiving support from their husbands for food purchases and production activities.

4.7.3 INFORMATION ACCESS AND USE

Most participants (27) reported they gained the skills, information, and knowledge necessary for their practices and decisions about food production, acquisition, preparation, and consumption through their personal experiences, training, and the media. Smallholder farmers must have access to a variety of information that can assist them in determining the optimal time to purchase inputs or sell their harvests, so saving them time and money, planning for weather changes that can help them capitalize on rainfall and maximize crop yield, so that they can make the most of their harvests. These channels help them make the most of their harvests.

4.7.3.1 PERSONAL EXPERIENCE

Four (4) participants claimed that their prior experience in crop production was the primary factor that guided their judgments on crop production.

One of the participants mentioned;

"As someone who was raised on a farm and I grew up asking my mother do you know what to plant… she told me always to consider crops that have a short maturation time… as short as three (3) months while planting the ones with longer maturation time as well" (Female, Farmer 30, 27/09/22)

Another participant added;

"From practice and also from education. I was taught to plant cassava, tomatoes, corn and okro" (Female, Farmer 25, 27/09/22)

The amount of farming expertise one has is critical to producing food. Farmers said they rely on prior knowledge to determine what kinds of plants may be grown successfully in a short amount of time and in large quantities on their property. Reliance on experience is frequently blamed for the costs involved in the production and their inappropriateness to the farming environment.

4.7.3.2 TRAINING

Eighteen (18) of the participants disclosed that the role of agricultural extension officers is to offer communities information regarding the supply of inputs, innovative technology, and early warning systems (on drought, pests and diseases).

A participant stated;

"When you go to the agric extension officers, they would educate you. I usually go to them if I need information on what to plant for the season and how to reduce insects on my farm. Ideally, they should be coming around, but they do not." (Male, Farmer 2, 26/09/22)

At various stages of production, farmers require varying types of information, and the nature of these requirements shifts depending on both the passage of time and the circumstances. Agricultural extension agents travel around communities to educate farmers on various aspects of farming, including best practices, to assist farmers in making informed decisions about what crops to plant, increasing their revenue, and more effectively adopting new technologies. On the other hand, other farmers mentioned that the adoption of procedures was inconsistent, with a few returning to their previous methods. According to them, the absence of surveillance by agricultural extension staff was the cause.

Other participants (3) mentioned that non-governmental organizations (NGOs) provided them with education on agricultural practices and nutritional facts.

According to one participant who received information from an NGO:

"There is a charity organization that teaches me things about farming. So they usually advise me on what to plant and what to eat. The last time they educated me that good nutrition has all the vegetables we need to consume." (Female, Farmer 27, 27/09/22)

Farmers' agricultural output can be improved further with additional assistance from the spread of agricultural information through non-governmental organizations (NGOs). Farmers benefit from training because they learn new ideas that can increase their productivity and the variety of foods they eat. In order to raise agricultural production and productivity, farmers need to have access to well-structured, need-based and relevant information. Additionally, farmers need to receive the appropriate agricultural training and knowledge.

4.7.3.3 MEDIA

Other channels farmers used to access information in the study area were televisions (TV), radio or mobile phones. Five (5) Participants said they mostly listened to or watched news segments or programmes focused on agriculture and nutrition to learn new techniques.

Participants remarked that;

"We use social media, and sometimes we get info from the television. Mainly because the agric extension officers do not come here." (Male, Farmer 4, 26/09/22)

"Radio, sometimes I listen to the radio... other times too when I go to the Elmina market, the agric officers come there and explain to us that some insect can attack maize. They sometimes gather farmers and educate them." (Female, Farmer 16, 27/09/22)

Media enables smallholder farmers to access information regardless of their location. Through the TV and radio, farmers can access information in vernacular languages through indigenous communication mechanisms such as drama and storytelling. Social media also allows farmers to access various nutrition and agriculture information conveniently. Media can also be used to distribute knowledge among farming communities to supplement what was gained verbally through training.

4.8 HOUSEHOLD COPING STRATEGIES FOR FOOD SHORTAGE

Food security coping strategies is a response tool to survive shocks and adverse events concerning food. Households adopted different and diversified coping strategies to meet their

daily food requirements from their own or external sources. The dominant coping strategies used by participants in the study area are categorized under rationing, dietary changes and increasing short-term household availability of funds.

4.8.1 RATIONING

Twenty-two (22) participants stated that their coping strategy for food insecurity was rationing. Measures are taken to ration food included; limited portion size at meal times, reduction of meal frequency, and restricted consumption of adults so small children could eat.

Responses were as follows;

"When it gets to the 27th of the month, we start managing the food. We do not eat continuously… As for the children, you cannot reduce their portions, so we, the adults, reduce our portions." (Female, Farmer 27, 27/09/22)

"We store some of our dried corn. So when we need food, we go in for the stored grains. We reduce the portions, but we, the adults, have to eat twice instead of three times." (Female, Farmer 8, 26/09/22)

"Sometimes when there is not enough to eat... We manage what is available. Even before cooking, we decide the portion each person is going to eat to prevent wastage." (Male, Farmer 1, 26/09/22)

"I share it among the children, and if there is nothing left, I find out if a seller will be willing to give me bread on credit. Sometimes I share the food for my husband and children without them knowing I did not get some." (Female, Farmer 29, 27/09/22)

Most households ration food by reducing the quantity during the period of shortage. Findings are similar to coping strategies identified in a study conducted in Ethiopia by Awoke, Eniyew, & Meseret (2022b), which stated that most adults try as much as possible to provide for their children at their expense. Some participants added that most foods are rationed except for bread and flour, potatoes, carrots and other vegetables, and fish.

4.8.2 DIETARY CHANGES

A few interview responses indicated that households make dietary changes to satisfy their hunger. Changes in consumption patterns included; relying on less expensive food and consumption of less preferred food.

One participant stated

"We eat rice often when there is a shortage of money, and we do not eat rice... we eat more gari and banku and less fish or meat… because I do not like to beg and borrow. It is my wife who goes to borrow food." (Male, Farmer 13, 27/09/22)

Although less preferred food was identified among a few participants, it was identified in other studies as a common and acceptable way of reacting to food shortages. (Awoke, Eniyew, & Meseret, 2022b; Kabubo-Mariara & Kabara, 2018; Zakari *et al*., 2014). Dietary changes can be challenging to adjust, especially when changes are made abruptly. Changes are disliked mainly by children, who usually prefer tasty dishes, including meat or eggs. Most preferred

foods include fufu and rice, mainly consumed in the rainy season when farming households can harvest and sell to gain income. Gari made from dried cassava is less preferred; however, it can be stored for long periods because it is not perishable.

4.8.3 INCREASING SHORT-TERM HOUSEHOLD AVAILABILITY OF FUNDS

In addition to dietary changes and rationing, most participants indicated that increasing a household's short-term availability of funds was their main coping mechanism which encompassed; borrowing food from a friend or relative and purchasing food on credit.

Some participants stated;

"We take food on credit... We usually borrow fish from the fish sellers when in need." (Male, Farmer 1, 26/09/22)

"Some people give me food. I also take loans from people... I prefer taking loans with the money you can buy what you want to eat and then repay when you get some." (Female, Farmer 27, 27/09/22)

"Mostly, we credit from sellers who see us to be loyal customers and repay when we get the money; my loyalty is important to the sellers. it makes it easy for them to give me commodities I need to be paid later." (Male, Farmer 1, 26/09/22)

"We borrow a lot and credit some foodstuff and snacks for the children. When I borrow to feed them, and they are satisfied, I also have my peace of mind". (Female, Farmer 28, 27/09/22)

Studies showed that borrowing and purchasing is a coping strategy common in other rural areas in LMICs in Africa (Armah *et al*., 2019; Ogunniyi *et al*., 2021; Olayemi, 2012). Borrowing and buying food on credit were similar as both strategies leave the household obligated to pay back. Purchasing food on credit was more common. One explanation is that many people have some financial income through trading or jobs in addition to farming, so traders are more likely to allow credit. Another explanation might be that borrowing food was also associated with shame, as most households felt that asking for food from a neighbour, primarily if they are not related, is a matter of exposing one's level of poverty to other villagers.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter provides a summary of the research, the conclusions and recommendations drawn from the research.

