

**FOOD AND NUTRITION SECURITY AMONG FARMING HOUSEHOLDS IN
LESOTHO: THE ROLE OF COMMERCIAL AGRICULTURE**

by

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DECLARATION

I hereby declare that this thesis submitted for the degree of Doctor of Philosophy at the University of the Free State. This is my own work, except as acknowledged in the text. The work has not been submitted for a degree in any other institution. I hereby forfeit any copyright of this thesis to the University of the Free State.

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May the Lord create rivers of solutions to the persistent food crises.

ABSTRACT

Food insecurity and malnutrition are persistent challenges to the global community. The COVID-19 pandemic, conflicts, climate change and the Russian-Ukraine war have exacerbated hunger and poverty rates. However, agriculture continues to be regarded as a critical pathway towards tackling food insecurity and malnutrition.

In Africa, investments in agricultural development have increased in the recent past, aiming to fight food insecurity and poverty. The transition from subsistence to commercial agriculture has received increased attention from significant investors. Lesotho is one of the least developed countries in the world that is also faced with persistent and high poverty rates that spread throughout the country. In the past decade, the government of Lesotho and its partners have invested in supporting farming households by commercialising agriculture and increasing market participation.

However, agriculture in Lesotho is constrained by limited access to production resources and erratic climatic events, among others. As a result, agriculture suffers from low productivity and its contribution to food insecurity and nutrition security is challenged. Despite the challenges, there is a continual investment in commercial agriculture as a development approach. However, the role of agriculture in yielding food and nutrition security outcomes is unclear, and empirical evidence is limited. In light of these, the study sought to assess the contribution of commercial agriculture on household food and nutrition security. The specific objectives to address the research aim were:

- To determine the food and nutrition security status of commercial and subsistence farming households in Lesotho.
- To determine the factors that affect the food and nutritional security of the farming households in Lesotho.
- To assess the contribution of commercial agriculture on the food and nutrition security of the farming households in Lesotho.
- To assess the characteristics of the food and nutrition security clusters.
- To make policy recommendations on household food and nutrition security in Lesotho.

The study adopted an exploratory research approach with a cross-sectional nature. Data were collected using questionnaires and semi-structured interview schedules. The findings indicated that farming households experienced food and nutrition insecurity differently. The household food insecurity access scale indicated the prevalence of varied levels of food insecurity among 60% of the surveyed households. Individual dietary diversity scores showed low dietary diversity among the majority of women of reproductive age (79.4%), under-five children (72%) and male adults (65.4%). Significant differences in food and nutrition security status were observed between the four districts that represent the agro-ecological zones. The household dietary diversity score reflected that farming households could afford diverse diets weekly, and not daily. There were significant differences in food and nutrition security between commercial and subsistence farming households. Household income was a determinant for all household food and nutrition security indicators. After grouping the surveyed households, the findings also indicated that the food and nutrition secure cluster was characterised by small household size, higher monthly household income, farming for commercial purposes, as well as respondents who are married and have higher education status. Food secure farming households also have access to extension services and credit to purchase agricultural inputs. In assessing commercial agriculture's contribution to food and nutrition security, qualitative and quantitative findings reflected a positive contribution to most indicators. Involvement in commercial agriculture is a pathway to enhancing food and nutrition security hence a nutrition-sensitive approach to commercial agricultural interventions is recommended for better food and nutrition outcomes. The findings also demonstrate that involvement in agriculture alone is inadequate for enhancing food and nutrition security. Since household income is a significant determinant for achieving food and nutrition security, there is a need to stimulate the economy to create income-generating activities. Farming households must also be capacitated with nutrition knowledge in combination with proper allocation of agricultural produce and farm income to meet the dietary requirements for all members of the households.

Keywords: Food and nutrition security, food and nutrition security indicators, commercial farming, malnutrition, food insecurity, food and nutrition security clusters, nutrition-sensitive agriculture.

Note: An article has been published from the findings of this study. The reference is stated below:

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LIST OF ABBREVIATIONS AND ACRONYMS

AU	African Union
BMI	Body Mass Index
BOS	Bureau of Statistics
CAADP	Comprehensive Africa Agricultural Development Programme
CBL	Central Bank of Lesotho
CDDS	Children's Dietary Diversity Score
CFS	Committee on World Food Security
CRS	Catholic Relief Services
FANTA	Food and Nutritional Technical Assistance
FAO	Food and Agriculture Organisation
FAOstat	Food and Agriculture Organization Statistics
FHI 360	Family Health International
FSIN	Food Security Information Network
GDP	Gross Domestic Product
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
IDDS	Individual Dietary Diversity Score
IFPRI	International Food Policy Research Institute
LENAFU	Lesotho National Farmers Union
LSL	Lesotho Loti
LVAC	Lesotho Vulnerability Assessment Committee
MDDW	Minimum Dietary Diversity for Women
MDG	Millennium Development Goals

NEPAD	New Partnership for Africa's Development
NGO	Non-governmental Organisation
NSDP	National Strategic Development Plan
PoU	Prevalence of Undernourishment
SADC	Southern African Development Community
SADP	Smallholder Agriculture Development programme
SD	Standard Deviation
SGD	Sustainable Development Goals
SHARE	Share of food expenditure on Household Income
SLP	Sustainable Livelihood Development
SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
USD	United States Dollar
WFP	World Food Programme
WHO	World Health Organisation

CHAPTER 1 :

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Malnutrition is a global challenge (Herrera *et al.*, 2020) and achieving food and nutrition security is a persistent concern worldwide (FAO *et al.*, 2022). It highlights an enormous challenge towards achieving the SDG Zero Hunger target by 2030. Much remains to be done in pursuing these targets, and there is a need to accelerate and intensify the efforts towards combating hunger.

The world has not recovered from the Coronavirus disease 2019 (COVID-19) pandemic. Instead, global hunger has risen further (FAO *et al.*, 2022; FAO, IFAD, UNICEF, WFP, 2023). World hunger had already increased for the third year in 2019. The ascending trend of global hunger places the number of hungry people in the world where it was over a decade ago. The 2017 and 2018 reports on the state of food security and nutrition in the world indicated that conflict and extreme climate events hindered efforts to end hunger, food insecurity and malnutrition. The 2019 report highlighted that economic recessions also challenged these efforts (FAO, IFAD, UNICEF, WFP, 2019).

In 2020, the COVID-19 pandemic delayed economic growth prospects significantly. Progress to meet the goals of ending hunger and ensuring access to food for all was further threatened (FAO *et al.*, 2022). These and several other factors, including conflicts, the climate crisis and the Russia-Ukraine war, have left the world hungrier (WFP, 2022a).

Hunger is defined as physical discomfort caused by inadequate consumption of dietary energy. It becomes chronic when occurrences of insufficient consumption are regular. Hunger can also be described as undernourishment (FAO, 2022). Food insecurity, which is the lack of regular access to sufficient safe and nutritious food for growth and development to sustain an active and healthy life, is related to hunger. People may not be experiencing a physical sensation due to a lack of sufficient food but may be uncertain that the food will last, or they may be forced to compromise the quality and quantity of the food they eat to survive (FAO, 2022). Food insecurity can affect diet

quality in different ways, potentially leading to malnutrition in its various forms: undernutrition, overweight and obesity, all of which have severe consequences for health and well-being (FAO *et al.*, 2020; Carvajal-Aldaz, Cucalon & Ordonez, 2022).

The fight against hunger and food insecurity has been a challenge for decades. The commitment to address these challenges is found in many countries' development agendas, particularly developing ones (Senanayake & Premaratne, 2014). It is reiterated by the United Nations' food security and nutrition targets in the Millennium Development Goals (MDGs) (2000 - 2015) and Sustainable Development Goals (SDGs) (2015 - 2030). SDG 2 speaks to ending hunger and ensuring access by all people, particularly people experiencing poverty and people in vulnerable situations, including infants, to safe, nutritious and sufficient food by 2030 (UNDP, 2023). The various challenges threaten the achievement of the SDG goals and targets, just as MDG goals and targets were not met (Mahmoud, 2021).

In the mid-twentieth century, food security interventions focused on increasing agricultural outputs, emphasising the production of staple foods to ensure adequate food supplies and meet dietary energy needs. As a result, less attention was given to nutritional diet quality. In the following decades, there was an increased awareness that this focus was largely misguided. Many people did not have access to healthy diets at affordable prices throughout the year. Consequently, the nutritional quality of diets became an important component of food security interventions (Sen, 1982; FAO *et al.*, 2020). It has been established that providing access to a healthy diet is required to achieve the SDG target of eradicating all kinds of malnutrition (FAO *et al.*, 2020).

Agriculture has been regarded as a significant contributor to achieving food and nutrition security. However, natural disasters have increased rapidly since the early 1990s, which has affected agricultural production. It was concluded that low agricultural harvests had been mainly caused by weather shocks and droughts (Food security Information Network (FSIN), 2019). The climate crisis is one of the leading causes of decreased agricultural production (WFP, 2022a). A decade ago, it was established that for every degree Celsius (1°C) that the temperature rises, agriculture production has the potential to decrease by 10%, placing further pressure on providing food for the global population to ensure food and nutrition security (Turrall, 2011). Despite the challenges that negatively affect the agricultural sector, it can still sustain

economies and feed nations in other world areas. Thus, the growth and development of agriculture continue amidst the challenges of climate change and natural disasters (Crush, Frayne & McCordic, 2017).

The role of agriculture is valued in the SDGs as a means to enhance the quality of life, aiming to double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers. The aim is to achieve this through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment (FAO *et al.*, 2020).

The past two decades have seen a rapid increase in agricultural growth and development investment worldwide. In particular, transitioning from subsistence to commercial agriculture is a sought-after development approach in developing countries. The aim is to improve the quality of life and fight food insecurity and malnutrition (Smalley, 2014; Carletto, Corral & Guelfi, 2017). This study explored food and nutrition security within farming households and the role of agricultural development in reducing food insecurity and malnutrition.

1.2 PROBLEM STATEMENT

1.2.1 Food and nutrition security challenges in Lesotho

A large part of Lesotho's population is exposed to situations of chronic food and nutrition insecurity, both in the rural and urban areas. The Lesotho Vulnerability Assessment Committee (LVAC) has projected that food and nutrition insecurity is likely to increase, owing to decreased livelihood opportunities like employment, remittances, and income from agriculture coupled with increased costs of food and non-food commodities. Lesotho is experiencing a triple burden of malnutrition, with stunting, micronutrient deficiencies and overweight among children and adults (WFP and UNICEF, 2019; WFP, 2023). While there has been progress towards reducing anaemia in women and stunting in under-five children, overnutrition and obesity have risen among children and adults (FAO *et al.*, 2022).

The rural population heavily depends on subsistence farming and other rural non-farm activities, which are often acquired through migration to urban areas, working in the textile industry, domestic work and mines (Food and Nutrition Coordinating Office, 2018; Rantšo & Seboka, 2019). Agricultural production in Lesotho is predominantly rain-fed and is vulnerable to climatic changes and weather shocks, significantly decreasing yields (FAO, 2019; Kheleli *et al.*, 2021; Muroyiwa & Linakane, 2021).

Urban food insecurity is a growing challenge in African cities, and Lesotho is no exception, as people's eating habits are shifting from traditional foods toward refined or processed foods, which are often of lower nutritional value (Crush *et al.*, 2017; Government of the Kingdom of Lesotho, 2018). Dietary diversity is low owing to the limited availability of fruits and vegetables and the low consumption of protein sources. These are also accompanied by a high unaffordability of healthy diets (WFP & UNICEF, 2019) and obesity among women and children (Rothman *et al.*, 2019; Development Initiatives, 2021)

Food insecurity, which can manifest as malnutrition, delays economic development and deepens poverty by reducing productivity due to poor physical and cognitive abilities and increasing healthcare costs. Chronic malnutrition costs Lesotho 7.13% of its Gross Domestic Product (GDP), and approximately 33% of children under five are stunted, with a low height for their age. The levels of child undernutrition reflect the continuing challenges of eradicating food and nutrition insecurity (African Union, 2016).

As the rate of undernutrition increases, the government and impacted families also endure an increasing burden of health costs, which may negatively affect livelihoods. These costly consequences can often be prevented with appropriate nutrition-sensitive actions. Without proper care, being overweight, underweight and wasting in children results in a higher mortality risk (Myatt *et al.*, 2018; James *et al.*, 2022). During their schooling years, stunted children are more likely to repeat grades and drop out of school, thus reducing their income-earning capabilities later in life (Oot *et al.*, 2016).

Furthermore, adults that were stunted as children are less likely to achieve their expected physical and cognitive development, impacting their productivity (Galasso & Wagstaff, 2019). Thus, cumulative losses due to malnutrition in Lesotho were estimated at LSL 1.96 billion (USD 200.3 million) in 2014, and this figure remained

unchanged in 2019. The most significant expense is the loss of future productivity due to undernutrition-related mortalities, roughly amounting to USD 200.3 million (African Union, 2016; Food and Nutrition Coordinating Office, 2018; WFP & UNICEF, 2019).

Poor diets are among the root causes of persistent malnutrition (FAO *et al.*, 2021), which is the case for Lesotho (African Union, 2016). Most poor households in African countries struggle to access healthy food (Hlophe-Ginindza & Mpandeli, 2021). However, there is limited focus on the systematic issues affecting access to healthy diets. It is not only about accessing enough food but also about accessing the right food.

1.2.2 The lack of empirical evidence on the role of commercial agriculture in enhancing food and nutrition security

Agricultural development is pivotal in enhancing food and nutrition security because a productive, sustainable and resilient agricultural sector is critical to safeguarding food security worldwide (Schönfeldt & Hall, 2017; Shetty, 2015). Agricultural commercialisation is a popular development strategy for improving food security in low-income countries despite the limited scientific evidence (Linderhof, Janssen & Achterbosch, 2019). The agricultural sector in Lesotho has received support from funders, such as the World Bank and International Fund for Agricultural Development (IFAD), through intervention projects that seek to promote and support commercial farming, among others (World Bank, 2019a).

Although commercialisation has contributed significantly towards poverty reduction and household income, its empirical evidence on its nutritional impact is limited (Carletto, Corral & Guelfi, 2017; Ogutu, Gödecke & Qaim, 2020). Moreover, previous research on food and nutrition security and agriculture in Lesotho has mainly focused on household food security and subsistence farming without a strong nutrition component (Crush, Frayne & McCordic, 2017; Rantšo & Seboka, 2019; Walsh *et al.*, 2020). It may add value to agricultural research in Lesotho to further look into the food and nutrition security status of the households involved in the different agricultural interventions.

The Lesotho Food and Nutrition Security Policy (2016-2025) has adopted a cross-cutting approach to address malnutrition and food insecurity. It firmly recognises the agricultural sector as one of the main contributors to enhancing food and nutrition security. (Food and Nutrition Coordinating Office, 2016). Thus, it is imperative to assess the contribution of the different agricultural approaches and transformations to improve food and nutrition security in its broader sense, especially in the light of an agricultural policy based on the assumption that agricultural development, particularly for smallholder farmers, improves food and nutrition security and thus reduces malnutrition (Pawlak & Kokodziejckak, 2020). According to Ntakyo & van den Berg (2019), commercialised households are more likely to consume less than the required calories per adult equivalent per day, which is somewhat unexpected. Thus, empirical evidence is needed to prove the policy assumptions that agricultural interventions improve household food and nutrition security and inform the development of these interventions.

1.3 SIGNIFICANCE OF THE STUDY

The study aimed to explore the significance of agriculture in enhancing food and nutrition security. Consequent to limited studies that analyse commercial agriculture on household food and nutrition security status in Lesotho, this study assessed the food and nutrition security status of households that are involved in commercial farming, focusing on the dietary assessment component, which will reflect food access, availability, dietary quality, food quantities and nutrition-related knowledge.

It is noted that agriculture plays a pivotal role in realising food and nutrition security, and the current research focuses on how agricultural development, particularly the involvement in commercial agriculture, contributes to tackling food and nutrition insecurity. Commercialising agriculture is one of the currently sought-after approaches for development among farming households. The relationship and linkages between agriculture and food and nutrition security are imperative to document. It is pertinent to the policy objectives that seek to ensure nutrition research that contributes to and supports policy objectives, poverty reduction and strategic views.

The current Lesotho Food and Nutrition Policy (2016-2025) has resolved to adopt an intersectoral and partnership approach, emphasising the cross-cutting nature of food

and nutrition security. One of the closely related sectors is agriculture, and the policy has objectives that speak to the leveraging the relationship between agriculture and food and nutrition security. The policy aims to achieve sustainable production, supply and utilisation of safe, adequate, affordable and nutritious foods.

While the government, through its ministries and supporting partners, already has some programs in place, achieving this objective calls for extensive research to understand the specific food and nutrition-related vulnerabilities. One of the several approaches to capitalise on the role of agriculture in tackling food and nutrition insecurity is developing nutrition-sensitive agricultural interventions.

The current study provided a baseline on the food and nutrition security status of households involved in agricultural production, the factors that influence their food and nutrition security status and the significance of agriculture on the food and nutrition security of farming households. The findings provide evidence of the farming community's experiences and views on food insecurity and malnutrition.

Recommendations for the relevant policy objectives have been stated to benefit relevant stakeholders. These findings may contribute to development planning in light of the policy objectives, highlighting areas that need the most attention. The information will inform evidence-based planning, management, decision making and enhanced public accountability.

The study did not focus on food security only but it combined food security and nutrition security to emphasise the importance of addressing the two concepts as one policy goal, and this approach is still limited, particularly in the context of Lesotho. However, the recent renaming of the responsible government ministry from the Ministry of Agriculture and Food Security to the Ministry of Agriculture, Food Security and Nutrition is a step in the right direction. This study's approach will contribute to knowledge-generation pertaining to the linkages and relationships between agriculture and food and nutrition security.

The findings are also valuable to government-supporting bodies and donors towards commercialising agriculture and all relevant stakeholders committed to enhancing food and nutrition security through agricultural development.

1.4 RESEARCH OBJECTIVES

1.4.1 Overall objective

In light of the demonstrated persistence of food insecurity and malnutrition challenges and their implications on the development agenda, combined with the limited empirical evidence on the nutritional impact of commercial agriculture, this study sought to analyse the role of commercial agriculture on the food and nutritional status of farming households.

1.4.2 Specific objectives

1. To determine the food and nutrition security status of commercial and subsistence farming households in Lesotho.
2. To determine the factors that affect the food and nutritional security of the farming households in Lesotho.
3. To assess the contribution of commercial agriculture to the food and nutrition security of farming households in Lesotho.
4. To assess the characteristics of the food and nutrition security clusters.
5. To make policy recommendations on enhancing household food and nutrition security in Lesotho.

1.5 RESEARCH QUESTIONS

1. What is the household food and nutrition security status of Lesotho's commercial and subsistence farmers?
2. What are the main factors that affect the food and nutrition security of farming households in Lesotho?
3. What is the contribution of commercial agriculture to the food and nutrition security of the farming households?
4. What are characteristics of the food and nutrition security clusters?
5. What policy recommendations on household food and nutrition security status can be drawn from the above outcomes?

1.6 HYPOTHESES

It can be assumed that involvement in commercial agricultural activity affords the household food and nutritional security. Even though the findings by Manda *et al.* (2020) stated that producing and selling agricultural outputs, significantly increased household income, food expenditure and food security, empirical evidence is needed to claim the same about households engaged in commercial agriculture in Lesotho.

Based on the problem statement mentioned above, the following are the hypotheses for this study:

1. The households involved in commercial farming are significantly more food and nutrition-secure than households engaged in subsistence farming.
2. Household income is a significant determinant of the food and nutrition security status of the households involved in agriculture in Lesotho.
3. Commercial agriculture has a positive impact on household food and nutrition security.
4. Food and nutrition-secure households are characterised by higher overall income, small-sized, receiving nutrition education and knowledge and having access to resources (land, credit, markets) are less vulnerable to food insecurity.

1.7 CONCEPTUAL FRAMEWORK

Figure 1.1 shows a food and nutrition security framework that indicates that the immediate causes of the nutritional status are dietary intake and health status. Dietary intake should meet a certain threshold in quantity and quality; nutrient intake should be balanced regarding carbohydrates, protein, fat (macronutrients) and vitamins and minerals (micronutrients) and appropriately absorbed in the human body. Food access, caring capacity, health services and environmental conditions determine dietary intake and health status. These can be entry points for enhancing nutritional quality.

The food security status at the household or individual level is influenced by, among others, agro-environmental, socioeconomic, and biological factors. The complex

interaction of these factors can be categorised into cumulative food availability, household food access and individual food utilisation.

The framework reflects the relationship between food security and nutrition security. Food security entails food availability, access and utilisation. Nutrition security, on the other hand, is achieved when all components interact successfully. Food security is a requirement for adequate dietary intake. The condition of sufficient consumption, which is adequate for physiological development, supports food utilisation.

Agriculture contributes to food security and is evident in food access and availability pillars. The linkages of food and nutrition security and agriculture were explored in this study. In particular, the significance of engagement in commercial agriculture on household food and nutrition security.

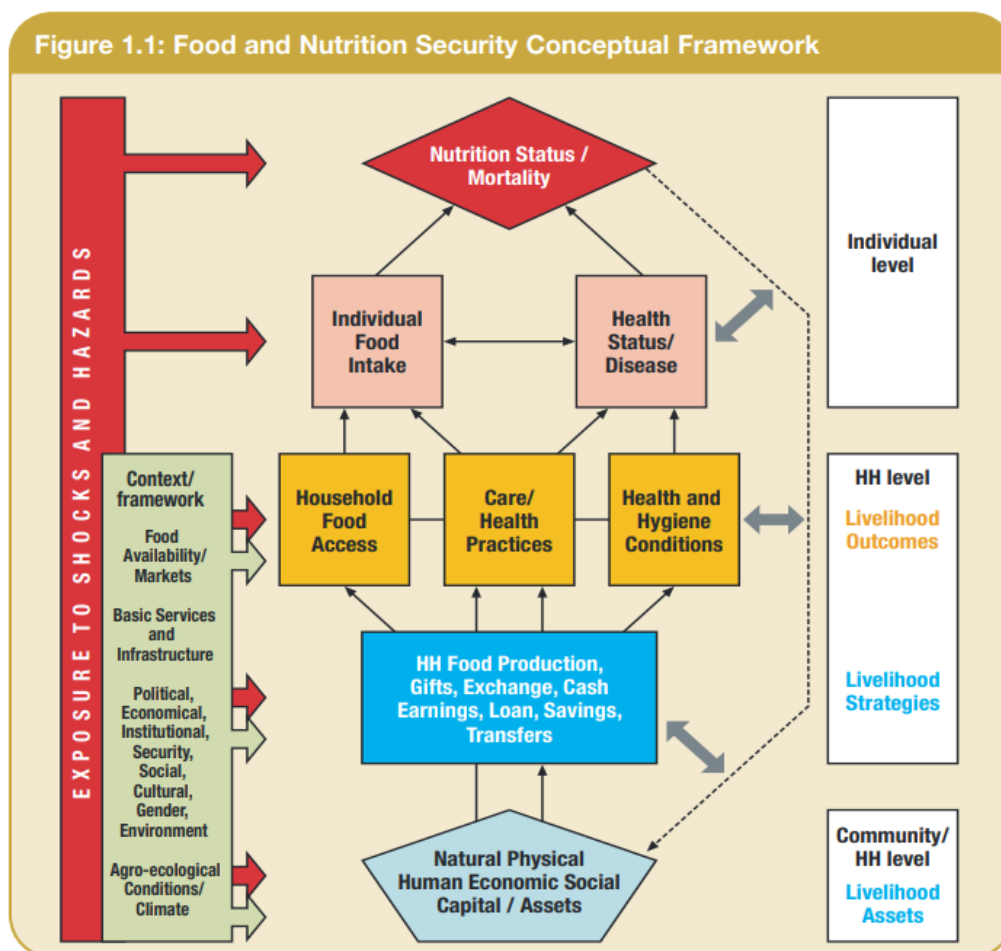


Figure 1.1: Food and nutrition security conceptual framework (WFP, 2009)

The pathways in which the transformation of agriculture can contribute to food and nutrition security outcomes are illustrated in Figure 1.2. Transitioning from subsistence to commercial agriculture is one of the ways of agricultural transformation and growth. Purchasing power for those who sell their produce and self-sufficiency among farmers who retain some produce for consumption may result in adequate food quality and quantity. Therefore, agricultural development and growth are expected to affect household food and nutrition significantly. This study adopted this lens in exploring the role of commercial agriculture as a developmental approach to food and nutrition security.

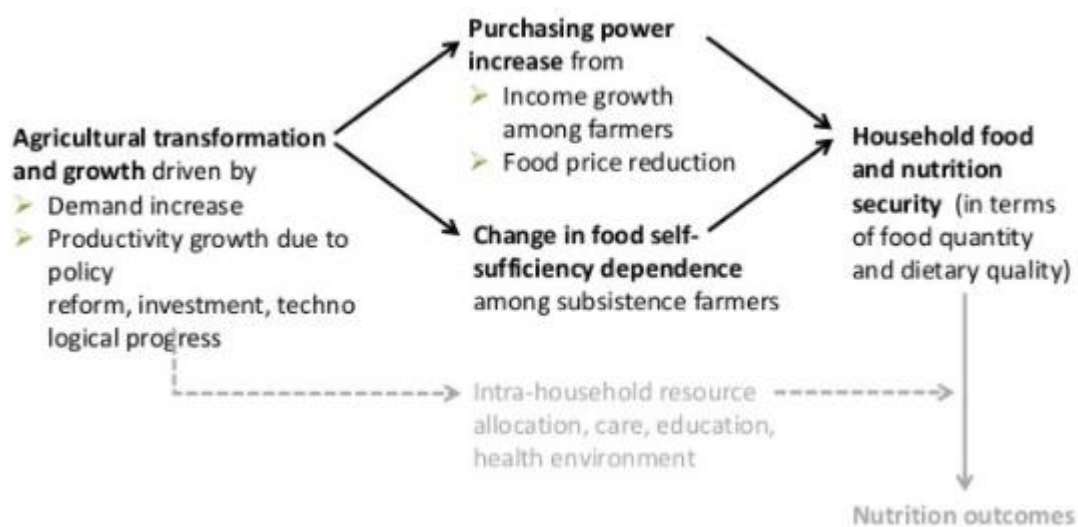


Figure 1.2: Pathways from agricultural transformation to food and nutrition security (Darith and Ecker, 2013)

1.8 TERMINOLOGIES USED IN THE STUDY

1.8.1 Food security

Food security is defined as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and preferences for an active and healthy life (FAO, 1996).

1.8.2 Food insecurity

A person is food insecure when they lack regular access to enough safe and nutritious food for normal growth, development and an active and healthy life. It may be due to the unavailability of food and the lack of resources to obtain food (WHO, 2020).



Figure 1.3: Levels of food insecurity (WHO, 2020)

1.8.3 Nutrition security

Nutrition security exists when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment, adequate health, education and care (Committee on World Food Security (CFS), 2012; FAO, WFP and IFAD, 2012).

1.8.4 Food and nutrition security

The term food and nutrition security combines the aspects of food security and nutrition security and points to the idea that they are related. This term is preferred by those who wish to highlight the integral linkages between food security and nutrition security, not only linguistically but also conceptually, in particular at the household and individual level (CFS, 2012; Pangaribowo, Gerber & Torero, 2013).

1.8.5 Malnutrition

Malnutrition refers to deficiencies, excesses or imbalances in a person's energy and nutrient intake. Malnutrition can exist in multiple forms, classified as undernutrition, micronutrient deficiencies, overweight and obesity. It is important to note that the different forms of malnutrition can co-exist within the same household and even the same individual during their life and can be passed from one generation to the next (WHO, 2020).

1.8.6 Undernutrition

Undernutrition refers to insufficient intake of nutritious foods to meet the body's functional needs for good health. It can lead to illnesses that include being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition) (Gibson, 2016).

1.8.7 Overnutrition

Overnutrition is also described as overweight and obesity, defined as an excessive accumulation of fat that can present a health risk. It is usually an uptake of excessive food relative to the energy used by the body. The state of being overweight can be determined using a Body Mass Index (BMI), depicted by ranges between 25 and 30. Obesity is defined as having a BMI equal to or higher than 30.

1.8.8 Micronutrient deficiency

Micronutrient deficiency (or hidden hunger) is the lack of vitamins, minerals and trace elements required in small amounts, which are essential for development and growth (WHO, 2020).

1.8.9 Subsistence agriculture

This type of agriculture involves producing more for household consumption than for selling. Surplus is stored or sold to the market, but the household's food needs mainly inform production. It uses traditional farming methods on rain-fed land with minimal to no agricultural inputs (fertilisers, pesticides, machinery) (Nieuwoudt, 2000; Wharton, 2017).

1.8.10 Commercial agriculture

Commercial agriculture is market-oriented farm production. Farmers mainly produce to meet the food demands of the markets. There is the use of advanced technologies with the size of land, ranging from small to large, depending on the scale of production (Babu & Gajanan, 2022; Muzekenyi, Zuwarimwe & Kilonzo, 2022).

1.9 DELINEATIONS AND LIMITATIONS OF THE STUDY

1.9.1 Delineations

- The study addressed the household's involvement in commercial farming and how it contributes to food and nutrition security, but the level of commercialization and its effect are not discussed.
- While the study has addressed food security and nutrition security as an integrated concept (food and nutrition security), only the dietary assessment aspect of nutrition security was addressed.
- The farming households were categorised into two groups: subsistence farming households were the control group, and commercial farming households were the treatment group.
- The control group was randomly selected from the districts where the commercial farming households resided.
- Since the commercial farming sector is predominantly practised on a small scale in Lesotho, commercial farming households mainly produce agricultural commodities for selling to the market at small to medium scale.

- Subsistence farming households are those that produce agricultural commodities for their consumption.
- The study focused on four districts that represent each agroecological zone; the researcher believes these represented all the districts in the four agroecological zones. However, the results may differ for non-farming households.
- The individual dietary diversity assessment focused on women of reproductive age (18-49 years), male adults (> 18 years) and under-five children.

1.9.2 Limitations

- The study's cross-sectional nature did not capture seasonal variation, as diets can change with agricultural seasons. It also presented limitations in assessing the contribution of commercial agriculture on food and nutrition security through comparison with historical data.
- A 24-hour recall was used to compute the individual dietary diversity scores. While this is common in most previous studies in this context, it does not capture day-to-day variation. However, this was also compensated by deriving a household dietary diversity score from a 7-day recall.
- The study depended on the respondents' memory, and the precision of data may be affected.
- The sample size for under-five children was less than 100, which may not be representative.
- The study depended on the opinions of the key informants regarding the contribution of commercial agriculture to household food and nutrition security, as well as the constraints.

1.10 CHAPTER OVERVIEWS

Chapter 1

The first chapter provided the background to the research topic, introducing the phenomenon under investigation, its significance and the boundaries within which it will be explored. It included the research problem, questions, objectives

and hypothesis. The terminologies, delineations and limitations were stated in this chapter.

Chapter 2

This chapter contains a review of the literature to contextualise the research focus within the existing body of knowledge. The main themes addressed are food and nutrition security on global, national and household levels; measurement of food and nutrition security; the factors affecting household food and nutrition security; and the challenges in achieving it. Food and nutrition security in relation agriculture is discussed.

Chapter 3

The chapter shows the research methods employed to address the research questions. It entails justifying the methods used and how the research methods were implemented. The sampling process, data collection, analysis and ethical considerations are stated.

The following chapters (4-7) mainly present the findings, discussion, conclusions and recommendations for each study objective. The chapters are structured as follows:

- **Chapter 4** – The food and nutrition security status of the farming households in Lesotho.
- **Chapter 5** – The factors affecting the food and nutrition security of the farming households.
- **Chapter 6** – The contribution of commercial agriculture to household food and nutrition security.
- **Chapter 7** – The characteristics of the food and nutrition security clusters among the farming households.

Chapter 8

In light of the findings in the previous chapters, the recommendations for the Lesotho Food and Nutrition Security Policy on tackling food and nutrition security are stated in this chapter.

Chapter 9

The overall conclusions and recommendations for further research are stated in this chapter

CHAPTER 2 : LITERATURE REVIEW

2.1 INTRODUCTION

This chapter contains a review of the literature to contextualise the research focus within the existing body of knowledge. The relevant scientific literature on general food and nutrition security on global, national and household levels, the factors affecting household food and nutrition security, the challenges in achieving it and food and nutrition security agriculture is articulated.

2.2 FOOD SECURITY

The term “food security” was first introduced in the 1940s, and its definition has changed continually. Following the food crisis during the 1970s, Sen’s work in the 1980s towards the evolving concept suggested that food-related challenges were not only about food availability through agricultural production but also determined by the governance of economies and communities. Consequently, a multi-sectorial approach to addressing food insecurity was introduced (Pangaribowo, Gerber & Torero, 2013; Peng & Berry, 2018).

A current widely used definition that was approved by the 1996 World Food Summit states that "it is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and preferences for an active and healthy life" (FAO, 1996). Global and local food systems play a vital role in achieving food security. These systems involve activities in all stages, such as production, processing, marketing, retail, consumption and disposal of agricultural produce, being food or non-food products (Haug, 2018; von Braun *et al.*, 2021).

Based on the definition of food security, the concept is characterised by four pillars: accessibility, availability, utilisation and stability (FAO, 1996; Gibson, 2016). Considering different dimensions of food security allows a better understanding of both food security and its underlying aspects (FAO, 2014).

2.2.1 Food accessibility

Food accessibility encompasses the access of individuals, households and populations to adequate economic and physical resources to acquire and consume a nutritious diet. These include self-production, the capacity to buy and transport food, access through social networks, the knowledge and skills to make appropriate choices and time and mobility to purchase and prepare food (FAO, 2006; Carletto, Zezza & Banerjee, 2013; Devereux, Béné & Hoddinott, 2020).

2.2.2 Food availability

Food availability represents sufficient quantities of food and appropriate quality supplied through domestic production, imports, food stocks, stores, food outlets and imports. At a local and community level, this dimension also includes the location of the stores/food outlets, the food prices, quality and variety of food and encompasses core and traditional foods and food aid (Aborisade & Bach, 2014; WFP, 2016).

2.2.3 Food utilisation

This pillar represents the optimum utilisation of food based on knowledge and an understanding of an adequate diet that ensures nutritional well-being and meets all human physiological needs. A physically healthy body is needed to digest and utilise the food consumed. Food utilisation considers water, sanitation, health care, cultural considerations, social environment preparation, storage and cooking skills (FAO, 2006; Carletto, Zezza & Banerjee, 2013). Other aspects of food utilisation include knowledge to make healthy choices, awareness of food safety issues, preparing healthy meals, cooking and storing food, and avoiding food waste (Zivkovic, 2017; Begley *et al.*, 2019).

2.2.4 Stability

Food insecurity is ultimately determined by the stability of the above three dimensions over time. Everyone must have sustained access to adequate and nutritious food on national, community, household and individual levels at all times. Factors that increase

the risk of losing access to food include wars, economic and climate crises and the seasonality of foods (Aborisade & Bach, 2014; WFP, 2016). Vulnerability is related to stability, as it is experienced when food insecurity occurs. Vulnerability assessment captures the changes in the state of food security and insecurity. The risks that come with altered availability, accessibility and utilisation of food are addressed by this pillar (Gibson, 2016; Serrat, 2017).

2.2.5 Sustainability of food security

Literature suggests that sustainability can be considered as part of the pillars to accommodate challenges, such as climate change that threatens the sustainability of food security (FAO, 2018b; Peng & Berry, 2018; Guiné *et al.*, 2021). Since the sustainability dimension continually challenges food security, environmental, social, and economic aspects for sustainable development must be considered (Guiné *et al.*, 2021).

2.2.6 Challenges that hinder food security

Climate change, political instability, conflict, wars and pandemics are among the challenges that hinder progress in enhancing global food and nutrition security in all its forms (FAO *et al.*, 2022). The COVID-19 pandemic and the Russia-Ukraine conflict caused crises in many of the world regions that affected food accessibility, availability and stability (Devereux, Béné & Hoddinott, 2020; FAO *et al.*, 2022; Shaifuddin *et al.*, 2022). Food and nutrition security interventions were compromised when all resources were used to address the COVID-19 pandemic, increasing nutritional vulnerabilities (Development Initiatives, 2021).

Additionally, there is a reciprocal relationship between the current diets and climatic shocks. The activities involved in the food system to produce current diets are significant drivers of environmental pollution and resource demands. On the other hand, global warming and pollution affect food production (Garnett *et al.*, 2016; Development Initiatives, 2021). There is an overarching need for transforming food systems making optimal use of natural resources and human capital. This change should be culturally acceptable and accessible, environmentally considerate,

economically fair and viable, providing nutritionally adequate, safe, healthy and affordable food to consumers for present and future generations (Capone *et al.*, 2014; Peng & Berry, 2018).

2.3 NUTRITION SECURITY

The term “nutrition security” emerged in the mid-1900s. It focused on household and individual food consumption and the utilisation of the food in the body, which was not the focus of food security at the time. It was first defined as “adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times” (CFS, 2012). The definition evolved, and the most recent definition developed by FAO states that “nutrition security exists when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment, adequate health, education and care” (FAO, WFP & IFAD, 2012). A person is considered nutrition secure when they have a nutritionally adequate diet. The food consumed is biologically utilised and sufficient for different body functions, such as growth, fighting disease and physical work (Pangaribowo, Gerber & Torero, 2013). Unlike the previous ones, this definition emphasises that a healthy and active life for all household members relies on the consumption of food that is needed by the body and not what is accessible at the time (CFS, 2012).

Figure 2.1 shows the nutrition security conceptual framework, which indicates that a nutrition status directly results from food intake and health status. The underlying factors include food access, caring capacity, health services and environmental conditions. Food access is further determined by production, purchase and donations. The framework also shows the relationship between food security and nutrition security.

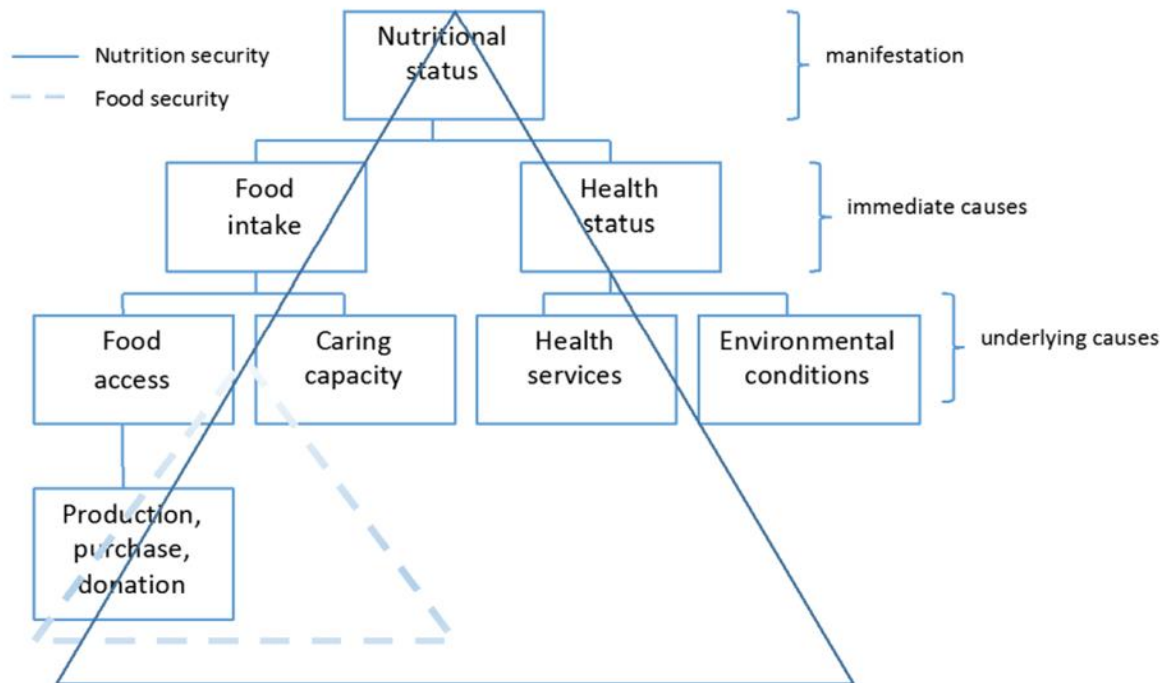


Figure 2.1: Nutrition security conceptual framework at the household level (Gross et al., 2000).

2.4 FOOD AND NUTRITION SECURITY

The relationship between food and nutrition has been appreciated at a technical level. However, a term that reflects the relationship between “food security”, “nutrition” and “nutrition security” was not agreed on. Thus, the terms “food security and nutrition”, “food and nutrition security”, “nutrition security”, and “food security” were used interchangeably, sometimes to illustrate the relationship (CFS, 2012; Pangaribowo, Gerber & Torero, 2013; Hwalla, El Labban & Bahn, 2016) Ammar *et al.*, 2023). The recently developed analytical framework shows nutrition security as integral to food security (Ammar *et al.*, 2023).

“Food security and nutrition” has been used more commonly when the objective was to differentiate between interventions needed at the global, national and local levels against interventions needed at household and individual levels. “Food and nutrition security” has been explicitly used at household and individual levels and when the objective focuses on interventions needed to highlight nutrition concerns at all points of the food chain (CFS, 2012).

The term “food and nutrition security” has been actively used by international bodies, such as IFPRI, UNICEF and FAO. IFPRI started using this term in the mid-1990s (CFS, 2012). This study adopted the term “food and nutrition security”, as it is particularly focused on household and individual levels. The term also emphasises integrating the two concepts and achieving food and nutrition security as a single goal (Pangaribowo, Gerber & Torero, 2013; Hwalla, El Labban & Bahn, 2016).

Existing literature predominantly discusses indicators for measuring food and nutrition security separately without integrating food security and nutrition security. Thus, the measurement of household food security and nutrition security are discussed separately in this review.

2.4.1 Defining nutrition status

Nutritional status denotes the human body's intake and use of nutritive and protective substances and reflects these in physical, physiological, and biochemical characteristics, functional capability, and health status (Shrivastava, Shrivastava & Ramasamy, 2014; Gurinovic *et al.*, 2017). Appropriate nutrition is a crucial determinant of nutrition status.

2.5 MEASUREMENT OF NUTRITIONAL STATUS

Nutritional assessment evaluates the nutritional status of individuals and groups within a population. The assessment reflects deficiencies, excesses and other dietary needs (Food and Nutrition Technical Assistance III (FANTA), 2016; Shamah-Levy *et al.*, 2018). The assessment of nutritional status can be defined as the interpretation from dietary, laboratory, anthropometric, and clinical studies. It is used to determine an individual or population's nutritional status as influenced by the intake and utilisation of nutrients (Gibson, 2005; Sonandi, 2018). This data is valuable in informing, guiding and tailoring relevant nutrition interventions, support programmes and policies (Gibson, 2005; Saltzman & Mogensen, 2013; Shrivastava, Shrivastava & Ramasamy, 2014).