5.2 SUMMARY

It has been shown that a lack of dietary diversity and food insecurity can harm the quality and amount of food consumed within a household. For households to cope effectively, it is necessary to identify the factors that lead to food insecurity and the determinants of dietary diversity and coping strategies. Although research has been conducted on food security and dietary diversity, most of this research is quantitative. In acquiring a comprehensive understanding, the information can be improved by conducting qualitative research that focuses on further investigating the experiences of farmers and the perspectives they hold on the factors that contribute to food insecurity. These factors influence dietary diversity, as well as the coping strategies that are utilized. The purpose of this study was to analyze such different viewpoints and experiences. To research community opinions on food security and dietary diversity among rural smallholder farming households in Elmina, a qualitative approach using a phenomenological study design was utilized. The study spotlighted the factors in food availability and access, causes of food insecurity, the determinants of dietary diversity and the coping strategies employed in the study area. A multistage sampling technique was used to sample participants that were interviewed. In all, 30 smallholder farm households were interviewed. The households were selected from 3 communities (Atonkwa, Kuful, and Abbina)

in Elmina Township, respectively. Data were analysed manually along four predetermined themes: household food availability and access causes of food insecurity, determinants of dietary diversity and coping strategies. Twelve (12) distinct sub-themes emerged from the interviews conducted. The findings from the study showed that the sources of food and market accessibility determined household food availability and access. These factors affected the households' food consumption patterns and perceptions of food adequacy. The study also indicated that the causes of food insecurity were based on socioeconomic factors and climate variability, affecting the availability and access to food. Again, it was found that the diversity of food consumed within the household was determined by farm production diversity, socio-economic factors, and information access and use. Lastly, as a result of household food insecurity conditions, most of these smallholder farming households in the study area resorted to rationing, dietary changes and increasing short-term income and food supply.

5.3 KEY FINDINGS

The key findings of the study were;

1. Food availability and access were mainly dependent on food sources and market accessibility. Farmers acquire food from their production or purchase foods unavailable on their farms for sustenance. Most farmers had challenges accessing the market due to proximity and the poor state of roads. These factors affected household food consumption and the perceptions of food adequacy.
2. Moreover, farmers shared their perceived causes of food insecurity. They perceived that food insecurity was predominantly caused by climatic variability, which caused flash floods and drought. Others also perceived the cause of food insecurity to be socioeconomic factors such as income displacement and lack of income.

3. The farm production diversity, socioeconomic factors and information use and access determined the dietary diversity of the participants. Under household food production, smallholder farmers considered the season, soil fertility, and production cost as the dietary diversity determinants. Socioeconomic factors such as; income and the gender of the household head were expressed in determining dietary diversity. Another determinant shared was information access and use, where information was sourced from personal experience, media, and training.
4. Finally, smallholder household heads explained how they cope with food security. Coping strategies employed included rationing and dietary changes. Aside from those mentioned above, increasing short-term income and food supply in the household through loans and borrowing food on credit were mentioned. These short-term measures helped the smallholder household manage the limited supply of food available.

5.4 CONTRIBUTION OF THIS STUDY TO THE KNOWLEDGE GAP

Over the past few years, much focus has been placed on food security. The current study adds to quantitative research on food insecurity, dietary diversity, and coping methods in Ghana's rural communities. In addition, it offers a literature review on the perceptions of food insecurity and the factors determining the variety of diets consumed in rural areas in Ghana. The findings offer evidence that stakeholders may use to address the socio-demographic determinants that can lead to food insecurity and determine the variety of diets people follow. The study provides empirical information that could serve as a primary point of reference for the government of Ghana, policymakers, and future researchers in their deliberations concerning food security, dietary diversity, and coping strategies in rural communities. The study also contains pertinent information for nutrition and food security surveillance.

5.5 CONCLUSION

In drawing from the outcome, the study concludes that challenges with food availability and accessibility among smallholder farmers affect the food security status and the dietary diversity of the household. Challenges with household food production and market accessibility mainly influence the food available within the household. Food availability, in turn, affects the household's food consumption pattern and the perceptions of food sufficiency. It can be further concluded that climate variations and socioeconomic issues contribute to food insecurity. Climatic variations affect the production capacity of farmers due to unpredictable rainfall patterns. Socioeconomic issues, such as a shortage of income and diversion of income toward education and healthcare, were identified as the cause of food insecurity. Farm production diversity, access to information, household income, and the gender of those who headed the households emerged as factors determining the household's dietary diversity. Evidence from the study also indicates that short-term coping strategies were employed to reduce the burden of food insecurity and manage the limited availability of food. Coping mechanisms include; making changes to their diets, practising rationing, and increasing the short-term available food supply.

5.6 RECOMMENDATIONS

Based on the findings of the study and the conclusions drawn, the food security situation and dietary diversity of smallholder farmers in the study area can be improved by considering the following recommendations:

1. The government can expand and improve social safety net programs to provide direct support to vulnerable households. This could include targeted cash transfers, food assistance, and subsidies for essential commodities, ensuring that those most in need receive adequate support during times of food insecurity.

2. To address the challenges faced by smallholder farmers, the government should invest in agricultural development initiatives. This may involve providing access to improved seeds, modern farming technologies, irrigation systems, and agricultural extension services. Supporting farmers with training and capacity-building programs can enhance productivity and resilience in the face of climate variability.

3. Coping mechanisms that smallholder households choose to implement only provide a sustainable means of subsistence for the near term and do not guarantee food security. The government by enhancing rural infrastructure, such as roads, transportation, and market facilities, can boost access to markets and reduce post-harvest losses. This would enable farmers to sell their produce at better prices and have improved access to diverse food sources, thereby enhancing food security.

4. Given the impact of climate variability on food production, the government should prioritize climate change adaptation measures. This includes investment in climate-resilient agriculture, early warning systems for extreme weather events, and disaster preparedness and response plans.

5. It was indicated in the study that short-term availability of funds is a coping strategy. adopted during periods of limited food availability. Encouraging the development of non-farm income-generating activities in rural areas can reduce dependency on agriculture alone and provide alternative sources of income for households.

6. The research was conducted in rural communities in Elmina, Central Region, Ghana; thus, the outcomes may not wholly reflect the perceptions of food security and dietary diversity of the region and country at large. A similar study could cover a wider geographical region with smallholder farmer households.

REFERENCES

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 201–210. https://doi.org/10.1016/J.JSSAS.2017.05.003

Abegaz, K. H. (2017). Determinants of food security: Evidence from Ethiopian Rural Household Survey (ERHS) using pooled cross-sectional study. *Agriculture and Food Security*, *6*(1), 1–7. https://doi.org/10.1186/S40066-017-0153-1/TABLES/3

Acheampong, P. P., Obeng, E. A., Opoku, M., Brobbey, L., & Sakyiamah, B. (2022). Does food security exist among farm households? Evidence from Ghana. *Agriculture and Food Security*, *11*(1), 1–13. https://doi.org/10.1186/S40066-022-00362-9/TABLES/3

Adom, P. (2015). Determinants of food availability and access in Ghana: what can we learn beyond the regression results? *Studies in Agricultural Economics*, *116*(3), 153–164. https://doi.org/10.7896/j.1423

Agidew, A. A., & Singh, K. N. (2018). Determinants of food insecurity in the rural farm households in South Wollo Zone of Ethiopia: the case of the Teleyayen sub-watershed. *Agricultural and Food Economics*, *6*(1), 1–23. https://doi.org/10.1186/S40100-018-0106-4/TABLES/6

Ahmad, K., & Ali, A. (2016). *Rising Population and Food Insecurity Linkages in Pakistan: Testing Malthusian Population Growth Theory*. https://mpra.ub.uni-muenchen.de/71131/

Ahmed, U. I., Ying, L., Bashir, M. K., Abid, M., & Zulfiqar, F. (2017). Status and determinants of small farming households' food security and role of market access in enhancing food security in rural Pakistan. *PLOS ONE*, *12*(10). https://doi.org/10.1371/JOURNAL.PONE.0185466

Ajani, S. R., Adebukola, B. C., & Oyindamola, Y. B. (2006). Measuring household food insecurity in selected local government areas of Lagos and Ibadan, Nigeria. *Pakistan Journal of Nutrition*, *5*(1), 62–67.

Alemseged, G. H., Bamlaku, A. A., & Zaid, N. Z. (2018). Determinants of rural household food insecurity in Northern Ethiopia : An empirical study. *Journal of Sustainable Development in Africa*, *20*(1), 35–36.

Alpízar, F., Saborío-Rodríguez, M., Martínez-Rodríguez, M. R., Viguera, B., Vignola, R., Capitán, T., & Harvey, C. A. (2020). Determinants of food insecurity among smallholder farmer households in Central America: Recurrent versus extreme weather-driven events. *Regional Environmental Change*, *20*(1), 1–16. https://doi.org/10.1007/S10113-020-01592-Y/TABLES/6

Amin, H., & Madrid, E. (2015). *Economics of Wheat in Egypt* [Technical University of Madrid]. https://doi.org/10.20868/UPM.thesis.39024

Arimond, M., & Ruel, M. T. (2004). Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys. *The Journal of Nutrition*, *134*(10), 2579–2585. https://doi.org/10.1093/JN/134.10.2579

Arimond, M., Wiesmann, D., Becquey, E., Carriquiry, A., Daniels, M. C., Deitchler, M., Fanou-Fogny, N., Joseph, M. L., Kennedy, G., Martin-Prevel, Y., & Torheim, L. E.

(2010). Simple food group diversity indicators predict micronutrient adequacy of women's diets in 5 diverse, resource-poor settings. *The Journal of Nutrition*, *140*(11). https://doi.org/10.3945/JN.110.123414

Armah, A. A., Nti, C. A., & Otoo, G. E. (2019). Climate change and food and nutrition security in the Bibiani-Anhwiaso Bekwai district in the Western Region of Ghana. *Cogent Environmental Science*, *5*(1). https://doi.org/10.1080/23311843.2019.1681613

Asare-Nuamah, P. (2021). Climate variability, subsistence agriculture and household food security in rural Ghana. *Heliyon*, *7*(4). https://doi.org/10.1016/J.HELIYON.2021.E06928

Asiamah, N., Mensah, H. K., & Oteng-Abayie, E. F. (2017). General, target, and accessible population: Demystifying the concepts for effective sampling. *The Qualitative Report*, *22*(6), 1607–1621. https://doi.org/10.46743/2160-3715/2017.2674

Atanga, R. A., & Tankpa, V. (2021). Climate change, flood disaster risk and food security nexus in Northern Ghana. *Frontiers in Sustainable Food Systems*, *5*, 273. https://doi.org/10.3389/FSUFS.2021.706721/BIBTEX

Awen-naam, M. (2019). *Local farming systems and food security in the Builsa area of Northern Ghana* [University of Ghana]. http://ugspace.ug.edu.gh/handle/123456789/35928

Awoke, W., Eniyew, K., Agitew, G., & Meseret, B. (2022a). Determinants of food security status of household in Central and North Gondar Zone, Ethiopia. *Cogent Social Sciences*, *8*(1). https://doi.org/10.1080/23311886.2022.2040138

Awoke, W., Eniyew, K., & Meseret, B. (2022b). Analysis of Causes and Coping Strategies of Food Insecurity: The Case of Central and North Gondar Zone, Ethiopia. *International Journal of Rural Management*, *18*(3), 429–448. https://doi.org/10.1177/09730052211035296

Ayenew, H. Y., Biadigilign, S., Schickramm, L., Abate-Kassa, G., & Sauer, J. (2018). Production diversification, dietary diversity and consumption seasonality: Panel data evidence from Nigeria. *BMC Public Health*, *18*(1). https://doi.org/10.1186/S12889-018-5887-6

Bandyopadhyay, A., Haile, B., Azzarri, C., & Somé, J. (2021). Analyzing the drivers of household dietary diversity: Evidence from Burkina Faso. *Food and Nutrition Bulletin*, *42*(4), 530–550. https://doi.org/10.1177/03795721211029092/ASSET/IMAGES/LARGE/10.1177_03795721211029092-FIG2.JPEG

Becher, E., Davis, J., Kumordzie, S., Wessells, K. R., Arnold, C., Tan, X., Adu-Afarwuah, S., Haskell, M., Adams, K., Vosti, S., & Engle-Stone, R. (2021). Dietary consumption patterns and their predictors among young children in Northern Ghana. *Current Developments in Nutrition*, *5*(2), 624–624. https://doi.org/10.1093/CDN/NZAB045_006

Beveridge, L., Whitfield, S., Fraval, S., van Wijk, M., van Etten, J., Mercado, L., Hammond, J., Davila Cortez, L., Gabriel Suchini, J., & Challinor, A. (2019). Experiences and drivers of food insecurity in Guatemala's dry corridor: Insights from the integration of ethnographic and household survey data. *Frontiers in Sustainable Food Systems*, *3*(August), 1–14. https://doi.org/10.3389/fsufs.2019.00065

Bogale, A. (2012). Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, *4*(4), 581–591. https://doi.org/10.1007/S12571-012-0208-

X/METRICS

Burchi, F., & De Muro, P. (2016). From food availability to nutritional capabilities: Advancing food security analysis. *Food Policy*, *60*, 10–19. https://doi.org/10.1016/J.FOODPOL.2015.03.008

Chandrasekara, A., & Josheph Kumar, T. (2016). Roots and tuber crops as functional foods: A review on phytochemical constituents and their potential health benefits. *International Journal of Food Science*, 1–15. https://doi.org/10.1155/2016/3631647

Charlton, K. E. (2016). Food security, food systems and food sovereignty in the 21st century: A new paradigm required to meet Sustainable Development Goals. *Nutrition and Dietetics*, *73*(1), 3–12. https://doi.org/10.1111/1747-0080.12264

Chegere, J., Kauky, M., & Sebastian, M. (2022). Agriculture commercialisation, household dietary diversity and nutrition in Tanzania. *Food Policy*. https://doi.org/10.1016/j.foodpol.2022.102341

Chileshe, R. A. (2005). *Land tenure and rural livelihoods in Zambia: case studies of Kamena and St. Joseph* [University of the Western Cape]. http://etd.uwc.ac.za/xmlui/handle/11394/235

Choudhury, S., Headey, D. D., & Masters, W. A. (2019). First foods: Diet quality among infants aged 6–23 months in 42 countries. *Food Policy*, *88*. https://doi.org/10.1016/J.FOODPOL.2019.101762

Coates, J., Frongillo, E. A., Rogers, B. L., Webb, P., Wilde, P. E., & Houser, R. (2006). Commonalities in the experience of household food insecurity across cultures: What are measures missing? *The Journal of Nutrition*, *136*(5), 1438S-1448S. https://doi.org/10.1093/JN/136.5.1438S

Codjoe, S. N. A., Okutu, D., & Abu, M. (2016). Urban household characteristics and dietary diversity: An analysis of food security in Accra, Ghana. *Food and Nutrition Bulletin*, *37*(2), 202–218. https://doi.org/10.1177/0379572116631882

Colecraft, E., Marquis, G. S., Aryeetey, R., Sakyi-Dawson, O., Lartey, A., Ahunu, B., & Canacoo, E. (2006). Constraints on the use of animal source foods for young children in Ghana: A participatory rapid appraisal approach. *Ecology of Food and Nutrition*, *45*(5), 351–377. https://doi.org/10.1080/03670240600985464

Cooke, E., Hague, S., & McKay, A. (2016). *The Ghana poverty and inequality report: Using the 6th Ghana living standards survey*.

Creswell, J. W. (2009). *Research Design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). SAGE Publications. https://books.google.com.gh/books?id=bttwENORfhgC

Darfour, B., & Rosentrater, K. A. (2016, July 17). Agriculture and food security in Ghana. *2016 ASABE International Meeting*. https://doi.org/10.13031/aim.20162460507

Demi, S. M., & Kuwornu, J. K. M. (2013). Assessing the degree of food insecurity among farming households: Evidence from the Central Region of Ghana. *Research on Humanities and Social Sciences*, *3*(3), 51–62.

Deschênes, S., Dumas, C., & Lambert, S. (2020). Household resources and individual strategies. *World Development*, *135*. https://doi.org/10.1016/j.worlddev.2020.105075

Doss, C. R., & Meinzen-Dick, R. (2015). Collective action within the household: Insights from natural resource management. *World Development*, *74*, 171–183. https://doi.org/10.1016/J.WORLDDEV.2015.05.001

Drammeh, W., Hamid, N. A., & Rohana, A. J. (2019). Determinants of household food insecurity and its association with child malnutrition in Sub-Saharan Africa: A review of the literature. *Current Research in Nutrition and Food Science*, *7*(3), 610–623. https://doi.org/10.12944/CRNFSJ.7.3.02

Durand-Lasserve, A., & Payne, G. (2012). *Holding on: security of tenure-types, policies, practices and challenges*.

El Bilali, H., Callenius, C., Strassner, C., & Probst, L. (2019). Food and nutrition security and sustainability transitions in food systems. *Food and Energy Security*, *8*(2). https://doi.org/10.1002/FES3.154

Entsiwah, M. M. (2018). *Perception of climate change and adaptation strategies undertaken by smallholder farmers in rural Ghana.* University of Ghana.

Evans, A. (2009). *The feeding of the nine billion global food security for the 21st century a Chatham house report*.