The measurement of nutritional status involves two methods: direct and indirect. Direct methods deal with individuals and measure the objective criteria, including dietary evaluation methods, anthropometric methods, biochemical or laboratory methods and clinical methods. The indirect measurement uses community indices reflecting community nutritional status. These methods are summarised into ecological variables, economic factors and vital health statistics (WHO, 1995; Shrivastava, Shrivastava & Ramasamy, 2014; FAO, 2018a).

2.5.1 Direct methods

2.5.1.1 *Anthropometric methods*

Anthropometric measurements assess nutrition status using height, weight, skin-fold thickness, and circumference. It can be used to evaluate a specific population's nutrition status, such as children and adults. The advantage of using anthropometric measurements is that routine anthropometric measurements can suggest patterns of growth and development of an individual (Shrivastava, Shrivastava & Ramasamy, 2014; Madden & Smith, 2016). However, skilled personnel should carry out these measurements to yield accurate results

2.5.1.2 *Dietary evaluation methods*

According to the FAO (2018), direct and indirect dietary assessment methods are summarised in Figure 2.2.

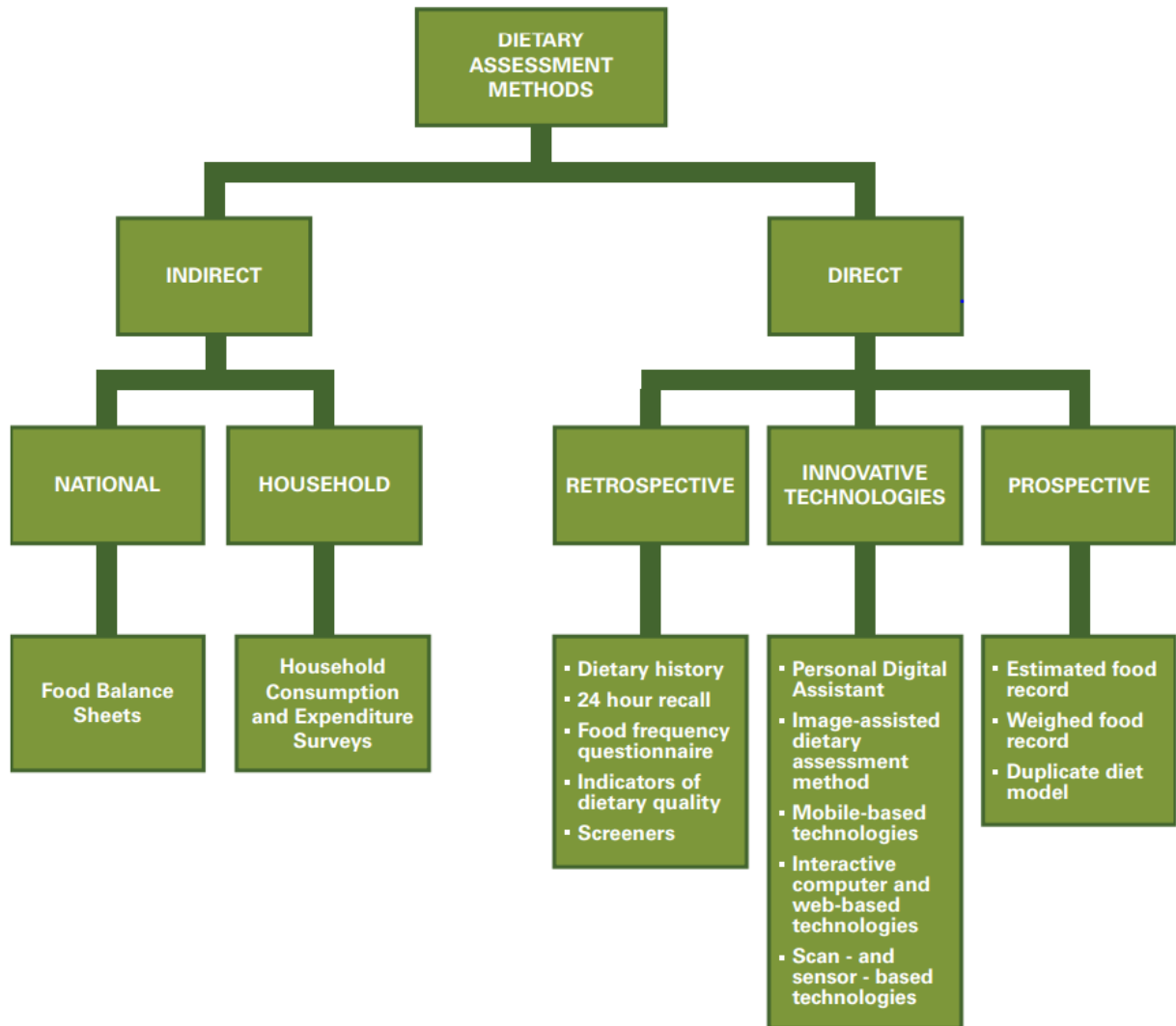


Figure 2.2: Dietary assessment methods (FAO, 2018a).

2.5.1.2.1 Direct methods of dietary assessment

The retrospective, innovative technologies and prospective approaches to dietary assessment are discussed below.

2.5.1.2.2 Retrospective direct methods

These methods gather data on foods and beverages that have already been consumed and rely heavily on the respondent's memory and ability to recall all items and portion sizes consumed over a given period.

Food models, food photographs, home measuring cups, spoons, and other tools can be used to determine the amount of food consumed. The most frequently used are food frequency questionnaires, 24-hour recall and diet records (FAO, 2018a; Yaghi *et al.*, 2022).

a) *Food frequency questionnaire*

This tool assesses the frequency with which foods and food groups are eaten over a certain period. Household dietary diversity can be measured from this data. HDDS is a tool that calculates the average of 12 major food groups consumed. The higher the score, the higher the dietary diversity and the lower the score, the lower the dietary diversity. The questionnaire includes a food list and a frequency category section with average food groups consumed daily (Shim, Kyungwon & Kim, 2014; Liu *et al.*, 2022; Yaghi *et al.*, 2022).

b) *24-hour recall*

This tool requires the respondents to recall and report all foods and beverages, with quantities, consumed during the preceding 24 hours, reflecting on the nutrient adequacy within the household. A single 24-hour recall is not enough to describe an individual's usual intake of food and nutrients. Multiple 24-hour recalls can increase quality control, minimising errors and maximising reliability (Napier & Oldewage-Theron, 2015; Ost *et al.*, 2017; Bailey, 2021).

c) *Dietary history*

A dietary history is a dietary assessment tool that describes the typical food intake of the respondent over a long period, usually six to 12 months (Guallar-Castillón *et al.*, 2014; Shim, Kyungwon & Kim, 2014; FAO, 2018a). It is used when an in-depth eating pattern and dietary intake over a relatively long period is required (Gurinovic *et al.*, 2017). This record includes a food list, estimates of portion sizes and a detailed description of food intake eating patterns (Gibson, 2005). While a highly trained enumerator is needed for this method, it still becomes burdensome to the respondent due to the long periods of data collection (FAO, 2018a).

2.5.1.2.3 Prospective direct methods

These methods use current food intake for dietary assessment. Respondents are interviewed at the time of consumption. They are more costly and labour-intensive than retrospective methods and depend on the respondents' literacy and numeracy skills (FAO, 2018a).

a) Estimated food records

The respondents provide information about food and beverages consumed in a specific period (one to seven days). The documented information includes details such as estimated food portions, cooking methods, time, occasion and location where the food was consumed (Shim, Kyungwon & Kim, 2014). Food recording occurs during meal times, limiting reliance on the respondent's memory, which can inconvenience the respondents and reduce reporting errors. The respondents must also be trained before participating to obtain accurate data (Ortega, Perez-Rodrigo & Lopez-Sobaler, 2015).

b) Weighed food records

This tool is also called a weighted food diary. It is similar to the estimated food records, but in this case, the enumerators quantify the respondents' food using weighing scales (Gurinovic *et al.*, 2017). The portion sizes and preparation methods record all food and beverages consumed. These records will be converted to obtain the nutrient intake of the respondents (Chinnock, 2006; Mueller-Stierlin *et al.*, 2021).

c) Duplicate meal method

This tool entails setting aside duplicate portions of foods and beverages consumed for a specific period. The enumerators or the respondents weigh the portions set aside. The nutrient intake is determined using laboratory chemical analysis (Shim, Kyungwon & Kim, 2014). In some instances, the enumerators lived with the household during the study period to weigh and create duplicate samples of all beverages and foods consumed, which are then subject to chemical analysis to measure nutrient content. This method can directly or indirectly be burdensome to the respondents, which is undesirable (FAO, 2018a). It also affects food waste and costs as duplicate portions are used.

2.5.1.2.4 Innovative technologies

Achieving standard dietary assessment results is challenging with the strengths and weaknesses of the current measurement methods. There is an emerging use of technologies to assess nutrition status to minimise inconsistencies, ensuring precision and reliability (Walton, 2015). Technology-based methods have been primarily used in developed countries. In contrast, most African countries and other less developed regions have relied on conventional methods (retrospective and prospective approaches). However, the use of technology has been slowly increasing (Wojtusiak, Gewa & Pawloski, 2011; FAO, 2018a).

The FAO has guided the use of innovative methods to increase their adoption. These technologies include personal digital assistants, mobile phones, and interactive computer software that seek to overcome manual methods' limitations while improving the precision and reliability of dietary information. Additionally, innovative technologies aim to reduce the cost of collecting and processing dietary information (Gurinovic *et al.*, 2017; FAO, 2018a; Zhao *et al.*, 2021). The new technologies have advantages as they do not rely on the participant's memory. Data is processed automatically and provides actual individual dietary information. However, these new technologies also have restrictions, including the practicality and cultural suitability of incorporating the latest innovative technologies in rural areas and low-resource settings, particularly among low-literacy groups (FAO, 2018a; Brenna, Johansen & Johansen, 2020).

2.5.1.2.5 Indirect methods of dietary assessment

These methods use secondary information to estimate food available for consumption at national and household levels, such as agricultural statistics and food expenditure and supply. They do not directly provide primary dietary data but help find food availability and consumption trends in different regions (FAO, 2018a).

a) Food balance sheets

They measure food consumption nationally (Baldwin *et al.*, 2017; van der Velde-Koerts, Rietveld and Boon, 2021), using food supply within a specific period, enabling assessment of the food available for consumption at a national level.

Food balance sheets present a comprehensive picture of a country's food supply over time. However, they are limited in providing information on the variability of food intake of individuals within a population (FAO, 2018a). The FAO statistical database (FAOstat) provides yearly food balance sheets of data for about 245 countries, which allows for standard data that can be compared within countries and regions (Rahman *et al.*, 2021; Al Hasan *et al.*, 2022).

b) Household consumption and expenditure surveys

These surveys measure food consumption at a household level, using food demand. It indicates household food consumption through multi-purpose surveys that collect various data, including information about food consumption and acquisition (FAO, 2016, 2018a; Joerin *et al.*, 2016). These surveys include the Household Budget Survey, Living Costs and Food Survey, Household Income and Expenditure Survey, Living Standards Measurement Study, Household Expenditure Survey and the Integrated Household Survey. The surveys above measure food consumption and its proxies (FAO, 2018a). They are regularly administered within countries to indicate consumer price indices, determine household living conditions and analyse poverty trends and income distribution (Molledo *et al.*, 2014).

c) Dietary diversity score

Dietary Diversity Score (DDS) is a proxy tool for food and nutrition security that stems from the notion that dietary diversity is a key critical element of diet quality, as a varied diet helps ensure adequate intake of essential nutrients that promote health (Ruel *et al.*, 2013). It assesses the food groups consumed over a certain period, as sufficient nutrients are necessary for optimum health in all stages of human life (Habte & Krawinke, 2016). DDS is classified as a Household Dietary Diversity Score (HDDS) and Individual Dietary Diversity Score (IDDS), which includes the Infant and Young Children Diversity Score (IYCDDS) and Minimum Dietary Diversity for Women score (MDDW) (FAO, 2018a). Dietary diversity at the individual level assesses micronutrient intake and reflects nutrient adequacy. At the household level, it assesses food access and the socio-economic status of the household (Nair, Augustine & Konapur, 2016).

2.5.1.3 Biochemical or laboratory methods

This method involves evaluating nutrient levels in the blood, urine or stools in the laboratory. The results provide trained professionals with information to detect nutrition status problems (Gibson, 2005; Food and Nutrition Technical Assistance III (FANTA), 2016). The results are precise, accurate and reproducible; however, this type of nutrition assessment is costly, time-consuming and cannot be used on a large scale (Shrivastava, Shrivastava & Ramasamy, 2014).

2.5.1.4 Clinical methods

Clinical methods assess the health status of the target group in light of the type of food consumed. It includes checking visible nutritional deficiencies and the presence of two or more signs of specific nutrition deficiency, which strengthens the significance of the results from the assessment (Food and Nutrition Technical Assistance III (FANTA), 2016). However, this method cannot quantify the level of nutrient deficiency. Biochemical analysis is usually needed to identify the nutritional status (Shrivastava, Shrivastava & Ramasamy, 2014).

2.5.2 Indirect methods of measuring nutrition status

These methods are categorised into ecological, economic and vital health statistics.

2.5.2.1 Ecological variables

These are environmental variables that could influence nutritional status, such as agricultural production (Gurinovic *et al.*, 2017). While it is difficult to quantify the influence of these factors, it is beneficial to identify them to indicate the possible factors that could affect nutrition status within the target group (Shrivastava, Shrivastava & Ramasamy, 2014; FAO, 2018a).

2.5.2.2 Socio-economic factors

These factors include socioeconomic and cultural habits and variables, such as household income, per capita income, food availability, food prices and the quality, accessibility and availability of healthcare services and diseases (Gibson, 2005; Gurinović, 2016; Sonandi, 2018).

2.5.2.3 Vital health statistics

This method uses statistics collected from population groups, which include data on mortality rates among vulnerable groups and morbidity rates of specific conditions that are used to assess the nutrition status of a particular community (Shrivastava, Shrivastava & Ramasamy, 2014; Gurinović, 2016).

2.5.2.4 Nutrition-related knowledge, attitude and practices

Measuring nutritional status may be complemented by assessing respondents' nutrition-related knowledge, attitudes and practices to better understand personal determinants of peoples' dietary habits (Marías & Glasauer, 2014). Literature shows that a mother's level of nutrition-related knowledge is significant as it determines their ability to provide optimum nutritional care for the household (Fadare *et al.*, 2019; Indris, Shaleka & Ashenafi, 2021; Melesse, 2021). Thus, nutrition educational interventions are among the sought-after means to enhance nutrition status (Saaka *et al.*, 2021; Jeihooni *et al.*, 2022).

2.5.2.5 Application of nutrition measurement methods

Each assessment method has strengths and limitations, and utilising them complementarily to assess the nutritional status gives an overall picture. In most cases, it is not feasible to use all methods. The research's purpose informs the methods used (Shrivastava, Shrivastava & Ramasamy, 2014). The costs and logistics will also determine the methods used (Herforth & Ballard, 2016).

Some researchers focus on the nutritional status of children as they are among the most vulnerable members of the household (Galgamuwa *et al.*, 2017; Amare, Ahmed & Mehari, 2019; Indris, Shaleka & Ashenafi, 2021), and the poor nutritional status of children is currently among the most significant concerns (FAO, IFAD, UNICEF, WFP, 2019; WFP, 2021). Wasting and stunting are the most common forms of malnutrition that researchers assess (Galgamuwa *et al.*, 2017; Myatt *et al.*, 2018; Chakraborty & Ghosh, 2020), where anthropometric measurement methods are primarily used.

Other research studies focus on women's nutritional statuses, which could be motivated by women's current nutrition vulnerability and their implications on general household food and nutrition status. Both anthropometric and dietary assessments are the most frequently used to measure female nutritional status (Gupta, Pingali & Pinstrip-Andersen, 2019; James *et al.*, 2022). Globally, 1 billion women are affected by at least one form of malnutrition (FAO *et al.*, 2020; James *et al.*, 2022). When women's health and quality of life are compromised, it not only affects their well-being but negatively affects children's development and learning in addition to the entire household, as most women are responsible for food handling and cooking (Vir, 2016; James *et al.*, 2022).

The discourse is also increasing in research on the impacts of gendered and nutrition-sensitive agricultural programs, where women's empowerment is identified as a pathway to improved household food and nutrition status (FAO, 2016; Schönfeldt, Pretorius & Hall, 2017; Sharma *et al.*, 2021).

The difference in nutrition status studies was brought about by the study's objectives, target groups, and thus the choice of indicators for nutrition status. To address the research void mentioned above, related to understanding nutrition-related vulnerabilities of farming households, individual dietary diversity (women of reproductive age and children) and nutrition-related knowledge were used to understand the nutrition component of food and nutrition security. These are retrospective methods relevant to Lesotho's rural and urban settings. Household food security indicators complemented these indicators to give a holistic insight into household food and nutrition security situation.

2.6 MEASURING HOUSEHOLD FOOD SECURITY

There are several challenges in measuring household food security. The absence of standard measurements makes comparing findings across different regions and cultures difficult. It also hinders the validation of different measurement approaches and conceptualisation. The different approaches can also show different food security results if areas are being compared, which must be interpreted cautiously (Jones *et al.*, 2013; Swanepoel, 2017).

Choosing an appropriate method to measure food security depends on the conceptualisation of the measured construct and the intended use of the data (Jones *et al.*, 2013). Since the study sought to understand the food security-related vulnerabilities of farming households, the frequently used indicators for the assessment of household food security will be discussed.

2.6.1 Household Food Insecurity Access Scale (HFIAS)

The Household Food Insecurity Access Scale (HFIAS) analyses participants' perceptions of household food security experiences over the previous month (four weeks). It uses domains and subdomains of experiencing household food insecurity and, more specifically, lack of access to food. Respondents give subjective responses on their experience of food insecurity (Coates, Swindale & Bilinsky, 2007; Castell *et al.*, 2015).

A set of questions that entails predictable reactions to the experience of food insecurity that can be summarised and quantified on a scale was developed by the Food and Nutritional Technical Assistance (FANTA). FANTA is part of the United States Agency for International Development (USAID) (Coates, Swindale & Bilinsky, 2007). The HFIAS has nine questions that cover three broad themes: i) anxiety and uncertainty about food access, ii) insufficient quality (variety, preferences, and social acceptability), and iii) insufficient food intake and the physical consequences (Coates, Swindale & Bilinsky, 2007; Pandey & Bardsley, 2019) and the questions are grouped by domains as follows:

- i. Anxiety and uncertainty about the household food supply:
 - Did you worry that your household would not have enough food?
- ii. Insufficient quality (includes variety and preferences of the type of food):
 - Were you or any household member unable to eat the foods you preferred because of a lack of resources?
 - Did you or any household member have to eat a limited variety of foods due to a lack of resources?
 - Did you or any household member have to eat some foods that you really did not want because of a lack of resources to obtain other types of food?
- iii. Insufficient food intake and its physical consequences:
 - Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
 - Did you or any household member have to eat fewer meals in a day, because there was not enough food?
 - Was there ever no food to eat of any kind in your household because of a lack of resources to get food?
 - Did you or any household member sleep hungry at night because of insufficient food?
 - Did you or any household member go all day and night without eating anything because there was not enough food?

Food insecurity access status of a household can be determined by categorising the scores obtained into four levels: severely food insecure, moderately food insecure, mildly food insecure and food secure (Coates, Swindale & Bilinsky, 2007).

2.6.2 Food consumption score

This method was developed by the World Food Program (WFP) and is a widely used variation of household dietary diversity. It indicates the quality and quantity of household diets (WFP, 2008; Leroy *et al.*, 2015). The score is calculated using the frequency of consumption of different food groups consumed by a household during the seven days before the survey. The analysis categorises each household as having either poor, borderline or acceptable food consumption (FAO, 2018a). There are different weights for each of the food groups that are applied to calculate the final

score, which will then reflect household food access (in relation to diet quality and quantity) as a dimension of food security (Carletto, Zezza & Banerjee, 2013; Swanepoel, 2017).

2.6.3 Income and household expenditure on food

The sources of income, the level and income stability indicate a household's food security status. It gives an insight into the household's economic access to acquiring food (Jones *et al.*, 2013; Swanepoel, 2017). Literature suggests that households with lower income levels are more likely to be food insecure than those with higher income levels (Chegini *et al.*, 2021; Khan *et al.*, 2022; Shuvo *et al.*, 2022). Food expenditure is another indicator of food security, as food insecurity is highly prevalent in households that spend a larger share of household income on food. Calculating the value of the amount of food purchased, the amount of food coming from self-production and food received as gifts is essential (WFP, 2016). Data on household food consumption and expenditures at the household level provides valuable information for measuring food security and is increasingly used for assessing a household's ability to procure food (Jones *et al.*, 2013; Zezza *et al.*, 2017; Russell *et al.*, 2018).

In the case of increased food prices, a higher share of total household expenditure will be spent on food, which can result in the household being more resource-constrained. Consequently, low-income households already consuming lower-cost foods tend to suffer the most. They are already opting for cheaper foods and will be forced to spend more on basic staples. It reduces the quality of their diets and the quantity of the least expensive foods that is consumed. Moreover, decreasing non-food expenditures like education and health is inevitable. The ultimate result is a compromised household food and nutrition security status and overall quality of life (Lele *et al.*, 2016; Abdallah, Fekete-Farkas & Lakner, 2021).

The use of complementary food security indicators, instead of a single indicator, better capture the different food security dimensions and components (Manikas, Ali & Sundarakani, 2023). Of the discussed indicators, this study will combine the food security and nutrition security indicators for measuring food and nutrition security as its single developmental goal (Ammar *et al.*, 2023). The Household Food Insecurity

Access Scale (HFAS), Households Dietary Diversity Score (HDDS), individual dietary diversity scores (minimum dietary diversity for women - MDDS, under-five children's dietary diversity - CDDS, dietary diversity for male adults - IDDS), nutritional knowledge and food expenditure as a share of income, will be employed to measure the food and nutrition security status of the farming households.

2.7 GLOBAL TRENDS IN FOOD AND NUTRITION SECURITY

Malnutrition is a worldwide challenge, with approximately 1.9 billion adults being overweight and 462 million underweight. Overweight or obese children account for 41 million under five, with 159 million stunted and 50 million wasted. Twenty-nine per cent (528 million) of women of reproductive age worldwide are anaemic (Dhuki, 2020; FAO *et al.*, 2021).

Under the shadow of the COVID-19 pandemic, global hunger rose in 2020. From 2019 to 2022, hunger increased in most of Africa, Asia, Latin America and the Caribbean, and hunger continued to grow in most subregions in 2021, but at a slower pace. Compared with 2019, the most significant increase was observed in Africa, in terms of percentage and number of people (FAO *et al.*, 2022).

The Prevalence of Undernourishment (PoU) increased from 8.0 to 9.3% from 2019 to 2020 and grew slower in 2021 to 9.8% (FAO *et al.*, 2022). Of the total number of undernourished people in 2021 (768 million), more than half (425 million) live in Asia and more than one-third (278 million) in Africa, while Latin America and the Caribbean account for close to 8% (57 million) (FAO *et al.*, 2022).

The COVID-19 pandemic micro-economic challenges occurred within countries and thus affected food and nutrition security. The Russia-Ukraine war exacerbated these challenges, as it came at a time when the pandemic had just hit countries. The war has had an enormous effect on global food systems due to the significant contributions Ukraine and the Russian Federation have on fuel production, fertilizers and food commodities like wheat, maize and sunflower oil (FSIN & Global Network Against Food Crises, 2023; World Bank, 2023).

The high cost of healthy diets, coupled with persistently high levels of income inequality, put healthy diets out of reach for around 3 billion people, especially people

experiencing poverty, in every region of the world in 2019 – slightly less than in 2017. Notably, only Africa and Latin America show an increase in the unaffordability of healthy diets between 2017 and 2019 (FAO *et al.*, 2020). While the most recent reports do not fully account for the impact of the COVID-19 pandemic on nutrition, it shows that in 2020, its impact on the affordability of healthy diets was significant. The world was sent into an economic recession, which increased the number of people who could not afford healthy diets in all regions, with Africa and Asia having the highest numbers (FAO *et al.*, 2022). Conflict, climate variability and extremes, as well as economic slowdowns and downturns, also raise hunger and slow progress in reducing malnutrition. These significant drivers are unique but not mutually exclusive, as they collectively detriment food security and nutrition by creating multiple, compounding impacts at many different points within our food systems (FAO *et al.*, 2021).

The State of Food Security and Nutrition Report indicated that many households cannot afford or access enough and varied nutritious foods. Consequently, there is a rapid rise in the number of children and adults who are overweight and obese in lower and higher-income countries alike. It is common to find undernutrition and overweight within the same community, household or even individual – it is possible to be both overweight and micronutrient deficient, for example. It is also known as the hidden burden of disease or hunger (FAO *et al.*, 2022; World Bank, 2023).

The occurrence of shocks and stressors, such as the natural disasters, inflation and conflicts, has become frequent and further compromises livelihood and food security. The Global Policy Report of 2023 highlights the facilitation of early warning systems and the establishment of anticipatory actions as critical approaches for reducing the impact of these shocks (International Food Policy Research Institute, 2023).

2.8 FOOD AND NUTRITION SECURITY IN SOUTHERN AFRICA

Hunger and malnutrition in Africa have been on the increase since the 1960s. During the 1970s, it is estimated that 30 million people were directly affected by famine and malnutrition. Despite the many interventions, malnutrition remains a growing challenge to the African continent. At nearly 20%, Africa has the highest prevalence of undernourishment (FAO, IFAD, UNICEF, WFP, 2019). In 2020, over one-third of the

people affected by hunger worldwide were from Africa. Hunger affected forty-six million (46 million) more people than in 2021 (FAO *et al.*, 2021).

Despite several interventions to enhance food and nutrition security, food insecurity in Southern Africa remains a major development challenge (Abdul Mumin & Abdulai, 2022). According to the Southern African Development Community (SADC) (2022), progress towards enhancing food and nutrition security is hindered by complex challenges, including gender inequalities, infectious diseases, malnutrition and marginalisation. Child malnutrition is another great concern. Food insecurity in the African continent is also exacerbated by the rapidly growing population, and the growth is not parallel with food production. Instead, food production had been decreasing (Ndhleve *et al.*, 2021; SADC, 2022).

These challenges directly affect the progress towards achieving SGD 2, which aims to eradicate hunger and improve nutrition by 2030 (FAO *et al.*, 2022). It threatens the possibility of realising the SGDs the same way the Millennium Development Goals were not achieved (Mahmoud, 2021).

Table 2.1 shows household food insecurity prevalence in Southern African cities, as indicated by The African Food Security Network (AFSUN) findings. The food insecurity access scale for households has been categorised have been presented. Blantyre (34%) and Johannesburg (44%) have the highest percentage of food-secure households, while Harare (2%) and Lusaka (4%) have the least. Eswatini (79%) and Harare (72%) have more severely food insecure households than the other cities. On the other hand, Blantyre (21%) and Johannesburg (27%) have the lowest number of severely food insecure households. The findings reflect that Blantyre and Johannesburg have better food and nutrition security than the other cities, while Eswatini and Harare have the worst food and nutrition insecurity situation.

Table 2.1: Percentages of household food insecurity in Southern African cities (N=6453)

Cities	Food secure (%)	Mildly food insecure (%)	Moderately food insecure (%)	Severely food insecure (%)
Windhoek - Namibia	18	5	14	63
Gaborone - Botswana	12	6	19	63
Maseru – Lesotho	5	6	25	65
Maputo - Mozambique	5	9	32	54
Manzini - Eswatini	6	3	13	79
Blantyre - Malawi	34	14	30	21
Lusaka – Zambia	4	3	24	69
Harare – Zimbabwe	2	35	24	72
Cape Town – South Africa	15	6	12	68
Msunduzi – South Africa	7	14	27	60
Johannesburg - South Africa	44	7	15	27
Total	17	7	19	57

Source: (Frayne, Crush and McLachlan, 2018).

Dietary diversity is also reflective of household food and nutrition security. Table 2.2 shows the diversity of diets of households chosen in Southern African cities and the percentage of households. The cities are Maseru, Harare, Gaborone, Cape Town, Johannesburg, Msunduzi, Blantyre, Windhoek, Manzini and Lusaka. More than 60% of the households consumed six or fewer food groups, and nearly a quarter consumed three or fewer. Most of these households have low dietary diversity, which explains the high malnutrition prevalence in these Southern African cities (Frayne, Crush & McLachlan, 2018).

Table 2.2: Percentage of household dietary diversity scores in Southern African cities (N=6453)

Number of food groups	% of households	Cumulative (%)
1	2	2
2	11	13
3	10	23
4	11	34
5	14	48
6	13	61
7	12	73
8	10	83
9	7	90
10	4	94
11	3	97
12	3	100
Total	100	

Source: (Frayne, Crush and McLachlan, 2018).

2.9 LESOTHO TRENDS OF FOOD AND NUTRITION SECURITY

The prevalence of malnutrition is high in Lesotho. Undernutrition has been the most dominant form of malnutrition, but overnutrition is also becoming a serious concern. Malnutrition has stalled the country's social and economic development, as it claims an estimated LSL1,97 billion (USD200 million) annually in GDP (African Union, 2016). The country is currently experiencing a triple burden of malnutrition, with stunting, micronutrient deficiencies and overweight across all age groups (WFP and UNICEF, 2019; WFP, 2023). While there has been progress towards reducing anaemia in women and stunting in under-five children, overnutrition and obesity have risen among children and adults. The prevalence of anaemia among women of reproductive age slightly decreased from 28.3% in 2012 to 27.9% in 2019. Stunting among under-five children decreased from 37.7% in 2012 to 32.1% in 2020. The frequency of overweight under-five children rose from 7.0% in 2012 to 7.2% in 2020. The prevalence of obesity among the adult population increased from 14.9% in 2012 to 16.6% in 2016 (FAO *et al.*, 2022).

Factors that hinder progress in fighting malnutrition include poverty, natural and disasters, low consumer demand for nutritious food, low agricultural productivity, little or no government prioritisation of nutrition issues, and limited commitment and capacity of local government units to deliver nutrition interventions (WFP and UNICEF, 2019).

Malnutrition has affected different age groups, including the most vulnerable groups (women and children) (Food and Nutrition Coordinating Office, 2018). Although economic progress and overall improvements in the health sector resulted in a 10% reduction in stunting from 2000 to 2014 (to 33%), the overall prevalence is still categorised as very high by WHO standards. It implies that 33% of Lesotho children under five years are stunted and unlikely to reach full mental and physical development potential. Increased stunting throughout a child's early years is also a sign of poor Infant and Young Child Feeding (IYCF). Stunting levels have increased from a moderate frequency (14%) among children under six months to a high prevalence (22%) among children aged 6–12 months and a very high prevalence (38%) among children aged 18–23 months (WFP and UNICEF, 2019).

Furthermore, adult (18 years and above) overweight and obesity rates have risen dramatically over the previous two decades (from 39% in 1999 to 54% in 2016) among women aged 18 and older, adding considerably to public health issues (WFP & UNICEF, 2019). Obesity levels among women in Lesotho are above the regional average of 20.7% and below the regional average of 9.2% in men (WFP, 2021). Lesotho is a clear case of a triple burden of malnutrition, with anaemia being common (51% of all children under the age of 5) and overweight growing more prevalent (45% of women 15-49 years of age are overweight or obese) (WFP & UNICEF, 2019).

Basotho households in rural areas rely on agriculture for their livelihoods, rendering them vulnerable to weather shocks in the form of heavy rains, early or late frost and drought (IFAD, 2018). Thus, food availability is compromised, causing poverty and hunger levels to increase. On the other hand, urban households are vulnerable to price increases as they depend on purchasing foods. They are forced to buy more carbohydrates for satiety, and the different food groups are minimally consumed. Their diets are also evolving from traditional to refined foods, which are low in nutritional quality (Food and Nutrition Coordinating Office, 2018).

The change in diets results from homogenous diets across borders due to the global food systems (Popkin, 2017; Ambikapathi *et al.*, 2022). This diet transition also causes an increased prevalence of overnutrition in most Southern African countries (Frayne, Crush & McLachlan, 2018). The Lesotho Vulnerability Assessment Report indicates that the country is currently experiencing a triple burden of malnutrition - high stunting, micronutrient deficiencies, overweight and obesity, across all age groups (WFP, 2023).

With the alarming malnutrition situation in Lesotho, there is limited research to inform interventions (African Union, 2016; Food and Nutrition Coordinating Office, 2018). A sustainable approach to addressing malnutrition requires a holistic view of the problem, which must appreciate all related sectors. Consequently, a multidisciplinary approach to addressing the challenge is imperative (Byerlee & Fanzo, 2019; Mpiira, Olobo Okello & Ali, 2019). Sectors that include social protection, education, health, water and sanitation, food and agriculture are nutrition-related. The contribution of each sector must be understood (Food and Nutrition Coordinating Office, 2018; Duncan *et al.*, 2022; WFP, 2023).

In understanding the role of each sector in fighting malnutrition, there is a need for empirical evidence on the extent and nature of malnutrition within different groups engaged in various sectors within the population, the factors affecting food and nutrition status (Neelakantan & Sonne, 2017; Setyawan & Lestari, 2021) and the identification of the contribution of different sectors to nutritional status. This is especially true for agriculture, a sector that contributes to the provision and procurement of food (Duncan *et al.*, 2022), economic development and whose significance in enhancing nutrition is becoming increasingly recognised (Byerlee & Fanzo, 2019; Pawlak & Kokodziejckak, 2020).

While malnutrition is a multisectoral challenge (Ouedraogo *et al.*, 2020; Coile *et al.*, 2021), research in Lesotho does not reflect this phenomenon. Research on the contribution of agriculture, in particular, and the sector's impact and linkages with food and nutrition status is limited. Understanding the role of the agricultural sector in yielding food and nutrition outcomes and its relationship with other sectors can benefit facilitation of a multisectoral approach to interventions and support programs (Duncan *et al.*, 2022). Moreover, the available nutrition-related studies in Lesotho used

anthropometric methods and clinical and vitality statistics as nutrition indicators with limited data on dietary assessment as a proxy for food and nutrition status (Makonnen, Venter & Joubert, 2003; Ranneileng, 2013; van den Berg, Seheri & Raubenheimer, 2014; Rothman *et al.*, 2019).

Despite being unrelated to agriculture, a study used anthropometric methods and dietary assessment as indicators for food and nutrition status among Basotho women. The study findings indicated a nutrition transition associated with increased consumption of processed, high-calorie, sugary, high-fat foods among the urban participants. These poor dietary practices may increase the risk of obesity and poor health outcomes. Developing culturally acceptable and relevant interventions were recommended (Rothman *et al.*, 2019). Some interventions to improve nutrition security include nutrition education (Food and Nutrition Coordinating Office, 2016; Ranneileng, Nel & Walsh, 2023). However, limited evidence exists on understanding the specific vulnerabilities and the effect of the ongoing interventions. Thus, more research is needed to guide the advancement of policy strategies and the development of relevant interventions for enhancing food and nutrition status.

Agriculture and the food systems contribute significantly to nutrition, health and food security. Agricultural produce, in the form of food, provides primary sources of energy and essential nutrients while simultaneously being a source of income and creating employment (Schönfeldt, Pretorius & Hall, 2017). However, literature shows a scarcity of information on the impact and pathways through which agriculture can improve food and nutrition security, as the absence of evidence does not imply that there is no impact (Webb & Kennedy, 2014; Schönfeldt, Pretorius & Hall, 2017; Sharma *et al.*, 2021). Lesotho is no exception, as ongoing agricultural activities could positively impact the challenges related to poor nutrition, yet their impact has not been determined.

Research findings show that food gardens improved the dietary diversity of the participants in Lesotho (Walsh *et al.*, 2020). A similar study was done earlier, which sought to investigate the contribution of household gardens to the nutritional status of pre-schoolers in Lesotho. The findings showed a significant association between home gardens and lower incidences of wasting and being underweight in children (Makhotla & Hendriks, 2004). The contribution of block farming to food security was

also investigated, and findings indicated the insignificant contribution of this type of farming to food security. The study focused on the food availability aspect of food security and not much on nutrition (Rantšo & Seboka, 2019).

In light of the many challenges brought by poor nutrition in Lesotho and the cited research voids, there is a need for more empirical evidence on agriculture and food and nutrition security. Identifying potential means to reduce malnutrition through different sectors would be worthwhile. According to the FAO *et al.* (2017), addressing malnutrition calls for transformation at all stages of the food chain and a broader approach that encompasses the entire food system. Thus, the linkages and associations between nutrition, agriculture and the food systems cannot be overlooked. Healthy diets are central to nutrition, and agriculture and food systems directly influence sustainable access and availability of healthy diets to consumers.

2.10 THE FACTORS AFFECTING HOUSEHOLD FOOD AND NUTRITIONAL STATUS

There is a paucity of studies that identify factors affecting household food and nutrition security. Most studies address factors affecting household food security or nutrition security, but not both. The factors that affect food security at household level have been researched in abundance (Abdullah *et al.*, 2019; Huluka & Wondimagegnhu, 2019; Nkomoki, Bavorová & Banout, 2019; Shuvo *et al.*, 2022), while this is not the case for the factors that affect nutrition security at the household level. Instead, most studies determine these factors at individual level (Galgamuwa *et al.*, 2017; Chakraborty & Ghosh, 2020).

The term “food and nutrition security” is used to combine the aspects of food security and nutrition security, and emphasises their relatedness. This study used food and nutrition security as a concept that integrates food security and nutrition security. However, the factors influencing the two concepts are first discussed separately, as it is mainly done in the literature.

2.11 FACTORS AFFECTING HOUSEHOLD FOOD SECURITY

The factors that affect food security differ with the level of interest: global, regional, national, household and individual. Therefore, it is crucial to identify factors that affect food security at different levels, as these cannot be addressed similarly (Abdullah *et al.*, 2019). Household food insecurity is influenced by several factors that will inform development planning (Swanepoel, 2017).

The determinants of food security have been researched in several countries that include Nigeria (Kassy *et al.*, 2021), Kenya (Chenge, 2015), Niger (Zakari, Ying & Song, 2014), Ghana (Aidoo, Mensah & Tuffour, 2013; Antwi & Lyford, 2022), Zimbabwe (Mango *et al.*, 2014), South Africa (Maziya, Mudhara & Chitja, 2017; Swanepoel, 2017), Ethiopia (Biyena, Wondu & Mewded, 2021; Awoke *et al.*, 2022), Zambia (Nkomoki, Bavorová & Banout, 2019), Iran (Rahim *et al.*, 2011), Bangladesh (Mannaf & Uddin, 2012) and Lesotho (Muroyiwa & Linakane, 2021). All these studies were not on a national level. Depending on the research objectives, only a particular section of the country's population formed part of the study. It highlights the voids in identifying these factors for other population categories.

These studies used different indicators for food security and various methods of analysis. Some of the food security indicators that are largely utilised include Food Consumption Score (Nkomoki, Bavorová & Banout, 2019), Household Dietary Diversity (Swanepoel, 2017; Ngema, Sibanda & Musemwa, 2018) and Household Food Insecurity Access Scale (Maziya, Mudhara & Chitja, 2017; Sekhampu, 2017; Swanepoel, 2017). Despite the difference in methodologies, the most common factors that influence household food security among them are age, education level, employment status, household income, food prices and land ownership (Ngema, Sibanda & Musemwa, 2018; Abdullah *et al.*, 2019; Nkomoki, Bavorová & Banout, 2019). Even during the COVID-19 pandemic, food prices, income levels, education and wealth status were found to be significant determinants of household food security (Ibukun & Adebayo, 2021; Das Shuvo *et al.*, 2022; Syafiq, Fikawati & Gemily, 2022). This study was conducted when the effects of COVID-19 on food and nutrition security were still lingering (FAO *et al.*, 2022) and shows if the pandemic brought any changes in the factors that influence food and nutrition security.

2.12 FACTORS AFFECTING HOUSEHOLD NUTRITION SECURITY

Household nutritional status is determined by household income, food prices, the level of nutrition knowledge, parental education, household size and access to food (Pourghasem, Pourjavid & Alibeigi, 2013). Neelakantan and Sonne (2017) stated additional factors, such as care, women's empowerment, health, water and sanitation. According to Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) (2014), the main factors determining household nutrition security include food, health and care and women empowerment.

2.12.1 Food

Access to and the availability of nutritious and healthy foods and the ability to acquire the foods by purchasing or producing them determine household nutrition security. The availability and accessibility of healthy food is not enough. The body's ability to efficiently metabolise nutrient-rich foods is also key, and this is dependent on the environment's health, water quality and accessible sanitation and health facilities (Verhart *et al.*, 2015; Neelakantan & Sonne, 2017; Bountogo *et al.*, 2021). For farming households, agriculture contributes significantly to food access and availability. Agriculture promotes access to food through the consumption of the produce or income generation that enables food purchases. Food availability and access are additionally determined by access to markets and related supply chain logistics. Facilities, such as roads, markets and means of transport play a significant role in linking agricultural producers to consumers, even if the consumers produce food for self-consumption (Neelakantan & Sonne, 2017; Pawlak & Kokodziejczak, 2020).

2.12.2 Care

Care and child feeding practices are women's responsibilities in most households. This has made women's empowerment another critical factor that determines household nutrition as they play a pivotal role in the functioning of the household (FAO, 2016; Gupta, Pingali & Pinstrup-Andersen, 2019; Mahofa, Sukume & Mutyasira, 2022). Care deals with the time, attention, skills and support provided to meet the household's mental, social, and physical needs. These include preparing nutritious

and healthy food that meets the needs of all household members. In most cultures, this is women's responsibility, which calls for understanding nutrition and nutritious food items. Access to resources, knowledge of foods, skills and the time to execute nutrition practices are central to proper household care (FAO, 2016; Neelakantan & Sonne, 2017).

2.12.3 Women's agency and empowerment

Women play a vital role in the household's functioning, ensuring that their own nutritional needs and those of other household members are met (Madzorera and Fawzi, 2020). Women's empowerment contributes to household nutrition through their role in decision-making in food production on the farm, food utilisation (storage, preparation and consumption), the spending of income, the distribution of food within the home, women's access to good healthcare, access to water and sanitation facilities, nutrition-related knowledge and practices, together with the ability to care for themselves and their households (Verhart *et al.*, 2015; Mahofa, Sukume & Mutyasira, 2022). An increasing number of studies suggest that women's empowerment is also a pathway in which agriculture can have a positive impact on nutrition (FAO, 2016; Schönfeldt, Pretorius & Hall, 2017; Odenigbo, Elabor-Idemudia & Geda, 2018; Sharma *et al.*, 2021). Women's decision-making on credit has been linked to their dietary diversity (Hawkes *et al.*, 2020). Farm income gives women the means to purchase food and other household necessities. However, increasing women's productivity and income alone is insufficient to improve women's nutritional status. Additional actions are required to ensure that women have access to production resources, decision-making power over productive assets and income from all sources to act on their nutrition knowledge (Madzorera & Fawzi, 2020).