FAO. (2000). *The state of food insecurity in the World 2000* (Vol. 48, Issue 5). https://doi.org/92-5-104328-0

FAO. (2005). *Trade reforms and food security: Conceptualizing the linkages*.

FAO. (2006). *The state of food insecurity in the world 2006*.

FAO. (2014). *FAO statistical yearbook 2014 on Africa food and agriculture* (Vol. 136, Issue 1).

FAO. (2017). *The future of food and agriculture – Trends and challenges*.

FAO (Food and Agriculture Organization). (2008). *Deriving food security information from national household budget surveys*.

FAO, IFAD, UNICEF, WFP, & WHO. (2021). The state of food security and nutrition in the world 2021. In *The State of Food Security and Nutrition in the World 2021*. FAO, IFAD, UNICEF, WFP and WHO. https://doi.org/10.4060/cb4474en

FAO, IFAD, UNICEF, WFP, & WHO. (2022). In brief to the state of food security and nutrition in the world 2022. In *In Brief to The State of Food Security and Nutrition in the World 2022*. FAO; IFAD; UNICEF; WFP; WHO; https://doi.org/10.4060/cc0640en

Feleke, S. T., Kilmer, R. L., & Gladwin, C. H. (2005). Determinants of food security in Southern Ethiopia at the household level. *Agricultural Economics*, *33*(3), 351–363. https://doi.org/10.1111/J.1574-0864.2005.00074.X

Ferreira, T. (2015). Does education enhance productivity in smallholder agriculture? causal evidence from Malawi. In *University of Stellenbosch Working Papers*.

Fikire, A. H., & Zegeye, M. B. (2022). Determinants of rural household food security status in in North Shewa Zone, Amhara Region, Ethiopia. *The Scientific World Journal*, *2022*, 1–8. https://doi.org/10.1155/2022/9561063

Florkowski, W. J., Klepacka, A. M., Nambiar, P. M., Meng, T., Fu, S., Sheremenko, G., &

Sarpong, D. B. (2014). Consumer expenditures on fresh fruit and vegetables. In *Postharvest Handling* (pp. 147–166). Elsevier. https://doi.org/10.1016/B978-0-12-408137-6.00007-7

Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douxchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., van Asten, P. J. A., & van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences*, *113*(2), 458–463. https://doi.org/10.1073/pnas.1518384112

Galbete, C., Nicolaou, M., Meeks, K. A., Aikins, A. D.-G., Addo, J., Amoah, S. K., Smeeth, L., Owusu-Dabo, E., Klipstein-Grobusch, K., Bahendeka, S., Agyemang, C., Mockenhaupt, F. P., Beune, E. J., Stronks, K., Schulze, M. B., & Danquah, I. (2017). Food consumption, nutrient intake, and dietary patterns in Ghanaian migrants in Europe and their compatriots in Ghana. *Food & Nutrition Research*, *61*(1). https://doi.org/10.1080/16546628.2017.1341809

Gallop, K. R. (2022). Raj Patel: Stuffed and starved: The hidden battle for the world food system. *Agriculture and Human Values*, *39*(2), 841–842. https://doi.org/10.1007/S10460-022-10309-2

Gebissa, B., & Geremew, W. (2022). Determinants of food insecurity and the choice of livelihood strategies: The case of Abay Chomen District, Oromia Regional State, Ethiopia. *The Scientific World Journal*, *2022*, 1–15. https://doi.org/10.1155/2022/1316409

Gebre, G. G. (2012). Determinants of food insecurity among households in Addis Ababa City, Ethiopia. *Interdisciplinary Description of Complex Systems - Scientific Journal*, *10*(2), 159–173. https://ideas.repec.org/a/zna/indecs/v10y2012i2p159-173.html

Govender, L., Pillay, K., Siwela, M., Modi, A., & Mabhaudhi, T. (2017). Food and nutrition insecurity in selected rural communities of KwaZulu-Natal, South Africa—linking human nutrition and agriculture. *International Journal of Environmental Research and Public Health*, *14*(1). https://doi.org/10.3390/IJERPH14010017

Green, H. E. (2014). Use of theoretical and conceptual frameworks in qualitative research. *Nurse Researcher*, *21*(6), 34–38. https://doi.org/10.7748/NR.21.6.34.E1252

GSS. (2013). *National analytical report: 2010 population and housing census*. https://www.researchgate.net/publication/274696661_National_Analytical_Report_2010_Population_and_Housing_Census

GSS, & GHS. (2020). *Food Security Vunerablility Assesment Survey*.

GSS, GHS, & ICF International. (2014). Ghana demographic health survey 2014. In *Ghana Statistical Service*.

Gundersen, C., & Ziliak, J. P. (2015). Food insecurity and health outcomes. *Health Affairs*, *34*(11), 1830–1839. https://doi.org/10.1377/HLTHAFF.2015.0645/ASSET/IMAGES/LARGE/2015.0645FIGEX1.JPEG

Guo, G., Wen, Q., & Zhu, J. (2015). The impact of aging agricultural labor population on farmland output: From the perspective of farmer preferences. *Mathematical Problems in*

Engineering, *2015*. https://doi.org/10.1155/2015/730618

Habtemariam, L. T., Gornott, C., Hoffmann, H., & Sieber, S. (2021). Farm production diversity and household dietary diversity: Panel data evidence from rural households in Tanzania. *Frontiers in Sustainable Food Systems*, *5*, 612341. https://doi.org/10.3389/fsufs.2021.612341

Hagos, S., Lunde, T., Mariam, D. H., Woldehanna, T., & Lindtjørn, B. (2014). Climate change, crop production and child under nutrition in Ethiopia; A longitudinal panel study. *BMC Public Health*, *14*(1), 1–9. https://doi.org/10.1186/1471-2458-14-884

Hall, J. N., Moore, S., Harper, S. B., & Lynch, J. W. (2009). Global variability in fruit and vegetable consumption. *American Journal of Preventive Medicine*, *36*(5), 402–409. https://doi.org/10.1016/J.AMEPRE.2009.01.029

Harris-Fry, H., Azad, K., Kuddus, A., Shaha, S., Nahar, B., Hossen, M., Younes, L., Costello, A., & Fottrell, E. (2015). Socio-economic determinants of household food security and women's dietary diversity in rural Bangladesh: a cross-sectional study. *Journal of Health, Population and Nutrition*, *33*(1), 1–12. https://doi.org/10.1186/S41043-015-0022-0

Hashmiu, I., Agbenyega, O., & Dawoe, E. (2022). Cash crops and food security: evidence from smallholder cocoa and cashew farmers in Ghana. *Agriculture and Food Security*, *11*(1), 1–21. https://doi.org/10.1186/s40066-022-00355-8

Hendriks, S. (2009). *Investigating household food insecurity coping strategies and the impact of crop production on food security usingCoping Strategy Index (Csi)*. https://www.academia.edu/76861438/Investigating_Household_Food_Insecurity_Coping_Strategies_and_the_Impact_of_Crop_Production_on_Food_Security_Using_Coping_Strategy_Index_Csi_

Herforth, A., & Ahmed, S. (2015). The food environment, its effects on dietary consumption, and potential for measurement within agriculture-nutrition interventions. *Food Security*, *7*(3), 505–520. https://doi.org/10.1007/S12571-015-0455-8/TABLES/1

Herrera, J. P., Rabezara, J. Y., Ravelomanantsoa, N. A. F., Metz, M., France, C., Owens, A., Pender, M., Nunn, C. L., & Kramer, R. A. (2021). Food insecurity related to agricultural practices and household characteristics in rural communities of northeast Madagascar. *Food Security*, *13*(6), 1393–1405. https://doi.org/10.1007/S12571-021-01179-3/FIGURES/5

Hirvonen, K., Hoddinott, J., Minten, B., & Stifel, D. (2017). Children's diets, nutrition knowledge, and access to markets. *World Development*, *95*, 303–315. https://doi.org/10.1016/j.worlddev.2017.02.031

Hoddinott, J., & Yohannes, Y. (2000). *Dietary diversity as a household food security indicator*.

Huluka, A. T., & Wondimagegnhu, B. A. (2019). Determinants of household dietary diversity in the Yayo biosphere reserve of Ethiopia: An empirical analysis using sustainable livelihood framework. *Cogent Food & Agriculture*, *5*(1), 1690829. https://doi.org/10.1080/23311932.2019.1690829

IRCS. (2006). *How to conduct a food security: A step-by-step guide for National Socities* (2nd ed).

Jalata, D. D., & Asefa, B. G. (2022). Trends and determinants of dietary diversity in children aged 6–59 months in Ethiopia: Analysis of 2005–2016 demographic and health survey.

Current Developments in Nutrition, *6*(10). https://doi.org/10.1093/cdn/nzac135

Jayne, T. S., Chamberlin, J., Traub, L., Sitko, N., Muyanga, M., Yeboah, F. K., Anseeuw, W., Chapoto, A., Wineman, A., Nkonde, C., & Kachule, R. (2016). Africa's changing farm size distribution patterns: the rise of medium-scale farms. *Agricultural Economics*, *47*(1), 197–214. https://doi.org/10.1111/agec.12308

Jones, A. D., Ngure, F. M., Pelto, G., & Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition*, *4*(5), 481. https://doi.org/10.3945/AN.113.004119

Kabubo-Mariara, J., & Kabara, M. (2018). Agricultural adaptation to climate change in Africa. In C. S. Berck, P. Berck, & S. Di Falco (Eds.), *Food Security in a Changing Environment* (Issue October). Routledge. https://doi.org/10.4324/9781315149776

Kairiza, T., Kembo, G., Magadzire, V., & Chigusiwa, L. (2021). Gender gap in the impact of social capital on household food security in Zimbabwe: does spatial proximity matter? *Review of Economics of the Household*, 1–23. https://doi.org/10.1007/S11150-021-09592-5/TABLES/7

Khandoker, S., Singh, A., & Srivastava, S. K. (2022). Leveraging farm production diversity for dietary diversity: Evidence from national level panel data. *Agricultural and Food Economics*, *10*(1). https://doi.org/10.1186/S40100-022-00221-Y

Kirilenko, A. P., & Sedjo, R. A. (2007). Climate change impacts on forestry. *Proceedings of the National Academy of Sciences*, *104*(50). https://doi.org/10.1073/pnas.0701424104

Kuwornu, J. K. M., Suleyman, D. M., & Amegashie, D. P. K. (2015). Analysis of food security status of farming households in the forest belt of the Central Region of Ghana. *Russian Journal of Agricultural and Socio-Economic Sciences*, *13*(1), 26–42. https://doi.org/10.18551/rjoas.2013-01.04

Larson, J. B., Castellanos, P., & Jensen, L. (2019). Gender, household food security, and dietary diversity in western Honduras. *Global Food Security*, *20*, 170–179. https://doi.org/10.1016/J.GFS.2019.01.005

Lioba, W. (2004). Food and nutrition security assessment instruments and intervention and strategies. *Food and Nutrition Security: Problems and Perspectives*, *I*, 1–28.

Liu, X., Xu, Y., Engel, B. A., Sun, S., Zhao, X., Wu, P., & Wang, Y. (2021). The impact of urbanization and aging on food security in developing countries: The view from Northwest China. *Journal of Cleaner Production*, *292*. https://doi.org/10.1016/j.jclepro.2021.126067

Lopez, K. A., & Willis, D. G. (2004). Descriptive versus interpretive phenomenology: Their contributions to nursing knowledge. *Qualitative Health Research*, *14*(5), 726–735. https://doi.org/10.1177/1049732304263638

Lukwa, A. T., Siya, A., Zablon, K. N., Azam, J. M., & Alaba, O. A. (2020). Socioeconomic inequalities in food insecurity and malnutrition among under-five children: Within and between-group inequalities in Zimbabwe. *BMC Public Health*, *20*(1), 1–11. https://doi.org/10.1186/S12889-020-09295-Z/TABLES/8

Makate, C., Wang, R., Makate, M., & Mango, N. (2016). Crop diversification and livelihoods of smallholder farmers in Zimbabwe: Adaptive management for environmental change. *SpringerPlus*, *5*(1). https://doi.org/10.1186/S40064-016-2802-4

Manda, J., Alene, A. D., Tufa, A. H., Feleke, S., Abdoulaye, T., Omoigui, L. O., & Manyong, V. (2020). Market participation, household food security, and income: The case of cowpea producers in northern Nigeria. *Food and Energy Security*, *9*(3), 2–11. https://doi.org/10.1002/FES3.211

Mango, N., Zamasiya, B., Makate, C., Nyikahadzoi, K., & Siziba, S. (2014). Factors influencing household food security among smallholder farmers in the Mudzi district of Zimbabwe. *Development Southern Africa*, *31*(4), 625–640. https://doi.org/10.1080/0376835X.2014.911694

Maxwell, D. (1996). Measuring food insecurity: the frequency and severity of "coping strategies." *Food Policy*, *21*(3), 291–303. https://doi.org/10.1016/0306-9192(96)00005-X

Maxwell, D., Levin, C., Armar-Klemesu, M., Ruel, M., Morris, S., & Ahiadeke, C. (2000). *Urban livelihoods and food and nutrition security in Greater Accra, Ghana*. IFPRI, Washington, DC, US. https://idl-bnc-idrc.dspacedirect.org/handle/10625/7082

McKay, F. H., Haines, B. C., & Dunn, M. (2019). Measuring and understanding food insecurity in Australia: A systematic review. *International Journal of Environmental Research and Public Health*, *16*(3), 476. https://doi.org/10.3390/IJERPH16030476

Mekuria, G., Wubneh, Y., & Tewabe, T. (2017). Household dietary diversity and associated factors among residents of finote selam town, north west Ethiopia: A cross sectional study. *BMC Nutrition*, *3*(1), 1–6. https://doi.org/10.1186/S40795-017-0148-0/TABLES/5

Mgbada, J., Adesope, O., & Enyinda, V. (2014). Contributions of compound farming practices to household food security in Niger Delta, Nigeria. *International Conference on Sustainable Environment and Agriculture*, *76*(16). https://doi.org/10.7763/IPCBEE

Milner, D., Wolf, L., Wijk, M. Van, & Hammond, J. (2022). Market access and dietary diversity: A spatially explicit multi-level analysis in Southern and Western Kenya. *Frontiers in Sustainable Food Systems*, *6*, 308. https://doi.org/10.3389/FSUFS.2022.740485/BIBTEX

MoFA. (2007). *Food and Agriculture Sector Development Policy (FASDEP II)* (Issue 2).

MoFA. (2019). *2019 Agricultural Sector Annual Progress Report*.

Mohammed, A., Wassie, S. B., & Teferi, E. T. (2021). Determinants of smallholders' food security status in Kalu District, Northern Ethiopia. *Challenges*, *12*(2), 17. https://doi.org/10.3390/challe12020017

Montgomery, D. R. (2007). Soil erosion and agricultural sustainability. *Proceedings of the National Academy of Sciences*, *104*(33), 13268–13272. https://doi.org/10.1073/pnas.0611508104

Muchenje, A., & Mushunje, V. (2013). Determinants of rural household dietary diversity: The case of Amatole and Nyandeni districts, South Africa. *International Journal of Development and Sustainability*, *2*(4), 2233–2247. www.isdsnet.com/ijds

Mukhamedova, N., & Pomfret, R. (2019). Why Does Sharecropping Survive? Agrarian Institutions and Contract Choice in Kazakhstan and Uzbekistan. *Comparative Economic Studies*, *61*(4), 576–597. https://doi.org/10.1057/S41294-019-00105-Z/TABLES/3

Muraoka, R., Jin, S., & Jayne, T. S. (2018). Land access, land rental and food security: Evidence from Kenya. *Land Use Policy*, *70*, 611–622.

https://doi.org/10.1016/J.LANDUSEPOL.2017.10.045

Murendo, C., Nhau, B., Mazvimavi, K., Khanye, T., & Gwara, S. (2018). Nutrition education, farm production diversity, and commercialization on household and individual dietary diversity in Zimbabwe. *Food & Nutrition Research*, *62*. https://doi.org/10.29219/FNR.V62.1276

Nabuuma, D., Ekesa, B., Faber, M., & Mbhenyane, X. (2021a). Community perspectives on food security and dietary diversity among rural smallholder farmers: A qualitative study in central Uganda. *Journal of Agriculture and Food Research*, *5*. https://doi.org/10.1016/j.jafr.2021.100183

Nabuuma, D., Ekesa, B., Faber, M., & Mbhenyane, X. (2021b). Food security and food sources linked to dietary diversity in rural smallholder farming households in central Uganda. *AIMS Agriculture and Food*, *6*(2), 644–662. https://doi.org/10.3934/agrfood.2021038

Namaa, B. H. T. (2017). Determinants of food security status of smallholder farming households in the Wa West and Sissala West Disricts of the Upper West Region of Ghana. *Agricultural Journal*, *53*(45), 1993–1999.