2.12.4 Health, water and sanitation

Health and nutrition have a mutual relationship. When an individual's health is poor, the body cannot properly utilise the ingested food. On the other hand, malnutrition results in poor health (Verhart *et al.*, 2015). Some indicators that assess household health include access to primary health facilities, the incidence of ill health and expenditure on health facilities and health-related items (Laokri, Soelaeman & Hotchkiss, 2018). Public health through access to water and sanitation is also critical

to nutrition. Unimproved water sources are prone to contamination, which can lead to the prevalence of diseases such as diarrhoea (Shrestha *et al.*, 2020). Poor sanitation can also be linked to malnutrition. In addition to toilet availability and usage, hand washing is another critical component of hygiene (Neelakantan & Sonne, 2017).

2.13 FACTORS AFFECTING THE INDIVIDUAL (WOMEN, CHILDREN AND THE ELDERLY) NUTRITION STATUS

Literature shows that studies on the factors that affect nutrition status typically focus on a specific group within the household (Acharya, Bhatta & Timilsina, 2017; Galgamuwa *et al.*, 2017; Amare, Ahmed & Mehari, 2019). The studies focus primarily on children, women of reproductive age and older people, who are among the most vulnerable groups within the household. Even though the determinants of the nutrition status of these groups may differ, some factors apply to all groups (Edris, Atnafu & Abota, 2018; Gitagia *et al.*, 2019; Sekartaji *et al.*, 2021; Sisay *et al.*, 2022).

The significant factors associated with children's nutritional status include household size and income, nutrition-related knowledge of the caretaker, place of residence, employment and education level of the caretaker (Galgamuwa *et al.*, 2017; Amare, Ahmed & Mehari, 2019). The main determinants of the nutrition status of women of reproductive age include marital status, food adequacy, residency, education, nutrition-related knowledge, diversity of food produced on the farm, household income and size (Mtumwa, Paul & Vuai, 2016; Acharya, Bhatta & Timilsina, 2017). As for the elderly group, factors such as education level, health, income or economic status and gender affect their nutrition status (Agarwalla, Saikia & Baruah, 2015; Ghosh *et al.*, 2017).

2.14 FACTORS AFFECTING FOOD AND NUTRITION SECURITY

This section considers the determinants affecting household food and nutrition security and individual nutrition security.

2.14.1 Education level

At the household level, the education status of the household head has been positively associated with food security (Sekhampu, 2017). Higher education levels are associated with a good nutrition status. In a study conducted among rural women in Nepal, it was observed that respondents who had attained an education level beyond secondary schooling had a better nutritional status compared to those with a lower education level. Educated mothers tend to be better able to use healthcare facilities, interact freely with healthcare providers, comply with treatment recommendations, and keep their living environment clean (Acharya, Bhatta & Timilsina, 2017). However, Mtumwa, Paul and Vuai (2016) found the opposite, where urban women with a primary school education were less likely to be affected by chronic undernutrition than women with secondary or higher education. It was because women with primary school education were mainly housewives, and their spouse or partner was employed. Subsequently, this results in adequate time to care for themselves and their households.

Compared to children whose mothers had no education, children whose mothers had secondary or higher educational attainment were less likely to be stunted (Amare, Ahmed & Mehari, 2019; Sekartaji *et al.*, 2021). It is also relevant to older people, as malnutrition was associated with no education (Rahman *et al.*, 2021; Obeng *et al.*, 2022). Children whose mothers are illiterate were found to be more underweight and stunted, and improvement in mothers' education could impact the children's education positively (Gibson, 2016; Galgamuwa *et al.*, 2017; Chakraborty & Ghosh, 2020).

2.14.2 Household size

Large household sizes have been negatively associated with household food and nutrition status, affecting all household members. Households with fewer household members were likely to have a higher food and nutrition status, as these households would need to procure less food (Acharya, Bhatta & Timilsina, 2017; Sekhampu, 2017). Household size plays a significant role, especially if there is low access and food availability (Assefa, Belachew & Negash, 2015; Maziya, Mudhara & Chitja, 2017; Abdullah *et al.*, 2019).

2.14.3 Healthy environment – sanitation and hygiene

Undernutrition has been associated with poor Water, Sanitation and Hygiene (WASH) household practices. Diarrhoea-associated infections also result from poor WASH practices. Their prevalence tends to inhibit the absorption of nutrients by the body and may lead to compromised immunity, thus causing a cycle of infections and undernutrition (Mshida *et al.*, 2018; Shrestha *et al.*, 2020). WASH practices are strongly associated with the nutritional status of children and women in less developed countries, and improvements in WASH could significantly reduce disease and dietary deficits (Edris, Atnafu & Abota, 2018; Zavala *et al.*, 2021).

2.14.4 Nutrition-related knowledge of the mother/caretaker

Mothers or caretakers with better knowledge of the best methods to attain good nutrition, that is, through the consumption of sufficient and various types of foods, had a significantly better nutritional status than their counterparts. The educational and social level of the primary caretakers of the family will, to a great extent, also determine their own household's health, as well as their health (Acharya, Bhatta & Timilsina, 2017; Edris, Atnafu & Abota, 2018). Maternal education and knowledge are also critical for improved maternal and child nutrition. Efforts to strengthen household economic status, increase the farmers' benefits from agriculture, and empower mothers to earn income and make decisions, complemented with nutritional and public health services, are more likely to improve both child and maternal nutrition, especially in regions with the highest burden of malnutrition (Acharya, Bhatta & Timilsina, 2017; Fadare *et al.*, 2019).

2.14.5 Area of residence

Whether a household resides in rural or urban areas tends to determine its members' food and nutrition security (Edris, Atnafu & Abota, 2018). Women living in rural areas are likely to be more nutrition insecure than those in urban areas (Mihretie, 2018a). Child dietary diversity has also been associated with the place of residence (Kundu *et*

al., 2022; Sisay *et al.*, 2022). Dietary diversity among older people is also influenced by the area of residence (Zhang & Zhao, 2021; Chalerm Sri *et al.*, 2022). Since the place of residence affects the availability and access to food, services and facilities, household and individual dietary patterns and behaviours tend to differ (Monge-Rojas, Vargas-Quesada & Gómez, 2022).

2.14.6 Food adequacy

Availability and access to sufficient and nutritious food is the main component of food and nutrition security (Pangaribowo, Gerber & Torero, 2013). Households with adequate quantity and quality of food are likely to be more secure than those without. Research findings by Acharya, Bhatta and Timilsina (2017) show that recently, women who had experienced food inadequacy seemed to have poor nutrition status. It will affect the food and nutrition status of all household members, as food quality and quantity are essential for good nutrition and health (Neelakantan & Sonne, 2017).

2.14.7 Marital status

Women's marital status is a significant determinant of nutritional status (Acharya, Bhatta & Timilsina, 2017; Mihretie, 2018a). Women's marital status significantly affects food and nutrition security, as malnutrition rates are higher in unmarried and divorced/separated women than in married women. Also, malnutrition was more likely in women who never married than married women or those living with their partner. Interestingly, the prevalence of malnutrition in widowed or divorced women was lower than that of married women or those living with their partner (Mtumwa, Paul & Vuai, 2016). Elderly people who are single, widowed or divorced are significantly more vulnerable to malnutrition when compared to elderly people who are married (Agarwalla, Saikia & Baruah, 2015; Mathew *et al.*, 2016; Ghosh *et al.*, 2017).

2.14.8 Employment

The household head's employment status has been significantly associated with the food security level in some studies (Mutisya *et al.*, 2016; Niankara, 2018). Other

findings have found the opposite; the employment of the household head was not associated with household food security (Santos *et al.*, 2022). Women's employment is an important positive as it implies increased household income, especially where women are household heads, which translates into the ability to purchase healthy food and meet other financial obligations for a good quality of life. However, employment also takes up time to care for the households, which requires time management skills. It could negatively impact women, children and other household members if it is not well managed (Galgamuwa *et al.*, 2017; Townsend *et al.*, 2017). The elderly's inability to work and sometimes not afford the lives they had when they could generate income affects their ability to procure basic needs (Putri & Lestari, 2018).

2.14.9 The education status of the mother or caretaker

This factor applies to children, as their nutrition status was found to be dependent on the care they receive from their mothers or caretakers. A higher level of education is positively associated with stunting in children (Edris, Atnafu & Abota, 2018; Amare, Ahmed & Mehari, 2019).

2.14.10 Health and access to health facilities

Individuals who have access to health facilities have good nutritional status as compared to those who don't. Access to health centres had a significant association with nutritional status. Ease of access to health care and the quality thereof affects nutritional status, which is usually a challenge in rural areas (Acharya, Bhatta & Timilsina, 2017; Mihretie, 2018a). Older people are vulnerable to malnutrition as ageing results in deteriorating health. Their depleting oral, physical, social and mental health are associated with undernutrition or overnutrition (Leslie & Hankey, 2015; Ghosh *et al.*, 2017; Wong *et al.*, 2019). Mental health, in particular, has also been identified as a determinant of nutrition status among the elderly (Rahman *et al.*, 2021). Malnutrition and depression are among the major illnesses in the ageing population (Al-Rasheed *et al.*, 2018).

2.14.11 Dietary practices and eating habits

Household dietary intake and food habits determine food and nutrition status. Adherence to these practices in children strongly and significantly affects their nutritional status. Consumption of inadequate and poor-quality food substantially increases children's malnutrition (Galgamuwa *et al.*, 2017; Chakraborty & Ghosh, 2020). It is also true for women and other household members, as consumption of fast foods with low nutrient content is among the deadly causes of obesity and overnutrition (FAO *et al.*, 2020), and this is prevalent among Basotho women (Rothman *et al.*, 2019).

2.14.12 Gender

Gender is another factor that affects food and nutrition status, as women of reproductive age are among the most vulnerable groups within the household. It also applies to the elderly population (Leslie & Hankey, 2015; Ghosh *et al.*, 2017). Malnutrition among the elderly people has been reported to be higher in females than males (Bardon *et al.*, 2021; Rahman *et al.*, 2021). Literature shows that even with children, gender is a determinant of nutrition status (Galgamuwa *et al.*, 2017; Chakraborty & Ghosh, 2020).

2.14.13 Diversity of food produced on the farm

Diversified farm produce is a prospect for food-secure households. While there are underlying dimensions that link production diversity on the farm and consumption diversity in the farm household, there is a likelihood for a positive relationship because smallholder farmers are likely to consume what they produce (Sibhatu, Krishna & Qaim, 2015). Other findings show that smallholder farmers, especially those who practice commercial agriculture, are more likely to consume less than the required calories per adult equivalent per day, which is somewhat unexpected (Ntakyio & van den Berg, 2019).

2.14.14 Household income

Economic status is the most common determinant of food security in food and nutrition security studies (Ngema, Sibanda & Musemwa, 2018; Abdullah *et al.*, 2019). Higher-income households can procure good quality and sufficient food and have better access to improved water access and health services that are prime to food and nutrition security. Thus, malnutrition in children tends to be expected in children from lower-income households (Galgamuwa *et al.*, 2017). Literature shows that lower-income women were more likely to have a poor nutrition status than their counterparts with higher income levels (Mtumwa, Paul & Vuai, 2016; Acharya, Bhatta & Timilsina, 2017; Mihretie, 2018a). The elderly are mostly unemployed and may have challenges producing or purchasing food, they tend to score lower on nutrition and food security indices. Even though some rely on grants, gifts, or pension schemes, their quality of life usually changes with ageing. Those with a low income tend to have a poorer diet and are at risk of malnutrition (Leslie & Hankey, 2015; Mihretie, 2018a; Mothepu, 2020).

2.14.15 Livelihood assets

“A livelihood comprises the capabilities, assets, and activities required for a means of living. It is deemed sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities, assets, and activities now and in the future while not undermining the natural resource base” (Serrat, 2017). The Sustainable Livelihoods Framework (Figure 2.3) illustrates food security as one of the main well-being outcomes (Chambers & Conway, 1992; Manlosa *et al.*, 2019). The household’s livelihood activities directly affect food security and nutrition. Thus, achieving food and nutrition security is significantly influenced by accessibility to appropriate and stable livelihood assets (Yazdanpanah *et al.*, 2021; Mukwedeya & Mudhara, 2023).

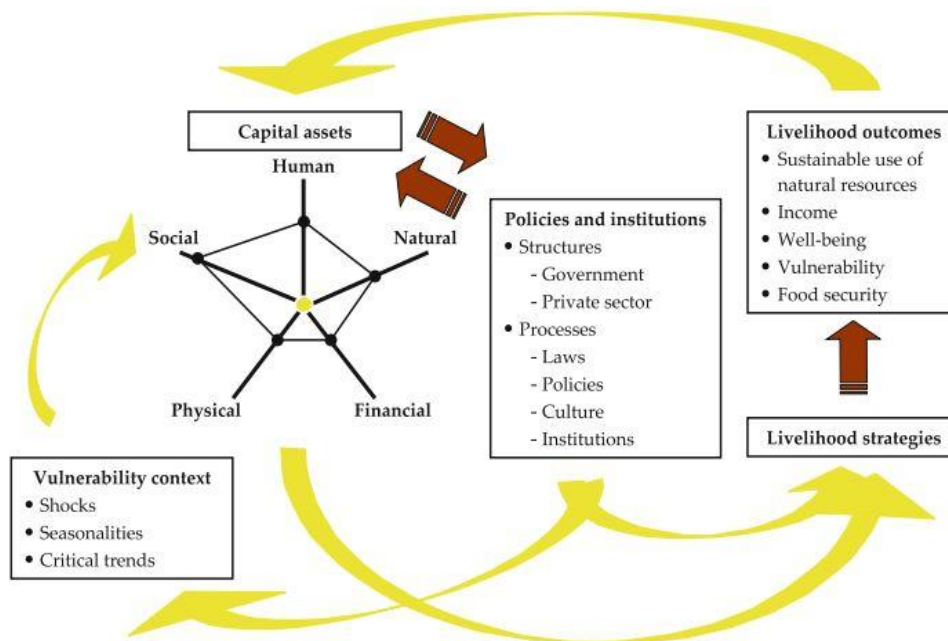


Figure 2.3: Sustainable Livelihoods Framework (Serrat, 2017).

Table 2.3 shows the classification of livelihood assets into human, social, natural, physical and financial assets (Gibson, 2016; Yazdanpanah *et al.*, 2021). These assets are necessary inputs for both agricultural and non-agricultural livelihoods. Eventually, the livelihood activities with the support of transforming structures and processes (policies and institutions) are expected to yield positive food and nutrition security outcomes, among others (Ehteshammajd *et al.*, 2022; Mukwedeya & Mudhara, 2023).

Table 2.3: Livelihood assets

Livelihood Assets	Description
Natural capital	Environmental resources include land, forests, water, livestock and plants.
Financial capital	These are liquid assets, such as income, savings, credit, pension, remittances and other assets that can be sold for cash.
Physical capital	Infrastructure that includes roads, energy, water and sanitation, communication, electricity, shelter, and farm production inputs. These are critical to the production phase of livelihoods.
Social capital	It entails social resources, such as group associations, networks and societal institutions supporting livelihood objectives.

Human capital	It consists of an individual's skills, knowledge, health, abilities, education, family and community that support their productivity and livelihoods.
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(Source: Gibson, 2016)

2.15 AGRICULTURAL LIVELIHOODS

Agriculture has been recognised as an important source of livelihood, positively contributing to food and nutrition security. This ideology is the basis for most agriculture-oriented developmental approaches (Ogutu, Gödecke & Qaim, 2020; Bezabih *et al.*, 2022; Khatri *et al.*, 2023). The type of agriculture practised is mainly informed by the purpose of farming and the availability of resources. The following are the common categories of agriculture.

2.15.1 Subsistence agriculture

This type of agriculture involves producing more for household consumption than for sale. Surplus is stored or sold to the market, but the household's food needs mainly inform production. It uses traditional farming methods on rain-fed land with minimal to no agricultural inputs (fertilisers, pesticides, machinery) (Nieuwoudt, 2000; Wharton, 2017). Its advantages include being ecologically friendly, with resilient and locally adapted species and cultivars. Producing a variety of commodities increases the likelihood of increased dietary diversity, reducing dependence on purchasing foods. However, this type of farming is often characterized by low productivity (Burlingame, Vogliano & Eme, 2019).

2.15.2 Emerging agriculture

This type of farming is a combination of subsistence and commercial agriculture. Farmers produce intending to participate in the market and aspire to commercialise their agricultural produce fully (Senyolo, 2007). Emerging farmers' participation in the market is limited because of various challenges, and these farmers need support to

increase the production of marketable agricultural produce and respond accordingly to market demands (World Bank, 2017).

2.15.3 Commercial agriculture

Commercial agriculture is a market-oriented farm production. Farmers mainly produce to meet the food demands of the markets. There is a use of advanced technologies with the size of land ranging from small to large depending on the scale of production (Babu & Gajanan, 2022; Muzekenyi, Zuwarimwe & Kilonzo, 2022).

2.16 COMMERCIALISATION OF AGRICULTURE

The commercialisation of agriculture is defined as “the transformation from subsistence production (production for own consumption) to producing for sale” (Kathmandu, 2015). The market demands inform farmers’ production and not simply selling surplus produce (Raj & Hall, 2020). The commercialisation of subsistence agriculture can take different forms. It can occur when agricultural outputs produced for the market have increased, and it can also happen when the inputs for production have been improved (Von Braun, Bouis & Kennedy, 1994).

2.16.1 Expectations of commercial agriculture

Commercialising agriculture is a form of development (Janssen, Linderhof & Berg, 2018) as the transition from subsistence (or semi-subsistence) to commercial agriculture is expected to contribute to economic growth and alleviation of poverty, especially in developing countries. Agricultural commercialisation enhances trade and efficiency, increasing wealth and improving welfare (Zhou, Minde & Mtigwe, 2013; Abdullah *et al.*, 2017). Commercialisation may enable the specialisation and adoption of technologies, resulting in increased yields and, thus, increased expected profits. This additional income may allow smallholders to purchase sufficient healthy foods in the market, enhancing their nutrition (Ogutu, 2018; van Asselt & Useche, 2022).

2.16.2 Criticisms on the impact of commercial agriculture

The criticism of commercial agriculture dates back to the 1970s when it was argued that commercialising agriculture did not contribute to poverty alleviation. The findings indicated that commercialising agriculture only benefited higher-income groups of farmers and did not improve the lives of people experiencing poverty. It was also suggested that if commercialisation were impactful, issues such as land distribution would have to be resolved (von Braun, 1995; Mellor & Malik, 2017). Other study findings have also suggested that commercialised farming households are not necessarily food and nutrition-secure, as they use income generated from farming for other household needs (i.e. education) and not healthy diets. In other instances, the majority of the food produce is taken to the market without leaving enough for household consumption (Ntakyo & van den Berg, 2019; Hervas & Isakson, 2020).

Agricultural production contributes the most to greenhouse gas emissions, resulting in climate change. Commercial agriculture strives for productivity and profitability while producing at a large scale. The environment is degraded in meeting the current diet demands (Garnett *et al.*, 2016; Development Initiatives, 2021). Contenders against the shift from subsistence to commercial agriculture argue that there are cases where countries use more resources to produce agricultural export produce. These resources could instead be invested in producing food for the local economy, subsequently contributing to reducing malnutrition (von Braun, 1995; Babu & Gajanan, 2022).

2.16.3 Impact of commercial agriculture on food and nutrition security

The role of agricultural commercialisation in enhancing food and nutrition security has continually received attention from researchers (Carletto, Corral & Guelfi, 2017; Ogutu, 2018; van Asselt & Useche, 2022). The discourse on the nutritional impact of agricultural change from subsistence to commercial dates back to the 1970s. There was a consensus that the effect depends on several factors, such as economic status, access to markets, gender of the farmer and occupation.

It was observed that agricultural developments, including commercialisation, did not benefit the low-income groups (Dewey, 1981; von Braun, 1995). Consequently,

agricultural development programs with an element of commercialisation have been largely targeted towards poor farming households (Von Braun, Bouis & Kennedy, 1994; Linderhof, Janssen and Achterbosch, 2019; van Asselt and Useche, 2022). A market-oriented approach is expected to result in increased food availability at national, community and household levels and improve livelihoods and food security of the involved households and their communities. Increased household income is an expected outcome, thus improving household consumption, food security and nutritional outcomes (Ochieng *et al.*, 2015; Carletto, Corral & Guelfi, 2017).

2.16.4 Research void

While agricultural commercialisation continues to be a perused approach for development, there is insufficient empirical evidence on its effect on household food and nutrition security, especially in developing countries. Moreover, evidence of a relationship between increased commercialisation and improved food security and nutritional status is still minimal and inconclusive (Carletto, Corral & Guelfi, 2017; Linderhof, Janssen and Achterbosch, 2019). There is insufficient scientific evidence on the effectiveness of commercial agriculture in yielding expected outputs, notably in relation to food and nutrition security (Komatsu *et al.*, 2019). Some findings indicate that although the nutritional effect of agricultural production exists for children, it does not exist for adults (Slavchevska, 2015). Others show a significant impact on women's nutrition, which also benefits children (Rao & Pingali, 2018). To the researcher's knowledge, no study has looked into commercial agriculture and food and nutrition security in Lesotho. Thus, the current research investigated the role of commercial agriculture on household food and nutrition security in Lesotho.

2.16.5 Global trends in commercial agriculture

The transition from subsistence-oriented to market-oriented agriculture is seen across the globe, occurring for decades in other countries. China and India are examples of cases of commercialisation. The commercialisation of agriculture started in 1816 and peaked in 1860 during British rule in India (Lakishmi, Hemarathi & Padma, 2017), and participation in contract farming significantly contributed to food security. Medium and

large-scale farmers benefited more than small-scale farmers (Kumar, 2006; Babu & Gajanan, 2022). In China, commercial agriculture was reported to have improved calorie and protein intake, significantly reducing food insecurity (Babu & Gajanan, 2022). Additionally, the support from agricultural policies in China was well designed to support commercial farmers, resulting in increased income for commercial farmers. The regulation of prices was among the main issues that the policies considered and implemented (Hejazi & Marchant, 2017).

2.16.6 Commercial agriculture in Africa

Most developing countries, especially in Africa, aim to increase agricultural productivity as an important part of their development plans. It has come with increased investment in the agricultural sector, government pledges, and commitment to public spending under the Comprehensive Africa Agricultural Development Programme (CAADP), endorsed as part of the New Partnership for Africa's Development (NEPAD). Significant donors, including the World Bank and the Bill and Melinda Gates Foundation, have supported agriculture in African countries through several interventions. The agricultural sector in Africa is experiencing a rapid shift from subsistence to commercial agriculture to eradicate hunger and improve livelihoods and economic growth (Smalley, 2014; Etuk & Ayuk, 2021; World Bank, 2022a). Historically, commercial farming in sub-Saharan Africa, in particular, has been described as unstable and yielding unexpected outcomes. Glover and Jones (2019) suggested that the impact of commercial agriculture, especially on smallholder farmers, remains controversial. For better results, the factors that influence the success of commercial agriculture developments must be researched and considered in development planning (Smalley, 2014).

2.17 COMMERCIAL FARMING IN LESOTHO

Commercial agriculture is still in its infancy, as most commercial farmers are not fully commercialised and still produce on a small scale (World Bank, 2019c). Lesotho's agriculture is characterised by smallholder farmers with limited land, which hinders large-scale production by individual farmers. It also results in the lack of capacity to

meet the national market demands. Most farmers produce at a subsistence level, as most of the produce is consumed by households (Millenium Challenge Corporation, 2018).

Farmers' challenges are mainly related to limited access to production resources. The constraints include little arable land, outdated farming methods and management practices, inadequate irrigation and drainage systems, weak rural infrastructure, and limited credit and investment capital access. Additionally, erratic climatic events and land degradation contribute to low productivity (Millenium Challenge Corporation, 2018; World Bank, 2019a). Small-scale farmers also have to compete with the already developed commercial sector, affecting their market survival (Lesotho National Farmers Union (LENAFU), 2020; Muroyiwa & Linakane, 2021).

Despite the challenges in Lesotho's agricultural sector, the commercialisation of agriculture is one of the currently pursued approaches for development. Lesotho's government and donor support have invested in commercialising agriculture, increasing production and encouraging market participation in the last decade. Consequently, the country has seen the mushrooming of commercial farm enterprises. Some farmers have received inputs, while others have also received capacitation on running commercial farm enterprises. The support has been made available to emerging farmers and those wishing to expand existing farm enterprises. All forms of assistance, including the provision of inputs, were a starting point for farmers that led to commercial farm development. However, some farms are still self-funded and do not benefit from additional subsidies (World Bank, 2019a).

The World Bank, through the Smallholder Agriculture Development Project (SADP), is a significant donor towards agricultural commercialisation and increased productivity in Lesotho (Millenium Challenge Corporation, 2018; Rantlo, Nyanguru & Muroyiwa, 2021). The government and donor support primarily focused on providing grants for greenhouses, shade nets, small-scale irrigation systems, and basic training on production and record-keeping. Inputs, such as shade nets and tunnels, combat frequent erratic weather conditions that do not favour open-field farming, particularly for commercial purposes. Although this support was sufficient to help most entrepreneurial farmers take off, it was not always enough to help them efficiently compete with imported produce in formal markets (World Bank, 2019c).

2.17.1 Commodities produced by commercial farmers in Lesotho

A commercial vegetable farmer survey indicated that Lesotho's commercial farmers primarily produced tomatoes, peppers, cabbage and lettuce (World Bank, 2019c). Dairy cattle, goats, sheep, poultry and piggery are the most kept livestock, while wool and mohair are the most exported livestock products. However, the overall sectoral growth is hampered by the farmers' inability to increase farm productivity, stabilise production and negotiate access to processing and marketing value chains with the private sector and business community of Lesotho. Thus, Lesotho still suffers from underdevelopment and is sustained by imported food (Johane, Makama & Rizvi, 2021). Given the expected outcomes from commercial agriculture and prevailing challenges, it is the researcher's interest to investigate the impact of the farmers' involvement in commercial farming on their well-being, particularly their food and nutrition security.

2.18 CONCLUSION

The literature review chapter has presented the food and nutrition security concept and the methods of measurement. The factors that influence food and nutrition security have also been covered. Food and nutrition trends and the role of commercial agriculture have been discussed. In light of the demonstrated persistence of food insecurity and malnutrition challenges and their implications on the development agenda, the phenomenon needs further exploration through research. This study will contribute to the body of knowledge through the empirical findings that yield a better understanding of the specific food and nutrition security-related vulnerabilities and the role of commercial agriculture in reducing the vulnerabilities.

CHAPTER 3 :

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter relates the research methodology used to address the questions and objectives. The research design and target population are described. The sampling processes and ethical considerations are outlined. Data collection and analysis approaches are also conveyed.

3.2 RESEARCH DESIGN

This is a cross-sectional study, and an exploratory research approach was used to investigate the research questions. This study adopted both qualitative and quantitative approaches. The two approaches complement each other, providing depth and breadth to the research outcomes (Creswell, 2014; Sonandi, 2018).

3.2.1 Qualitative approach

This approach reflects people's views and perspectives and covers the contextual conditions within which people live (Yin, 2011; Creswell, 2014). In this study, it was used to establish the opinions of key informants on the contribution of commercial agriculture to household food and nutrition security. It was used to supplement the quantitative outcomes and to get a comprehensive understanding of the significance of agriculture on the food and nutrition security of farming households.

3.2.2 Quantitative approach

This approach used numeric expressions to measure variables and assess trends and relationships between variables (Creswell, 2014).

The methods were used for the following:

- To establish the food and nutrition security status of the farming households. The study used recommended standard tools that are quantitative. These tools include the Household Food Insecurity Access Scale, Household Dietary Diversity Score, Minimum Dietary Diversity for Women, Child Dietary Diversity Score and Share of Food Expenditure.
- To assess the factors influencing the food and nutrition security status of the farming households. Quantitative methods enabled the estimation of relationships between dependent and independent variables.
- It was used to estimate the significance of commercial agriculture on household food and nutrition security. Since research on this phenomenon is limited, a fuller understanding was sought, and quantitative methods alone were insufficient to understand the effect.

3.3 STUDY AREA/ LOCATION

Lesotho is a small, low-middle-income country landlocked by South Africa. It has a population of about 2.2 million. The nation is faced with widespread poverty rates throughout the country, especially in rural areas (FAO, 2019; World Food Programme (WFP), 2023). Over half (57%) of the population lives below the national poverty line, and 34% fall below the extreme poverty line, with the poverty rate at about 49.7% (World Bank, 2020).

Agriculture is a significant source of livelihood for 70% of the population residing in rural areas and contributes to 7% of the country's GDP (FAO, 2019; World Bank, 2020). The most significant (75%) total agricultural output comprises livestock and semi-intensive and intensive production of pigs and poultry (free-range) goats and sheep on rangelands in the foothills and highland areas. Sheep and goats dominate the livestock sector and are reared mainly for wool and mohair (FAO, 2019). Most rural populations are subsistence farming: rain-fed, undiversified farming, primarily cereal production and extensive livestock grazing characterise the sector (Lesotho National Farmers Union (LENAFU), 2020; World Bank, 2020).

Lesotho's agricultural sector suffers from low levels of productivity and commercialisation, which has made the country heavily dependent on food imports to meet domestic consumption needs (World Bank, 2020). Productivity challenges in the sector include limited size of arable land, unfavourable farm structures, outdated farm technologies and farm management practices, limited technical expertise, sub-optimal use of inputs, lack of adequate irrigation and drainage system, a weak rural infrastructure, an undeveloped rural advisory system, limited access to credit and investment capital. In addition, the country has experienced severe land degradation. Massive soil erosion and loss of scarce agricultural land have resulted in deficient agricultural productivity levels (FAO, 2019; World Bank, 2020).

The country is vulnerable to extreme weather events, particularly floods and drought, which affect the productivity of agriculture. The country's development challenges are food insecurity, low agricultural productivity, modifiable disease outbreaks, and poverty. Lesotho is also experiencing a triple burden of malnutrition - high stunting, micronutrient deficiencies, overweight and obesity, across all age groups (World Bank, 2020; WFP, 2023).

Despite the challenges, the agricultural sector in Lesotho is growing, with both subsistence and commercial farming pushing against the climate changes that have significantly lowered agricultural production in the country. The Ministry of Agriculture, Food Security and Nutrition has seen a vigorous transition from subsistence to commercial farming, as the high employment rate in the country is forcing citizens to seek other means of making a living. However, commercial farmers are still relatively small, on average 8-10 hectares, representing the smallest group of farmers in Lesotho. Some of the farms are self-funded, and others rely on the government's and its partners' support.

3.4 STUDY POPULATION

The target population for a survey is the entire set of units for which the survey data are used to make inferences. Thus, the target population defines those units for which the survey findings are meant to be generalised (Lavrakas, 2008). This study focused on commercial farmers in Lesotho who were reached through extension officers. Subsistence farmers were the control group. There are ten districts in Lesotho, and

the sample size was drawn from four districts of Lesotho: Mafeteng, Berea, Thaba-tseka and Quthing Districts, each representing the four agro-ecological zones in the country: Lowlands, Foothills, Mountains and Senqu River Valley, respectively (Bureau of Statistics (BOS), 2016).

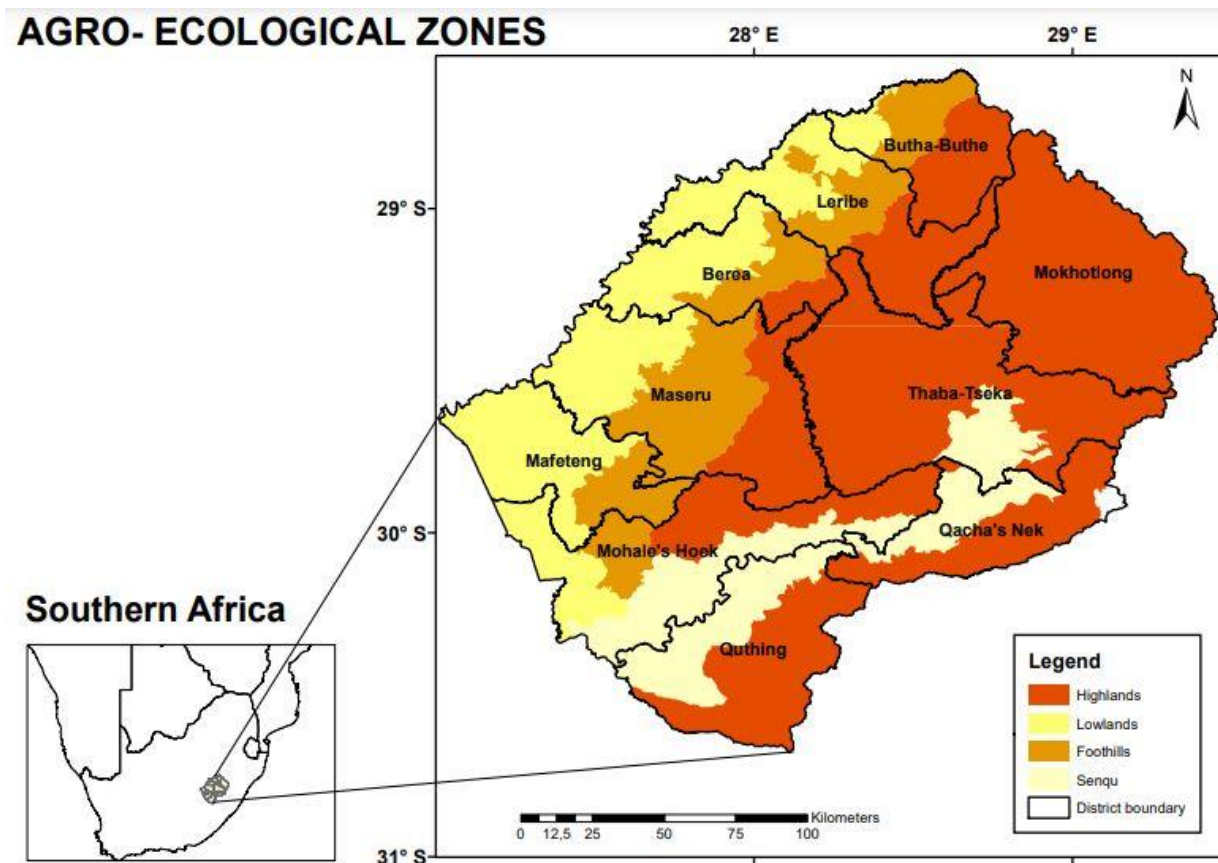


Figure 3.1: Agro-ecological zones in Lesotho

3.5 SAMPLE

A multi-stage sampling technique was employed for the quantitative approach. In the first stage, four of the ten districts of Lesotho were selected. Mafeteng, Berea, Thaba Tseka and Quthing Districts are representative of the four agro-ecological zones in the country: Lowlands, Foothills, Mountains and Senqu River Valley respectively (Bureau of Statistics (BOS), 2016). The second stage involved a selection of 13 district constituencies, which were determined through the guidance of extension officers focusing on those that were concentrated with active farmers. In the last stage, 22

villages were selected from constituencies, and 236 farming households were randomly selected to participate in the study. The farming households had to be involved in farming for at least five years. Both male and female adults (18 years and above) participated in the study. At least ten subsistence farmers from each district served as a control group and were selected at random.

Two hundred and eighteen (218) respondents were randomly selected from four districts (Berea, Thaba Tseka, Quthing and Mafeteng). The sample size was calculated using the following formula:

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

where n=sample size; N=population size; C=Coefficient of variation, which is $\leq 30\%$; e=margin of error fixed between 2-5%). The study sample was calculated at a 30% coefficient of variation and a 2% margin of error for low variability and minimising error (Nassiuma, 2000).

This number was increased by 10% to derive 240 households to compensate for non-responses and reduce the margin of error. However, due to incomplete answers, four responses were excluded during data cleaning, and 236 questionnaires were ultimately used.

A qualitative approach was adopted to establish the perspectives of key informants on the contribution of commercial agriculture to household food and nutrition security. Individuals who were professionals and practitioners in agriculture, food security and nutrition were targeted and purposefully selected. A total of 13 key informants, including nutrition officers, academics, agricultural economists, agricultural project officers and extension workers, participated in the study. A saturation point occurred at the 13th participant and the data collection for this section ended. Their expertise and years of experience (12 months and above) in the industry are relevant to the phenomena being investigated. Hence, their input would be valuable.

3.6 DATA COLLECTION

Data were collected from April to June 2022 in four Districts of Lesotho: Berea, Mafeteng, Quthing and Thaba Tseka. The respondents were 181 commercial farmers

and 55 subsistence farmers who served as the control group. Questionnaires were used to collect quantitative data. The researcher and trained enumerators administered the questionnaire face-to-face to ensure a thorough understanding of the questions and minimise a low response rate (Miller & Brewer, 2003). Qualitative data were collected through face-to-face interviews with the key informants.

3.6.1 Instruments that were used for data collection

3.6.1.1 *Semi-structured interview schedule*

A semi-structured interview schedule is often used in qualitative research and contains pre-determined questions to prompt a discussion between the participant and the interviewer (Magaldi & Berler, 2020; Yin, 2011). An interview schedule (Appendix B) was used to ascertain the opinions and perceptions of key informants on the contribution of agriculture to the food and nutrition security of farming households. It was used to obtain insights into the phenomena being investigated from professionals and practitioners in the industry.

Qualitative data was collected to determine the contribution commercial agriculture to the food and nutrition security of the farming households in Lesotho. The data will complement the quantitative aspect to provide an in-depth understanding.

3.6.1.2 *Questionnaire*

A questionnaire was used to collect quantitative data. It comprises a set of questions on a specific topic and is commonly used in quantitative research (Peterson, 2000). The questionnaire was used to address the following objectives:

1. To determine the food and nutrition security status of commercial and subsistence farming households in Lesotho.
2. To determine the factors that affect the food and nutritional security of the farming households in Lesotho.
3. To assess the contribution of commercial agriculture to the food and nutrition security of the farming households in Lesotho.
4. To assess the characteristics of the food and nutrition security clusters.

3.6.2 Questionnaire questions

The questionnaire comprised of the following sections:

1. *Demographics*

- Age, education and marital status of the respondent
- Household size

2. *Household Income*

- What are the sources of income?
- What are the levels of household income?
- Are the income sources stable?

3. *Household composition*

- How many males, females, children and elderly do the household have?
- How many income earners does the household have?
- How many dependents does the household have?

4. *Household expenditure*

- What are the household's main monthly expenses?
- What is the monthly household food expenditure?
- What is the share of food expenditure on household monthly spending?

5. *Access to facilities*

- Do the households have access to water and sanitation facilities?
- Do the households have access to input and output markets?

6. *Household food and nutrition security*

- What types of foods are consumed mainly by farming households?
- What are the primary sources of food in the area?
- What are the household's experiences with food insecurity?

7. *Nutrition-related knowledge*

- Have the households received any nutrition-related knowledge in the recent past?
- Who is the most knowledgeable on proper nutrition?
- Are the households equipped with nutrition knowledge and skills?

8. *Women's responsibilities*

- Are women's responsibilities related to the household's food and nutrition security status?

- Does women's decision-making relate to household food and nutrition security status?

9. *Agricultural production*

- Do the farming households have access to resources (land, credit, extension workers)?
- Are the farming households beneficiaries of agricultural development programs?
- Which vegetables, grains and fruits do the households produce?
- Which livestock do the households keep?

10. *The role of agriculture in food and nutrition security*

- What are the opinions and perspectives of the farming households and key informants on the contribution of commercial agriculture to food and nutrition security?

3.7 PILOT STUDY

A pilot study was conducted to pretest of the main research. Amendments informed by this phase were incorporated into the measuring instrument, and the enumerator's misinterpretations were corrected. Most of the respondents could not provide accurate measurements of their land, and could not remember the quantity of their harvest 12 months before data collection. Since this would affect the data quality, the questions were rephrased. Repetitive questions that were identified during the pilot study were edited.

3.8 DATA ANALYSIS

3.8.1 The level of household food and nutrition security status among farming households

The choice of indicators used in this study is guided by the objectives of the research and the logistics incurred in using the methods. The following tools were used to get a representative assessment of the household food and nutrition security status.

3.8.1.1 Socio-economic characteristics

Descriptive statistics, including frequencies, means and standard deviations, were used to present the socio-economic characteristics.

3.8.1.2 Child dietary diversity score

The score is computed from a count of 7 groups, based on the food consumption of under-five children (6-59 months) the previous day. Children who consumed four or fewer food groups had a higher likelihood of micronutrient inadequacy than their counterparts who consumed four or more food groups.

3.8.1.3 Household Dietary Diversity Score

The score was computed from a count of 12 groups based on the food consumed by the household seven days before the interview. A higher score is associated with a diverse diet and an increased economic ability to procure various foods (FAO, 2018a). The average score was used to categorise the household dietary diversity into low (0-3), medium (4-5) and high nutritional diversity (6-12) (Otekunrin *et al.*, 2021; Sambo, Oguttu & Mbombo-Dweba, 2022).

3.8.1.4 Minimum Dietary Diversity for Women (MDDW)

A score was calculated from the food groups consumed by women of reproductive age, using a score ranging from 0 to 10 from 10 MDD-W groups. Each woman was then coded "yes" or "no" for scoring ≥ 5 , followed by calculating the proportion of women who scored from 5 to 10, indicating the percentage of those who achieved minimum dietary diversity who are likely to have adequate micronutrient intakes. Descriptive statistics, including percentages and means, were used to present the food group diversity (FAO, 2016; Chakona & Shackleton, 2017).

3.8.1.5 Household Food Insecurity Access Scale

Frequencies were used to present the data into the following categories: food secure, moderately food insecure and severely food insecure, as indicated by the Food and Nutritional Technical Assistance (FANTA) (Coates, Swindale & Bilinsky, 2007). This measure is a food security proxy that suggests the quality and quantity of food available to the households.

3.8.1.6 Food expenditure as a share of household expenditure

Monthly household food expenditures were presented, and the share of food expenditure on total household expenditure was calculated.

ANOVA was used to test for statistical significance between the means for different districts while the Independent T-Test tested for statistical significance between means for types of farming which the households have undertaken. P-values that were equal to or below 0.05 were interpreted as significant.

3.8.2 The factors affecting household food and nutrition security among farming households

The regression techniques and principal factor analysis have primarily been used to analyse factors that determine household food security (Zakari, Ying & Song, 2014; Swanepoel, Van Niekerk & Van Rooyen, 2018; Abdullah *et al.*, 2019; Huluka & Wondimagegnhu, 2019).

In the current study, a multiple linear regression model was employed to determine the factors associated with Child Dietary Diversity Score (CDDS), Household Food Insecurity Access Scale (HFIAS), Household Dietary Diversity Score (HDDS) and the Minimum Dietary Diversity for Women (MDDW).