Nandi, R., Nedumaran, S., & Ravula, P. (2021). The interplay between food market access and farm household dietary diversity in low and middle income countries: A systematic review of literature. *Global Food Security*, *28*. https://doi.org/10.1016/J.GFS.2020.100484

Neubauer, B. E., Witkop, C. T., & Varpio, L. (2019). How phenomenology can help us learn from the experiences of others. *Perspectives on Medical Education*, *8*(2), 90–97. https://doi.org/10.1007/S40037-019-0509-2/TABLES/2

Nkegbe, P. K., Abu, B. M., & Issahaku, H. (2017). Food security in the Savannah Accelerated Development Authority Zone of Ghana : an ordered probit with household hunger scale approach. *Agriculture & Food Security*, 1–11. https://doi.org/10.1186/s40066-017-0111-y

Ntwenya, J. E., Kinabo, J., Msuya, J., Mamiro, P., & Majili, Z. S. (2015). Dietary patterns and household food insecurity in rural populations of Kilosa District, Tanzania. *PLOS ONE*, *10*(5). https://doi.org/10.1371/journal.pone.0126038

Ochieng, J., Afari-Sefa, V., Lukumay, P. J., & Dubois, T. (2017). Determinants of dietary diversity and the potential role of men in improving household nutrition in Tanzania. *PLOS ONE*, *12*(12). https://doi.org/10.1371/JOURNAL.PONE.0189022

Ogunniyi, A. I., Omotoso, S. O., Salman, K. K., Omotayo, A. O., Olagunju, K. O., & Aremu, A. O. (2021). Socio-economic drivers of food security among rural households in Nigeria: Evidence from smallholder maize farmers. *Social Indicators Research*, *155*(2), 583–599. https://doi.org/10.1007/S11205-020-02590-7/TABLES/4

Olayemi, A. O. (2012). Effects of family size on household food security in Osun State, Nigeria. *Asian Journal of Agriculture and Rural Development*, *2*(2), 136–141. https://doi.org/10.22004/AG.ECON.197951

Onumah, E. E., Quaye, E. A., Ahwireng, A. K., & Campion, B. B. (2020). Fish consumption behaviour and perception of food security of low-income households in urban areas of Ghana. *Sustainability*, *12*(19). https://doi.org/10.3390/SU12197932

Panghal, A., Mor, R. S., Kamble, S. S., Khan, S. A. R., Kumar, D., & Soni, G. (2022). Global food security post COVID-19: Dearth or dwell in the developing world? *Agronomy*

Journal, *114*(1), 878. https://doi.org/10.1002/AGJ2.20932

Patton, M. Q. (2002). Two decades of developments in qualitative inquiry. *Qualitative Social Work*, *1*(3), 261–283. https://doi.org/10.1177/1473325002001003636

Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security*, *1*(1), 5–7. https://doi.org/10.1007/S12571-008-0002-Y

Poczta-Wajda, A., Sapa, A., Stępień, S., & Borychowski, M. (2020). Food insecurity among small-scale farmers in Poland. *Agriculture*, *10*(7), 295. https://doi.org/10.3390/agriculture10070295

Poole, N., Amiri, H., Amiri, S. M., Farhank, I., & Zanello, G. (2019). Food production and consumption in Bamyan Province, Afghanistan: the challenges of sustainability and seasonality for dietary diversity. *Https://Doi.Org/10.1080/14735903.2019.1680229*, *17*(6), 413–430. https://doi.org/10.1080/14735903.2019.1680229

Powell, B., Bezner Kerr, R., Young, S. L., & Johns, T. (2017). The determinants of dietary diversity and nutrition: Ethnonutrition knowledge of local people in the East Usambara Mountains, Tanzania. *Journal of Ethnobiology and Ethnomedicine*, *13*(1), 1–12. https://doi.org/10.1186/S13002-017-0150-2/TABLES/1

Quisumbing, A. R. (2013). Generating evidence on individuals' experience of food insecurity and vulnerability. *Global Food Security*, *2*(1), 50–55. https://doi.org/10.1016/J.GFS.2012.11.004

Rademacher-Schulz, C., Schraven, B., & Mahama, E. S. (2014). Time matters: shifting seasonal migration in Northern Ghana in response to rainfall variability and food insecurity. *Climate and Development*, *6*(1), 46–52. https://doi.org/10.1080/17565529.2013.830955

Rapsomanikis, G. (2015). *The economic lives of smallholder farmers: An analysis based on household data from nine countries*. www.fao.org/publications

Ruel, M. T. (2003). Operationalizing dietary diversity: A review of measurement issues and research priorities. *The Journal of Nutrition*, *133*(11). https://doi.org/10.1093/jn/133.11.3911S

Saaka, M. (2016). How is household food insecurity and maternal nutritional status associated in a resource-poor setting in Ghana? *Agriculture and Food Security*, *5*(1), 1–8. https://doi.org/10.1186/S40066-016-0059-3/TABLES/6

Sandelowski, M. (1995). Sample size in qualitative research. *Research in Nursing & Health*, *18*(2), 179–183. https://doi.org/10.1002/NUR.4770180211

Sarkar, A., Hongyu, W., Jony, A. A., Das, J. C., Memon, W. H., & Qian, L. (2021). Evaluation of the determinants of food security within the COVID-19 pandemic circumstances- a particular case of Shaanxi, China. *Global Health Research and Policy*, *6*(1), 1–11. https://doi.org/10.1186/S41256-021-00230-2/FIGURES/2

Sharma, R. (2013). The family and family structure classification redefined for the current times. *Journal of Family Medicine and Primary Care*, *2*(4), 306. https://doi.org/10.4103/2249-4863.123774

Siauw, C. (2008). Food Security And Climate Change. *Nutridate*, *19*(3), 6–8.

Sibhatu, K. T., Krishna, V. V., & Qaim, M. (2015). Production diversity and dietary diversity in smallholder farm households. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(34). https://doi.org/10.1073/PNAS.1510982112/SUPPL_FILE/PNAS.201510982SI.PDF

Sibhatu, K. T., & Qaim, M. (2017). Rural food security, subsistence agriculture, and seasonality. *PLOS ONE*, *12*(10). https://doi.org/10.1371/journal.pone.0186406

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q. F., Mario, H., Anthony, N., Nicolas, N., Joash, M., Lieven, C., & Rufino, M. C. (2015). Households and food security: Lessons from food secure households in East Africa. *Agriculture and Food Security*, *4*(1), 1–15. https://doi.org/10.1186/S40066-015-0042-4/TABLES/4

Sisha, T. A. (2020). Household level food insecurity assessment: Evidence from panel data, Ethiopia. *Scientific African*, *7*. https://doi.org/10.1016/j.sciaf.2019.e00262

Small, F. A. A., & Raizada, M. N. (2017). Mitigating dry season food insecurity in the subtropics by prospecting drought-tolerant, nitrogen-fixing weeds. *Agriculture and Food Security*, *6*(1), 1–14. https://doi.org/10.1186/S40066-017-0096-6/TABLES/3

Songsore, J. (2011). *Regional development in Ghana: The theory and the reality*. Woeli Pub. Services.

Steiner-Asiedu, M., Saa, D., Newton, S. K., & Akotia, C. (2017). *Addressing Sustainable Development Goal 2: Ghana Zero Hunger Strategic Review*.

Swaminathan, M. S., & Bhavani, R. V. (2013). Food production & availability - Essential prerequisites for sustainable food security. *Indian Journal of Medical Research*, *138*(SEP), 383–391.

Takane, T. (2008). Customary land tenure, inheritance rules, and smallholder farmers in Malawi. *Journal of Southern African Studies*, *34*(2), 269–291. http://www.jstor.org/stable/40283138

Tang, J., & MacLeod, C. (2006). Labour force ageing and productivity performance in Canada. *Canadian Journal of Economics*, *39*(2), 582–603. https://doi.org/10.1111/J.0008-4085.2006.00361.X

Tomiyama, J. M., Takagi, D., & Kantar, M. B. (2020). The effect of acute and chronic food shortage on human population equilibrium in a subsistence setting. *Agriculture and Food Security*, *9*(1), 1–12. https://doi.org/10.1186/S40066-020-00261-X/TABLES/3

Tour, J. (2016). *Food Insecurity And Coping Strategies In Nadowli District, Upper West Region, Ghana* [University of Ghana]. http://ugspace.ug.edu.gh:8080/handle/123456789/22684

Usman, Muhammed A, & Haile, M. G. (2022). Market access, household dietary diversity and food security: Evidence from Eastern Africa. *Food Policy*. https://doi.org/10.1016/j.foodpol.2022.102374

Usman, Muhammed Abdella, & Callo-Concha, D. (2021). Does market access improve dietary diversity and food security? Evidence from Southwestern Ethiopian smallholder coffee producers. *Agricultural and Food Economics*, *9*(1), 1–21. https://doi.org/10.1186/S40100-021-00190-8/FIGURES/9

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis:

Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences*, *15*(3), 398–405. https://doi.org/10.1111/NHS.12048

Vandyck, N. A. (2019). *Factors affecting food security and nutritional status of children under five in rural communities in Elmina, Central Region*. [Unpublished bachelor's dissertation]. University of Ghana.

Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: Systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, *18*(1), 1–18. https://doi.org/10.1186/S12874-018-0594-7/TABLES/3

Vellema, W., Desiere, S., & D'Haese, M. (2016). Verifying validity of the household dietary diversity score. *Food and Nutrition Bulletin*, *37*(1), 27–41. https://doi.org/10.1177/0379572115620966

Verger, E. O., Le Port, A., Borderon, A., Bourbon, G., Moursi, M., Savy, M., Mariotti, F., & Martin-Prevel, Y. (2021). Dietary Diversity Indicators and Their Associations with Dietary Adequacy and Health Outcomes: A Systematic Scoping Review. *Advances in Nutrition*, *12*(5), 1659. https://doi.org/10.1093/ADVANCES/NMAB009

Weil, D. N., & Wilde, J. (2010). How Relevant Is Malthus for Economic Development Today? *The American Economic Review*, *100*(2), 378. https://doi.org/10.1257/aer.99.2.255

WFP. (2009). Comprehensive Food Security & Vulnerability Analysis Guidelines. In *World Food Programme (WFP), Food Security Analysis Service. Italy: Rome* (Vol. 108, Issue 716). United Nations World Food Programme.

WFP. (2012). *Comprehensive food security & vulnerability analysis Ghana 2012: Focus on Northern Ghana* (Issue May).

WFP. (2020). *WFP early warning analysis of acute food insecurity hotspots*. https://www.wfp.org/

WFP. (2022a). *Cameroon | World Food Programme*. https://www.wfp.org/countries/cameroon

WFP. (2022b). *Ethiopia | World Food Programme*. https://www.wfp.org/countries/ethiopia

Validation of the World Food Programme's food consumption score and alternative indicators of household food security, (2009). www.ifpri.org/pubs/otherpubs.htm#dp.

Wijk, M. T. van, Hammond, J., Frelat, R., Fraval, S., Teufel, N., Tavenner, K., & Henderson, B. B. (2018). *Smallholder farmers, food security, and livelihoods: Exploring trade offs and synergies using farm household characterization data*. CGIAR Independent Science and Partnership Council. https://cgspace.cgiar.org/handle/10568/98577

Wondimagegnhu, B. A., Huluka, A. T., & Nischalke, S. M. (2019). Determinants of farm livelihoods of smallholder farmers in Yayu biosphere reserve, SW Ethiopia: A gender disaggregated analysis. *Cogent Economics & Finance*, *7*(1). https://doi.org/10.1080/23322039.2019.1645583

World Bank. (1986). Poverty and hunger: Issues and options for food security in developing countries. In *Agriculture*.

Young, H., Jaspars, S., Brown, R., & Frize, J. (2001). *Food-security assessments in*

emergencies : a livelihoods approach (Issue June).

Zakari, S., Ying, L., & Song, B. (2014). Factors influencing household food security in West Africa: The case of Southern Niger. *Sustainability*, *6*(3), 1191–1202. https://doi.org/10.3390/su6031191

Zhu, X., Yuan, X., Zhang, Y., Liu, H., Wang, J., & Sun, B. (2022). The global concern of food security during the COVID-19 pandemic: Impacts and perspectives on food security. *Food Chemistry*, *370*. https://doi.org/10.1016/J.FOODCHEM.2021.130830

APPENDIX I

PARTICIPANT INFORMED CONSENT

SECTION A- BACKGROUND INFORMATION

Greetings: Good morning/afternoon

My name is Nana Akua Awotwe Vandyck, a Master of Philosophy in Home Science student at the University of Ghana. I want to ask a few questions, which would take about thirty minutes of your time. The questions intend to explore your perspectives on food security and dietary diversity as a smallholder farmer regarding causes, challenges, and coping strategies for food security and dietary diversity. Your genuine response is requested to assist in documenting the perspectives on food security and dietary diversity after you have read through and understood the following facts about the study, stated below:

SECTION B- CONSENT TO PARTICIPATE IN RESEARCH

Title of study: Food Security and Dietary Diversity- A phenomenological study of smallholder farmers in rural communities, central region.

The study's objective is to investigate community perspectives on food security, dietary diversity, and their determinants among rural smallholder farming households.

Duration of the study: The interview Session is expected to last thirty (30) minutes.

Data collection procedure: The researcher will ask questions that enable the participant to give detailed answers. The interview sessions will be recorded with a voice recorder for later transcribing by the researcher.

The benefit of the study: participants will have the opportunity to have their perspectives on food security and dietary diversity documented as part of the study.

Confidentiality: Any information solicited from a participant will not require any specific name identification. Therefore, information from the participants would remain anonymous.

Compensation: There will be compensation (one pack of 1 kg of rice per participant) at the end of the study. Compensation will be done after participants have finished the interview session.

Withdrawal from the study: Participation in this study is voluntary. The participant will not have to answer questions he/she may not want to without explaining why. Participants may withdraw from the study at any time without penalty.

Contact for Additional Information

If you have concerns about this study or your rights as a research participant, please call the researcher at +233235090497. or email: neavandyck@st.ug.edu

Your right as a Participant

If you have any issues with your rights as a participant, you can contact the address below:

Administrator, Ethics Committee for Basic and Applied Sciences

College of Basic and Applied Sciences

University of Ghana

P. O. Box LG 68

Legon – Accra

IP No.: 3014

SECTION C- PARTICIPANT AGREEMENT

"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and I am willing to consent to participate. I have not waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my records."

Signature/thumbprint…… Date……

Signature of witness …… Date ……

Researcher's signature……..... Date……

APPENDIX II

INTERVIEW GUIDE

SECTION A- DEMOGRAPHICS

1. Community ….....
2. Participants Age……..
3. Gender …….
4. Marital Status …….
5. Highest Education Qualification …….
6. Occupation ……..
7. Religion ……..
8. Number of children ……..
9. The number of years in the community ……
10. Size of Household ……
11. What was the nature of your farms in the past three years? In terms of:
    i. Farm types.
    ii. Number of fields.
    iii. Size of each field.
12. Who owns the land you grow food? Do you pay for that land, or is it given freely?
13. How is farm labour acquired in this community? Family or hired labour, and what relations are involved?

14. What kinds of crops do you grow in these fields? Let us arrange them in descending order by field.

SECTION B- FOOD AVAILABILITY AND ACCESSIBILITY

1. From where do you usually obtain the food you eat ? (Probe: Do you consume crops grown and livestock kept or buy from the market)
2. How are you able to buy food? (Probe for access to resources/money to buy food?)
3. Is the market accessible?
4. What is usually bought from the market?
5. How often do you buy food from the market?
6. Apart from buying food, how else can you access food?
7. What challenges have you experienced obtaining food to eat?
8. What challenges have you experienced regarding the quantity of food you eat?
9. What challenges have you experienced regarding the food quality (type) you eat?
10. What challenges have you experienced regarding how frequently/how often you eat?
11. Have you run out or worried about running out of food during the past year?
12. In considering the frequency of these things happening. Did these things happen at specific times of the month? Or at certain times of the year?
13. Do these events (running out of food or worrying about it) follow any pattern? That is, does something else happen regularly that causes you to run out of food or to worry about it? (Probe for medical emergencies, large bills, helping family members with their needs)

SECTION C- CAUSES OF FOOD INSECURITY

1. What factors contribute to your current status of food security? (probe for; climate change, low prices, poor road infrastructure, lack of access to finance, inadequate markets, post-harvest losses, insufficient education and knowledge, unsustainable farming systems, rural-to-urban migration, inappropriate policies and lack of technological change

SECTION D- DETERMINANTS OF DIETARY DIVERSITY

1. What determines the crops grown or the livestock kept?
2. What staple crops do you consume?
3. What kinds of foods do you and your family prefer in this village?
4. Are your preferred foods coming from your farms or elsewhere?
5. How are decisions made about food consumed at home, and why? (Probe for whose responsibility it is to provide food items for the home, the role of men and women, husbands and wives in feeding the household)
6. Who will purchase the ingredients for preparing food if you have to purchase them?
7. Where do you usually acquire the food mentioned (For each of the foods/meals mentioned, probe for its source to the point of production)
8. How do you achieve a balanced diet?
9. Do you consume animal source foods? How do you access animal sources?
10. Do you consume fruits often?
11. Tell me about healthy foods. What are the attributes of healthy foods?

12. List such foods and perceptions of their health and nutritive values (Probe for what they learnt from health workers, media, and other people in the community and what tradition has been handed down to them)

13. Are some of these foods produced in the community? List them. How else can they be accessed?

14. From which sources do you know about new farming methods or varieties of crops and nutrition? (Probe for; Radio, Mobile phones, Friends, Extension officers, and Non-governmental organisations)

15. What is the source of nutrition and agriculture information or training received?

16. What information on agriculture techniques or nutrition training have you received in the last year?

17. What are some of the drivers of these changes in the farming systems? [drivers such as Media, Self-experimentation, Climate-related, Markets, Dietary changes, Government induced, Technological induced, NGO initiatives, others

18. Do these sources influence your decisions to grow new varieties of crops and keep new breeds of farm animals?

19. How much input do you have in household decisions about food and livestock

20. How much input do you have in household decisions about foods to buy

SECTION E- COPING STRATEGIES

1. what do you do if there is not enough food?

   Let us start by discussing the things you might do to make the food you have last longer. What are some of these things? (Probe for: cut amounts of food, cut the size of meals, skip meals, water down ingredients, eat cheaper foods, serve less expensive foods, serve less nutritious foods because that are cheaper, serve children nutritious foods but eat less or less nutritious foods yourself)

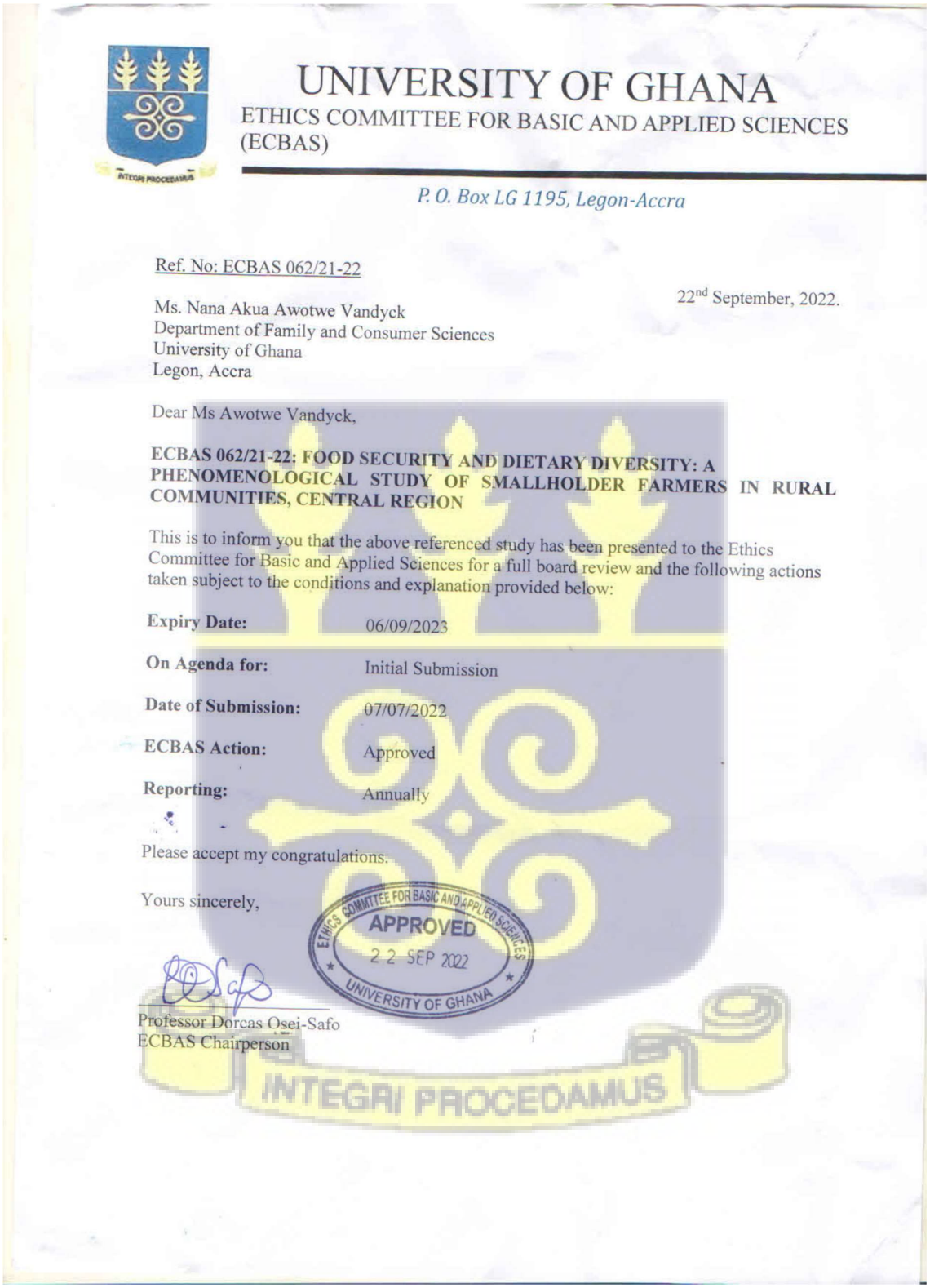
2. Do you go to people who will lend you money, give you food, feed you, or let you buy on credit? Can you describe some of these options

3. What would you say is most important in helping you cope when food or food concerns are a major problem?

4. What do you think the community (farmers, government, businesses, people) could do to make it easier for people to get enough food? Think about how they could work to make food accessible, available, and affordable.

APPENDIX III

ETHICAL CLEARANCE



UNIVERSITY OF GHANA
ETHICS COMMITTEE FOR BASIC AND APPLIED SCIENCES
(ECBAS)

P. O. Box LG 1195, Legon-Accra

Ref. No: ECBAS 062/21-22

22nd September, 2022.

Ms. Nana Akua Awotwe Vandyck
Department of Family and Consumer Sciences
University of Ghana
Legon, Accra

Dear Ms Awotwe Vandyck,

ECBAS 062/21-22: FOOD SECURITY AND DIETARY DIVERSITY: A PHENOMENOLOGICAL STUDY OF SMALLHOLDER FARMERS IN RURAL COMMUNITIES, CENTRAL REGION

This is to inform you that the above referenced study has been presented to the Ethics Committee for Basic and Applied Sciences for a full board review and the following actions taken subject to the conditions and explanation provided below:

Expiry Date: 06/09/2023

On Agenda for: Initial Submission

Date of Submission: 07/07/2022

ECBAS Action: Approved

Reporting: Annually

Please accept my congratulations.

Yours sincerely,

ETHICS COMMITTEE FOR BASIC AND APPLIED SCIENCES
APPROVED
22 SEP 2022
UNIVERSITY OF GHANA

Professor Dorcas Osei-Safo
ECBAS Chairperson

INTEGRI PROCEDAMUS

APPENDIX IV

INTRODUCTORY LETTER

UNIVERSITY OF GHANA
DEPARTMENT OF FAMILY AND CONSUMER SCIENCES
SCHOOL OF AGRICULTURE

Ref. No.:.....

27th September, 2022

The Chief and Elders
Atonkwa Community
P. O. Box EL 51
Elmina, Central Region

Dear Sir/Madam,

LETTER OF INTRODUCTION
MS. NANA AKUA VANDYCK (STUDENT # 10558648)

The above-named is a second-year MPhil student of Department of Family and Consumer Sciences, College of Basic and Applied Sciences, University of Ghana, Legon.

She is conducting research on "**Food security and dietary diversity: A phenomenological study of smallholder farmers in rural communities, Central Region**".

I shall be grateful if they are offered the necessary assistance to access the needed information from Atonkwa Community.

Thank you.

Yours faithfully

Dr. Cynthia Gadegbeku
(Head of Department)

COLLEGE OF BASIC AND APPLIED SCIENCES
• Telephone: +233 (0) 244 615 310 P. O. Box LG 91, Legon, Accra, Ghana. • Email: fcsciences@ug.edu.gh • Website: www.ug.edu.gh

UNIVERSITY OF GHANA
DEPARTMENT OF FAMILY AND CONSUMER SCIENCES
SCHOOL OF AGRICULTURE

Ref. No.:.....

27th September, 2022

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Kuful Community
P. O. Box EL 51
Elmina, Central Region

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