3.8.3 The significance of commercial agriculture on household food and nutrition security

Due to the absence of historical data on the study group (commercial farmers), a control group (subsistence farmers) was used for a matching comparison to assess the contribution of commercial agriculture to household food and nutrition security. Propensity score matching is a quantitative method that matched the control and treatment groups and evaluated the effect as employed in similar studies (Swanepoel, 2017; Ngarava, Mushunje & Chaminuka, 2021; Okyere & Usman, 2021). Propensity score methods remove bias by balancing covariate distributions between treated and untreated groups (Leite, 2017). However, it is noted that since this technique matches the treatment and control group, its validity may be slightly compromised in studies where the control group is smaller than the treatment group (Stuart, 2010). Thus, such findings must be interpreted cautiously (Bryson, Dorsett & Purdon, 2002).

Content analysis was used to analyse qualitative data on the opinions and perceptions of key informants regarding the contribution of commercial agriculture to household food and nutrition security. Data were analysed using themes, and the findings were presented in a descriptive narrative form (Creswell, 2014; Lune, 2017).

3.8.4 To assess characteristics of the food and nutrition security clusters

From previous indicators of food and nutrition security, indicators that were most differentiating on household food and nutrition security levels were selected for cluster analysis to try to identify groupings of the indicators within the same cluster that were relatively homogenous. The aim was to identify clusters that could be characterised as severely food and nutrition insecure, moderately food and nutrition insecure, and food and nutrition secure.

The characterising variables included different food and nutrition security indicators, socio-economic indicators and agricultural production factors. The classification is expected to arrange data so that the objects in one cluster are similar yet different from objects in other clusters.

3.9 STRENGTHS AND LIMITATIONS

This section highlights the strong points and the areas that may be improved for future studies.

3.9.1 Strengths

- Using both qualitative and quantitative methods strengthened the study's validity.
- The study addressed food security and nutrition security as a single development goal (food and nutrition security), thus covering the dimensions of both concepts.
- The study used validated and widely used instruments for the measurement of food and nutrition security.
- Different methods for assessing food and nutrition security were used to better capture the different food security dimensions and components and attain a clear depiction. It also improved the validity of the findings.
- The study represented all four agroecological zones in Lesotho. Therefore, findings can be generalised to all farming households in Lesotho.

3.9.2 Limitations

- The cross-sectional study limited the comprehensive assessment of the contribution of commercial agriculture to household food and nutrition security. In addition, it does not capture seasonal variation, as diets can change with agricultural seasons.
- Some of the questions depended on the respondents' memory, and the accuracy of remembering was challenging to some.
- Respondents were sometimes uncomfortable responding to specific questions related to household income. However, the training, pilot study and close monitoring of the data collection process in the first weeks improved the data quality.
- The under-five children among the farming households totalled 75, which may not be representative. Thus, results must be interpreted with caution.
- A 24-hour recall has been used to compute the individual dietary diversity scores. While this is common in most previous studies in this context, it does

not capture day-to-day variation. However, this was also compensated by deriving a household dietary diversity score from a 7-day recall.

3.10 ETHICAL CONSIDERATIONS

Research ethics ensures that research that involves human beings respects the protection of their rights. Ethical clearance was sought from the University of the Free State Research Ethics Committee (UFS-HSD2021/1888/21) (Appendix A). The objectives of the study were conveyed to the participants to ensure comprehension before participation. The respondents were also informed that their identity would be protected and that their information would be accessed by those involved in the study. It was further conveyed to the respondents that they had a right to withdraw at any point during the process. After explaining the research and the rights of the respondents, a consent form was signed.

3.11 CONCLUSIONS

The methodology chapter has introduced the study area, target group and sampling procedures. The data collection and analysis methods have been stipulated, together with the ethical considerations. The study employed qualitative and quantitative research approaches to address the research questions, which yields a comprehensive understanding of the research topic.

CHAPTER 4 :

HOUSEHOLD FOOD AND NUTRITION SECURITY STATUS AMONG FARMING HOUSEHOLDS

ABSTRACT

The prevalence of food insecurity and malnutrition remains a serious concern in developing countries. Unexpectedly, farming households tend to experience these challenges. The study sought to understand the food and nutrition security-related vulnerabilities of farming households in Lesotho. The participants consisted of 236 farming households. Household food and nutrition security has been assessed using different indicators that include the Minimum Dietary Diversity for Women (MDDW), under-five Children's Dietary Diversity Score (CDDS), Individual Dietary Diversity Score for male adults (IDDS), household dietary diversity score, Household Food Access Scale (HFIAS) score, and food expenditure as a share of household expenditure.

The HFIAS findings indicate the prevalence of varied levels of food insecurity for 60% of the farming households. The individual dietary diversity scores (MDDW, CDDS and IDDS) informed by a 24-hour recall show low dietary diversity among the majority of women of reproductive age (79.4%), under-five children (72%) and male adults (65.4%). However, the HDDS results show consumption of a varied diet seven days before data collection. Thus, it suggests that households can afford varied diets weekly and not daily.

The difference in food and nutrition security status is mostly more significant within the districts than in farming types. The findings from Household Dietary Diversity Score (HDDS), HFIAS, Minimum Dietary Diversity for Women (MDDW), and Individual Dietary Diversity Score (IDDS) for male adults and under-five children's Dietary Diversity Score (CDDS) show significant differences in food and nutrition security status within the four districts. HDDS, food expenditure as a share of total household expenditure and HFIAS indicated significant differences in food and nutrition security status between commercial and subsistence farmers.

Household food and nutrition insecurity is most prevalent in the highlands (Thaba Tseka), followed by the Senqu Valley (Quthing) and less prevalent in the lowlands (Mafeteng), followed by the foothills (Berea). The overall average monthly food expenditure for the surveyed districts is LSL1578.15 (USD100)¹, with Berea having the highest (LSL1673.36 – USD107) and Quthing the lowest (LSL1404.17 – USD90). Berea also has the highest share spent on food, and Thaba Tseka has the lowest. Commercial farmers have the lowest percentage spent on food than subsistence farmers.

Leaving out sugar, oils and fats, the farming households primarily consume cereals, green leafy vegetables, legumes and flesh meats. Purchasing is the primary source of procuring food, and self-production comes second. Cereals, oils and fats and flesh meats have the highest cost. The farming households are experiencing food and nutrition insecurity. The findings have policy implications highlighting the nutrition-sensitivity of agricultural interventions that capitalise on the role of agriculture in enhancing food and nutrition security and self-sufficiency.

Keywords: dietary diversity, household food insecurity access scale, commercial farming

4.1 INTRODUCTION

Ensuring food and nutrition security is an important agenda for most developing countries. Food insecurity and malnutrition have been a burden bearing detrimental implications on development in the past decades. With the COVID-19 pandemic and the Russia-Ukraine war, food insecurity and malnutrition levels have risen significantly (FAO *et al.*, 2022).

Food security is also a challenge for farming households in developing countries, which is unexpected (Herrera *et al.*, 2021). Involvement in agricultural production is often associated with improved food and nutrition security. The ongoing research on linkages between agriculture and food and nutrition security emphasises the need for nutrition-sensitive agricultural interventions for food and nutrition security outcomes (Schönfeldt, Pretorius & Hall, 2017; Sharma *et al.*, 2021). Agriculture must be

¹ Exchange rate (average) as on March to June 2022 – LSL 1=USD15.67 (<https://www.exchangerates.org.uk/USD-ZAR-exchange-rate-history.html>)

maximized for increased impact to enable access to healthy diets, as this is central to reducing malnutrition and realising the human right to food.

Like other African countries, malnutrition and food insecurity are a concern in Lesotho, as 7.13% of the GDP is lost to chronic malnutrition. Among other food security related challenges, dietary diversity is low, owing to limited access to various food groups. While improvements have been made in the health sector, malnutrition remains a serious concern. Additionally, there is high inability to afford healthy diets due to insufficient resources to procure these foods (African Union, 2016; WFP and UNICEF, 2019). Lesotho is currently experiencing a triple burden of malnutrition, high stunting, micronutrient deficiencies and overweight and obesity across all age groups (WFP, 2023).

Limited information is available to understand the specific food and nutrition-related vulnerabilities within the households in Lesotho (WFP & UNICEF, 2019). This information is needed to inform relevant development plans. With the increasing attention placed on understanding the links between agriculture and food and nutrition security, there is an overarching need to gather empirical evidence to support the development of interventions and programs that fight malnutrition in all its forms.

This chapter seeks to estimate the food and nutrition security status of farming households in Lesotho, which includes assessing the household's access to healthy diets. Clinical and anthropometric indicators are the most accurate in assessing the nutrition component but are less appropriate for evaluating the food accessibility and availability and dietary quality, which was the focus of this study (FAO, 2018a; Sonandi, 2018). Thus, the attention will be directed towards the dietary assessment aspect of food and nutrition security.

4.2 OBJECTIVE

To determine the food and nutrition security status of farming households in Lesotho.

4.3 HYPOTHESIS

Households involved in commercial farming are significantly more food and nutrition-secure than households engaged in subsistence farming.

4.4 METHODOLOGY

4.4.1 Study area and population

The study focused on farming households in Lesotho. The farmers were accessed through extension workers. There are ten districts in Lesotho, and the sample size was drawn from four districts: Mafeteng, Berea, Thaba-tseka and Quthing. Each district represents the four agroecological zones in the country: Lowlands, Foothills, Mountains and Senqu River Valley, respectively (Bureau of Statistics (BOS), 2016). A total of 236 farming households were randomly selected as participants. Within the households, members who were responsible for meal planning and food preparation participated in the study. It was done to improve the accuracy of the data collected.

4.4.2 Data collection

A questionnaire was used to collect qualitative and quantitative data. The researcher and trained enumerators administered the questionnaire face-to-face to ensure a thorough understanding of the questions and to minimise a low response rate. The questionnaires were administered at the farmers' homes or farms. Food and nutrition security indicators were selected based on the purpose of this study. The validated and widely used indicators were employed to understand the food and nutrition security of the farming households, and the following sets of questionnaires were part of the instrument:

i. Socio economic questionnaire

This questionnaire contains data on various socio-economic aspects of a household.

ii. Child dietary diversity questionnaire

Quantitative data on the foods that were consumed by under-five children the previous day was gathered in this section. The score measures the nutrient adequacy in the children's diets (FAO, 2018a).

iii. Minimum Dietary Diversity for Women (MDDW) questionnaire

Respondents were asked questions related to food consumed by women of reproductive age the previous day. The MDDW indicator is a quantitative measure of

dietary diversity and micronutrient adequacy central to the diet quality of women of reproductive age. It is associated with a higher probability of nutrient adequacy for 11 micronutrients (Adubra *et al.*, 2019; Chakona & Shackleton, 2017; FAO and Family Health International (FHI 360), 2016).

iv. Household Dietary Diversity questionnaire

The tool collected data on the foods consumed by the household seven days before the data collection, excluding foods consumed outside the home. The Dietary Diversity Score (DDS) is indicative of the diet quality as a varied diet helps ensure adequate intake of essential nutrients for optimal health (Ruel *et al.*, 2013). An increase in dietary diversity at the household level was positively associated with household food security (Hoddinott *et al.*, 2002; FAO, 2018)

v. Household Food Insecurity Access Scale (HFIAS) questionnaire

Data collected in this section provided the participants' subjective responses relating to their experiences of food insecurity. A set of questions that entails predictable reactions to the experience of food insecurity that can be summarised and quantified on a scale was developed by the Food and Nutritional Technical Assistance (FANTA) (Coates, Swindale & Bilinsky, 2007). The HFIAS questions cover three broad themes: i) anxiety and uncertainty about food access, ii) insufficient quality (variety, preferences, and social acceptability), and iii) insufficient food intake and the physical consequences (Coates, Swindale & Bilinsky, 2007; Pandey & Bardsley, 2019).

vi. Individual Dietary Diversity Score (for male adults)

Respondents were asked to provide information on the foods consumed by male adults (> 18 years) in the past 24 hours. The tool measures dietary diversity for male adults (Dolui *et al.*, 2023; Otekunrin *et al.*, 2023).

4.4.3 Data analysis

The food and nutrition security of the farming households was assessed using the following indicators:

i. Household food insecurity access scale

A score was computed from the nine questions assessing the household's food insecurity experiences four weeks before data collection. The score enabled the categorisation of the farming households into food secure, mildly food insecure, moderately food insecure and severely food insecure (Ndhleve *et al.*, 2021; Otekunrin *et al.*, 2021; Santos *et al.*, 2022; Honarvar *et al.*, 2023).

ii. Household dietary diversity score

The households provided information on the consumption of different food groups seven days before data collection. The score was computed based on the consumption of 12 food groups: cereals, roots and tubers, vegetables, fruits, flesh meats, eggs, legumes, nuts and seeds, milk and milk products, oils and fats, sugar and condiments. The average score was used to categorise the dietary diversity of the farming households into low dietary diversity (0-3 food groups), medium dietary diversity (4-5 food groups) and high dietary diversity (6-12 food groups) (Huluka & Wondimagegnhu, 2019; Walsh *et al.*, 2020; Shuvo *et al.*, 2022; Sambo, Oguttu & Mbombo-Dweba, 2022).

iii. Minimum dietary diversity for women

The respondents provided a 24-hour recall of the food groups consumed by women of reproductive age (18-49 years). A score was built from the ten food groups: starchy staples, legumes, nuts and seeds, all dairy, flesh meats, eggs, vitamin A-rich dark vegetables, other vitamin A-rich fruits and vegetables, and other vegetables, as well as other fruits. The dietary diversity of women of reproductive age was categorised into low dietary diversity (0-4 food groups) and adequate dietary diversity (5-10 food groups) (FAO, 2021; Otekunrin & Otekunrin, 2021).

iv. Individual dietary diversity score (for adult males)

It is a tool that measures the dietary diversity of adult men (> 18 years). The score is computed from 9 food groups: starch staples, dark green leafy vegetables, other vitamin A-rich fruits, other fruits and vegetables, flesh meats, fish, eggs, legumes, nuts and seeds and milk (all dairy products). The dietary diversity of the male adults was categorised into low (0-3 food groups) and adequate (4-9 food groups) (Dolui *et al.*, 2023; Otekunrin *et al.*, 2023).

v. *Children's dietary diversity score (for under-five children)*

The dietary diversity score is developed from a 24-hour recall of food consumed by under-five children. The score is computed from 7 food groups: grains, roots and tubers, legumes and nuts, dairy products, flesh meats, eggs, vitamin A-rich fruits and vegetables, and other fruits and vegetables. The children's dietary diversity scores were categorised into low (0-3 food groups) and adequate (4-7 food groups) (Keno *et al.*, 2021; Otekunrin *et al.*, 2022).

vi. *Food consumption and sources*

The food sources and consumption patterns of the different groups were presented, to further depict the vulnerabilities of the farming households to food and nutrition insecurity.

vii. *Food consumption as a share of household expenditure*

The household income and expenditure-related information were utilised to calculate the household's share of the expenditure spent on food.

ANOVA was used to test for statistical significance between the means for different districts while the Independent T-Test tested for statistical significance between means for types of farming which the households have undertaken. The significance level was determined using p-values, where significance was identified using the p-value of 0.05.

4.5 RESULTS AND DISCUSSION

4.5.1 Household Food Insecurity Access Scale (HFIAS) Score

This score measures the degree of household food insecurity (access) in the past four weeks (30 days) before data collection. The score ranges from 0-27, where 0 means the household responded "no" to all occurrence questions, while 27 indicates the households responded "often" to all nine frequency-of-occurrence questions. The higher the score, the more food insecurity (access) the household experienced. The lower the score, the less food insecurity (access) a household experienced (Coates, Swindale & Bilinsky, 2007).

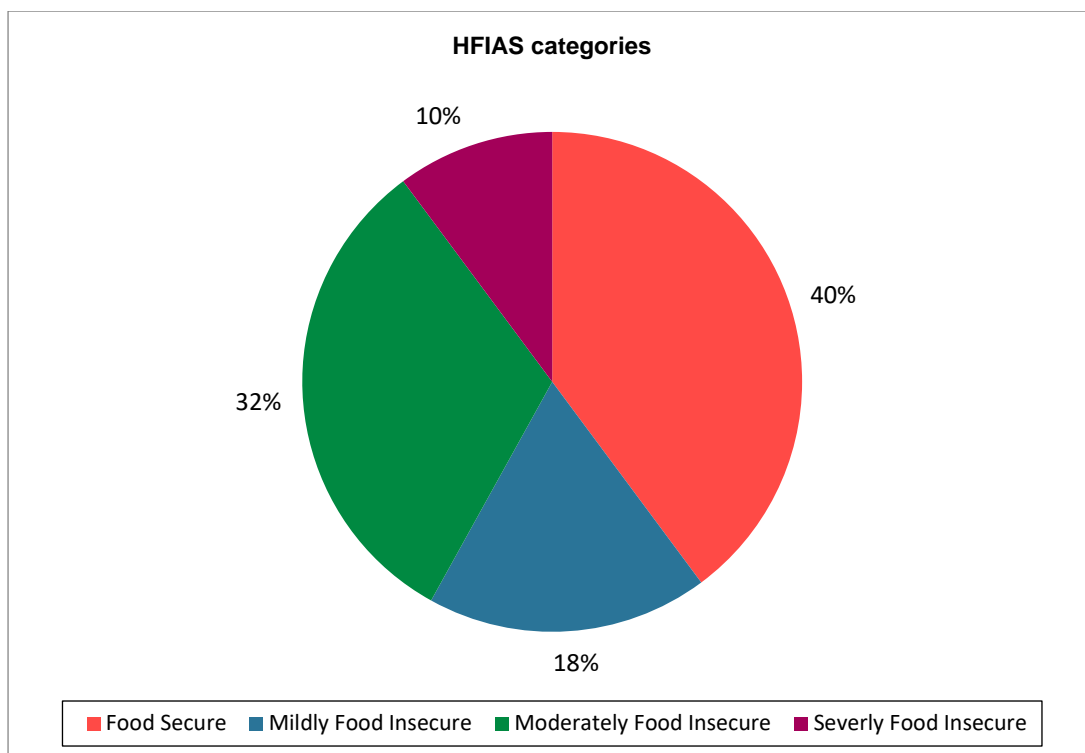


Figure 4.1: Household food insecurity categories

As seen in Figure 4.1, over half (60%) of the surveyed farming households are experiencing varied levels of food insecurity. Of the food insecure households, 32% are moderately food insecure, 18% are mildly food insecure, and 10% are severely food insecure. The World Food Program (WFP) report indicated that almost half of the population of Lesotho is poor (49.7%) and almost one quarter (24.1%) is extremely poor, living below the food poverty line (WFP, 2023). In Oyo State, Nigeria, food insecurity among farming households was more prevalent as only 12.8% were food secure, and 54% were severely food insecure (Otekunrin *et al.*, 2021). Farming households in Ethiopia (Tehuledere Woreda District) did not experience severe food insecurity; 17.9% were food secure, 54.4% were mildly food insecure, and 27.4% were moderately food insecure (Indris, Shaleka & Ashenafi, 2021). Food secure farming households in Iran (Dowreh Chegeni County in Lorestan Province) were almost equivalent (40.8%) to Lesotho (40%), with 13.4% experiencing mild food insecurity, 14.4% moderate food insecurity and 31.4% severe food insecurity (Chegini *et al.*, 2021). Although the study was not focused on farming households, in Northern Iran, 43.2% of the households were food secure, 52.% were mildly food insecure, 32.8%

were moderately food insecure, and 14.7% were experiencing severe food insecurity (Honarvar *et al.*, 2023).

Table 4.1: Household food insecurity access scale categories

Area	N	Frequency (%)			
		Food secure	Mildly food insecure	Moderately food insecure	Severely food insecure
Berea	68	42.6	19.1	36.7	1.4
Mafeteng	77	32.4	28.5	31.1	7.7
Quthing	38	36.8	15.7	31.5	15.7
Thaba Tseka	53	49.0	3.7	26.4	20.7
Type of farming (%)					
Subsistence farming	55	30.9	12.7	29.0	27.2
Commercial farming	181	42.5	19.8	32.5	4.9

The HFIAS results in Table 4.1 indicate that Thaba Tseka has more (49%) households that are food secure, followed by Berea (42.6%), Quthing (36.8%) and Mafeteng (32.4%), which had the least. The findings contradict previous study findings as areas in the highlands (including Thaba Tseka) of Lesotho were more susceptible to food insecurity owing to their remoteness and limited access to facilities (WFP and UNICEF, 2019). Interestingly, severe food insecurity is also mostly experienced in Thaba Tseka (20.7%) and is least experienced in Berea (1.4%). The findings further show that there are more commercial farming households (42.5%) who are food secure than subsistence farming households (30.9%). Consistently, subsistence farming households also had more (27.2%) severely food insecure households than commercial farming households (4.9%).

Table 4.2: The mean Household Food Insecurity Access Scores for different districts and types of farming in Lesotho

District	N	Mean	Std. deviation
Berea	68	3.92	4.68
Mafeteng	77	4.46	5.06
Quthing	38	5.23	5.58
Thaba Tseka	53	5.62	6.56
F statistic			1.145
Type of farming			
Subsistence farming	55	7.47	7.41
Commercial farming	181	3.85	4.34
T Statistic			4.510**
Total 236			

Levels of significance: 0.05*, 0.01**, 0.001***

The findings in Table 4.2 show that households in Thaba Tseka have the highest (5.62) average household food insecurity score, implying that they are the most food insecure among the districts. Households in Berea are the least food insecure (3.92). Even though the difference between the districts is statistically insignificant, a report stated that the non-affordability of a nutritious diet is particularly high in the mountainous regions (above 70%) of Lesotho, where high cost and low economic status overlap. The lowlands have more affordability for a nutritious diet in the country, although the number of households unable to afford healthy foods remains high (50%). The findings are similar since Thaba Tseka is in the mountainous regions, while Berea is towards the country's lowlands (WFP & UNICEF, 2019).

On the other hand, subsistence farmers experience less food access as they have a higher score than commercial farmers, and the difference is statistically significant (p value = 0.001). In Ghana, farmers who were engaged in commercial farming were more food secure than their counterparts (Otchere, Banunle & Bediako, 2019). It could be attributed to income generation by commercial farmers that can be used to improve food access. A study on farmers in Zimbabwe showed a very weak but positive relationship between the household's involvement in commercial agriculture and the HFIAS score (Otekunrin, 2022). Agricultural production that is primarily meant for selling to the market, may enhance household food security.

Table 4.3: Frequency-of-occurrence questions for farming households in Lesotho

Occurrence questions	Frequency (%)			
	Never (0)	Rarely (1-2)	Sometimes (3-10)	Often (>10)
Worry about food	42.4	31.4	22	4.2
Unable to eat preferred foods	45.8	20.3	27.1	6.8
Eat a limited variety of foods	49.6	15.7	27.1	7.6
Eat foods you did not want to eat	55.1	16.1	24.2	4.7
Eat smaller meals in a day	74.2	10.6	12.7	2.5
Eat fewer meals in a day	80.1	5.9	11.9	2.1
No food of any kind to eat in the household	91.1	3.8	3.8	13
Go to sleep at night hungry	92.8	4.2	2.5	0.4
Go the whole day and night without eating anything	93.6	3.4	2.5	0.4

Levels of significance: 0.05*, 0.01**, 0.001***

Table 4.3 depicts the responses to frequency-of-occurrence questions in all surveyed areas. Most (57.6%) of the farming households in all districts conveyed worry that there would not be enough food, which indicates anxiety and uncertainty concerning the food supply. Most households from Berea, Mafeteng and Quthing rarely (once or twice in the past 30 days) worried there would be insufficient food. An equal number of households rarely (once or twice in the past 30 days) and sometimes (3 to 10 times) worried about having enough food in Thaba Tseka.

The majority (54.2%) of the households from all surveyed districts stated that one of the household members could not eat the kinds of foods they preferred because of a lack of resources. Mafeteng and Quthing had more households that ate the types of food they did not prefer, while Berea and Thaba Tseka had the least.

About half (50.4%) of the surveyed households reported that one or more members ate a few kinds of food due to a lack of funds. More households are worried sometimes (3 to 10 times in the past 30 days). Households from Thaba Tseka were worried the most, while households in Quthing were worried the least.

Less than half (44.9%) of the households in all districts did not eat food they did not want because of a lack of funds. Of the households that did, most households in all districts sometimes (three to 10 times in the past 30 days) ate food they did not want to eat owing to lack of money.

About three-quarters (74.2%) of the surveyed households reported that none of the household members ate smaller food portions than they felt they needed as there was insufficient food.

While the findings show anxiety and uncertainty over the food supply, the findings also suggest that the surveyed households were challenged by food quality more than food quantities, as the majority did not have to eat smaller food portions than they felt they needed or eat food they did not want, due to lack of funds. However, most households reported that one or more members could not eat the kinds of food they preferred and had to eat a few kinds of food due to a lack of funds.

More than three-quarters of the surveyed households in all districts reported that none of the household members had to eat fewer meals (80.1%) or go to sleep at night hungry because there was not enough (92.8%). Additionally, these households never experienced the absence of food of any kind or went day and night without eating anything due to a lack of resources to procure enough food.

Only one of the surveyed farming households reported that one of the household members often (more than ten times in the past 30 days) went to bed on an empty stomach and went for a whole day and night without food because there was not enough. The findings further show that while the households may have had food intake challenges, most did not experience extreme consequences, including having no food, going to sleep with a feeling of hunger or going the whole day and night without a meal.

However, poor dietary quality reflected in the reported experiences indicates a nutritional challenge for these households to eat a variety of food, which translated into poor dietary diversity, as observed using the dietary diversity tools.

4.5.2 Minimum Dietary Diversity for Women (MDDW)

The indicator is based on data related to food consumed by women the day before the interview. The score shows the number of food groups consumed, which indicates diversity and micronutrient adequacy. A 10-group score is computed from the food consumption data provided. The ten food groups are starchy staples, legumes, nuts and seeds, all dairy, flesh foods, eggs, vitamin A-rich dark green leafy vegetables, vitamin A-rich vegetables and fruits, and other vegetables and fruits. Women must consume at least five groups and above for an increased likelihood of micronutrient adequacy.

Therefore, women who had consumed a minimum of five food groups or more in the past 24 hours had adequate dietary diversity, and those who consumed less than five had low dietary diversity (FAO, 2018a, 2021). The findings in Figure 4.2 indicate that only 20.6% of the women of reproductive age from farming households had consumed a recommended minimum of five out of ten food groups (5.63). The overall mean dietary diversity was 3.45. Women of reproductive age in Nigeria had a slightly higher dietary diversity (4.37) (Otekunrin & Otekunrin, 2021), while women in Tanzania had a lower dietary variety of 3 (Bellows *et al.*, 2020). Even though other studies assessed dietary diversity using fewer food groups, low nutritional diversity among women of reproductive age was evident. Women in South Senegal (Tine *et al.*, 2018), Mali (Adubra *et al.*, 2019), South Africa (Chakona & Shackleton, 2017) and Burkina Faso (Custodio *et al.*, 2020) had low dietary diversity. It can be attributed to an inability to afford nutritious diets, Lesotho in particular, the household cost to meet only energy needs in 2019 ranged from LSL 500-650 (USD32-41)/month, with most districts being around LSL 600(USD38)/month (WFP and UNICEF, 2019). This cost is likely to have increased with the rise in food prices as a result of the COVID-19 pandemic and the Russia-Ukraine conflict (Devereux, Béné & Hoddinott, 2020; Olutosin, Otekunrin & Otekunrin, 2021; Shaifuddin *et al.*, 2022).

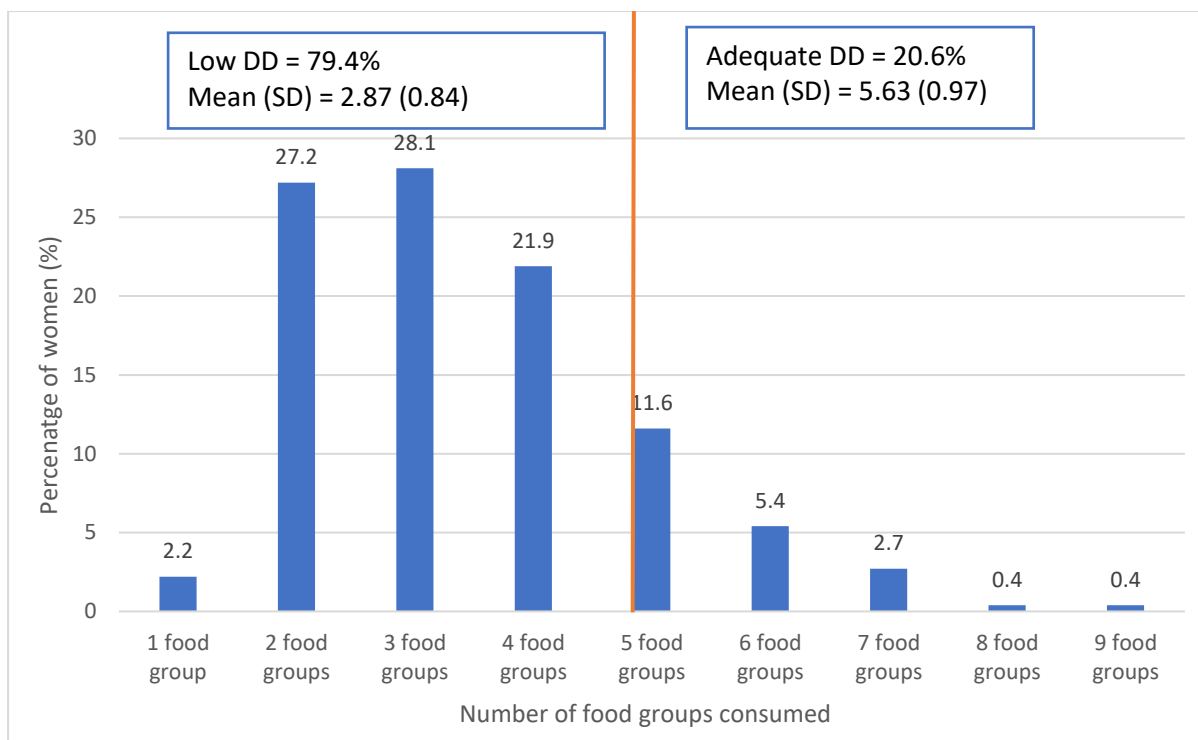


Figure 4.2: Minimum Dietary Diversity for Women (MDDW) among farming households in Lesotho

Table 4.4 shows that Berea (3.85) and Mafeteng (3.60) have the highest women's dietary diversity score, while Quthing (3.13) and Thaba Tseka (2.96) have the lowest. The differences in women's dietary diversity scores in the study areas are significant (p -value = 0.003). There is no significant difference in women's mean dietary diversity scores of households engaged in subsistence and commercial farming. In Bangladesh, women from households actively selling agricultural produce in the output markets had a significantly higher dietary diversity score than those not participating (Barua, 2022). It can be explained by income generation from the sale of agricultural produce that enables households to meet the nutrition needs of all members. Most studies focus on the impact of agricultural production diversification and not much on producing for the market. However, selling agricultural produce in the markets is more relevant in improving nutrition than production diversity. The results of a study in Ethiopia suggest that policies that merely focus on encouraging smallholder farmers to diversify production would not be that effective unless they are coupled with interventions that aim to integrate smallholder farmers' participation in the market for economic benefits (Getahun & Fetene, 2021).

Table 4.4: Mean Minimum Dietary Diversity – Women (MDD-W) for different districts and types of agriculture in Lesotho

Districts	N	Mean	Std. deviation
Berea	63	3.85	1.65
Mafeteng	73	3.60	1.37
Quthing	38	3.13	1.27
Thaba Tseka	50	2.96	1.10
F Statistic			4.827***
Type of farming			
Subsistence farming	53	3.43 (2.03)	2.03
Commercial farming	171	3.53 (1.45)	1.45
T Statistic			-1.203
Total	224		

Levels of significance: 0.05*, 0.01**, 0.001***

4.5.3 Individual dietary diversity score

This score measures the diet diversity for male adults (> 18 years) (Dolui *et al.*, 2023; Otekunrin *et al.*, 2023). The individual dietary diversity score measures micronutrient adequacy and indicates dietary quality (FAO, 2018a). However, male dietary diversity has received less attention from researchers, yet men are also vulnerable to malnutrition (Maila *et al.*, 2021).

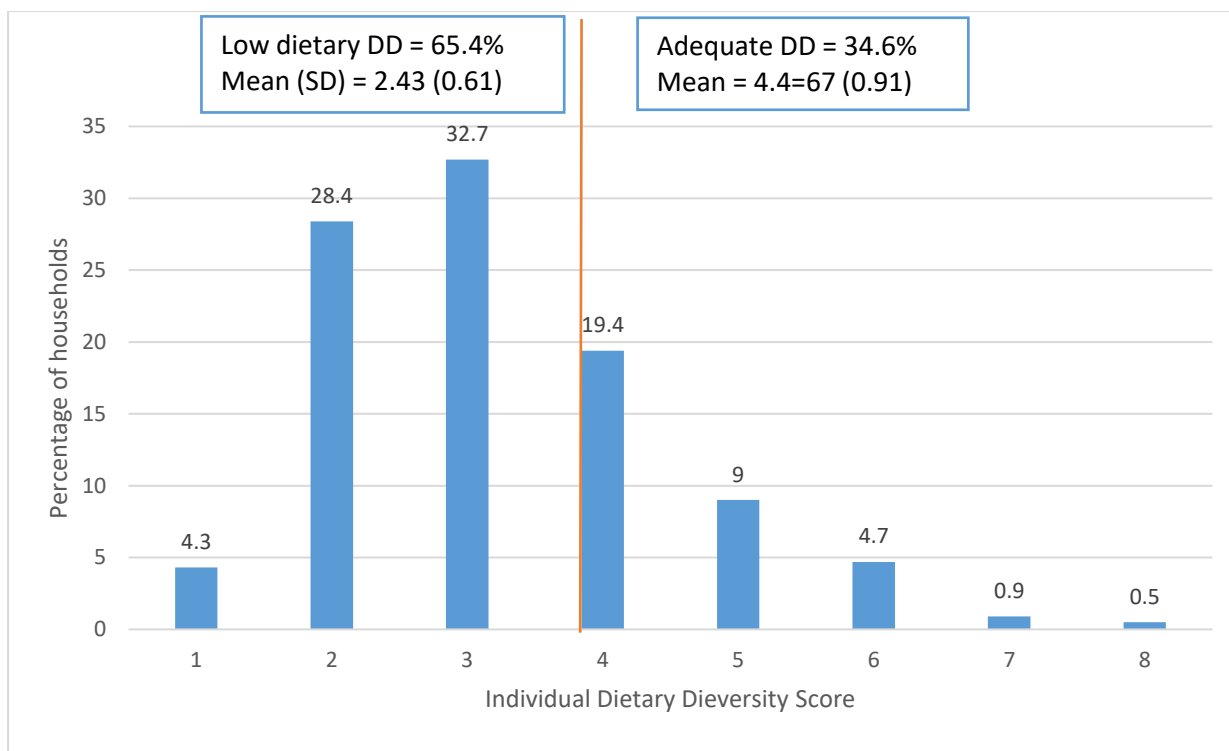


Figure 4.3: Dietary diversity score for male adults from farming households in Lesotho

As seen in Figure 4.3, the majority (65.4%) of the male adults had low dietary diversity (mean=2.43), as they consumed less than five food groups and were vulnerable to nutrient inadequacy. The overall dietary diversity variety (mean = 3.21) is below the recommended intake of a minimum of 5 food groups. Male adults from Berea had the highest dietary diversity score, and those from Thaba Tseka had the least (Table 4.5). The mean differences between the four districts are statistically significant (p-value=0.03). Male adults from households engaged in commercial agriculture had higher dietary diversity than those from households involved in subsistence farming. However, this difference is not statistically significant. A study conducted in Guatemala showed a negative impact of commercialising agriculture on household nutrition, as commercial agriculture increased the likelihood of overnutrition in both males and females within the household (van Asselt & Useche, 2022).

Table 4.5: The mean Dietary Diversity Scores for males from farming households in Lesotho

Districts	N	Mean	Std. deviation
Berea	53	3.58	1.48
Mafeteng	72	3.25	1.18
Quthing	36	3.05	1.32
Thaba Tseka	50	2.86	1.10
F statistic			2.98***
Type of farming			
Subsistence farming	48	2.97	1.22
Commercial farming	163	3.27	1.30
T statistic			-1.40
Total 211			

Levels of significance: 0.05*, 0.01**, 0.001***

4.5.4 Children's Dietary Diversity Score (CDDS)

The score is computed for the 24-hour recall of food consumed by the children. The Children's Dietary Diversity Score (CDDS) has been categorised based on the recommended consumption of a minimum of four food groups for adequate dietary diversity and low dietary diversity for those who consumed less than four food groups in the past 24 hours (FAO, 2018a; Keno *et al.*, 2021). As seen in Figure 4.4, the under-five children who met the minimum dietary diversity of four food groups were 28% of the surveyed children. The mean dietary diversity was 2.76 (1.19), which was lower than children in Nigeria at 3.28 (1.28) and higher than children in Ethiopia (West Shoa Zone) with a mean of 1.82 (0.015) (Keno *et al.*, 2021). Other study findings have similar outcomes in Indonesia (Sekartaji *et al.*, 2021) and Ethiopia (Bench Maji Zone) (Edris, Atnafu & Abota, 2018).

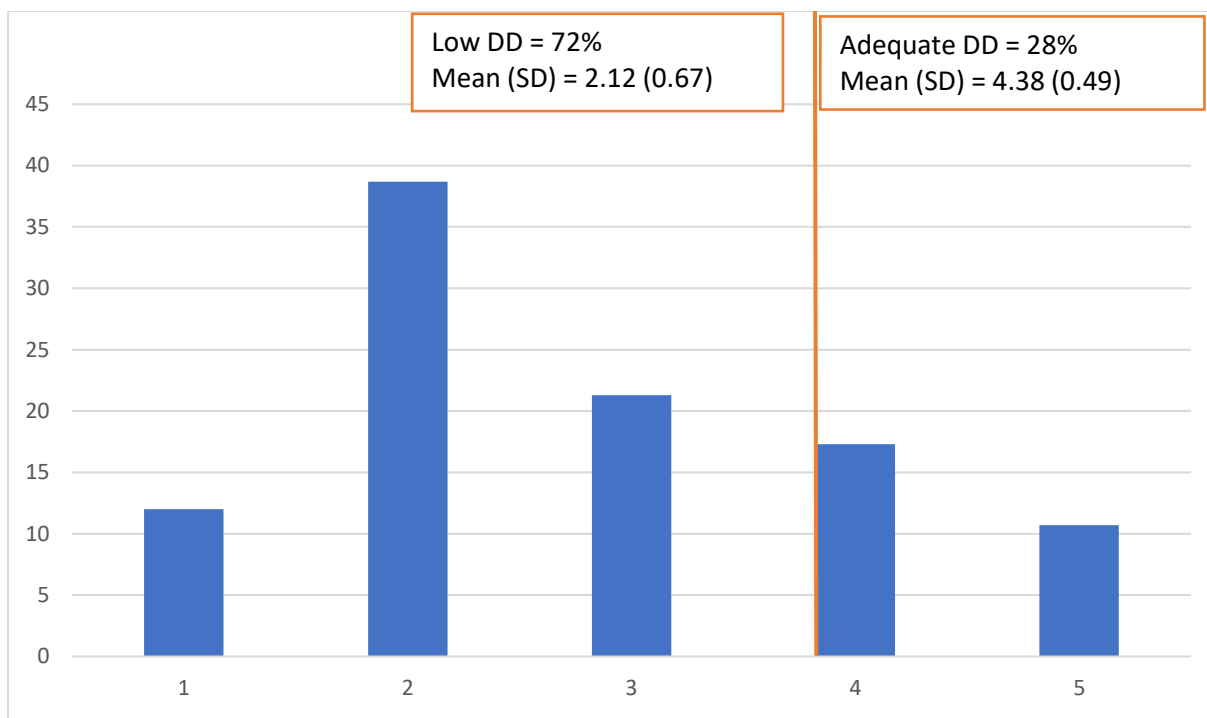


Figure 4.4: Children's dietary diversity score among farming households in Lesotho

Table 4.6 indicates that children in Berea have the highest dietary diversity score, while those in Thaba Tseka have the lowest. The mean difference between the districts is statistically significant (p value=0.005), while the difference between children from commercial and subsistence farming households is statistically insignificant. Commercial agriculture was found to be positively related to child dietary diversity in Zimbabwe (Murendo *et al.*, 2018), while in Nigeria, child dietary diversity and the household's involvement in commercial agriculture had a very weak negative relationship (Otekunrin *et al.*, 2022). While other studies on commercial agriculture and child nutrition used anthropometric indicators to assess child nutrition, it was found that the effect of commercial agriculture on child nutrition was insignificant (Mofya-mukuka & Kuhlitz, 2016; Chegere, Kauky & Sebastian, 2022). It can be attributed to most households selling most of their farm produce, and leaving little for home consumption.

Table 4.6: Mean dietary diversity scores for children for different districts and types of agriculture in Lesotho

Districts	N	Mean	Std. deviation
Berea	18	3.33	1.23
Mafeteng	18	3.11	1.18
Quthing	14	2.64	0.92
Thaba Tseka	25	2.16	1.06
F statistic			4.642***
Type of farming			
Subsistence farming	17	2.47	1.32
Commercial farming	58	2.84	1.15
T Statistic			-1.13
Total 75			

Levels of significance: 0.05*, 0.01**, 0.001***

4.5.5 Household Dietary Diversity Score (HDDS)

HDDS indicates the number of food groups a household consumes over a particular period. Table 4.7 shows the dietary diversity categories of the farming households seven days before data collection. The majority (97%) of the households had consumed a highly varied diet (6-12 food groups) in the previous week, with a mean of 9.83. The dietary diversity of farming households in Cape Town Metropole was slightly higher (10.38) (Swanepoel, 2017). Other findings on dietary diversity of farming households were computed from a 24-hour recall and were not comparable to the results of the 7-day recall (Walsh *et al.*, 2020; Mulenga, Ngoma & Nkonde, 2021; Sambo, Oguttu & Mbombo-Dweba, 2022).

Table 4.7: Household dietary diversity categories

Categories	Range	Frequency	(%)	Mean	(SD)
Low	1-3	0	0	0	0
Medium	4-5	7	3	4.57	0.53
High	6-12	229	97	9.83	1.59
Total	1-12	236	100	9.68	1.81

Table 4.8 shows that Berea had the highest (10.22) score, followed by Mafeteng (9.71), Quthing (9.55) and Thaba Tseka, which had the lowest score (9.03). It implies that households in Berea have better food access than the other areas, while Thaba Tseka has the least. Commercial farming households have a significantly higher (9.98) dietary diversity than the subsistence farming households (8.67). Studies on market participation and commercialisation of agricultural produce show that households that produce for the market have significantly higher HDDS (Manda *et al.*, 2020; Mulenga, Ngoma & Nkonde, 2021; Cele & Mudhara, 2022). Selling agricultural produce improves dietary diversity, as the income generated allows households to procure diverse foods (Qaim *et al.*, 2016). Other study findings showed that commercial farmers had high dietary diversity, which was unrelated to commercialisation. These households could get their diversified food from subsistence production (Olabisi, Obekpa & Liverpool-Tasie, 2021; Chegere, Kauky & Sebastian, 2022).

Table 4.8: The mean Household Dietary Diversity scores for different districts and different types of agriculture for farming households in Lesotho

Districts	N	Mean	Std. deviation
Berea	68	10.22	1.44
Mafeteng	77	9.71	1.89
Quthing	38	9.55	1.58
Thaba Tseka	53	9.03	2.0
F Statistic			4.51***
Type of farming			
Subsistence farming	55	8.67	2.15
Commercial farming	181	9.98	1.57
T Statistic			-4.956**
Total 236			

Levels of significance: 0.05*, 0.01**, 0.001***

4.5.6 Food consumption and sources

4.5.6.1 Consumption per type

The findings in Figure 4.5 show the percentage of food groups consumed by the surveyed households in the four districts.

Leaving out sugar, oils, and fats, the most consumed food groups are cereals, dark leafy vegetables, other vegetables and legumes. Lesotho's overall agricultural production consists of cereals and legumes, including maize, wheat, sorghum, beans and peas, which comprise about 78% of production. Although there is substantial livestock (half a million cattle and three million sheep and goats) very little is consumed. Livestock is mainly treated as a valuable asset for commercial purposes, such as trading for wool and mohair (WFP & UNICEF, 2019). Green leafy vegetables are also produced in most gardens, primarily for consumption. The findings of another study show that the most consumed foods within farming households in Tanzania are cereals, oils and fats, spices, condiments and beverages (Ochieng *et al.*, 2017). Starch grains are the staple food in most African countries.

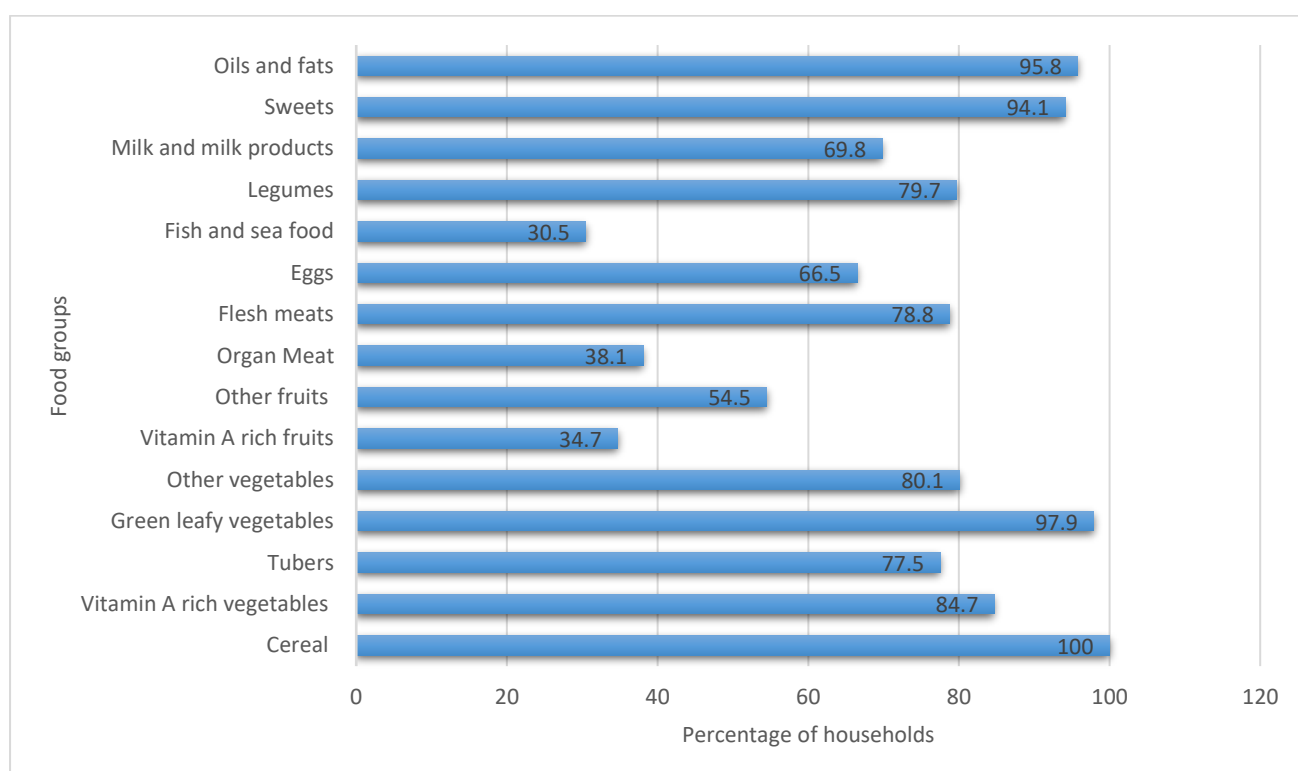


Figure 4.5: The percentage of household consumption per group for farming households in Lesotho

4.5.6.2 Cost per food group

Figure 4.6 shows households surveyed in all districts spent most of their food expenditure on cereals (LSL379.47). Flesh meats (LSL163.33) are second, followed by oils and fats (LSL114.58). The least amount of money was spent on vitamin A-rich fruits and dark green leafy vegetables. Dark green leafy vegetables are grown by almost all households, which accounts for the low amount spent on them. Vitamin A-rich fruits, such as peaches and apricots, were in season in some areas during data collection and were easily accessible. The average food expenditure for the surveyed households is LSL1578.15, and cereals comprise about a quarter of the total. Farming households in Cape Town Metropole also spent the most on grains (Swanepoel, 2017).

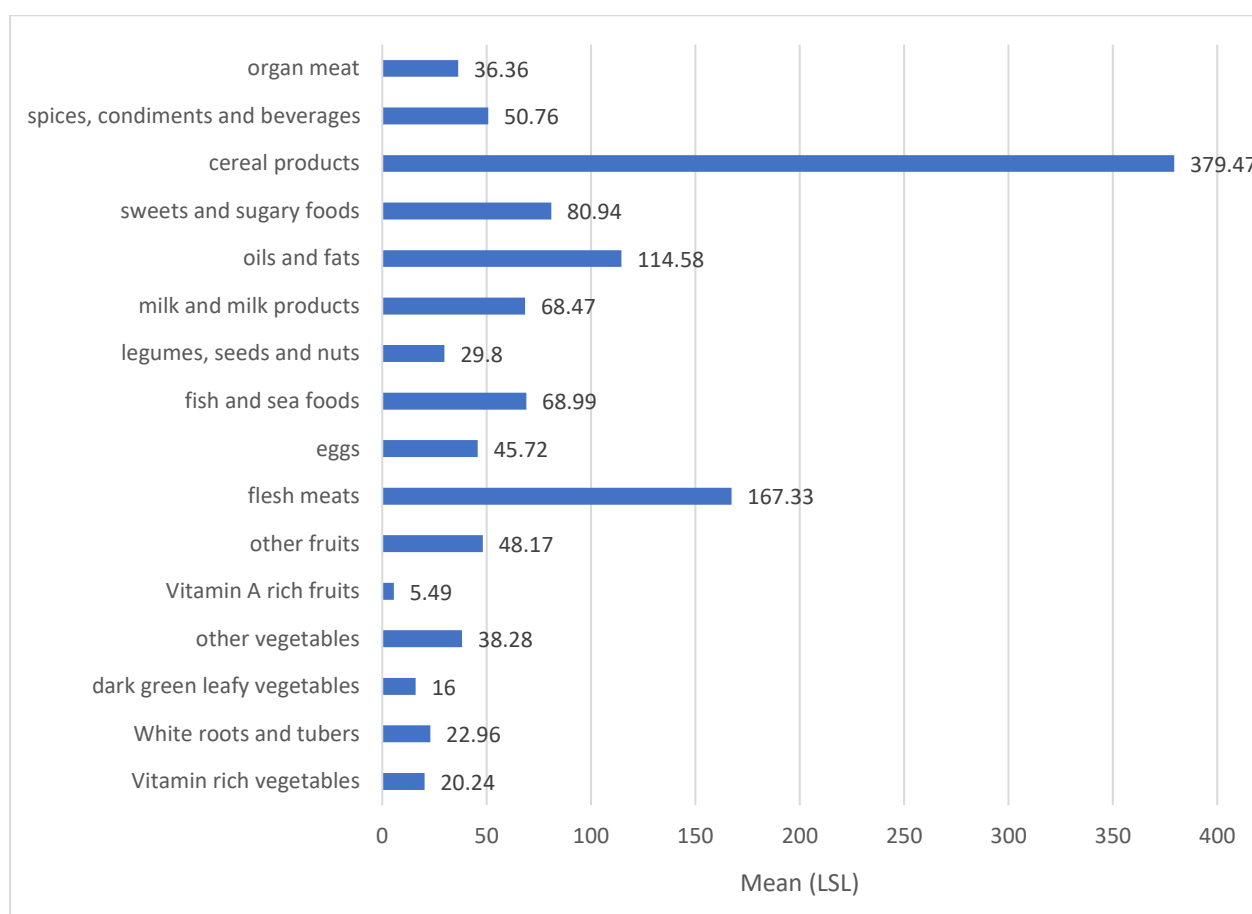


Figure 4.6: Cost per type for farming households in Lesotho

4.5.6.3 Food sources

Figure 4.7 shows the sources per food group in the surveyed areas. The findings indicate that purchasing from the store is a primary source for most food groups. When households depend on purchasing to procure food, they are vulnerable to food insecurity, as they can be affected by price increases or changes in the income flow (Lele *et al.*, 2016). Self-production is the second food source for most food groups, which is a significant positive. Most households produce vitamin A-rich vegetables, green leafy vegetables and legumes. The surveyed households received no food from food aids except for a few that received legumes. The households seldom received food from their employers, except for a few who received milk and milk products, legumes and fish. The households seldom received food from their neighbours, except for a few who received milk and milk products, legumes and fish.

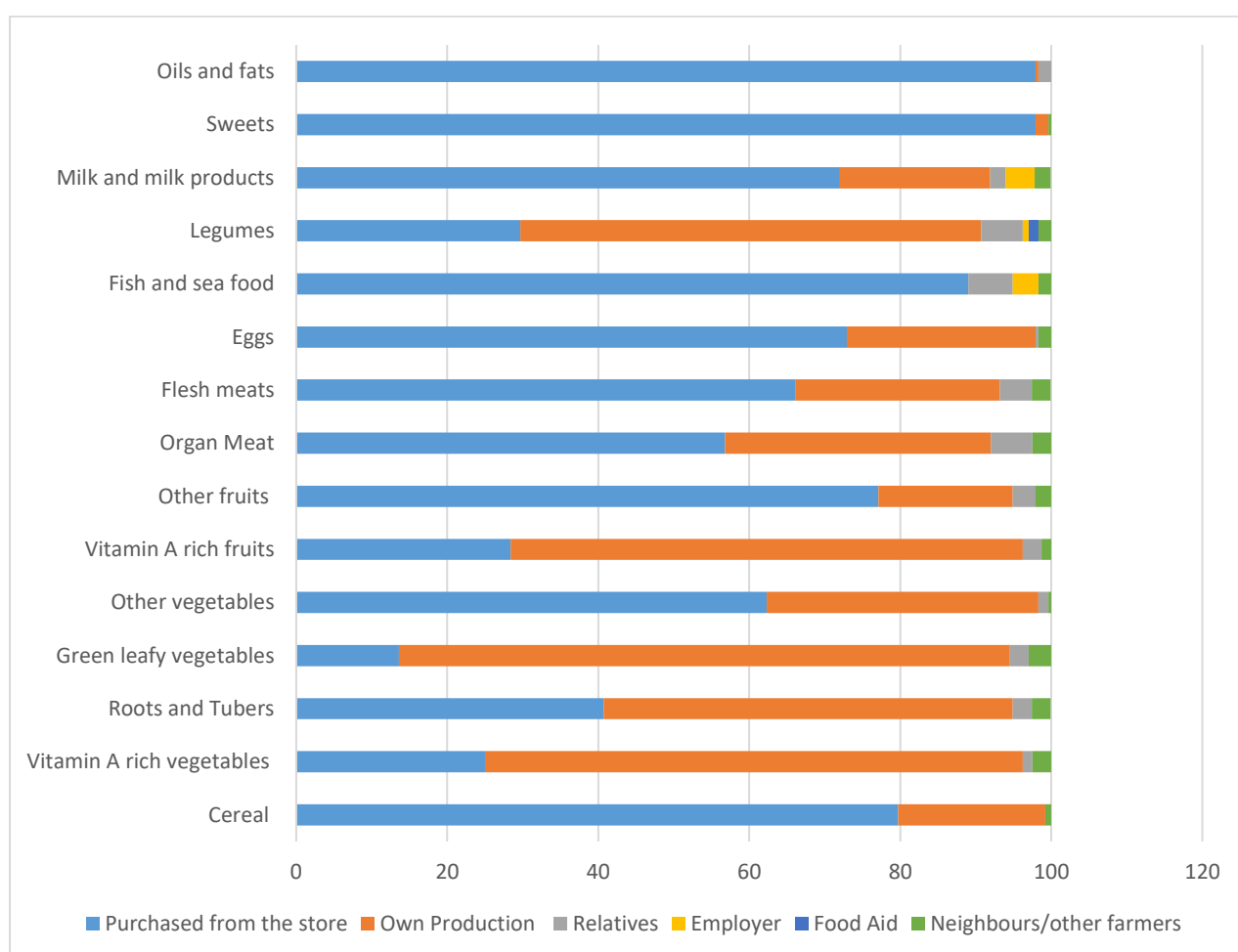


Figure 4.7: Sources per food group for farming households in Lesotho

4.5.7 Food consumption as a share of household expenditure

Food expenditure, as a share of total household expenditure, is one of the most valuable indicators of food security at the household level. Its importance emanates from Engel's law, which states that poorer and more vulnerable people generally devote a larger share of their resources to obtaining food. A household's share of expenditure spent on food is also a good indicator of food security because it estimates the losses experienced when food prices rise. Engel's law is among the oldest empirical observations in economics. It has consistently been found to hold both for a given individual or country over time and between different people or groups at any given time (Lele *et al.*, 2016).

As seen in Table 4.9, households from Berea have the highest food expenditure LSL1673.36 (USD107)², while Quthing LSL1404.17 (USD90) spends the least on food. Households in Berea also had a more significant share (58%) of expenditure spent on food, while Thaba Tseka had the least (42%) share of food costs. While these differences between districts are not statistically significant, the results suggest that households in Berea are the most vulnerable to food security as they have the highest share of resources devoted to food. In contrast, households in Quthing are the least vulnerable.

Commercial farmers spent more LSL1718.42 (USD110) on food than subsistence farmers who spent LSL1081.60 (USD69). The difference is statistically significant (p-value=0.001). While commercial farmers spent the most on food, the results show that subsistence farmers have a higher expenditure share spent on food than commercial farmers, implying that commercial farmers are less vulnerable to food insecurity. However, the differences in the percentage of spending between commercial farmers and subsistence farmers are statistically insignificant.

² Exchange rate (average) as on March to June 2022 – LSL 1=USD15.67 (<https://www.exchangerates.org.uk/USD-ZAR-exchange-rate-history.html>)

Table 4.9: Average food expenditure and share of household expenditure among farming households in Lesotho

Districts	N	Food expenditure (LSL)	Share of expenditure
Berea	67	1673.36	0.58 (0.52)
Mafeteng	75	1635.07	0.54 (0.43)
Quthing	36	1404.17	0.48 (0.38)
Thaba Tseka	49	1488.67	0.42 (0.46)
F statistic		0.495	1.088
Type of farming			
Subsistence farming	50	1081.60	0.68 (0.63)
Commercial farming	177	1718.42	0.47 (0.39)
T statistic		-3.249**	2.632***
Total 227			

Levels of significance. 0.05*, 0.01**, 0.001***

4.6 CONCLUSIONS

Most household food and nutrition security indicators (HFIAS, MDDW, CDDS, IDDS) used show that farming households experience high levels of household food and nutrition insecurity despite their different districts and types of farming.

The HFIAS results reflect the prevalence of varied levels of food insecurity for over half of the surveyed households. The individual dietary diversity scores from a 24-hour recall depict low dietary diversity. Dietary diversity is low among most under-five children, women of reproductive age and male adults. However, the household dietary diversity from a 7-day recall shows consumption of a varied diet. Thus, the available evidence suggests that households can only afford a varied diet weekly and not daily.

The HDDS, CDDS, IDDS AND SHARE indicated a significant difference in the food and nutrition security of households in the four Districts (Berea, Mafeteng, Quthing and Thaba Tseka), which are representative of the four agro-ecological zones in Lesotho.

The HDDS, MDDW, IDDS and CDDS reflected that food and nutrition insecurity is primarily experienced in the highlands (Thaba Tseka), followed by Senqu Valley (Quthing) and is least experienced in the foothills (Berea), followed by the lowlands (Mafeteng).

The HFIAS score, HDDS and food expenditure, as a share of total household expenditure, indicated a significant difference in the food and nutrition security status of commercial farmers and subsistence farmers. Thus, the hypothesis is accepted that commercial farming households are significantly more food and nutrition secure than subsistence farming households.

4.7 RECOMMENDATIONS

In assessing and understanding food insecurity and malnutrition for specific target populations, it is recommended that food security and nutrition security be measured as an integrated concept – food and nutrition security. The two are interlinked and must be addressed as a single goal for improved outcomes. It is further recommended that nutrition education programs be tailored for farming households, for capacitation on food and nutrition-related knowledge to complement agricultural productivity, with added attention on the highlands and Senqu Valley, where food and nutrition insecurity was more prevalent.

CHAPTER 5 :

FACTORS AFFECTING THE HOUSEHOLD FOOD AND NUTRITION SECURITY OF SMALL-SCALE FARMING HOUSEHOLDS IN LESOTHO

ABSTRACT

In tackling the challenge of food insecurity and malnutrition, agricultural productivity alone is insufficient to enhance food and nutrition security. Several other factors must be considered in developing practical and relevant interventions. This study sought to identify the factors contributing to food and nutrition security in farming households. A total of 236 farming households participated in the study, and multiple regression analysis was used to identify the factors that influence household food and nutrition security in farming households. The findings show that household income is the most significant determinant of food and nutrition security. Monthly household income is associated with the Household Food Insecurity Scale (HFIS), Household Dietary Diversity Score (HDDS), Minimum Dietary Diversity for Women (MDDW) and Child Dietary Diversity Score (CDDS). Other factors that influence food and nutrition security are the education status of the caretaker, the area of residence and access to retail markets for procuring food. It is vital to create additional income generation activities for the farming households since it is implied that their involvement in farming is insufficient for an enhanced food and nutrition security status. Market participation must be encouraged to maximise agriculture for income generation and improved food and nutrition security. Interventions that aim to improve food and nutrition security through agriculture must consider socio-economic and nutritional factors and adopt more nutrition-sensitive approaches.

Keywords: small-scale commercial agriculture, food and nutrition security, household income, household size

5.1 INTRODUCTION

Food insecurity and malnutrition levels concern the global community, and solutions for tackling malnutrition continue to be explored (FAO *et al.*, 2022). Farming households are expected to be food and nutrition secure, owing to enhanced food availability and access through agricultural productivity and income generated from the sale of agricultural produce (Schönfeldt, Pretorius & Hall, 2017; Pawlak & Kokodziejczak, 2020). However, farming households, particularly in developing countries, are also challenged by food insecurity and malnutrition (Herrera *et al.*, 2021; Acheampong *et al.*, 2022) due to several factors that differ with regions and specific target populations.

Previous studies that looked at the factors affecting food security and nutrition have used different indicators (Swanepoel, Van Niekerk & Van Rooyen, 2018; Abdullah *et al.*, 2019; Drammeh, Hamid, Noor, Aman & Rohana, 2019; Nkomoki, Bavorová & Banout, 2019). Studies adopt a single or multiple indicators depending on the research objectives. These indicators include household food insecurity access score, dietary diversity scores, household consumption and expenditure surveys and food expenditure as a share of income (Hossain, Mullally & Asadullah, 2016; FAO, 2018a; Nkomoki, Bavorová & Banout, 2019).

Agriculture is an important source of livelihood and subsistence in Lesotho. About 70% of the nation depends on agriculture for consumption and income generation (World Bank, 2022b). However, Lesotho's agriculture is rain-fed and vulnerable to climate change, among others. The erratic weather occurrences in the past years and economic shocks have significantly affected agricultural yields (FAO, 2019; World Bank, 2022b). The years of drought and the COVID-19 pandemic have harmed agriculture, as some agricultural enterprises struggle to recover from the shocks (Lesotho National Farmers Union (LENAFU), 2020; Rantlo, Nyanguru & Muroyiwa, 2021).

Increasing agricultural productivity to improve food security is not enough. Other factors such as market functionality, more significant agricultural investments, and the proper use and allocation of resources in food systems are equally important (FAO and IFPRI, 2020; Rose, Ihsan & Adil, 2021). These factors must be considered and joined with agricultural efforts to facilitate the development of relevant interventions for

food-insecure farming households. While agriculture continues to be a sought developmental approach and a pathway for tackling food insecurity challenges, its ability to yield food and nutrition security outcomes is limited. It has been found that social, environmental and economic factors also determine the household food and nutrition security status and will differ with target groups (Swanepoel, Van Niekerk & Van Rooyen, 2018; Rose, Ihsan & Adil, 2021). When these factors are known, interventions can be more customised.

While the methods and indicators differ, literature shows that some of the factors that influence household food and nutrition security include household income, household size, dependency ratio, food expenditure, education status, employment status, sources of income and the area of residence (Mango *et al.*, 2014; Abdullah *et al.*, 2019; Drammeh *et al.*, 2020; Sekartaji *et al.*, 2021).

There is limited understanding regarding the factors associated with household food and nutrition security in Lesotho, particularly among farming households (Food and Nutrition Coordinating Office, 2016; WFP and UNICEF, 2019). In light of the linkages between agriculture and food security, the study will explore socio-economic, agricultural and nutrition-related factors that influence food and nutrition security in farming households.

5.2 OBJECTIVE

To determine the factors that affect household food and nutrition security of farming households in Lesotho.

5.3 HYPOTHESIS

Household income is the most significant determinant of food and nutrition security among farming households.

5.4 METHODOLOGY

5.4.1 Study population

The study focused on commercial farmers in Lesotho. The farmers were accessed through extension workers. There are ten districts in Lesotho, and the sample size was drawn from four districts: Mafeteng, Berea, Thaba-tseka and Quthing. Each district represents the four agroecological zones in the country: Lowlands, Foothills, Mountains and Senqu River Valley, respectively (Bureau of Statistics (BOS), 2016). Multi-stage sampling was used to randomly select a total of 236 farming household as participants.

5.4.2 Data collection

A questionnaire was used to collect quantitative data on their socio-economic characteristics, agricultural production and food and nutrition-related factors. The researcher and trained enumerators administered the questionnaires face-to-face to ensure a thorough understanding of the questions and minimise a low response rate. The questionnaires were administered at the farmers' homes or farms.

5.4.3 Data analysis

A multiple linear regression was employed to identify the factors that affect household food and nutrition security. A forward stepwise regression was specifically used for the factors that determine HDDS, HFIAS and MDDW. The stepwise regression analysis has been criticised for its limitations. However, it was found suitable, as it can be a valuable method for finding important variables in a dataset, particularly in predicting a dependent variable based on several independent variables, which is the case for this study. Several reasons justify its use (Loftus & Taylor, 2014; Chowdhury & Turin, 2020):

- **Variable selection:** Stepwise regression is specifically designed for variable selection. It systematically adds and/or removes predictors from the model to find a subset of variables that best predicts the dependent variable.

- It can be beneficial when you start with many potential predictors and need to focus on the most relevant ones.
- **Simplicity and interpretability:** By selecting a subset of predictors, stepwise regression can often result in a more straightforward and more interpretable model. A model with fewer predictors is easier to understand and communicate, which can be very important in practical applications.
- **Insights into relationships:** Regression models generally provide insights into the relationships between the independent and dependent variables. The sign and magnitude of the coefficients can tell you the direction and strength of the relationship between each predictor and the dependent variable.

However, it is important to use stepwise regression with caution due to the following (Harrell, 2016; Smith, 2018):

- **Overfitting risk:** Stepwise regression can sometimes result in overfitting, especially when the number of observations is small compared to the number of predictors.
- **Biased estimates:** Stepwise regression may produce biased coefficient estimates and underestimate the variability of these estimates.
- **Dependency on criteria:** The results of stepwise regression can be highly dependent on the criteria used for adding and removing variables (e.g., p-values, AIC, BIC).
- **Model validation:** It is critical to validate the final model using techniques like cross-validation to assess its performance on unseen data.
- **Multicollinearity:** It does not handle multicollinearity well. When two variables are highly correlated, stepwise regression might choose one over the other somewhat arbitrarily.

The dependent variables were the food and nutrition security indicators: HDDS, HFIAS, CDDS and MDDW. The selection of independent variables was guided by literature (Leroy *et al.*, 2015; Chakraborty & Ghosh, 2020), including education status, income, and employment status. All possible factors were tested for significance, and only the significant ones were included in the final model. The level of significance was determined using a p-value of 0.05.

The regression model that was used to identify the factors that influence food and nutrition security for farming households is expressed (Wijaya *et al.*, 2020; Ma & Hidayat, 2022):

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + \epsilon \quad (1)$$

Where y = outcome or dependent variable, in this case, these are food and nutrition security indicators (HDDS, HFIAS, CDDS and MDDW),

β_0 = the model intercept

β_{1-n} = the coefficient

x_1 = the independent variable and

ϵ = the standard error

5.5 RESULTS AND DISCUSSION

5.5.1 Household characteristics

5.5.1.1 Household head

The survey consisted of more women (84.3%) than men. The preference for respondents was members of the household who could provide information on the household's food and nutrition-related practices. The findings show that women headed 32% of the surveyed farming households. It could have been influenced by the study's purposive choice to select individuals responsible for food and nutrition, and women are more likely to assume responsibilities related to food and nutrition within the households (Rao & Pingali, 2018; Fongjong, 2022). However, the findings are consistent with a survey on farming households in Lesotho that indicated that 32% were female-headed (Moshoeshoe & Nchake, 2021).

Table 5.1: Household head and gender of the respondents

Variables		Gender		Total N (%)
		N (%)		
		Male	Female	
Are you the household head?	Yes	33 (14%)	76 (32%)	109 (46%)
	No	4 (2%)	123 (52%)	127(54%)
Total		37 (15%)	199 (84%)	236 (100%)

5.5.1.2 The education status of the respondent

Figure 5.1 shows the education status of the respondents from the surveyed farming households. Most (32.6%) of the respondents’ highest education level was primary (Grade R to Grade 8), followed by secondary – Grade 9 to Grade 12 (29.7%). Only 16.9% of the respondents had tertiary qualifications.

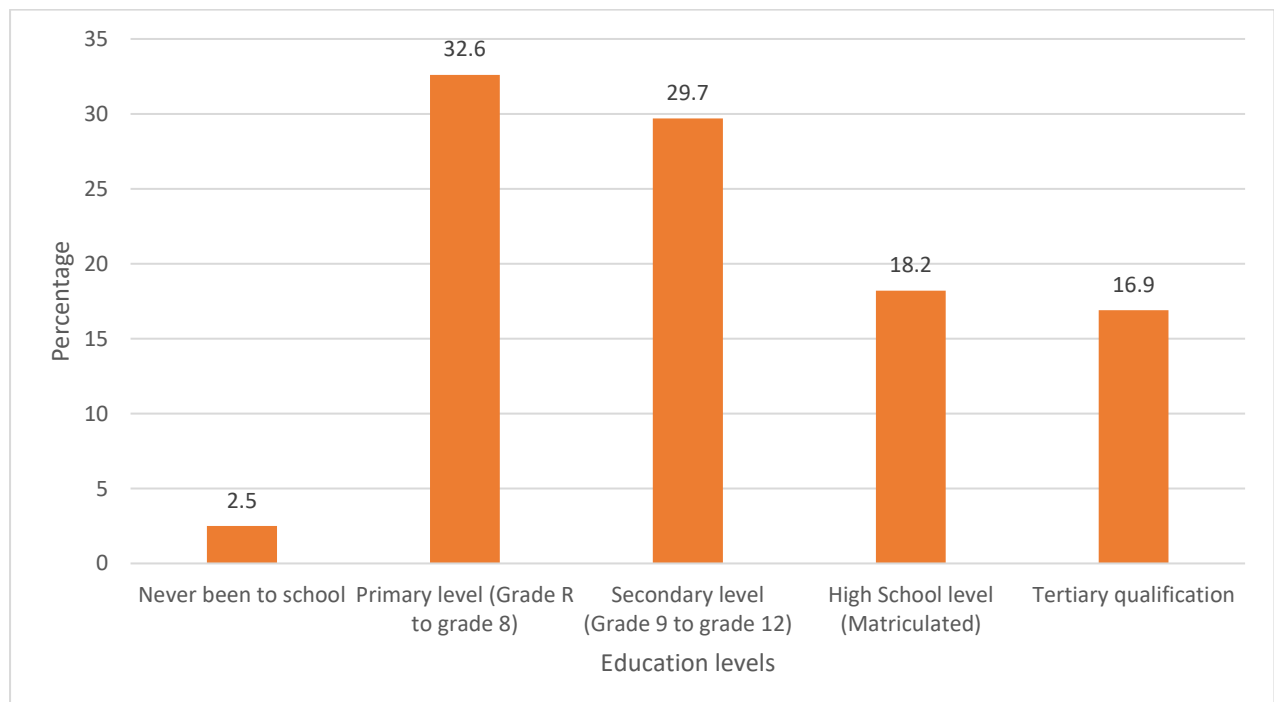


Figure 5.1: Highest education level obtained by the respondents

5.5.1.3 Household size

The mean household size for the surveyed households is 4.46. A survey on farming households in Lesotho indicated a smaller average household size of 2.77 (Moshoeshoe & Nchake, 2021). Quthing District, which represents the Senqu Valley, has the highest average household size (4.87), while Berea, which represents the Foothills, has the lowest (4.06). The difference in the average household size between districts is not statistically significant. Household size is related to food and nutrition security in that food-insecure households have often been characterized by larger household sizes, and the contrary is also true (Acharya, Bhatta & Timilsina, 2017; Sekhampu, 2017). It is primarily valid for developing countries (Maziya, Mudhara & Chitja, 2017; Abdullah *et al.*, 2019). The average household size for households involved in commercial farming is 4.48, which is higher than that of the subsistence farmers (4.40), although the difference is not statistically significant.

Table 5.2: Average household size

Districts	N	Mean	Std.
Berea	68	4.06	2.051
Mafeteng	77	4.52	1.854
Quthing	38	4.87	1.679
Thaba Tseka	53	4.60	1.964
F Statistic			1.70
Commercial farmers	55	4.48	1.90
Subsistence farmers	181	4.40	1.97
T-test			-2.72
Total	236		

Levels of significance: 0.05*, 0.01** 0.001***

5.5.1.4 The age group of the respondent

Most respondents were middle-aged, with the age group 56-60 having the highest (15.7%) frequency, 51-55 with 12.3% and 46-50 with 11.4%. The respondents, who participated in the survey are mostly within the range of 46-60 years.

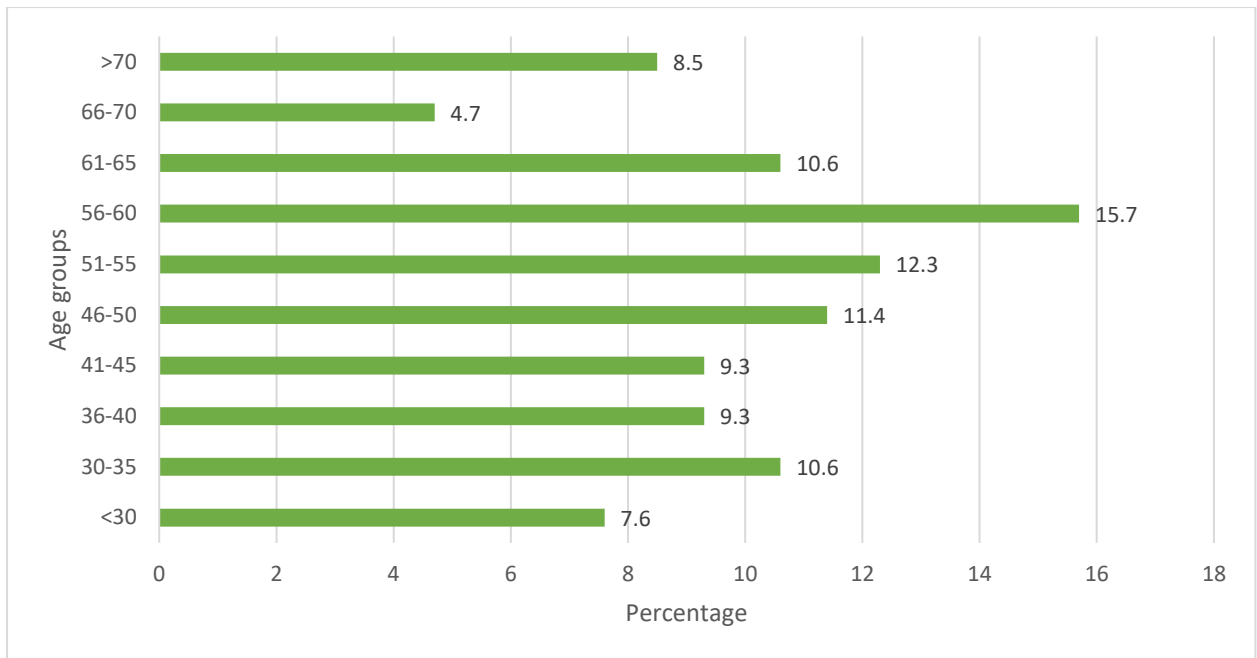


Figure 5.2: Frequency of the age groups

5.5.2 Access to water and sanitation

5.5.2.1 Access to water

Access to clean water is vital to food and nutrition security and is among the pathways for improving nutrition (Neelakantan & Sonne, 2017; Zavala *et al.*, 2021). The findings show that the majority (98%) of the surveyed farming households have improved water sources. Improved water sources are protected from all kinds of contamination. The WHO (2021) reported that 72% of Lesotho’s population uses basic drinking water sources, while 29% uses safely managed drinking sources. Involvement in farming may afford these households the means to access improved water sources, as only 2% relied on unimproved water sources.

As seen in Figure 5.3, all surveyed farming households in the Mafeteng and Quthing Districts have access to improved water sources. Berea (Foothills) and Thaba Tseka (Highlands) have a few households that do not have access to improved water sources.

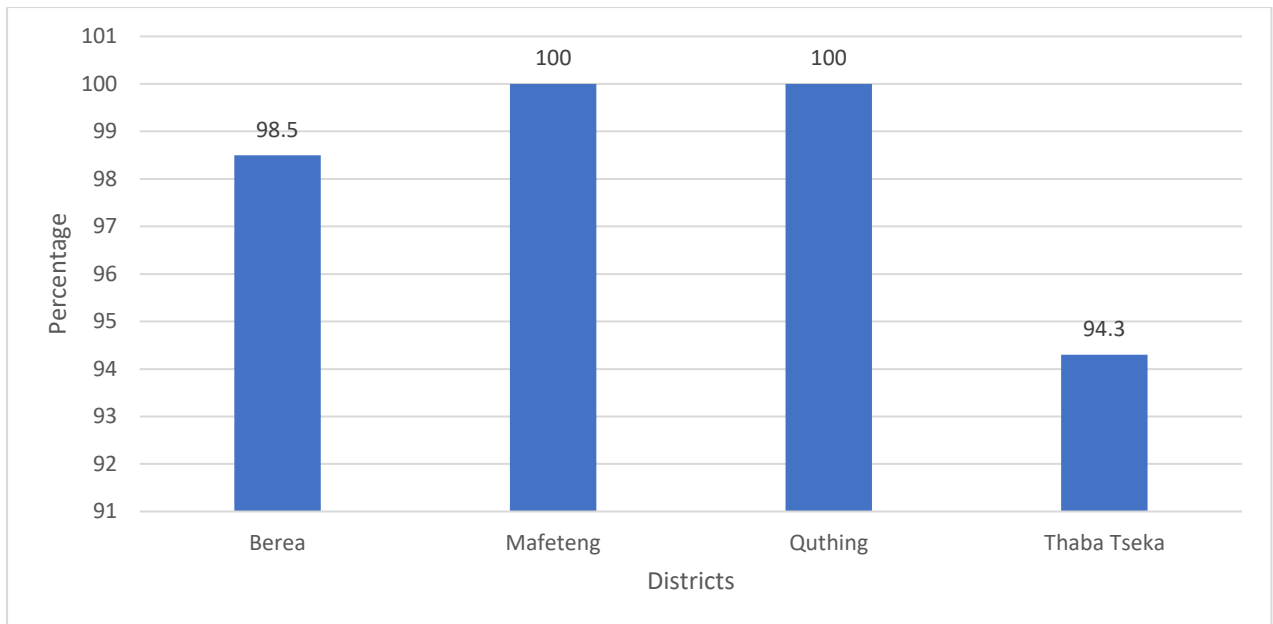


Figure 5.3: Access to improved drinking water sources

5.5.2.2 Access to sanitation

Access to sanitation facilities is linked to food and nutrition security, as poor sanitation can contribute to malnutrition, disease and even death (Neelakantan & Sonne, 2017; Shrestha *et al.*, 2020). The findings indicate that most (95%) of surveyed households had a toilet per household. It shows a decreased likelihood of exposure to infections, which can cause illness, thus negatively affecting nutrition status (Shrestha *et al.*, 2020; Bountogo *et al.*, 2021).

Figure 5.4 shows that households in Berea all had their own toilets, while 86.8% of those in Quthing had toilets of their own. A minority (2.6%, 4.4% and 7.5%) of households in Mafeteng, Quthing and Thaba Tseka respectively, did not have toilets of their own.

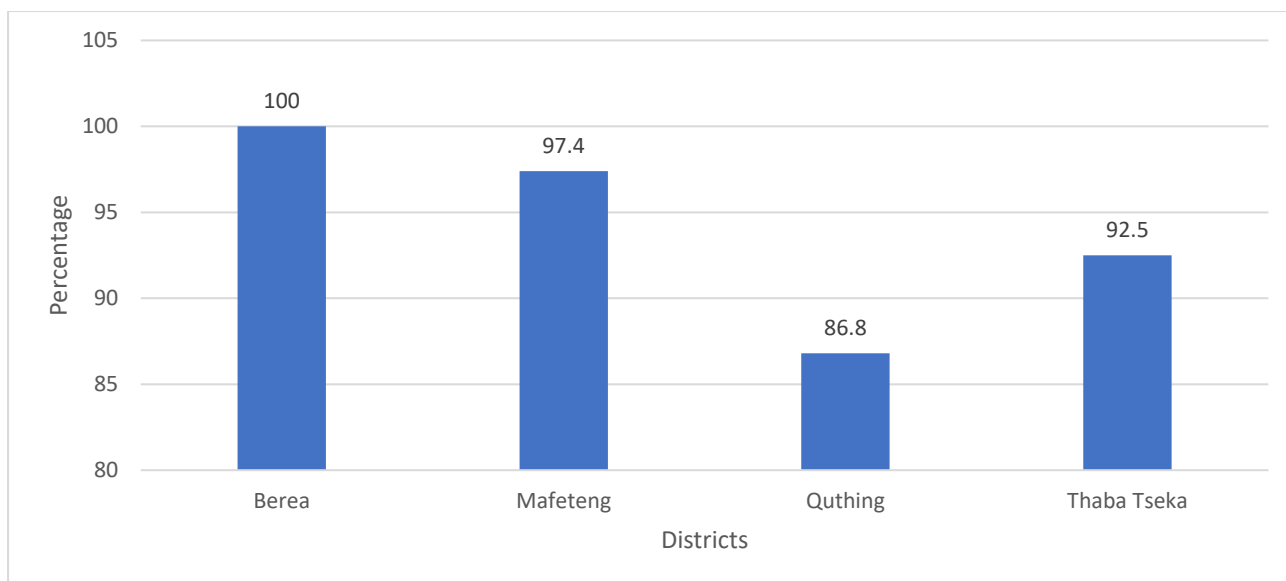


Figure 5.4: Percentage of toilet ownership in a farming household

5.5.3 Household income

5.5.3.1 Household income levels per month

A tenth (10%) of the surveyed households abstained from responding to questions related to income, and the researcher speculates that they found the information too confidential to share. Additionally, the respondents were not responsible for income-generating activities, and the information related to income was not shared with them by the household members, who are income earners. It is further speculated that the respondents feared that if they shared their income levels, they would not receive any assistance from community development programs. The average monthly income of 90% of the households that provided information is LSL 4606.00 (USD294)³. Figure 5.5 reflects the household income levels of the surveyed households. Quthing had the highest frequency (86.1%) of households with the lowest income level LSL0-2000 – (USD0-128), followed by Thaba Tseka (83.7%), Mafeteng (78.7%) and Berea (71.6%), respectively. Although these are small percentages, Berea has more (4.5%) households whose monthly income level ranged between LSL4001-5000 (USD256-319), followed by Thaba Tseka (4.1%), Quthing (2.8%) and Mafeteng (2.7%),

³ Exchange rate (average) as on March to June 2022 – LSL 1=USD15.67 (<https://www.exchangerates.org.uk/USD-ZAR-exchange-rate-history.html>)

respectively. Mafeteng is the only district with farming households whose monthly income is more than LSL5000 (USD319).

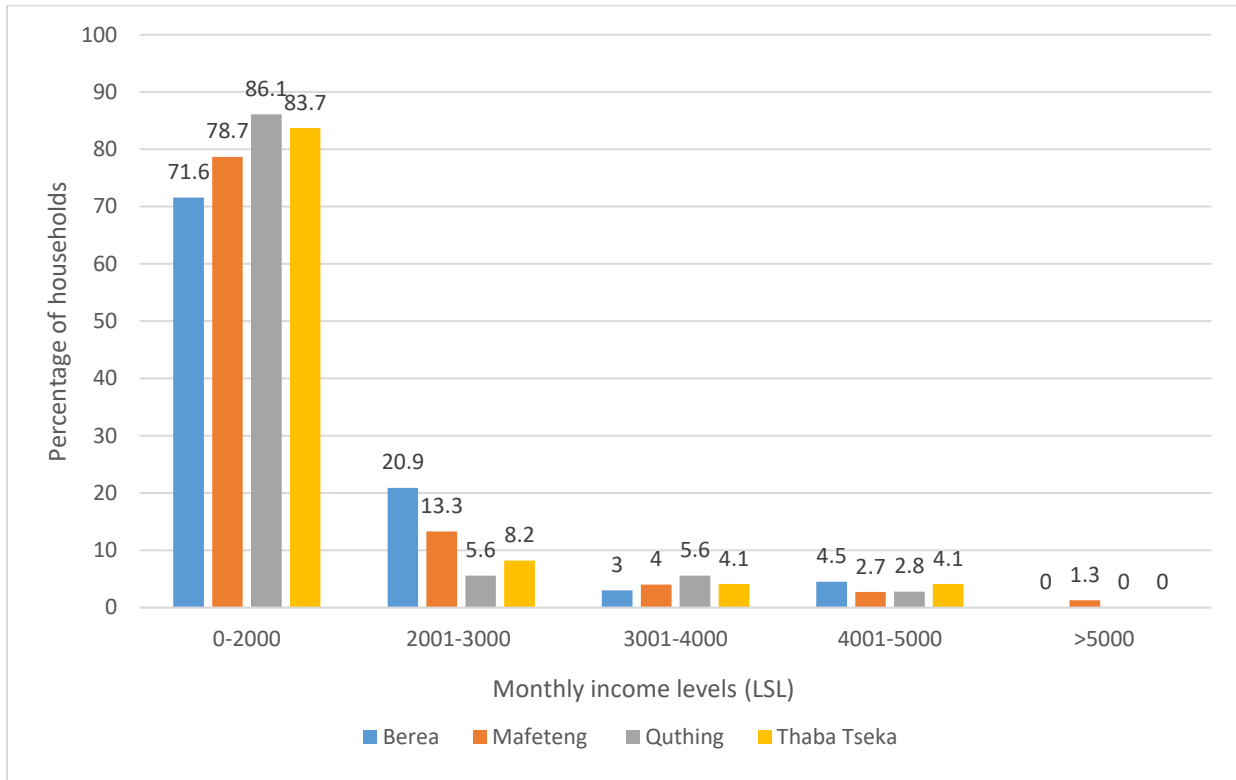


Figure 5.5: Household income levels

5.5.3.2 Sources of income

One expected benefit of commercial agriculture over subsistence farming is the prospect of generating income for the involved households and their communities (Ogotu, 2018; Gomez, Riesgo & Louhichi, 2020). The findings in Figure 5.6 indicate that agriculture is the main source of income for just over half (52.1%) of the surveyed farming households. Agriculture is also a secondary source of income for the majority (44.5%) of the surveyed households. Thus, agriculture plays a significant role in the livelihoods of these households.

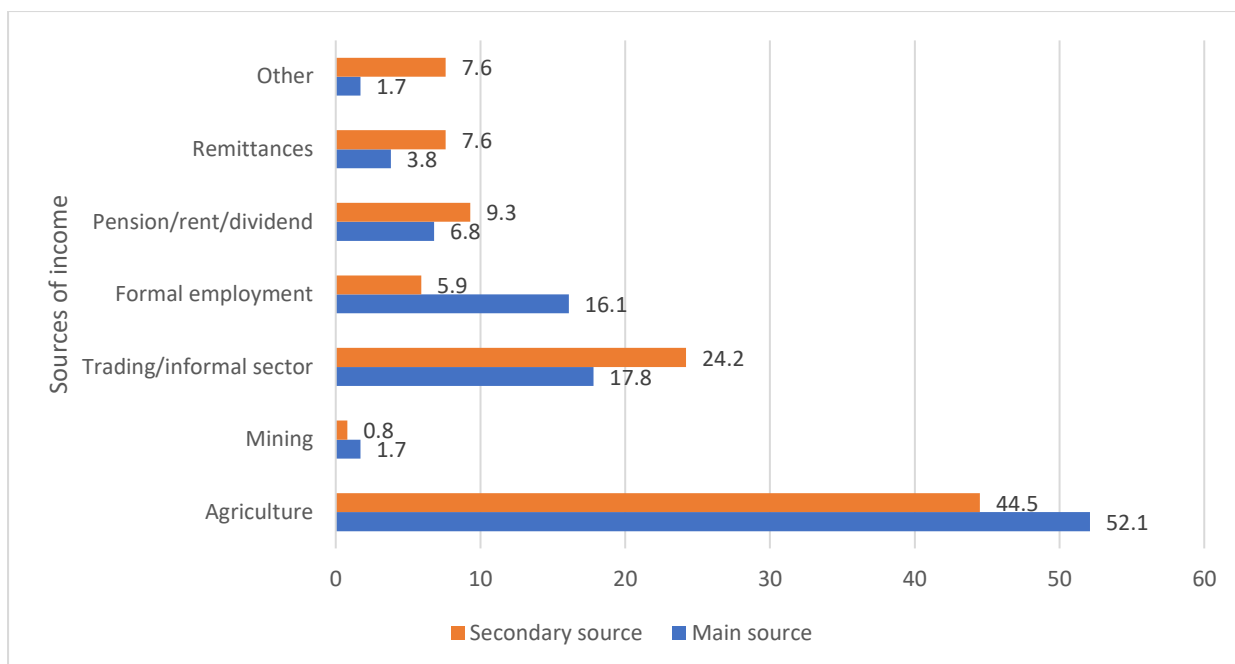


Figure 5.6: Stability of the sources of income

5.5.3.3 Stability of the sources of income

Stability is a pillar of food and nutrition security that addresses sufficient access to nutritious food at all times. Haq *et al.* (2022) suggests that the stability of income sources has implications on the economic access to food acquisition. When there is no income, households may be unable to procure food, resulting in food insecurity, which translates into different forms of malnutrition.

The households that selected other sources of income indicated that they did not have any source of income. Some depended on their children for food and different needs. In contrast, others stated that they do not have any regular source of income, and agricultural production allows them to be self-sufficient.

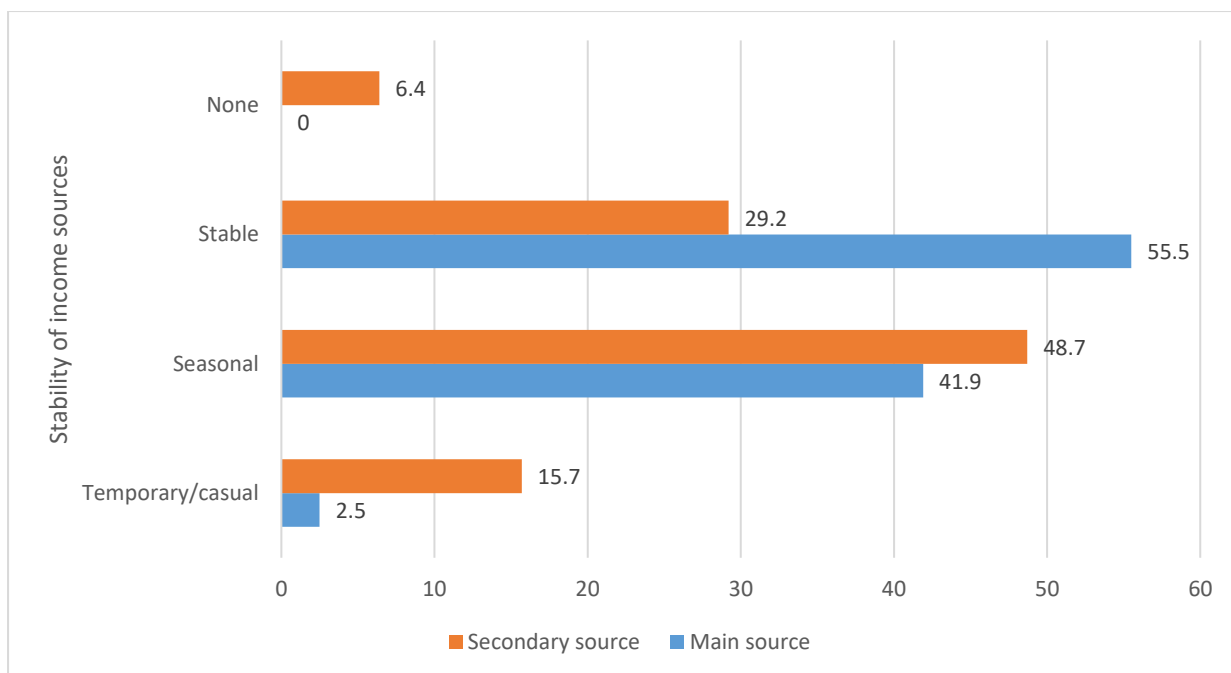


Figure 5.7: Frequency of the stability of income source

5.5.4 Agricultural factors

5.5.4.1 Land ownership

Land ownership is significant in tackling food insecurity and malnutrition, as land is the medium through which food production occurs (Gomez, Riesgo & Louhichi, 2020). There are no significant differences in land ownership between commercial and subsistence farming households, with 92.7% of subsistence farmers and 91.2% of commercial farmers owning their agricultural land. A few (7.2%) commercial farming households used rented land for agricultural production.

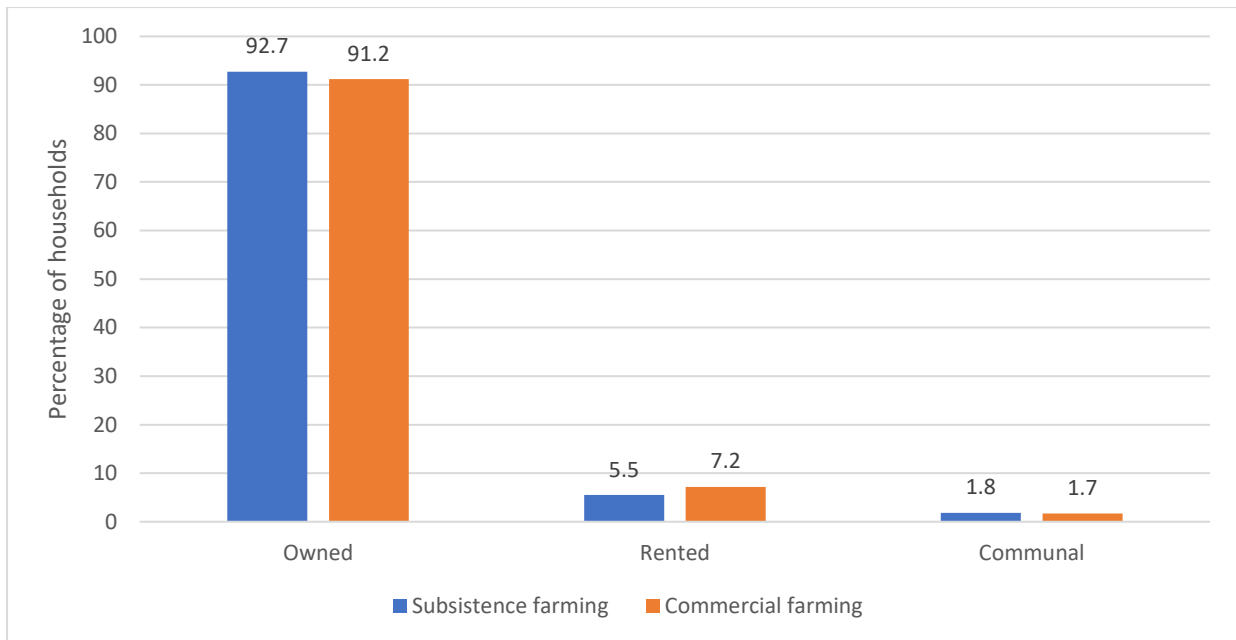


Figure 5.8: Land ownership

5.5.4.2 Agricultural development program beneficiaries in relation to districts

More households in Berea (34%) and Mafeteng (34%) were beneficiaries of agricultural development programs. Those who were beneficiaries of agricultural programs benefitted from programs, such as the FAO seed project, Smallholder Agricultural Development Program (SADP), World Vision, WFP and the Ministry of Trade.

Mafeteng and Berea were in the first phase (2012-2018) of one of the major agricultural development programs (SADP) in Lesotho. The program has extensive coverage of farming households and moved to the rest of the country, including Thaba Tseka and Quthing, in the second phase (World Bank, 2017, 2019a).

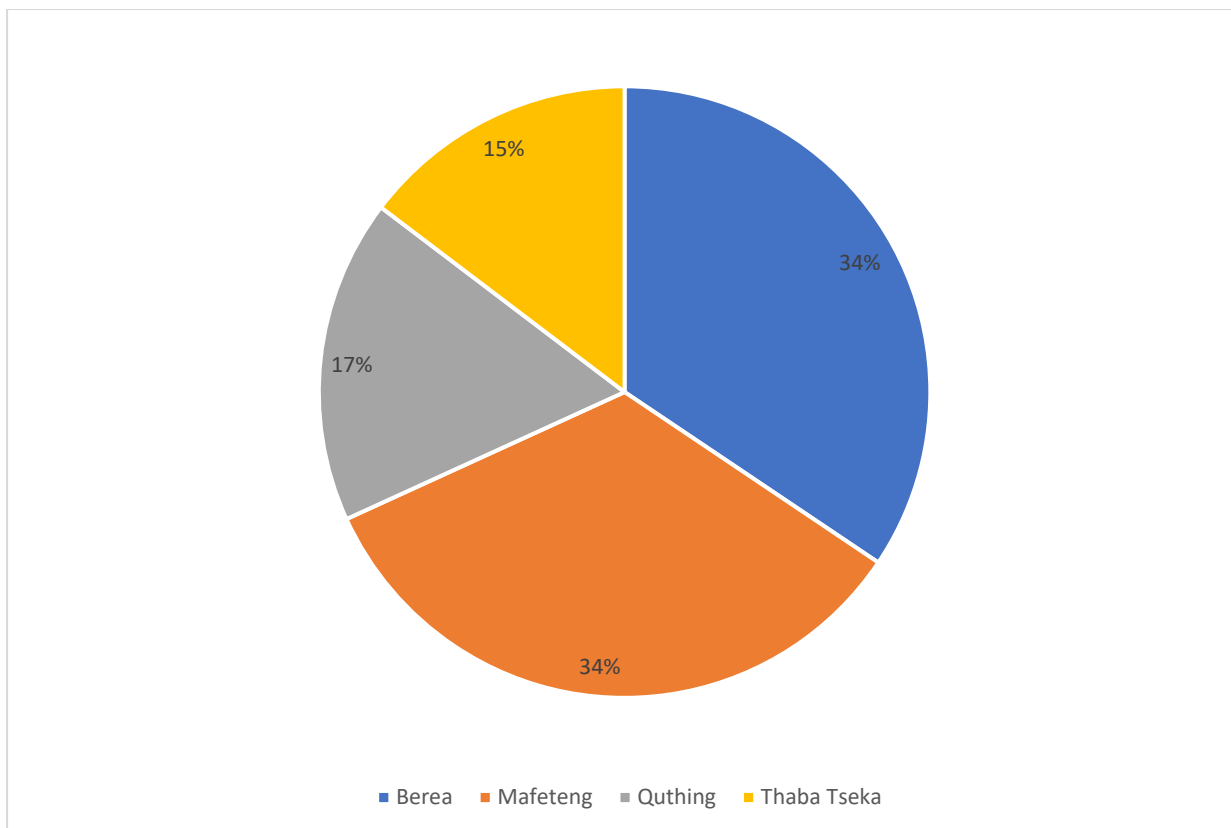


Figure 5.9: Frequencies of households who are beneficiaries of agricultural programs

5.5.5 Nutrition-related factors

5.5.5.1 Receiving nutrition education

Respondents were asked if they had received nutritional education in the past 12 months before data collection. Households that have received nutrition education are more likely to observe good nutrition behaviours and practices, which in turn contributes to alleviating food insecurity and malnutrition (Fadare *et al.*, 2019; Melesse, 2021). Households whose caregivers have been part of nutrition educational interventions tend to be more informed than their counterparts, which may positively affect food and nutrition security (Saaka *et al.*, 2021). More (34%) households in Quthing had received nutritional education than households in Berea (23%) and Mafeteng (23%), while Thaba Tseka (20%) had the least number of households.

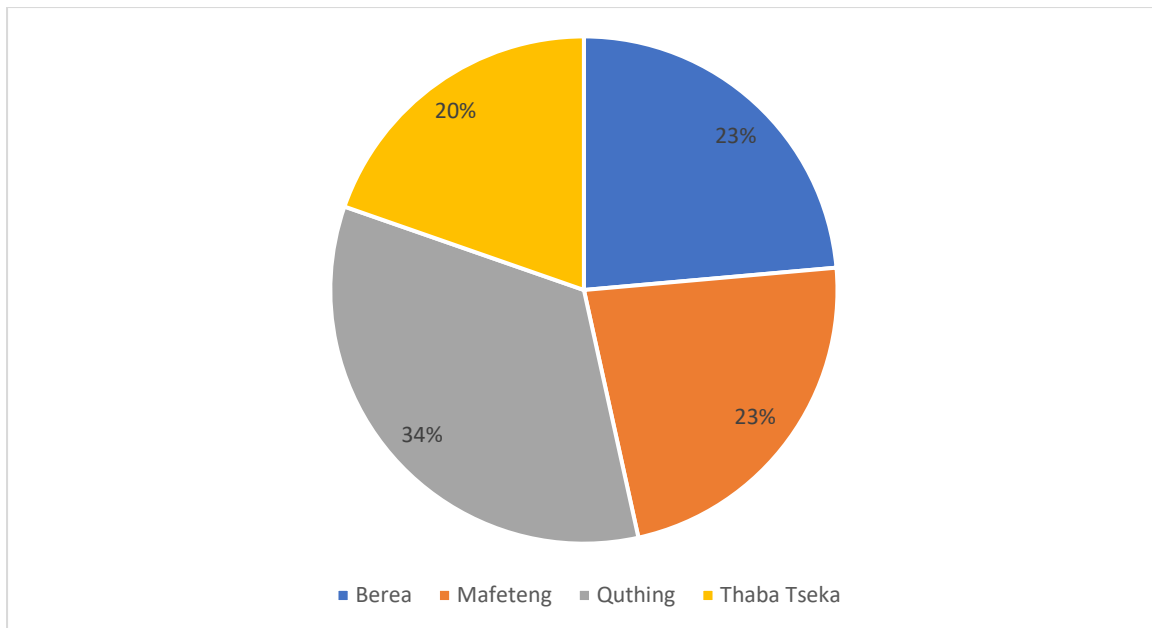


Figure 5.10: Nutrition education in relation to districts

5.5.5.2 Nutrition and Agriculture-related knowledge

Household members perceived as the most knowledgeable about nutrition were women (77.1%), and those more knowledgeable about agriculture were men 53%. While nutrition knowledge seems more female-dominated, agricultural knowledge has an almost equal representation (53% and 44.9%) of men and women, respectively. Men’s involvement in household nutrition-related matters is minimal. At the same time, women are actively involved in agricultural production in most developing countries and play a pivotal role in sustainable development (van den Bold, Quisumbing & Gillespie, 2013; United Nations, 2021). Mokati, Ncube and Bahta (2022) found that women in Lesotho were responsible for food production, processing, preparation and feeding, highlighting their importance in addressing food insecurity and malnutrition at the household level.

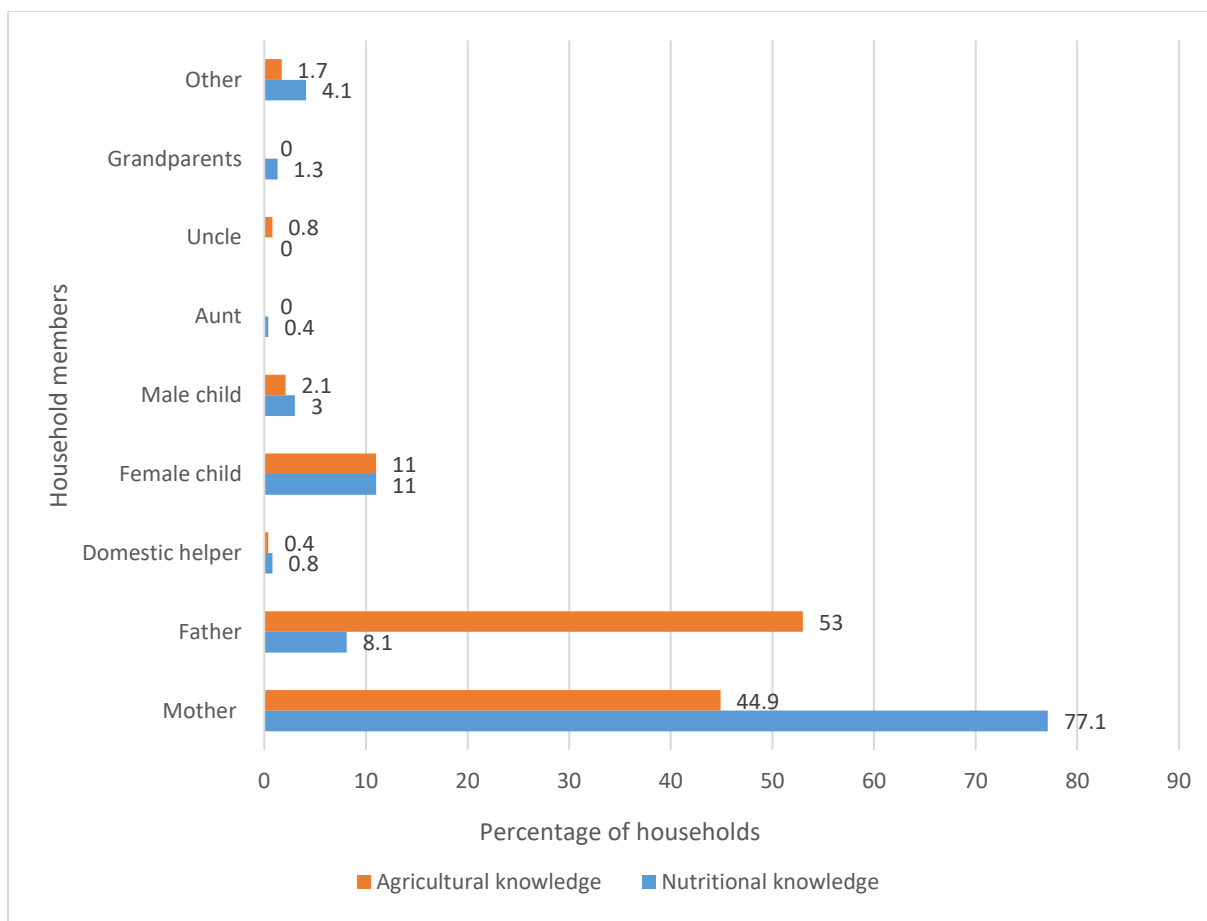


Figure 5.11: Nutrition and agriculture-related knowledge

5.5.6 Access to markets and infrastructure

Access to markets and infrastructure may influence the household’s ability to attain food and nutrition security (Neelakantan & Sonne, 2017; Pawlak & Kokodziejckak, 2020). Respondents were asked if they had access to markets and infrastructure within a 30-minute (2km) walk from the house. The findings in Figure 5.12 show that over half of the households could access a tarred road, a shop where basic food was bought and a health facility within a 30-minute walk. Markets were the least accessible facilities, as only 8.1% of the households had access to markets to buy fresh food, 21.2% had access to markets to purchase agricultural inputs, and 39.0% had access to markets to sell agricultural produce. Supermarkets (44.5%), banks (23.7%) and extension services (37.3%) were further than a 2km radius for more than half of the households.

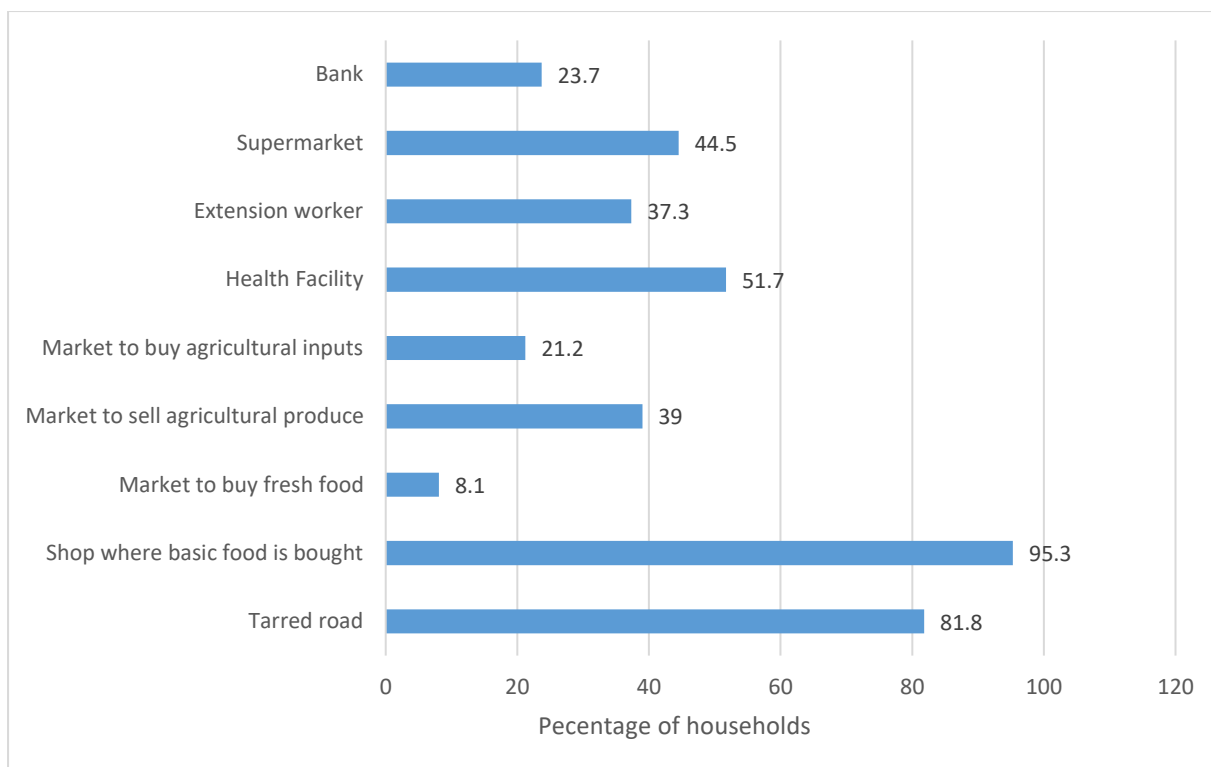


Figure 5.12: Household’s access to markets and infrastructure (within 30 minutes or 2km)

5.5.7 Women’s roles and responsibilities within the household

In most households, women are usually responsible for caring for the household, which makes them critical players in enhancing household food and nutrition security (United Nations, 2021; Mokati, Ncube & Bahta, 2022). Their roles and responsibilities differ with regions, and understanding them in the household context is critical and may have implications on a household’s food and nutrition security.

Figure 5.13 depicts that the activities that most women are involved in on a daily basis are agricultural (81.4%), food preparation and cooking (87.7%), household chores (89.8%) and caring for children (57.2%). Women specified that their agricultural activities are related to production, harvesting, post-harvest handling and selling the produce. The findings are consistent with previous findings that women contribute significantly to enhancing food and nutrition security at the household level, owing to their substantial involvement in the important activities of household food and nutrition security (Madzorera & Fawzi, 2020; Mahofa, Sukume & Mutyasira, 2022). The

respondents that selected 'other' specified that they had disabilities and illnesses that hindered their activeness in carrying out their responsibilities.

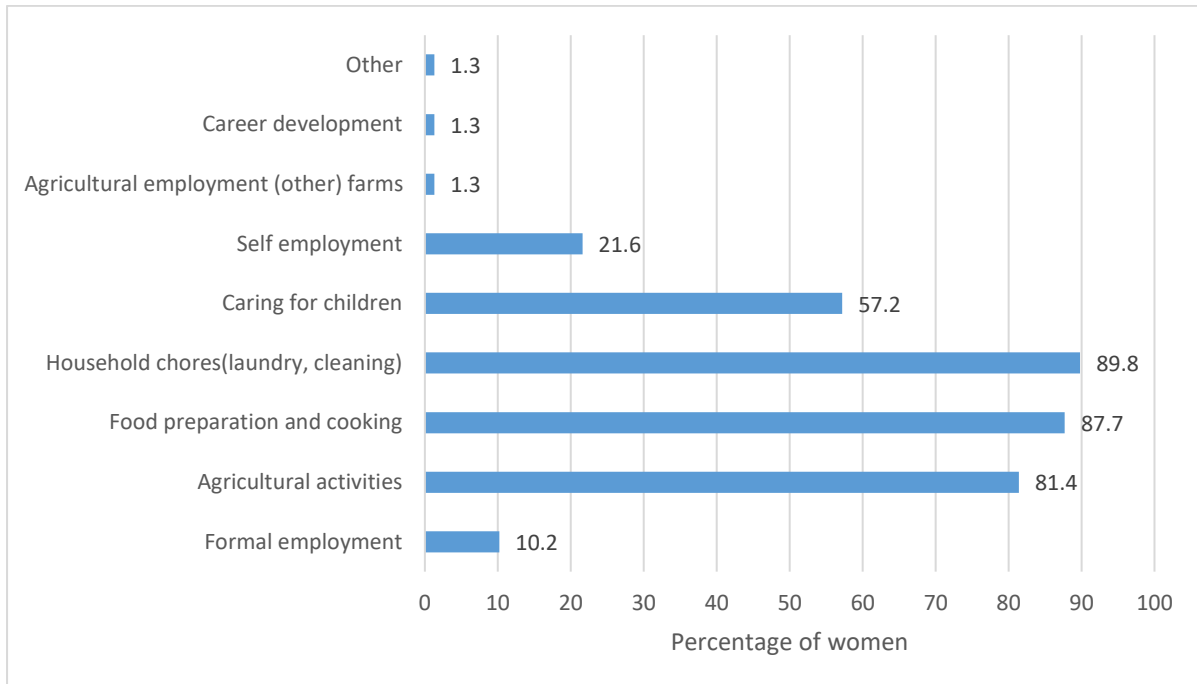


Figure 5.13: Women's responsibilities within the household

5.5.8 Women's role in decision making

The respondents were asked if women took part in some of the activities that played a strategic role in enabling them to ensure food and nutrition security for their households. When women are not involved in these decisions, it may hinder feeding the household nutritious foods (Hawkes *et al.*, 2020). Figure 5.14 shows positive results in this regard, as the majority of women from the surveyed households were involved in decision-making on the use of agricultural land (87.9%), purchase of agricultural inputs (90.9%), where the outputs would be sold (87.9%), how much of the outputs would be sold (87.9%) and how much would be retained for agricultural produce (87.9%).

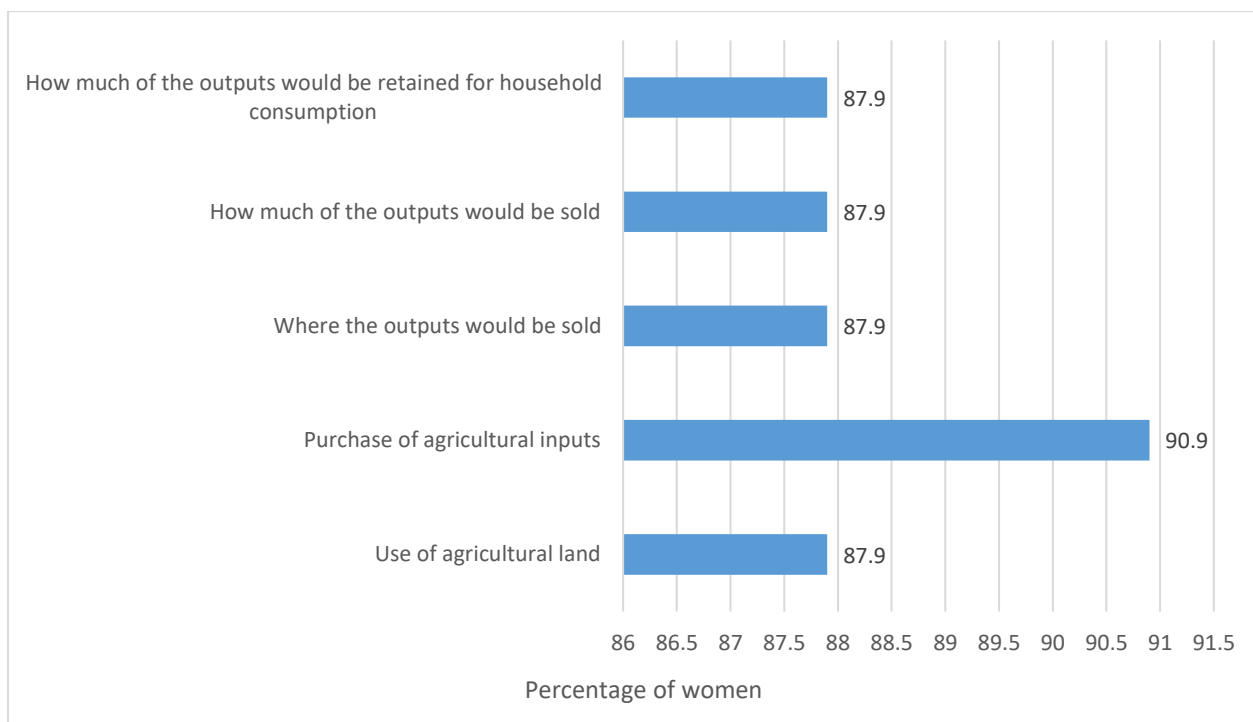


Figure 5.14: Women’s involvement in decision making

5.5.9 Household decision making

The respondents were asked to provide information on the household members responsible for making decisions about household income from all sources, food purchases, allocation of food expenditure and non-food expenditure. The findings in Figure 5.15 indicate that the household's men and women made most decisions. The use of household income earned by all members (50.8%), the use of farm income (49.6%) and the allocation of non-food expenditure (52.1%) were jointly decided on by both the woman and man in the household. Decisions related to the distribution of food expenditure in 48.75% of the households and food purchases in 62.7% of the households rested solely on women.

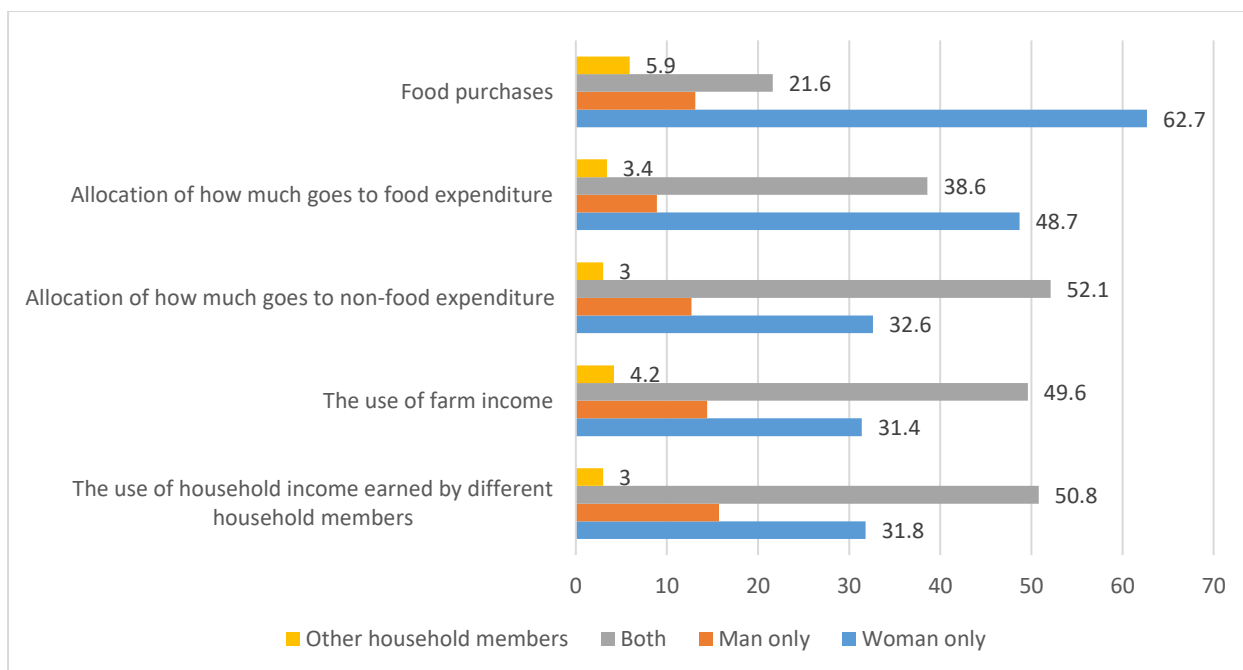


Figure 5.15: Decision-making by household members

5.6 FACTORS AFFECTING HOUSEHOLD FOOD AND NUTRITION SECURITY

The factors that influence food and nutrition security have been identified and discussed by focusing on each one of the indicators: HFIAS, HDDS, CDDS and MDDW.

5.6.1 Factors affecting the household food insecurity

The Household Food Insecurity Access Scale score (HFIAS) is a measure of household food insecurity in the past four weeks. For interpretation, a lower HFIAS score indicates low food insecurity, while a higher HFIAS score reflects high food insecurity. The results in Table 5.3 show the factors affecting HFIAS as an indicator of food and nutrition security.

Table 5.3: Determinants of Household Food Insecurity Access Score (HFIAS)

Model Term	Coefficient	Coefficient Estimate	p-value
Intercept	β_0	0.18	0.934
Is the secondary source of income stable - Temporary	β_1	2.716	0.003**
Is the secondary source of income stable - Seasonal	β_2	3.236	<0.001***
Is the primary source of income stable - Temporary	β_3	9.842	<0.001***
Is the primary source of income stable - Seasonal	β_4	0.959	0.167
Respondent's highest education status – Never been to school	β_5	8.713	<0.001***
Respondent's highest education status – Primary level	β_6	-1.113	0.271
Respondent's highest education status – Secondary level	β_7	-0.448	0.650
Respondent's highest education status – High school level	β_8	-0.015	0.989
Farm income decision maker – Woman-only	β_9	4.164	0.031*
Farm income decision maker – Man only	β_{10}	5.899	0.004**
Farm income decision maker - Both	β_{11}	2.418	0.203
Food preparation - Woman	β_{12}	3.657	<0.001***
During the last four weeks, how would you rate your health – Very good	β_{13}	-3.151	0.002**
During the last four weeks, how would you rate your health - Good	β_{14}	-2.799	0.003**
During the last four weeks, how would you rate your health – Not good or not poor	β_{15}	-1.188	0.293

During the last four weeks, how would you rate your health – A little poor	β_{16}	-1.741	0.08
What is the primary source of energy for cooking - Firewood	β_{17}	1.575	0.139
What is the primary source of energy for cooking – Liquid petroleum gas	β_{18}	-0.802	0.365
What is the average income of the household per month?	β_{19}	-0.000186	0.002**
Taking care of children – Woman is responsible for taking care of children	β_{20}	-1.395	0.028*
Production – Woman is involved in agricultural production	β_{21}	2.141	0.034*
R squared 0.54			
P-value <0.001			

Levels of significance: 0.05*, 0.01** 0.001***

The socio-economic factors that affect HFIAS are income (p-value=0.002) and education status (p-value=<0.001). If the secondary source of income is temporary or seasonal, then the HFIAS is higher. Similarly, if the primary source of income is temporary, then the HFIAS increases significantly. The average monthly household income negatively relates to HFIAS; the more the household income, the less the HFIAS, which indicates improvement in food and nutrition security. The more the households earn, the less the household food insecurity. The findings are consistent with previous study findings among households in Sri Lanka, Cape Town Metropole (South Africa), Maphumulo Local Municipality (South Africa) and Pakistan (Galgamuwa *et al.*, 2017; Ngema, Sibanda & Musemwa, 2018; Swanepoel, Van Niekerk & Van Rooyen, 2018; Abdullah *et al.*, 2019). Higher income affords households good quality and sufficient food and other necessities for a good quality of life (Galgamuwa *et al.*, 2017). However, De Beer, Harmse and Mielmann (2020), suggest that income may be a primary determinant. However, it must be complemented by other relevant interventions as high-income households still experience food insecurity and malnutrition.

If a respondent had not been to school, it increases food insecurity significantly ($p\text{-value} < 0.001$), which suggests that lack of education increases food insecurity. Higher education status is associated with a caretaker's ability to take care of the household better, use healthcare facilities, interact freely with healthcare providers, comply with treatment recommendations, keep the living environment clean and good nutrition practices (Acharya, Bhatta & Timilsina, 2017; Sekhampu, 2017; Sekartaji *et al.*, 2021).

The findings also show that household members' roles and responsibilities affect food and nutrition security, and women's responsibilities seem to affect household food and nutrition security outcomes more. Having the man or woman as the only decision maker on farm income increases HFIAS, and if the woman is not responsible for food preparation, the HFIAS increases. If the woman is not responsible for caring for the children, the HFIAS decreases ($p\text{-value} = 0.028$). Since taking care of children may require the women's constant presence, this could hinder their commitment to other activities, such as income generation, that enhance household food security. Haq *et al.* (2022) found that households with working women in Pakistan had a higher likelihood of improved food and nutrition security than those without. Thus, women empowerment has been established as a pathway to enhance household food and nutrition security. Women play a significant role in the functioning of the household, and ensuring that their own nutritional needs and those of other household members are met (Madzorera & Fawzi, 2020; Mahofa, Sukume & Mutyasira, 2022).

Interestingly, when women are involved in agricultural production, the HFIAS increases ($p\text{-value} = 0.034$). It implies that women's involvement in agricultural activities increases the likelihood of household food and nutrition insecurity. Despite the importance of agricultural production, women's participation does not contribute to an enhanced food and nutrition security status. Commitment to agricultural activities could also take time for other activities that improve the household's food and nutrition security, including preparing nutritious meals.

The findings further show that health also determines HFIAS. If the respondent has very good or good health, the HFIAS decreases significantly. Good health enables productivity and increases the likelihood of participating in income-generating activities. Thus, health is critical to achieve food and nutrition security. Health status and food security have a reciprocal relationship. When an individual's health is poor,

the body cannot properly utilise the ingested food. On the other hand, malnutrition and food insecurity result in poor health (Verhart *et al.*, 2015; Beyene, 2022).

5.6.2 Factors affecting the household dietary diversity

The household dietary diversity score indicates the household's economic ability to procure various foods and is a proxy for dietary quality. The higher the dietary diversity score, the higher the food and nutrition security; the lower the dietary diversity score, the lower the food and nutrition security. Table 5.6 shows the factors that influence the dietary diversity of the surveyed households.

Table 5.4: Determinants of Household Dietary Diversity Score (HDDS)

Model Term	Coefficient	Coefficient Estimate	p-value
Intercept	β_0	9.509	<0.001
Responsible for feeding the children – Woman only	β_1	-1.209	<0.001
Responsible for feeding the children – Man only	β_2	-1.977	0.001
Number of children	β_3	-0.117	<0.001
What is the primary source of energy for cooking – Firewood	β_4	-0.868	0.016*
What is the primary source of energy for cooking – Liquid petroleum gas	β_5	0.052	0.867
During the last 12 months, could you obtain credit for the purchase of operational agricultural expenses- Yes	β_6	1.036	0.001*
Have you heard of the following macronutrients? –Protein	β_7	1.264	0.004*
Where do you buy the majority of your food – Shop where basic foods are sold in the village	β_8	-0.365	0.413
Where do you buy the majority of your food – Supermarket in the village	β_9	-0.715	0.017**

What is the monthly expenditure on food?	β_{10}	0.000203	0.017**
Are there any of the following facilities within a 30-minute (2km) walk from the house – Shop where basic food can be bought	β_{11}	-1.281	0.019*
Are there any of the following facilities within a 30-minute (2km) walk from the house – Supermarkets	β_{12}	0.528	0.019*
R squared 0.54			
P-value <0.001			

Levels of significance: 0.05*, 0.01** 0.001***

The findings depict that when the man or woman alone are responsible for feeding the children, the dietary diversity decreases. The results suggest that the involvement of both women and men in feeding children is related to household food and nutrition security. There is a relationship between food insecurity and child-feeding practices (Arlinghaus & Laska, 2021). When a parent has the responsibility of feeding children alone, it may affect their ability to engage in means to procure diverse food, and these include agricultural production or other income-generating activities, as they must be present much of the time to take care of the child's food-related needs.

The more children there are, the lower the HDDS (p-value=<0.001). Household size affects food and nutrition security, as fewer members would need to procure less food (Acharya, Bhatta & Timilsina, 2017).

The findings also show that the availability of cooking facilities and energy are associated with dietary diversity. Households that use firewood for cooking have a lower dietary diversity (p-value = 0.016). Sola *et al.* (2016) established the link between access to energy and food security in Sub-Saharan Africa. It may be difficult to prepare various foods when the energy sources are not convenient. Access to cooking facilities and fuel is a socio-economic driver and a pathway to food security and sustainable development (WFP, 2022b).

Access to credit was significantly (p -value=0.001) associated with HDDS. Households that could obtain credit for purchasing operational agricultural expenses have a higher dietary diversity. Access to credit was positively related to the consumption of a varied diet in Ghana and Bangladesh (Bidisha *et al.*, 2017; Annim & Frempong, 2018). The ability to purchase inputs increases the likelihood of high yields and improved food and nutrition security. While agriculture is a significant activity in Africa, the commercial banks' lending towards the sector is minimal (Gomez, 2020).

Respondents who knew protein as a food category had a higher HDDS. Knowing what is important in a diet seems to improve dietary diversity. While the knowledge of other food types is not evident, it would seem that some knowledge about food types influences the household's consumption of a varied diet. Nutrition-related knowledge has been found to be significantly associated with household food security and nutrition. The more the knowledge, the higher the likelihood for enhanced food security and nutrition (Begley *et al.*, 2019; Saaka *et al.*, 2021).

The household's access to shops and the type of shops affects the dietary diversity. Households that buy food from the shop in the village have a lower HDDS than those buying from a supermarket in town. However, access to supermarkets is more significant if it can be accessed within a 30-minute (2km) walk from the house. The findings also indicate that if a shop where basic food can be bought is within the range mentioned above, the HDDS is lower. It could be attributed to the limited diversity of food products in supermarkets and shops in the village, compared to those in towns. Households will find it convenient to go to shops and supermarkets that are closer at the expense of finding a variety of food products in supermarkets that are in town. Shops in the village usually sell very basic foods, and supermarkets in the same location are not very different from shops, particularly in rural communities. However, town supermarkets have a high market-level diversity and could positively influence HDDS (Chege *et al.*, 2021).

5.6.3 Factors affecting child dietary diversity score

Child dietary diversity score reflects the variety in children's (6-59 months) diets, which also informs the likelihood of nutrient adequacy. The higher the score, the higher the

dietary diversity, and the opposite is true. Table 5.5 shows the determinants of child dietary diversity among the surveyed households.

Table 5.5: Determinants of Child Dietary Diversity Score (CDDS)

Model Term	Coefficient	Coefficient Estimate	p-value
Intercept	β_0	0.824	0.145
What is your monthly household expenditure on food?	β_1	0.000288	0.004**
What is the household's average income (from all sources) per month?	β_2	0.0000526	0.022*
Districts-Berea	β_3	1.377	0.00013***
Districts-Mafeteng	β_4	0.728	0.040*
Districts- Quthing	β_5	0.867	0.015*
Are you the household head?-Yes	β_6	-0.403	0.187
Respondent's highest education status- Never been to school	β_7	0.246	0.765
Respondent's highest education status- Primary level	β_8	0.289	0.513
Respondent's highest education status- Secondary level	β_9	0.686	0.117
Respondent's highest education status- Tertiary level	β_{10}	0.963	0.024*
What type of farming are you involved in? - Commercial farming	β_{12}	0.463	0.155
R squared	0.52		
P-value <0.0001			

Levels of significance: 0.05*, 0.01** 0.001***

Children's reliance on adults for their well-being makes them even more vulnerable to malnutrition (Gibson, 2016). As seen in Table 5.5, the association between the caretaker's education status and child dietary diversity is statistically significant (p-value = 0.024). Children whose caretakers have attained a higher level of education

have a higher dietary diversity score than their counterparts. Consistently, studies in Madagascar (Rakotonirainy *et al.*, 2018) and Indonesia (Sekartaji *et al.*, 2021) showed that poor education status was associated with a less varied diet. Study findings in Ethiopia (Sisay *et al.*, 2022) differ as there was no statistically significant association between the education status of the caretaker and children's dietary diversity score. Thus, a high education status will not always translate into adequate dietary diversity.

Average monthly food expenditure is significantly associated with child dietary diversity (p-value=0.004). An increase in food expenditure is associated with an increased dietary diversity. Food expenditure is another indicator of food and nutrition security and is increasingly used for assessing a household's ability to procure food (Jones *et al.*, 2013; Zezza *et al.*, 2017; Russell *et al.*, 2018). While households need to have the capacity to procure a diverse food basket, when a larger share of household income is spent on food, the households become vulnerable to food insecurity (WFP, 2016).

The household's average yearly income increases the child's dietary diversity score (p-value = 0.022). An increase in monthly household income was also significantly associated with increased women's dietary diversity (Table 5.6) and reduced food insecurity (Table 5.3). An increase in the household's annual income leads to a more diversified diet for children. The findings suggest that income is more likely to enhance children's dietary diversity when income levels are stable over extended periods.

The child dietary diversity will increase if the households reside in other districts except Thaba Tseka (highlands). The prevalence of food insecurity and malnutrition is higher in remote areas of Lesotho, and the highlands tend to have more of these remote areas. Access to markets is limited by distance, among others, and the availability of various foods is relatively low in these areas (WFP and UNICEF, 2019). The place of residence contributes significantly to the access to resources that drive food and nutrition security. There is a higher likelihood for enhanced food and nutrition security in areas with access to facilities, such as markets, than those that have limited access (Edris, Atnafu & Abota, 2018; Mihretie, 2018b).

5.6.4 Factors affecting women’s dietary diversity

The women’s dietary diversity score is an indicator used to assess the diet diversity of women of reproductive age (15 - 49 of age). Women who have consumed five food groups or more have a higher likelihood of nutrient adequacy in comparison to those who consumed less than five food groups. Thus, the higher the dietary diversity score, the more varied the diet is (FAO, 2018a).

Table 5.6: Determinants of Women’s Dietary Diversity Score

Model Term	Coefficient	Coefficient Estimate	p-value
Intercept	β_0	3.079	<0.001
District - Berea	β_1	0.906	0.002**
District – Mafeteng	β_2	0.645	0.026*
District – Quthing	β_3	-0.162	0.627
Average income per month for the household	β_4	0.0000661	0.001**
Is secondary income stable - Temporary?	β_5	-0.842	0.011*
Is secondary income stable - Seasonal?	β_6	-0.537	0.023*
Access to credit - Yes	β_7	0.714	0.016*
R squared 0.22			
P-value <0.001			

Levels of significance: 0.05*, 0.01** 0.001***

The findings in Table 5.6 reflected that if women are from farming households in Mafeteng and Berea, their dietary diversity improves. These two districts represent the lowlands and foothills regions, respectively. Households residing in these districts have better access to facilities, which heightens obtaining diverse diets (WFP & UNICEF, 2019).

Average monthly income has a significant positive relationship with the score (p-value=0.001). An increase in income leads to an increase in women’s dietary diversity. It is similar to other study findings among women in Southern Ethiopia (Delil *et al.*, 2021; Gudeta *et al.*, 2022) and Central Ethiopia (Desta *et al.*, 2019).

Increased income enables economic access to food, and enables procurement of a diverse foods (Carletto, Corral & Guelfi, 2017; Ogutu, Gödecke & Qaim, 2020).

The stability of the secondary source of income has a significant effect on the women's dietary diversity. If it is temporary or seasonal, then the score decreases. It is implied that when there is no secondary source of income, household members are vulnerable to food insecurity and malnutrition. The household's ability to constantly access nutritious and sufficient food is essential (García-Díez *et al.*, 2021).

Women consume diverse diets when farming households can access credit to purchase agricultural inputs (p -value=0.016). Similar findings were observed for the determinants of household dietary diversity (Table 5.4).

5.7 CONCLUSIONS

Household income is a determinant for all food and nutrition security indicators: HFIAS, HDDS, CDDS and MDDW, making it a significant factor in food and nutrition security. The determinants for HFIAS are average monthly income, stability of the income, education status of the respondent, farm income decision maker, health status of the respondent and those who are responsible for taking care of children. The factors associated with HDDS are the primary source of energy for cooking, access to credit to purchase agricultural inputs, where most of the food is bought, nutrition knowledge received in the recent past (the last 12 months) and monthly expenditure on food. The determinants for MDDW are area of residence, monthly income and access to credit. The factors influencing CDDS are monthly expenditure on food, place of residence, monthly income and education status of the caretaker. The effect of income on HDDS is implied in its association with monthly expenditure on food.

Therefore, the hypothesis is accepted that household income is a significant determinant of food and nutrition security within farming households. Other than income, factors that influenced the different food and nutrition security indicators are the education status of the respondent, type of retail markets that sell food, access to credit for purchasing agricultural inputs, area of residence and being a beneficiary of

an agricultural development program. These findings were consistent with previous study findings in developing countries in Africa and Asia, predominantly.

5.8 RECOMMENDATIONS

The Food and Nutrition Policy (2016-2025) has strategised to target the socio-economically deprived households, and these seemingly include the farming households. The interventions that seek to enhance food and nutrition security among farming households must consider income as the main determinant and develop relevant programs. The economic development plans that create more income-generating activities specific to farming households are essential. Farming households must be empowered to gain maximum economic benefits from their agricultural efforts. Agricultural interventions must consider access to credit for purchasing agricultural inputs and market access to create an enabling environment. Interventions must also be tailored to the different districts as the areas of residence impact the food and nutrition security of the farming households.

CHAPTER 6 :

THE SIGNIFICANCE OF COMMERCIAL AGRICULTURE ON HOUSEHOLD FOOD AND NUTRITION SECURITY

ABSTRACT

The government of Lesotho and its donor support have invested vastly in commercial agriculture in the past decade. Transitioning from subsistence to commercial agriculture aims to create employment, reduce poverty and hunger and grow the country's economy. The objective of the study was to assess the contribution of commercial agriculture to the farming households' food and nutrition security. Randomly selected commercial farmers served as the treatment group, while the subsistence farmers were the control group. A propensity score matching was employed as a quantitative approach to estimate the contribution of commercial agriculture to household food and nutrition security. Face-to-face interviews with key informants addressed the qualitative approach. The findings from both the qualitative and quantitative methods complementarily reflected a positive contribution of commercial agriculture to the food and nutrition security of the involved households. It was highlighted that commercial agriculture must be nutrition-sensitive to yield positive food and nutrition security outcomes. Interventions that support the commercialisation of agriculture must be deliberate about assisting the farming households to understand the channels through which commercial agriculture can be maximised to enhance their food and nutrition security.

Keywords: Commercial agriculture, food and nutrition security, propensity score matching

6.1 INTRODUCTION

Despite the many interventions to enhance food and nutrition security, food insecurity and malnutrition remain a challenge in most developing countries (FAO *et al.*, 2022). Agricultural growth and development continue to be sought as a development

approach for improving livelihoods and food security for agrarian households (Carletto, Corral & Guelfi, 2017). Agriculture in developing countries has seen a rapid transition from subsistence to commercial agriculture in the last decade. African countries have committed public spending towards agricultural development under the Comprehensive Africa Agriculture Development Programme (CAADP) (NEPAD, 2022). Substantial donors, including the World Bank and the Bill and Melinda Gates Foundation, have increased their footprint in the agricultural sector. African agriculture has become an investment venture and pathway for fighting food insecurity and malnutrition (Smalley, 2014; World Bank, 2014).

The development of commercial farming in most countries in the sub-Saharan Africa has been delayed, unstable, and has not yielded the expected outcomes (Inikori, 2013; Smalley, 2014). Agriculture in this region is dominated by small-scale farms, which reduces the prospects for increased productivity (FAO and IFPRI, 2020). Although commercialisation has been shown to contribute to poverty reduction and household income, empirical evidence on its nutritional impact is limited (Carletto, Corral & Guelfi, 2017; Ogutu, Gödecke & Qaim, 2020).

Agriculture in Lesotho has transformed in the last decade with the increased establishment of commercial farm enterprises. The government and donor support have invested in supporting the transition from subsistence to commercial farming to reduce poverty, creation of employment and the growth of the economy (World Bank, 2019b, 2022b). On the other hand, agriculture has also been hit hard by drought and erratic weather conditions, causing some farmers to abandon their farming enterprises owing to their inability to cope and adapt (Kheleli *et al.*, 2021; Muroyiwa & Linakane, 2021). Therefore, the role of agriculture in yielding food and nutrition outcomes has been challenged. In light of the challenges, it would be beneficial to assess the contribution of these enormous efforts towards improving livelihoods and reducing food and nutrition security. The assessment will yield information that may guide improvements for future planning and further investment in the commercialisation of agriculture.

The evidence pertaining to the significance of commercial agriculture in yielding food and nutrition security outcomes in Lesotho, is limited. Therefore, this study aimed to contribute to the existing literature by providing empirical findings for the assessment

of the contribution of commercial agriculture to the food and nutrition security of farming households.

6.2 OBJECTIVE

To determine the contribution of commercial agriculture to the food and nutrition security of the farming households in Lesotho.

6.3 HYPOTHESIS

Commercial agriculture has a positive contribution to household food and nutrition security.

6.4 METHODOLOGY

6.4.1 Research design

Both qualitative and quantitative research approaches have been used to determine the contribution of commercial agriculture to household food and nutrition security. It was done to appreciate the complementarity of the two approaches in providing a comprehensive understanding of the phenomena under study (Creswell, 2014; Schoonenboom & Johnson, 2017). While quantitative and qualitative research approaches have been separately criticised for their limitations, combining the strengths of the two adds value, which also minimises the limitations to obtain a richer insight into the research topic (Creswell, 2014; Sonandi, 2018).

6.4.2 Study area and population

The study focused on commercial farmers in Lesotho. The farmers were accessed through extension workers. Multi-stage sampling was used to select commercial farmers who will participate in the study. The first stage involved selecting four out of ten districts in Lesotho, namely Mafeteng, Berea, Thaba-Tseka and Quthing. Each district represents the four agro-ecological zones in the country: Lowlands, Foothills, Mountains and Senqu River Valley, respectively (Bureau of Statistics (BOS), 2016). The second stage involved selecting 13 district constituencies, which were determined

through the guidance of extension officers focusing on those concentrated with active farmers. In the last stage, 22 villages were selected from constituencies, and 181 commercial farmers were randomly selected to participate in the study. Subsistence farmers from the same area served as a control group, and 55 were selected randomly. On the other hand, key informants were purposively selected by expertise and years (12 months and above) of practice in the related topic.

6.4.3 Data collection

Data related to the food and nutrition security situation were collected using food and nutrition security indicators (household dietary diversity score, household food insecurity access scale, minimum dietary diversity for women and under-five child dietary diversity score). Respondents were also asked to provide information related to socio-economic characteristics, agricultural production and access to resources (water, land, markets). The data was used to estimate the significance of commercial agriculture on household food and nutrition security.

Qualitative data were collected through face-to-face interviews, where key informants were asked about their perspectives and opinions on the contribution of commercial agriculture to household food and nutrition security. The interviews occurred at a time set by the key informants to avoid disturbing their schedules. Data saturation occurred within 13 interviews. No additional issues were generated at this point, and no further dimensions were found. Guest, Bunce and Johnson (2006) also found that saturation occurred within the first 12 interviews with key informants, and Muellmann *et al.* (2021) found minor variation in the responses of 10 key informants. However, it is crucial to consider related studies with a similar context for improved results. The interviews were recorded, and detailed notes were taken during the interview with key informants and labelled to ease reference.

6.4.4 Data analysis

6.4.4.1 Analysis of qualitative data

To analyse qualitative data, the recorded information was repeatedly listened to, transcribed, and linked to the written notes. The opinions and perspectives of the key informants were manually categorised into repeatedly mentioned themes. The data were manually handled, owing to the small number of participants. Thematic analysis was selected because of its efficiency in depicting the common themes in the responses (Creswell, 2014). Data was analysed to develop a patterned comprehension of the participants' responses (Braun *et al.*, 2019). The themes were described and interpreted to produce an analytic narrative of the participants' perceptions of the contribution of commercial agriculture to the food and nutrition security of farming households (Bezabih *et al.*, 2022).

6.4.4.2 Analysis of quantitative data

Quantitative data analysis used R-programming to conduct a Propensity Score Matching (PSM) technique. This technique is beneficial in estimating the causal effect in experimental research by finding a matched control group for a treatment group (Stuart, 2010; Huber *et al.*, 2017). It is applicable in estimating the attribution of the outcomes to the intervention and strengthening causal arguments (Randolph *et al.*, 2014). PSM stimulates randomisation to reduce selection bias on participants and confounding variables (Stuart, 2010).

A significant difference in food and nutrition security between the commercial (treatment group) and subsistence (control group) farmers has been established. However, the contribution of commercial agriculture to the difference is unknown. Historical data is also absent to allow comparison and measurement of the impact of agriculture on the food and nutrition security of the surveyed households. Therefore, a propensity score matching was more suitable.

A propensity score matching was used to estimate the average marginal effect of commercial farming on those who participated, accounting for confounding by the included covariates. This technique was adopted by Swanepoel, Van Niekerk and Tirivanhu (2021) in analysing the contribution of urban agriculture to household food

security in Cape Town Metropole, South Africa. Alam *et al.* (2023) also used propensity score matching to analyse the impact of the COVID-19 pandemic on vegetable farmers in Bangladesh. Based on the observed characteristics, PSM matches the treatment group and the control group to estimate the effect of commercial agriculture on households' food and nutrition security.

However, it is noted that since this technique matches the treatment and control group, its validity may be slightly compromised in studies where the control group is smaller than the treatment group (Stuart, 2010). Thus, such study findings must be interpreted with caution (Bryson, Dorsett & Purdon, 2002).

The analysis involved the first attempt, a 1:1 nearest neighbour propensity score matching without replacement with a propensity score estimated, using logistic regression of the treatment on the covariates. This matching outcome indicated poor balance, so a full matching on the propensity score was attempted. The result showed an adequate balance, as illustrated in Figure 6.1. A probit regression of the treatment on the covariates was used to estimate the propensity score. The results had a better balance than a logistic regression. Post-matching, all standardised mean differences for the covariates were below 0.1, and all standardised mean differences for squares and two-way interactions between covariates were below 0.15, indicating an adequate balance. Full matching uses all treated and all control units without discarding any units. PSM matches the treatment group and the control group based on the observed characteristics to estimate the effect of commercial agriculture on household food and nutrition security.

Separate linear regression models with HFIAS, HDDS, CDDS or MDDW as the outcome and treatment were fitted, covariates and their interaction as predictors, and the full matching weights were included in the estimation to estimate the treatment effect and its standard error. The `lm()` function was used to fit the outcome, and the `comparisons()` function in the marginal effects package was used to perform g-computation in the matched sample to estimate the average treatment effect in the treated (ATT). A cluster-robust variance was used to estimate its standard error with matching stratum membership as the clustering variable.

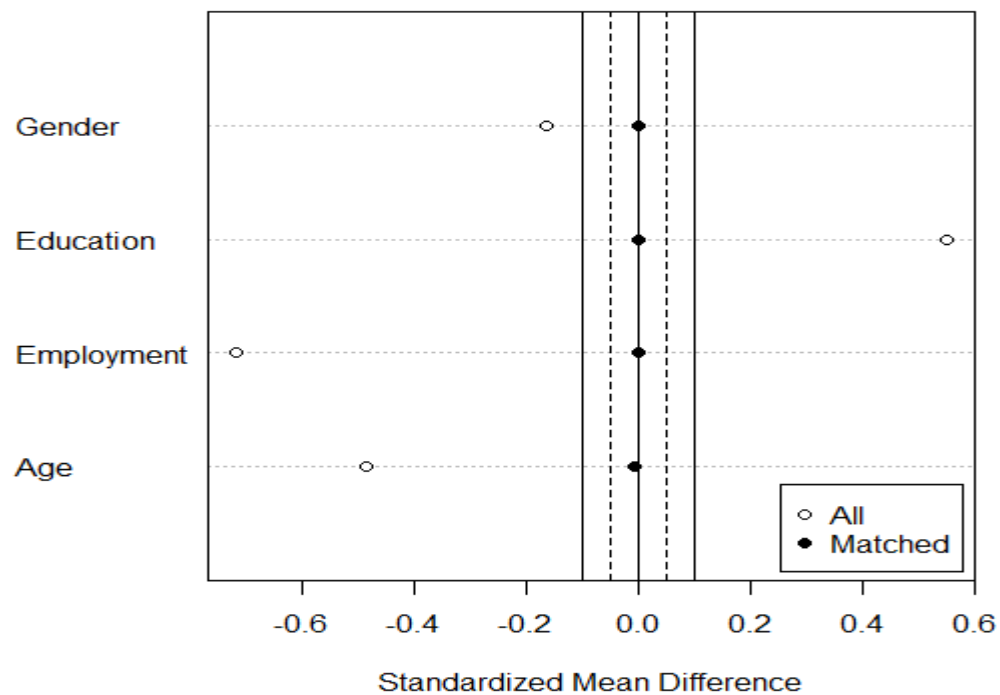


Figure 6.1: Balance of the full matching on the propensity score

6.5 RESULTS AND DISCUSSION

This section presents the qualitative and quantitative analytic outcomes for the contribution of commercial agriculture to food and nutrition security.

6.5.1 Quantitative findings

The findings in Table 6.1 indicates differences in food and nutrition security for the two farming types. Commercial farming households were more food secure, while the subsistence farming households had a higher (7.47) HFIAS. Commercial farming households also had access to more (9.98) diverse diets than their counterparts. The dietary diversity score for women and children was higher (3.53 and 2.84, respectively) for commercial farming households than that of subsistence farming households (3.43 and 2.47, respectively), although statistically insignificant.

The mean dietary diversity scores for women and children were below the recommended dietary diversity (a minimum of 5 and 4 food groups, respectively), which could have affected the outcome.

Table 6.1: Types of farming by food and nutrition security indicators

Food and nutrition security indicator	Subsistence farming households	Commercial farming households	T-Test
HFIAS	7.47 (7.41)	3.85 (4.34)	4.510***
HDDS	8.67 (2.15)	9.98 (1.57)	-4.956**
MDDW	3.43 (2.03)	3.53 (1.45)	-1.203
CDDS	2.47 (1.32)	2.84 (1.15)	-1.13
Monthly food expenditure	1081.60 (1108.59)	1718.42 (1254.06)	-3.429**
Monthly income	2417.02 (2673.73)	5237.74 (5484.00)	-3.407***

Levels of significance: 0.05*, 0.01**, 0.001***

The propensity score matching was employed to estimate the contribution of commercial agriculture to household food and nutrition security. The findings in Table 6.2 show the estimated contribution of commercial farming on the food and nutrition security proxies – HFIAS, HDDS, MDDW AND CDDS. The estimated effect was a decrease in the Household Food Insecurity Access Scale (HFIAS) by -2.84. Since it is statistically significant (p-value=0.004), this indicates that the average effect of commercial agriculture for those who participated in it is to decrease household food insecurity. The estimated effect on the Household Dietary Diversity Score (HDDS) was a significant increase of 1.02 (p-value=0.0024), indicating that the average effect of commercial agriculture for the households who participated, was an increased household dietary diversity. The estimated effect was a significant increase in the Women’s Dietary Diversity Score (MDDW) by 0.568 (p-value= <0.001), indicating the average effect of involvement in commercial agriculture is an increased diet diversity among women of reproductive age who were from commercial farming households.

Table 6.2: Propensity score matching outcome

	HFIAS	HDSS	MDDS	CDDS
Estimated effect	-2.84	1.02	0.568	-0.87
Standard Error	0.994	0.0337	0.167	0.968
P-value	0.004	0.0024	<0.001	0.369

The estimated effect was a decrease in the Child Dietary Diversity Score (CDDS) by -0.87 (p-value= 0.369), indicating that the average effect of the treatment for those who received it is to decrease children’s dietary diversity. However, the result was statistically insignificant, implying no positive impact on food and nutrition security regarding child dietary diversity for households involved in commercial agriculture. The number of children from commercial farming households was 58, and those from subsistence farming were 17, which can be too low to yield meaningful results.

6.5.2 Qualitative findings

All key informants indicated a positive contribution of commercial agriculture to household food and nutrition security. Participants provided their perspectives on the contribution of commercial agriculture to food quality and quantity, dietary diversity, income generation, women empowerment and quality of life. The themes for the different food and nutrition security aspects are discussed in this section.

6.5.2.1 Food quality

Participants indicated that the households’ involvement in commercial agriculture enhances food quality in the following ways:

Households involved in commercial agriculture can buy hybrid and quality seeds, which are likely to produce quality crops. Commercial agriculture also heightens farmers’ exposure to modern and innovative crop production practices that will ensure that they deliver quality produce that contributes to household income and, therefore, provides the household with the ability to access high food quality through the access and availability pillars of food security.

Participants conveyed that commercial farming involves farmers who produce to meet the market demands and adhere to specific quality standards. Thus, these farmers are likely to produce and consume high-quality crops if part of the produce is allocated for household consumption. Commercial farmers have storage facilities to keep the produce and retain their nutritional value. Thus, this enables them to preserve and consume food in good form.

Additionally, income generated from selling agricultural produce improves the buying power of these households, and their economic access to a nutritious food basket is improved. Thus, income generation improves the households' access to quality foods. The households eat fresh food dense with nutrients as they pick them from the garden, compared to food transported over long distances.

Participants indicated that the contribution of commercial agriculture to household food and nutrition security depends on production practices. Participant G, who is a nutrition officer, notably stated that:

“If chemicals are overly used during production, as is sometimes the case with commercial agriculture, then food quality is compromised. Households who produce organically will have the best quality of food.”

The key informants further emphasised that commercial agriculture only contributes to food quality if the households allocate part of the produce and income for household consumption.

6.5.2.2 Food quantity

In determining the contribution of commercial agriculture to food quantity, the participants shared the following perceptions:

Households can buy storage and preservation facilities from income generated from the sale of agricultural produce. Consequently, food preservation increases quantity by keeping food fresh for future use.

The key informants stated that households producing for commercial purposes produce large quantities to meet market demands and make profits. Households that practice commercial agriculture are most likely to have excess or sufficient food

quantities for consumption. Besides easy access to what they produce, they have a source of income that will help them supplement the household food requirements, especially for those commodities they do not produce. Participant E indicated that:

“Income generation improves households’ access to sufficient foods and sometimes more, which can result in overeating or food waste. They have economic access to adequate food quantities.”

Participants also stated that good soil management practices increase the likelihood of high yields, and there is enough to sell and retain for household consumption.

6.5.2.3 Dietary diversity themes

The participants indicated that involvement in commercial agriculture increases the households’ access to diverse diets, and these were their common thoughts:

Households that practice commercial agriculture can afford to buy additional household food needs from the proceeds of agricultural sales. They can buy foods they cannot produce, which adds diversity. It is different for households producing for subsistence purposes. If well managed, proceeds from agricultural sales also enable them to purchase agricultural inputs to diversify their produce.

The commercialisation of agriculture and diversification are an excellent combination for enhanced household food and nutrition security, and Participant L indicated that:

“When commercial agriculture interventions are paired with diversification, there is a higher likelihood for increased diet diversity, but when this is not the case, there is no causal relationship. However, the generated income can be used to purchase diverse diets.”

6.5.2.4 Income generation

The main themes for the contribution of commercial agriculture to income generation are as follows:

Commercial agriculture is more organised, production is informed, and risk management is considered. Together with extension support, these increase the

probability of good harvests and higher income generation. The proceeds can create a household income stream as primary or secondary income.

Adaptation to climatic shocks is essential for agricultural productivity and food and nutrition security. Participant M compared subsistence and commercial farmers and stated that:

“Income levels for commercial farming households are higher compared to subsistence farming households as commercial producers usually adopt and cope with climatic shocks better and hence stand a better chance of generating income from agricultural produce, compared to their subsistence farmer counterparts. Income generation also contributes positively to food and nutrition security.”

Commercial agriculture can promote the diversification of income streams, and Participant K elaborated that:

“If proceeds from the sale of agricultural produce are well managed, households can invest and save for long term and emergencies. Profits are also used to reinvest into the farming enterprise to expand and increase income generated from agriculture. It can also be used as a seed for non-agricultural enterprises, thus leading to diversified means of income.”

The participants also highlighted that when households allocate part of their produce for household consumption, income is positively affected as they save funds that would be directed towards purchases of food.

6.5.2.5 Women empowerment

The participants offered the following sentiments on the effect of commercial agriculture on the empowerment of women from households that farm for commercial purposes:

There are fewer opportunities for women, and farming creates a means of earning a living, enabling women to meet their financial obligations through income generated from commercial agriculture. The women in commercial production can make their own decisions and have access to means of production, which contributes to women's empowerment and the welfare of the entire household. Vulnerable women, such as

widows, single parents and the unemployed, who are involved in commercial agriculture have the means to generate income and fulfil their financial obligations.

The participants indicated that women's involvement in commercial agriculture promotes their financial independence and the ability to better care for the household since they play a significant role in planning and preparing food for the families. Therefore, when income is generated, they can meet their household's food and nutrition needs.

Women empowerment is dependent on who is running the farm enterprise, and Participant K emphasised that:

“Women are only empowered if they are involved in commercial farming, that is, if it is not only the men in the households who are involved. Furthermore, they are empowered if they are involved in decision-making on what will be planted, how much of the harvest will be sold, how much will be kept for the household and the use of income from commercial farming.”

Women's health is likely to improve from their farm income, and this enhances their functionality and productivity. They can also participate in societal activities. Additionally, when the health of women of reproductive age is improved, the health and development of the child are likely to improve.

Participants described that the Government of Lesotho and its supporting bodies (including NGOs) have intentionally included women in opportunities for agricultural grants and capacitation for growing their farm enterprises. Women also benefit from training sessions that capacitate them with skills and knowledge that inform decisions about their agricultural production.

However, it was added that laws in Lesotho do not support women regarding access to production resources, such as land. While there are reforms towards this, more still needs to be done to support women's participation in commercial farming to ease land ownership for women, among others.

It was further emphasised that if commercial agriculture interventions are nutrition-sensitive, some of the activities will include capacitating women on food and nutrition-related knowledge and skills for improved food and nutrition security for the benefit of the household.

6.5.2.6 Quality of life

The participants made the following assertions relating to the contribution of commercial agriculture to the quality of life:

Commercial agriculture improves the household's quality of life, as they can work around consistently increasing their income through the adoption of new innovations and practices that increase their production. Increases in production and productivity and adopting new innovations improve the quality of produce and production. All these factors lead to improved income, positively influencing the quality of life.

An improved household economy affords the household access to nutritious and healthy diets, and Participant D indicated that:

“Commercial agriculture heightens the consumption of nutritious foods, which increases the likelihood of better health. Food and nutrition security also encourages children's cognitive and physical development, resulting in improved intellectual and physical labour of future adults.”

The participants further indicated that if income generated from selling agricultural produce is well managed, it can be reinvested to diversify income streams and expand farm and non-farm enterprises. Proceeds from agricultural sales also enhance the household economy, enabling access to primary services, such as health facilities, education, shelter, clothing, water and sanitation. In some cases, households have access to improved (standard) services, including affording a private hospital other than a public one.

In addition, it was shared that commercial agriculture improves household welfare and the standard of living even to afford leisure activities for the household. The improvement may not be instant, but gradually, their lives improve, and they can afford things that make life more comfortable.

6.5.2.7 Benefits of commercial agriculture

Participants were asked to state other benefits of commercial agriculture that have not been discussed in the previous sections, and the following statements were common among the participants:

Sustainable management of land for future use. Commercial farmers tend to practice sustainable management practices that preserve the land for use by future generations.

Access to income has spillover effects on social life. Social ills, such as violence and theft stem from lack of access to resources, among others. Commercial farming heightens the creation of income and access to resources. When households have access to resources, it restores their dignity and creates a habitual community.

Commercial agriculture can create employment for members of other households and improve their well-being and quality of life, even though they are not directly engaged in commercial agriculture.

6.5.2.8 *Constraints that hinder the positive impact of commercial agriculture on household food and nutrition security*

The following themes were stated by the respondents regarding the constraints that hinder the positive impact of commercial agriculture on household food and nutrition security:

The participants indicated that farming households lack the knowledge and training on nutritional information. Farming households may have generated income but cannot utilise it to improve food and nutrition security due to a lack of food and nutrition-related knowledge. Thus, it results in poor decisions about procuring, using and storing nutritious diets. Furthermore, other households focus on producing for the market, and no priority is given to the household's food and nutrition security.

Farming households also possess limited skills and knowledge in effectively managing commercial farming enterprises. The high employment rate has invited more people to explore agriculture to earn a living, and most of them are not skilled. Consequently, some farm enterprises underperform and do not achieve maximum yields due to the lack of management practices.

The participants further stated that farming households had limited access to production resources, including extension services, credit and land. A lack of resources mainly brought about the lack of support from extension services. The

Government of Lesotho offers free extension services to farmers, but these services are not accessible, as they often lack resources to reach them. The number of extension workers to farmers is also low, compromising the coverage of these services.

Farming households also have limited access to credit. Most farmers are excluded from the formal credit system and cannot expand their farm enterprises. The majority of farmers have small-sized land, which limits their production. It is also costlier to produce on a small scale than on a larger scale, and the yields do not meet the market demands. Lesotho Flour Mills, for example, mainly relies on imported raw materials as local farmers cannot meet the demand.

The lack of resources at the national level also forces farmers to depend on outsourced services. The cost of production is also increased by the dependence on imported inputs, rendering farmers vulnerable to global markets.

The participants further stated a lack of policies and regulations to support farming households. Current policies are not revised for relevance, and regulations are not enforced to protect farmers from illegal and unauthorised agricultural service providers.

A concern was conveyed regarding the several efforts from different projects on commercial agriculture that have the same objectives and thus lead to duplication of efforts and a waste of resources. These efforts are not coordinated, as this would result in a more significant impact if they were well coordinated.

The existing farmers' associations are not fully functional in driving agricultural development, particularly in supporting the government in establishing aggregation systems, among others, to enable farmers to meet market demands collectively.

Data management across the agricultural value chain is flawed and inaccessible, and sufficient data is needed to inform production decisions, interventions and convince prospective investors to grow the sector.

6.5.2.9 Integration of key informants' perceptions and experiences of the farming households

The results from the propensity score matching provided a quantitative approach to the contribution of commercial agriculture to household food and nutrition security. Household engagement in commercial agriculture contributed to a decrease in household food insecurity and an increase in the household dietary diversity score and the minimum dietary diversity score for women.

The perceptions of key informants on the contribution of agriculture to household food and nutrition security confirm and complement the quantitative findings. All 13 key informants believe that households that are engaged in commercial agriculture will have improved food and nutrition security. Participants suggested that involvement in commercial agriculture contributes positively to food quality and quantity, dietary diversity, income generation, women empowerment and the overall quality of life. It is emphasised that this is true if commercial farming activities are well planned, risk management is considered, and market research is done. These, together with the support of extension services, maximise production yields and the ability to meet market demands and thus generate income for the engaged households. If household food and nutrition security must be enhanced, households must allocate part of the produce and income for improving food and nutrition.

Commercial agriculture also positively affected household food security in Rwanda and the Democratic Republic of Congo (DRC). Households involved in commercial agriculture had higher dietary diversity, and fewer adopted coping strategies during food shortages (Ochieng *et al.*, 2015). Similar findings were observed in Kwazulu Natal, South Africa, where households who produced to sell in the market had higher dietary diversity than their counterparts (Cele & Mudhara, 2022). Ogutu, Gödecke and Qaim (2020) found that commercial agriculture positively contributed to household food security and dietary quality among Kenyan small-sector farmers.

Contrary to the present study's findings, Ntakyio and van den Berg (2019) found that highly commercialised households are more likely to consume low-caloric diets owing to the displacement of harvested food for consumption and poor allocation of income to acquiring sufficient and nutritious foods. Van Asselt and Useche (2022) also found that commercialising smallholder coffee farmers increased the likelihood of

overnutrition in women and men. The findings of the present study indicated that commercial farming households have the financial muscle to buy more food than they need, which leads to overeating or food waste. Using data from three African countries (Malawi, Tanzania and Uganda), Carletto, Corral, and Guelfi (2017) found that agricultural commercialisation was high, even among small landholders and lower-income households. Yet, there was little evidence of the positive contribution to nutrition outcomes. It implies that the effect of commercial agriculture on food and nutrition security must be further explored to reach conclusive findings. Furthermore, the pathways through which commercial agriculture improves food and nutrition security must be standardised to compare results reasonably.

6.6 CONCLUSIONS

The quantitative findings of the propensity score matching show a positive effect of commercial agriculture on food and nutrition security in terms of HFIAS, HDDS and MDDW, and not for CDDS. Commercial agriculture positively affected food insecurity and dietary diversity at household and individual levels. The qualitative findings indicate that all key informants perceive a positive contribution of commercial agriculture to food and nutrition security. The participants agreed that food quality and quantity, dietary diversity, income generation and overall quality of life will likely improve when households produce for commercial purposes. Thus, the hypothesis that commercial agriculture has a positive impact on household food and nutrition security is accepted on the basis of its effect on the majority of the indicators.

6.7 RECOMMENDATIONS

A positive impact of commercial agriculture on food and nutrition security requires that commercial farming, as an intervention, considers capacitation on nutrition-related knowledge and practices together with proper allocation of harvested produce and income generated. As households are supported to produce for commercial purposes and actively participate in the markets, the channels through which they can capitalise on commercial agriculture to yield food and nutrition security outcomes must be an important aspect of the interventions. When the households are aware, their food and

nutrition-related practices and behaviour may be positively affected. Therefore, the nutrition-sensitivity of agriculture is of paramount importance in enhancing food and nutrition security through agriculture. It is recommended that the contribution of commercial agriculture to household food and nutrition security be further researched, paying attention to the commercialisation of specific agricultural commodities.

CHAPTER 7 :

FOOD AND NUTRITION SECURITY CLUSTERS AMONG THE FARMING HOUSEHOLDS IN LESOTHO

ABSTRACT

Food and nutrition security is central to human well-being and livelihoods. The ways in which food insecurity and malnutrition can be tackled continues to be explored. Organising a targeted population into clusters is a valuable technique that enables a clearer understanding of the food and nutrition security situation. This chapter explores food and nutrition security clusters within farming households and their characteristics. A cluster analysis was used to group the farming households into homogenous clusters. The analysis yielded three groups: food and nutrition secure, moderately food and nutrition insecure and severely food and nutrition insecure. The findings indicated that the food and nutrition secure households were small-sized (4.18), had higher incomes (LSL5960.00 (USD 380)⁴, produced agricultural commodities for commercial purposes and had obtained higher educational levels. They also have access to extension services and credit to purchase agricultural inputs. The moderately food and nutrition insecure group had a lower monthly income LSL2939 (USD188) than the food and nutrition secure group with a larger household size (4.65) than the food and nutrition secure group, but less than the severely food and nutrition insecure group. The severely food and nutrition-insecure households had the largest household size (5.67) and lowest monthly income, LSL1411.00 (USD90), produced mainly for their consumption. They could not access extension services and credit to purchase agricultural inputs. A cluster analysis complements other methods used to assess the food and nutrition security situation by identifying the most vulnerable groups within the target group and comprehensively depicting its nature and extent. Understanding these clusters' specific strengths and vulnerabilities is needed to design relevant interventions for enhancing food and nutrition security.

Keywords: Cluster analysis, food and nutrition security, farming households

⁴ Exchange rate (average) as on March to June 2022 – LSL 1=USD15.67
(<https://www.exchangerates.org.uk/USD-ZAR-exchange-rate-history.html>)

7.1 INTRODUCTION

Food and nutrition security is achieved when adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily used and utilised by all individuals at all times to live a healthy and active life (CFS, 2012). The food and nutrition security concept combines food security and nutrition security concepts and highlights their relatedness. It is a complex and multifaceted phenomenon that needs a multidimensional approach to address it holistically. Thus, interventions targeted towards tackling food insecurity and malnutrition will need more than determining the food and nutrition security status. For policymakers to respond accordingly, identifying homogenous groups within the target population and a more detailed description of the food and nutrition security clusters is needed (Gibson, 2012; Righettini & Bordin, 2022).

A cluster analysis explores naturally occurring groups within a data set (Cutillo, 2019). Cluster analysis could be adopted to understand the food and nutrition security groupings within a data set. It further complements the results of the food and nutrition security indicators by subsequently showing the characteristics of the identified groups, using the variables in the data (Swanepoel, 2017; FAO & IFPRI, 2020).

The classification is based on the similarities observed in the households. It provides a fuller understanding and underlying aspects of the food security situation. It sheds light on the factors involved and areas that need attention. This comprehensive depiction can inform development plans to address specific needs (Babu, Gajanana & Sanyal, 2009; Swanepoel, 2017).

This chapter will use the statistically proven food and nutrition security indicators to classify the surveyed farming households into homogeneous clusters. It will supplement the food and nutrition security assessment to depict better the unique food and nutrition security situation for the different clusters. The findings are valuable to stakeholders that seek to improve the quality of life of agrarian households.

7.2 OBJECTIVE

To assess the characteristics of the food and nutrition security clusters.

7.3 HYPOTHESIS

Households that are less vulnerable to food and nutrition security are characterised by higher overall income, smaller household size, who have received nutrition education in the past 12 months, produce for commercial purposes and have access to resources (land, credit, extension services) are less vulnerable to food and nutrition insecurity.

7.4 METHODOLOGY

7.4.1 Study area and population

The study focused on commercial farmers in Lesotho. The farmers were accessed through extension workers. There are ten districts in Lesotho, and the sample size was drawn from four districts: Mafeteng, Berea, Thaba-Tseka and Quthing. Each district represents the four agroecological zones in the country: Lowlands, Foothills, Mountains and Senqu River Valley, respectively (Bureau of Statistics (BOS), 2016). A total of 236 farming households were randomly selected as participants.

7.4.2 Data collection

Questionnaires were used to collect quantitative data from respondents' homes or farms. The respondents were asked to provide information on the socio-economic characteristics, agricultural production, food and nutrition security experiences and access to resources (land, credit, extension services, and markets). The information was used to describe the food security levels and living conditions of the farming households.

7.4.3 Data analysis

Data were analysed using cluster analysis. It is a technique that classifies variables within a data set into groups. It categorises data based on similarities (McIntosh, Sharpe & Lawrie, 2010; Cutillo, 2019). The clusters categorise the farming households into homogenous groups, using the food and nutrition security indicators, demographic

and agricultural characteristics. A k-means cluster analysis was performed with k= 3 and the independent variable as HFIAS. The cluster divisions reflect the different food and nutrition security statuses. The three categories were food and nutrition secure, moderately food and nutrition insecure and severely food and nutrition insecure.

7.5 RESULTS AND DISCUSSION

The clusters have been generated using the food and nutrition security levels as informed by the indicators. Attaining household food and nutrition security is characterised by a low Household Food Insecurity Access Score (HFIAS), high Household Dietary Diversity Score (HDSS), Child Dietary Diversity Score (CDDS) and Minimum Dietary Diversity score for Women (MDDW). Table 7.1 shows that cluster 1 has the lowest HFIAS (1.04) value and the highest HDDS (10.15), CDDS (3.22) and MDDW (3.85) values, indicating that that particular cluster has the most food and nutrition-secure households. The households in cluster two show signs of moderate food and nutrition insecurity as they have slightly a higher HFIAS (7.99) and slightly lower dietary diversity values with mean HDDS of 9.45, CDDS of 2.59 and MDDW of 2.99. The last cluster has characteristics of severe food and nutrition insecurity. The HFIAS (17.33) is the highest among all clusters, with the lowest HDDS (7.38), CDDS (1.73) and MDDW (2.57). The differences between the clusters are statistically significant, with a p-value of 0.00 for mean differences of all food and nutrition security indicators.

The findings in Table 7.1 further show that most (59%) of the farming households are in the food and nutrition secure cluster 32% are moderately food and nutrition insecure, and 9% are severely food and nutrition insecure.

Household characteristics of cluster 1 (the food and nutrition secure cluster):

- The category has a mean household size of 4.18, the lowest among all clusters, implying that they have fewer people to feed.

- The average monthly income from all sources is LSL5960.00 (USD380)⁵, which is higher than that of all clusters and suggests that they have more economical access to procuring nutritious and varied diets.
- Most of the households in this cluster reside in Berea (30%) and Mafeteng (35%), representing the Foothills and Lowlands, respectively. Living in these two areas increases the likelihood of enhanced household food and nutrition security.
- The majority (65.7%) of households use gas for cooking, and have the lowest frequency of households that use firewood (17.1%). Gas may afford these households the convenience to cook for short periods, compared to those that use fire, allowing them to prepare diverse foods.
- Marital status for the majority (72.1%) of the respondents is married.
- The cluster has the highest (23.6%) frequency of households who had obtained tertiary education.

Table 7.1: Cluster analysis for food and nutrition security

	Cluster 1 (Food and nutrition secure)	Cluster 2 (Moderately food and nutrition insecure)	Cluster 3 (Severely food insecure)		
N	140 (59%)	75 (32%)	21 (9%)	F Statistic	
Food Security Indicators (means)	Mean (Std dev)	Mean (Std dev)	Mean (Std dev)		
<i>HFIAS</i>	1.04 (1.41)	7.99 (2.27)	17.33 (3.31)	803.03*	
<i>HDDS</i>	10.15 (1.40)	9.45 (1.95)	7.38 (1.86)	27.24*	
<i>CDDS</i>	3.22 (1.06)	2.59 (1.27)	1.73 (0.47)	8.56*	
<i>MDDW</i>	3.85 (1.44)	2.99 (1.19)	2.57 (1.27)	14.43*	
Demographics					
<i>Number of people per household</i>	4.18 (1.95)	4.65 (1.86)	5.67 (1.39)	6.30*	

⁵ Exchange rate (average) as on March to June 2022 – LSL 1=USD15.67 (<https://www.exchangerates.org.uk/USD-ZAR-exchange-rate-history.html>)

<i>Monthly income</i>	5960 (5594)	2939 (2622)	1411 (912)	12.34*	
				Likelihood	Chi-Square
Gender of the respondent	N (%)	N (%)	N (%)		
<i>Male</i>	21 (15.0)	13 (17.3)	3 (14.3)	0.23	0.23
<i>Female</i>	119 (85.0)	62 (82.7)	18 (85.7)		
Education level				Likelihood	Chi-Square
<i>Never been to school</i>	2 (1.4)	2 (2.7)	2 (9.5)		
<i>Primary Level (Grade R to 8)</i>	38 (27.1)	27 (36.0)	12 (57.1)		
<i>Secondary Level (Grade 9 to 12)</i>	40 (28.6)	28 (37.4)	4 (19.0)	23.24*	23.24*
<i>High School Level (Matriculated)</i>	27 (19.3)	12 (17.3)	3 (14.3)		
<i>Tertiary Qualification</i>	33 (23.6)	6 (9.3)	0 (0.1)		
Districts					
<i>Berea</i>	42 (30.0)	25 (33.3)	1 (4.8)		
<i>Mafeteng</i>	49 (35.0)	23 (30.7)	5 (23.8)	13.7*	12.6*
<i>Quthing</i>	22 (15.7)	10 (13.3)	6 (28.6)		
<i>Tsaba Tseka</i>	27 (19.3)	17 (22.7)	9 (42)		
Employment Status					
<i>Employed</i>	18 (12.9)	6 (8.0)	0 (0.0)		
<i>Self Employed</i>	74 (52.9)	41 (54.7)	11 (52.4)		
<i>Pensioner</i>	13 (9.33)	6 (8.0)	2 (9.5)	10.1	7.6
<i>Business Entrepreneur</i>	5 (3.6)	1 (1.3)	0 (0.0)		
<i>Unemployed</i>	30 (21.4)	21 (28.0)	8 (38.1)		
Marital Status					
<i>Married</i>	101 (72.1)	45 (60.0)	12 (57.1)	12.3**	12.1**
<i>Divorced</i>	5 (3.6)	7 (9.3)	0 (0.0)		
<i>Widowed</i>	20 (14.3)	16 (21.3)	8 (38.1)		
<i>Single</i>	14 (10.0)	7 (9.3)	1 (4.8)		
Agricultural characteristics				Likelihood	Chi-Square
Type of Farming					
<i>Subsistence</i>	23 (16.4)	19 (25.3)	13 (61.9)	18.32*	21.38*
<i>Commercial</i>	117 (83.6)	56 (74.7)	8 (38.1)		

Agricultural Program beneficiary					
Yes	35 (25.0)	10 (13.3)	4 (19.0)	4.08	4.29
No	105 (75.0)	65 (86.7)	17 (81.0)		
Access to resources					
Access to extension services					
Yes	64 (45.7)	20 (26.0)	17 (19.0)	11.50*	11.09**
No	76 (54.3)	55 (74.0)	4 (81.0)		
Access to credit					
Yes	26 (18.8)	9 (12.3)	3 (14.3)		
No	114 (81.2)	66 (87.7)	18 (85.7)	1.55	1.60
Farm Land Ownership					
Owned	127 (90.7)	71 (94.7)	18 (85.7)	2.51	2.78
Rented	11 (7.9)	3 (4.0)	2 (9.5)		
Communal	2 (1.4)	1 (1.3)	1 (4.8)		
Nutrition characteristics				Likelihood	Chi-Square
Source of Drinking water					
Improved	138 (98.6)	74 (98.7)	20 (95.2)		
Unimproved	2 (1.4)	1 (1.3)	1 (4.8)	1.30	0.93
Receiving nutrition education)					
Yes	46 (32.9)	19 (25.3)	6 (28.6)	1.34	1.36
No	94 (67.1)	56 (74.7)	15 (71.4)		
Awareness of fruit and vegetable consumption					
Yes	80 (56.8)	42 (56.0)	6 (28.6)	8.83**	8.53**
No	34 (24.6)	21 (27.7)	8 (38.1)		
I don't know	26 (18.6)	16 (21.3)	7 (33.3)		

Levels of significance. 0.05*, 0.01** 0.001***

Household characteristics of cluster 2 (the moderate food and nutrition-insecure cluster):

- The households in this cluster have a mean household size of 4.65, slightly more than the food and nutrition secure cluster but less than the severely food and nutrition insecure cluster.
- The household average monthly income is almost half LSL2939 (USD188)⁶ of the food and nutrition secure cluster, which makes this cluster moderately food and nutrition insecure.
- Similar to the food and nutrition secure cluster, the majority of households in this cluster reside in Berea (33.3%) and Mafeteng (30.7%), but these are less than the frequencies in the food and nutrition secure cluster, and the frequency of households that reside in Thaba Tseka (highlands) is higher.
- The majority (60%) of the respondents are married. These are less than those in the food and nutrition secure cluster but more than those in the severely food and nutrition insecure cluster.
- More respondents had obtained secondary (37.4%), high school (17.3%) and tertiary education (9.3%) than in the severely food insecure cluster.

Household characteristics of cluster 3 (the severely food and nutrition insecure cluster):

- The mean household size is 5.67, the highest among all clusters, which suggests that they have more people to feed, and presents a challenge when there are limited resources to acquire food.
- The household monthly average income is LSL1411.00 (USD90)⁷ and is the lowest. These households have low economic access to food.
- The majority (42%) reside in Thaba Tseka (highlands). The region is described by remote areas, limited access to facilities, high food prices and low affordability of nutritious foods (WFP & UNICEF, 2019).
- Most (81%) of the households in this cluster use firewood as fuel for cooking. The collection of firewood requires ample time and labour, which makes it inconvenient for food preparation. The cost of cooking fuel requires the

⁶ Exchange rate (average) as on March to June 2022 – LSL 1=USD15.67 (<https://www.exchangerates.org.uk/USD-ZAR-exchange-rate-history.html>)

economic ability of the households, so it is related to household income (WFP, 2022b).

- The cluster has the highest frequency of respondents who are widowed (38.1%) and the lowest of married respondents (57.1%).
- The majority (57.1%) of households in this cluster have only obtained primary education, and the highest (9.5%) frequency of those who have not been to school is found in this cluster.

The findings on the three clusters are consistent with previous study findings. In Nigeria, food-insecure households were characterized by low education level, large household size and low average income (Kaoje *et al.*, 2019; Otekunrin *et al.*, 2021; Otekunrin, 2022). Swanepoel (2017) found that food-secure households were characterized by higher education levels, smaller household sizes and higher income in Cape Town Metropole (South Africa). Shushu and Mmbengwa (2021) found that food insecurity is more prevalent among low-income households in Francis Baard District Municipality, Northern Cape Province of South Africa. Household food security was influenced by education status, and this was attributed to low education levels being associated with low-income jobs, impeding the ability to procure healthy and nutritious food in Bantul, Indonesia (Wijaya *et al.*, 2020), and Ghana (Acheampong *et al.*, 2022).

Concerning agricultural characteristics, the food and nutrition secure group has more (83.6%) commercial farming households than moderately food and nutrition insecure (74.7%) and severely food and nutrition insecure (38.1%). The differences in clusters are statistically significant. The frequency of subsistence farmers is higher (61.9%) in the severely food and nutrition insecure cluster, compared to the moderately food and nutrition insecure (25.3%) and food secure clusters (16.4%). The findings suggest that agricultural production meant for selling in the market is associated with an enhanced household food and nutrition security status. Manda *et al.* (2020) also found that selling agricultural produce significantly improved income and food security in Tanzania. Households that sold their agricultural produce in Kwazulu Natal (South Africa) were more likely to be food secure (Cele & Mudhara, 2022). A study in Kenya, Tanzania and Uganda revealed that food-secure farming households devoted their land to farming and were market-oriented (Silvestri *et al.*, 2015).

The differences in clusters in relation to being a beneficiary of an agriculture program, were statistically insignificant (p -value = 0.13). Agricultural development programs are meant to capacitate and support farmers in their agricultural production alongside enhancing food and nutrition security (Fiorella *et al.*, 2016; Adu *et al.*, 2018). It is becoming increasingly appreciated that these interventions must not only focus on increased production but be developed to yield nutrition outcomes, which is termed the nutrition-sensitivity of agriculture (Schönfeldt, Pretorius & Hall, 2017; Sharma *et al.*, 2021). Since nutrition-sensitive agricultural programs are still limited, this could explain the insignificant differences between the clusters.

The differences between the clusters regarding access to extension services were statistically significant (p -value=0.004). The severely food and nutrition insecure cluster has more (81%) households who did not have access to extension services than the moderately food and nutrition insecure (74%), and the food and nutrition secure cluster has the least (54.3%).

Thus, the food secure cluster has the highest frequency of households accessing extension services; similar findings were established in South Africa (Raidimi & Kabito, 2019) and Kenya (Chege, Lemba & Semenyee, 2018). Extension services educate farmers to increase their agricultural production and food security. It exposes farmers to new knowledge and technologies that improve agricultural yields and combat production challenges (Chege, Lemba & Semenyee, 2018). In most developing countries, including Lesotho, agriculture is rain-fed, making it vulnerable to drought and erratic weather occurrences (FAO, 2019; World Bank, 2020). Therefore, access to extension services can be associated with higher food production and enhanced food security, as farmers who have been capacitated are likely to have higher yields.

Although the differences relating to the nutrition education received by the surveyed households are not significant (p -value=0.512), the food and nutrition secure cluster had the highest (32.9%) frequency of households who had received nutrition education, compared to the moderate food and nutrition insecure (25.3%) and the severely food and nutrition insecure (28.6%). There are significant differences (p -value=0.006) in the awareness of the respondents on the problems associated with limited consumption of fresh fruits and vegetables. The food and nutrition secure cluster is more aware (56.8%) than the moderately food and nutrition insecure (56.0%)

and the severely food and nutrition insecure (28.6%). The findings suggest that households that are more informed about practices and behaviours that improve nutrition will likely have an enhanced food and nutrition security status (Agize, Jara & Dejen, 2017). Jeihooni *et al.* (2022) believes that food and nutrition education and awareness are vital in tackling food insecurity as they change perceptions and improve nutrition behaviours and practices.

7.6 CONCLUSIONS

The surveyed households were clustered into three homogenous groups using food and nutrition security indicators. The groups were food and nutrition secure, moderately and severely food and nutrition insecure. The food and nutrition secure cluster is characterised by small household size, higher monthly household income, farming for commercial purposes, and respondents who are married and have higher education status. They also have access to extension services and credit to purchase agricultural inputs. They mostly reside in Berea and Mafeteng.

The moderately food and nutrition insecure cluster has the second lowest household size, compared to the other two clusters and lower income, compared to the food and nutrition secure cluster. The households also have a lower average income and education level than the food and nutrition secure cluster, yet higher than the severely food and nutrition insecure cluster.

The severely food and nutrition insecure group has the largest household size, with the lowest monthly income, and most respondents have only acquired primary education. Their main source of fuel for cooking is firewood. They mainly farm for subsistence and have limited access to extension workers and credit to purchase agricultural inputs. The majority of the farming households in this cluster reside in the highlands (Thaba-Tseka).

Therefore, the hypothesis that households with higher overall income, smaller household sizes, who have received nutrition education, produce mainly for selling in the market and have access to resources (land, credit, extension workers) are less vulnerable to food and nutrition insecurity is accepted.

7.7 RECOMMENDATIONS

As depicted by the food and nutrition security clusters, there are different characteristics for the different groups. The interventions that seek to tackle food insecurity and malnutrition at the household level may benefit from considering these vulnerabilities. In addressing food insecurity and malnutrition, it is recommended that the target population be categorised into homogenous clusters that are informed by the food and nutrition security indicators. These will highlight areas that must be prioritized, and subsequently, relevant interventions should be designed for the specific needs of each cluster.

CHAPTER 8

POLICY RECOMMENDATIONS ON FIGHTING FOOD INSECURITY AND MALNUTRITION IN LESOTHO

ABSTRACT

Empirical findings play a significant role in informing the development and implementation of policies. This chapter contains recommendations to the Lesotho Food and Nutrition Security Policy (2016-2025) to alleviate food insecurity and malnutrition. Policy recommendations are drawn from the findings pertaining to the food and nutrition security of farming households in Lesotho, the factors that influence food and nutrition security, the contribution of commercial agriculture on food and nutrition security and the characteristics of the identified food and nutrition clusters within the farming households. The recommendations include increased commercialisation of agriculture and other (farm or non-farm) income-generating activities. Challenges of limited access to production resources and erratic weather events must be addressed to increase agricultural productivity. Women's empowerment must be upheld as an important pathway to yielding positive household food and nutrition security outcomes. Increased investment in agriculture and food and nutrition security of research is recommended. The monitoring and evaluation of the contribution of agricultural interventions on food and nutrition security is of great importance. Additionally, multisectoral efforts for fighting food insecurity and malnutrition should be supported by capacitating relevant teams for effective implementation.

Keywords: food and nutrition security, commercial agriculture, nutrition-sensitive agriculture, climate change, women empowerment, joint planning and evaluation.

8.1 INTRODUCTION

Lesotho is vulnerable to food insecurity, malnutrition and disasters, particularly floods and drought, contributing to low agricultural productivity (Food and Nutrition Coordinating Office, 2016; WFP, 2023). The National Strategic Development Goal I

(2012/13 – 2016/17) has yielded progress towards tackling malnutrition in some areas. However, food insecurity and malnutrition remain severe challenges, with an incidence of a triple burden of malnutrition in the country. Stunting, micronutrient deficiencies and overweight are highly prevalent across all age groups (Government of the Kingdom of Lesotho, 2018; WFP, 2023). The effects of malnutrition are costly to the households and government, and these include impaired cognitive development in children, poor academic performance, a high likelihood of nutrition-related diseases and compromised human capital in their adult life (African Union, 2016; Government of Lesotho, 2018; Galasso & Wagstaff, 2019).

The National Strategic Development Plan (2018/19 - 2022/23) of the Government of Lesotho has desired outcomes that are relevant to enhancing food and nutrition security. One is to strengthen human capital by reducing all forms of malnutrition across all ages. Secondly, it is achieving sustainable commercial agriculture and food security (Government of Lesotho, 2018).

Agriculture-related interventions that have already been implemented in NSSP 1 (2012/13 – 2016/17) to improve food and nutrition security at household and individual level in Lesotho, include:

- Community gardens,
- Conservation farming,
- Training on food preservation, storage, processing and preparation at a community level,
- Animal exchange programs and,
- Orchard development and diversification.

Subsequently, the current National Strategic Development Plan (NSDP II) has added the promotion of commercial agriculture as a pathway to not only fight food insecurity and malnutrition but also to enhance inclusive and sustainable economic growth and job creation led by the private sector (Government of Lesotho, 2018). Hence, the recommendations of this study seek to draw the attention of the policymakers and stakeholders responsible for the food and nutrition security policy in Lesotho to the local situation. These recommendations are informed by the empirical findings on the

food and nutrition security situation among farming households, with reference to the contribution of commercial agriculture.

8.2 OBJECTIVE

To make policy recommendations on enhancing food and nutrition security among farming households in Lesotho.

8.3 FOOD AND NUTRITION SECURITY CHALLENGES IN LESOTHO

The Lesotho Food and Nutrition Policy (2016-2025) takes cognisance of the following prevailing challenges:

- The high prevalence of undernutrition affects growth among young children, leading to impaired cognitive development, reproductive difficulties and compromising their human capital as adults.
- Increased over-nutrition results in vulnerability to other diet-related non-communicable diseases which affects efficiency, productivity and national development efforts.
- High prevalence of food insecurity, inadequate knowledge and time for preparation of healthy and nutritious meals leads to poor dietary intake. Mothers and caregivers often have several responsibilities, including agricultural activities, preparing meals, employment and collecting firewood and water (particularly in rural areas).
- Food security and malnutrition have a complex nature, and their causes are multifaceted and thus require integrated action by multiple stakeholders. The integrated efforts will be functional when there is effective coordination, which is currently lacking.
- There are inadequate guidelines and unclear national policies, regulations and standards related to food and nutrition security.
- There is a lack of access to facilities and infrastructure in mountainous areas, which limits people's access to health services.
- Lack of regular monitoring and evaluation of food and nutrition security indicators.

- Agricultural productivity is vulnerable to climate change, and the yields are low.
- Lack of information on food insecurity and malnutrition.

The approach of the Lesotho Food and Nutrition Policy (2016-2025) entails nutrition-specific programming, nutrition-sensitive planning and creating an enabling environment. The policy has adopted a cross-cutting approach to address malnutrition and food insecurity as one of the strategies. It firmly recognises the agricultural sector as one of the main contributors to enhancing food and nutrition security (Food and Nutrition Coordinating Office, 2016). The following policy recommendations are informed by the local situation as reflected by this study's findings pertaining to food and nutrition security and the significance of commercial agriculture. These can be beneficial in advancing areas of improvement and informing policy implementation.

8.4 POLICY RECOMMENDATIONS

8.4.1 Food and nutrition security clusters

Arranging the target population into clusters shows the characteristics specific to each group. It permits tailoring relevant interventions to address particular community needs. The findings of this study, in consistency with previous study findings, show that households that reside in areas with limited accessibility to facilities, with lower incomes, larger household sizes, whose caretakers/household heads that are uneducated and widowed are the most vulnerable to food and nutrition insecurity. It is recommended that food and nutrition security interventions should not be generalised, as there are different and unique groupings. Clusters must be established, and the characteristics of a particular cluster must be considered in developing interventions and support programs as the intervention is likely to be more impactful. This approach is relevant for the policy strategy to target the socio-economically deprived and nutritionally vulnerable households and individuals.

8.4.2 Income generating activities

The policy has strategised to create livelihood opportunities as a pathway to alleviating food insecurity and malnutrition. Household income is central to tackling food

insecurity and malnutrition, even among farming households income has a significant effect on household food and nutrition security. Among others, income facilitates the ability to afford nutritious and adequate food to feed the household. It is recommended that the economy be stimulated to accommodate more income-generating ventures. The direct implications for the high unemployment rate and low household income contribute to vulnerability to food insecurity and hunger. The role of agriculture in enhancing household food and nutrition security must be complemented by other income-generating activities for more significant impact, as involvement in agriculture alone is not sufficient. Commercial agriculture yields both food production and income generation for the engaged households. However, interventions for off-farm income-generating ventures are also recommended.

8.4.3 Multi-sectoral and nutrition-sensitive approaches to food and nutrition security

The Lesotho Food and Nutrition Policy has resolved to a multi-sectoral approach to address food insecurity and malnutrition. It is recommended that the integration of agriculture, health, nutrition and social protection efforts be coordinated and sustained for increased impact and cost-effectiveness. In addressing food security and nutrition, various interventions can be joined to yield maximum nutrition outcomes. Thus, nutrition-sensitivity remains of paramount importance. The findings of this study demonstrate a positive impact of commercial agriculture on household food and nutrition security, and it is assumed that the difference would be more significant if agricultural interventions also included the nutrition aspect. It is recommended that the policy resolution to link sectors (nutrition, agriculture, health and others) be anchored on improving technical and human resources for implementation. Operation teams must be capacitated with cross-sectoral knowledge and skills to heighten smooth linkages. Joint planning, monitoring and evaluation will facilitate improvements, as this is a novel approach.

8.4.4 Education

Education has been identified as a critical factor in various human development interventions (Gibson, 2016). The level of education attained by the household heads or caretakers has been associated with the household's food and nutrition security status. Even though it is argued that education does not always translate to improved food and nutrition security, educated caretakers tend to make informed choices on nutrition and health. In addition, there are important positives observed from households with heads or caretakers who have attained higher education. They are better able to use healthcare facilities, interact with healthcare providers, follow treatment recommendations, and keep a clean living environment than those with lower education levels. Education also increases the adoption of innovation and technology, which in turn improves food and nutrition security. Higher education is also positively associated with higher incomes, which can result in increased economic access to food. Low education levels hinder the development of a country and individuals. Adults who have received minimal education are likely to have households that are vulnerable to food and nutrition insecurity. Thus, obtaining higher education is a form of empowerment for a better quality of life.

Therefore, investing in the accessibility of quality education to all has beneficial returns to the recipient and the nation and improving food and nutrition security, among other well-being outcomes. Furthermore, nutrition and agricultural education has been employed as an intervention targeted at adults to empower them to feed and take care of their households better. It will be valuable to include agriculture and nutrition education from an early age, at all education levels in order to embed the importance of nutrition and agriculture for their well-being. The policy strategy to increase knowledge on nutrition, food production and livelihood opportunities at all schools needs rigorous implementation.

8.4.5 Commercial agriculture for smallholder farmers

Promoting commercial agriculture is a developmental approach to improving food and nutrition security, among others. The findings of this study demonstrate differences in the food and nutrition security of commercial and subsistence farming households, where commercial farming households are more food and nutrition secure. With the

high unemployment rate, many are moving to agriculture for their livelihoods. It is recommended that support be provided to the amateurs and those transitioning from subsistence to commercial farming. These must be accompanied by capacitation in allocating agricultural produce and income to benefit household consumption.

Commercial agriculture in Lesotho is predominantly practised on a small scale, and it would also benefit the country if it grows from small-scale to large-scale. Transitioning from subsistence farming to commercial agriculture alone is insufficient to fight food insecurity and malnutrition. Commercial agriculture will generate income for the households, among other benefits, but adhering to good food and nutrition practices calls for complementary interventions.

8.4.6 Climate change

It is evident that the effect of climate change on agricultural productivity is substantial, and thus contributes to increased hunger, food insecurity and malnutrition. In line with the policy strategy to promote climate-smart agriculture, interventions must have a wide coverage as all regions of the country are vulnerable. The success of commercial agriculture, in particular, is dependent on climate-smart technologies to encourage adaptation, mitigation and resilience. The recommendation is that support be granted to farmers transitioning from subsistence to commercial agriculture and those already in commercial agriculture. Adaptation strategies and skills must be rigorously disseminated to the farming community.

Additionally, equipment that allows protected farming is needed to enable production of crops despite the erratic weather occurrences. Effective early warning systems and accessible agro-weather tools must also be developed to guide farmers, and these must be accessible even to farmers in remote areas. If these systems are functional, together with research, preparedness and the identification of agricultural opportunities could be possible through the projected climate conditions.

8.4.7 Access to credit

Lack of access to financial services in developing countries hinders economic growth. Access to credit for farming households, in particular, has been established as a significant factor that influences the prospects of the farming enterprises. The agricultural sector in Lesotho is dominated by small-scale farming, as a result of limited financial resources to expand the enterprises, among other causes (Ogundeji *et al.*, 2018; Daemane & Muroyiwa, 2022). Lack of access to credit services impedes growth and improved productivity of agricultural ventures. Consequently, the food and nutrition security of the farming households is affected. There is strong evidence on the effect of access to credit in improving the different components of food and nutrition security.

Lesotho's National Strategic Development Policy (2018/19 - 2022/23) has identified a lack of access to credit as a significant constraint to investment and resolved to prioritise increasing access to finance and financial inclusion (Government of Lesotho, 2018). Several interventions for improved access to credit have been put into place, including public credit guarantee schemes by the Central Bank of Lesotho. Non-Governmental Organisations (NGOs), such as CARITAS, Catholic Relief Services (CRS) and Care for Basotho, have supported through facilitating the formation of savings groups in remote areas and assisting with capacity building of these groups. Other services that have been introduced include loan tracking systems, savings and credit, and cooperative and loan portfolios that have been met with significant defaults. While there has been progress in this area in the last five years, lack of access to credit services among farmers is still highly prevalent, as is food insecurity and malnutrition. Most credit services remain unregulated, and farmers have limited access to formal credit services. Given the small size and informality of the savings groups, bringing them under regulation is an overarching need. The Central Bank of Lesotho (CBL) only regulates deposit-taking institutions and, only recently, cooperatives that have annual savings of more than LSL 5 million, which is farfetched for most farmers. Savings groups operate informally, depending on a self-drawn constitution that defines the union's objective and terms and conditions. The members of savings groups depend on mutual trust and honesty to guide their operations and compliance with their constitution. Thus, further development in

improving access to credit for the farming community is imperative, strengthening the regulation of existing bodies and heightening farmers 'access to formal credit services.

8.4.8 Access to extension services

The current policy primarily addresses limited human resources for nutrition programs. Agricultural extension services are pivotal to the success of the agricultural sectors, as it educates farmers on how to improve their productivity. Low agricultural productivity is associated with compromised food and nutrition security. Due to unemployment, many are flocking to agriculture as a means of making a living, and these amateurs could grow the sector if there is enough capacitation from extension services. However, Lesotho has had the challenge of an optimal ratio of extension workers to farmers, thus resulting in an inability to reach all farmers. Information Communication Technologies (ICTs) are still minimally used in Lesotho, and therefore, the extension services in Lesotho should take advantage of the wide coverage that could be achieved through ICTs.

Agriculture has become severely vulnerable to climatic shocks. Some farmers have abandoned their agricultural ventures due to poor coping strategies. Farmers need guidance even more on resilience, adaptation and mitigation of climate change impacts. Early warning systems in Lesotho are still lagging and agricultural productivity has been negatively affected by the lack of information to cope with recent erratic events.

8.4.9 Women empowerment

Women often assume a significant role in the food and nutrition security of the household. Women do the role of producing and preparing food for the households in most developing countries. Hence, consuming balanced diets and alleviating food insecurity and malnutrition is relatively their burden. Women also play the reproductive role of bearing children and providing primary care. Their health and nutrition are critical to their wellbeing and that of their children. The various demands on women also affect the health and their well-being and that of their households. Women empowerment is, therefore, a strategic pathway to improving food and nutrition

security. It is recommended that there should be measures to reduce women's workloads that include alternative child-care centres, improved access to healthcare facilities, convenient sources of energy for cooking and an increase in the mechanisation of agriculture. The policy primarily focuses on provision of adequate nutrition in child-care centres, and accessibility is another critical aspect that must be addressed particularly in remote areas. Women could also benefit from being capacitated with time management skills, as it may be challenging to carry out all these responsibilities successfully.

The role of women in decision-making on issues such as agriculture and income, has been associated with enhanced household food and nutrition security. Thus, gender-sensitive approaches should be considered in developing initiatives for tackling food insecurity and malnutrition.

8.4.10 Research

The development of frameworks and plans for monitoring, evaluation and research on nutrition form part of the policy strategies, however, there is slow improvement in these areas and several challenges persist. The consistent rise in food insecurity and malnutrition highlights the need for more research to understand the dynamics and nature of these challenges. Furthermore, food and nutrition security is multifaceted and complex, needing an integration of different sectors. However, there is limited evidence to understand its linkages with other related sectors. The information would support the formulation of evidence-based policies and interventions. The development of support programs and interventions would be informed by specific experiences and vulnerabilities acquired through research. Hence, it is recommended that the value of research be evident through prioritisation and investments that will yield quality data to improve understanding of the food insecurity and malnutrition challenges and enable timely decision-making. The management and accessibility of the generated agricultural information is another critical aspect that must be improved.

8.4.11 Monitoring and evaluation

Agriculture has been recognised as an important pathway for tackling food insecurity. Most agricultural interventions are expected to yield development outcomes in sectors that include economic growth and enhanced food security and nutrition. Alongside ascertaining agriculture-related goals, agriculture is projected to reduce poverty and hunger. The impact of these interventions is rarely evaluated, and their implications for food and nutrition security remains unclear.

It would be a waste of resources if the interventions were not evaluated for effectiveness to achieve the set goals. Similar mistakes are likely to be repeated, resulting in redundancy of these projects. Monitoring and evaluating projects allow for the assessment of the relevance of the agricultural projects in solving food and nutrition security challenges. It further highlights successes and areas that need improvement. It is recommended that monitoring and evaluation systems be established and valued as a critical aspect of these agricultural interventions to assess their effectiveness.

8.5 CONCLUSIONS

The policy recommendations have been stated to advance areas of improvement and inform implementation based on the findings of this study. It is an important positive that the current policy strategies cover critical issues in the alleviation of food insecurity and malnutrition. The persistent challenges related to hunger and malnutrition highlight the importance of ensuring implementation these strategies. The policy recommendations are mainly relevant for the multisectoral linkages between food and nutrition security and agriculture.

CHAPTER 9 :

CONCLUSIONS AND RECOMMENDATIONS

9.1 OVERALL CONCLUSIONS

The study evaluated the impact of commercial agriculture in improving the food and nutrition security situation among farming households in Lesotho. The summary of these conclusions is as follows:

- Farming households generally have high food and nutrition insecurity, despite the type of farming and districts they reside in. However, farming households that live in highland areas and those engaged in subsistence farming are more vulnerable to food and nutrition security than their counterparts who farm for commercial purposes and reside in the lowland areas.
- The main determinant for household food and nutrition security among farming households is income since it is a common factor among all indicators. The Households Food Insecurity Access Score (HFIAS) of these households is influenced by the stability of the source of income, education status, decision-making on farming income, health status, average income and who is responsible for taking care of children. The Household Dietary Diversity Score (HDDS) is associated with the primary source of energy for cooking, access to credit to purchase agricultural inputs, access to facilities where food is purchased, nutrition knowledge and monthly expenditure on food (implies household income). The Child Dietary Diversity Score (CDDS) is determined by monthly food expenditure, district of residence, average income per month and education status. Minimum Dietary Diversity for Women (MDDW) is influenced by the district of residence, average income per month, monthly expenditure on food and education status.
- Commercial agriculture positively contributes to the food and nutrition security of farming households as it decreases household food insecurity and increases both household and women's dietary diversity.
- Households with higher overall income, smaller household sizes, who have received nutrition education, mainly produce for commercial purposes and have

access to production resources (land, credit and extension services) are less vulnerable to food and nutrition insecurity.

9.2 OVERALL RECOMMENDATIONS

Food security and nutrition security are interrelated concepts that must be addressed as a single policy goal. It enables a comprehensive approach to the food insecurity and malnutrition challenges.

The complex and multifaceted nature of food and nutrition security requires tailoring interventions for specific needs. In addressing food insecurity and malnutrition, it is recommended that the target population be grouped into homogenous clusters that are informed by the food and nutrition security indicators. These will highlight the characteristics of each cluster, the areas that must be prioritized, and subsequently, relevant interventions that should be designed for the specific needs of each cluster.

Commercial agriculture has been established as a pathway to improving food and nutrition security. However, it is also important to note that agriculture alone is not sufficient to yield food and nutrition security outcomes. Complementary interventions that include nutrition education, women empowerment and stimulating the economy for income-generation are needed.

Food insecurity and malnutrition have a complex nature, therefore, there is an overarching need for joint efforts from relevant sectors and disciplines in tackling these challenges. Research needs to be fully utilised to aid understanding of the nature of the challenges and inform evidence-based formulation of policies and interventions. Coordination of efforts and implementation of policies are very critical. Implementation must also be monitored and evaluated for efficiency in meeting the desired goals, so that improvements are made where necessary.

9.3 RECOMMENDATIONS FOR FURTHER RESEARCH

The study assessed food and nutrition security to demonstrate and emphasise the integration of food security and nutrition security as a single development goal. Future research in this subject is recommended to consider other aspects of nutrition

assessment (such as the anthropometric measures) in the choice of indicators to strengthen analysis of the different dimensions of food and nutrition security.

The current study established a positive contribution of commercial agriculture on household food and nutrition security. Hence, it is recommended that the input of commercial agriculture to household food and nutrition security be further researched, paying attention to the degree of commercialisation and the role of commercialising specific agricultural commodities.

It is further recommended that the nutrition sensitivity of commercial agricultural interventions be assessed, as this approach is expected to yield better nutrition outcomes.

Since the need for multisectoral efforts towards enhancing food and nutrition security has been highlighted, further research is needed to establish the successes and challenges in relation to the effectiveness of the current joint planning and implementation teams.

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APPENDICES

APPENDIX A – ETHICAL CLEARANCE



GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

29-Nov-2021

Dear Miss Nthabeleng Nkoko

Application Approved

Research Project Title:

ANALYSIS OF COMMERCIAL AGRICULTURE ON HOUSEHOLD NUTRITION STATUS IN LESOTHO

Ethical Clearance number:

UFS-HSD2021/1888/21

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. Furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Dr Adri Du Plessis

Chairperson: General/Human Research Ethics Committee

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APPENDIX B – SEMI-STRUCTURED INTERVIEW SCHEDULE



SEMI-STRUCTURED INTERVIEW SCHEDULE

THE CONTRIBUTION OF COMMERCIAL AGRICULTURE ON HOUSEHOLD FOOD AND NUTRITION SECURITY

1. Does involvement in commercial agriculture contribute to household food and nutrition status?

YES () NO ()

2. If yes, how does it contribute to the following?

a) Food quality

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b) Food quantity

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c) Dietary diversity

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d) Income generation

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e) Women empowerment



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f) Improvement of quality of life

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g) What is the impact of commercial agriculture on other aspects (elaborate)

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3. What are the constraints that hinder the positive contribution of commercial agriculture on household food and nutrition security?

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APPENDIX C - QUESTIONNAIRE

evasys	Food security [Copy]	
University of the Free State		
Department of Sustainable Food Systems and		PhD Consumer Science Agriculture and household nutrition status

Mark as shown: Please use a ball-point pen or a thin felt tip. This form will be processed automatically.

Correction: Please follow the examples shown on the left hand side to help optimize the reading results.

1. DEMOGRAPHICS

1.1 Who are you in this household? Wife Husband Son or daughter
 Relative Other

1.2 Are you the household head? Yes No

1.3 Gender of the respondent Male Female Other

1.4 Age group of the respondent <30 30-35 36-40
 41-45 46-50 51-55
 56-60 61-65 66-70
 >70

1.5 Marital status of the respondent Married Divorced/
 separated Widowed
 Single/never married

1.6 Respondent highest education status Never been to school Primary level (Grade R to grade 8) Secondary level (Grade 9 to grade 12)
 High School level (Matriculated) Tertiary qualification

1.7 Employment status of the respondent Employed Self employed Pensioner
 Business entrepreneur Unemployed

1.8 Total members of the household

1.9 How many members are involved in agricultural activities?

2. HOUSEHOLD COMPOSITION

How many of the household adults (18 and above) are female, male or other?

2.1 Female

2.2 Male

2.3 Other

How many adults in the household are employed, unemployed, self-employed, business entrepreneurs or pensioners?

2.4 Employed

3. INCOME [Continue]

3.6 Is the secondary source of income temporary, seasonal or stable? Temporary/casual Seasonal Stable

3.7 Other (specify)

3.8 What is the average income of the household (from all sources) per month?

3.9 What is the average income of the household (from all sources) per year?

3.10 What is the total non-farm income in your household per year?

3.11 How much does agriculture contribute to total income? Low (less than 25%) Moderate (approximately 50%) High (more than 75%)

3.12 What is your monthly household expenditure on food?

4. HOUSEHOLD EXPENDITURE

- 4.1 In the last 30 days did you spend any money on the following items? (More than one option may be selected)
- | | | |
|--|---|---|
| <input type="checkbox"/> Cereals (maize, wheat, sorghum) | <input type="checkbox"/> Roots and tubers (potatoes, carrots) | <input type="checkbox"/> Legumes (beans, peas, lentils) |
| <input type="checkbox"/> Fruits | <input type="checkbox"/> Vegetables | <input type="checkbox"/> Flesh meat (chicken, pork, beef, mutton) |
| <input type="checkbox"/> Fish | <input type="checkbox"/> Eggs | <input type="checkbox"/> Oil, fat, butter |
| <input type="checkbox"/> Milk and milk products | <input type="checkbox"/> Milling | <input type="checkbox"/> Medical care (doctors fees, medicine) |
| <input type="checkbox"/> Education | <input type="checkbox"/> Rent for house | <input type="checkbox"/> Loan payments |
| <input type="checkbox"/> Communications (airtime) | <input type="checkbox"/> Transport (public transport, fuel) | <input type="checkbox"/> Paraffin |
| <input type="checkbox"/> Gas | <input type="checkbox"/> Water | <input type="checkbox"/> Electricity |
| <input type="checkbox"/> Personal items | <input type="checkbox"/> Detergent/washing soap | <input type="checkbox"/> Insurance |
| <input type="checkbox"/> Recreation and entertainment | <input type="checkbox"/> Contributions (church, group) | <input type="checkbox"/> Remittances transferred to other household |
| <input type="checkbox"/> Other household expenditure (specify) | | |

4.2 Other (specify)

5. WATER AND SANITATION

5.1 Please indicate the type of ownership of the house you currently live in Owned Rented Live with family Other

5.2 Other

5.3 Does the household have a toilet of its own? Yes No



5. WATER AND SANITATION [Continue]

- 5.4 If yes to question 5.3 what kind of toilet is it? Improved (flush/pour to piped sewer system, septic tank, pit latrine with slab, ventilated improved pit latrine, composting toilet) Unimproved (pit latrines without slab, bucket latrines) No sanitation services (excreta disposed in fields, forests, bushes, open bodies of water and other open spaces)
- 5.5 If no to 5.3, does the household have access to a shared or community toilet? None Shared in building Shared in an outside building
 Public/government toilet
- 5.6 Location of the toilet Inside the house Outside the house, in yard Outside the yard
- 5.7 What is your source of drinking water? Improved drinking water sources (Public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection) Unimproved drinking water sources (Unprotected dug well, unprotected spring, cart with small tank/drum, tanker truck, and surface water (river, dam, lake, pond, stream, canal, irrigation channels), bottled water) Piped water on premises (Piped household water connection located inside the user's dwelling, plot or yard)
- 5.8 Do you boil water before drinking every time? Yes No
- 5.9 If not, why do you not boil water?

- 5.10 What is the primary source of energy for cooking? Coke/coal Firewood Liquid petroleum gas
 Animal dung Charcoal Kerosene
 Electricity Solar Straw/Shrubs/Grass
 Agricultural crop No cooking arrangement
- 5.11 What is the main source of energy for lighting? Kerosene/paraffin Liquid petroleum gas Candle
 Electricity No lighting arrangement Solar

6. ACCESS TO FACILITIES

- 6.1 Are there any of the following facilities within a 30 minute (2km) walk from the house?
 Tared road Shop where basic food can be bought Market to buy fresh food
 Market to sell agricultural output Market where agricultural inputs can be bought Health facility
 Extension worker Supermarkets, convenience stores Bank
- 6.2 Where do you buy majority of your food? Shop where basic foods are sold in the village Supermarket in the village Supermarkets in town
 Other (specify)



6. ACCESS TO FACILITIES [Continue]

6.3 Other (specify)

6.4 How often do you go (in a week) visit to purchase food?

7. ACCESS TO CREDIT

7.1 During the last 12 months, could you obtain credit if you needed it for the purpose of operational agricultural expenses (eg buying a fertilizer and paying for labour) Yes No

7.2 During the last 12 months, have you or any other household member receive any credit to buy inputs, or received inputs on credit? Yes No

7.3 If yes to question 7.2, how much did you receive in maloti?

7.4 How much went into purchasing inputs?

8. HOUSEHOLD FOOD CONSUMPTION

1. Cereals (corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these, papa, bohobe likhobe, lesheleshele)

8.1 How frequently did you consume cereals within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.2 Where do you get your cereal products? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.3 What is your average expenditure on cereal products per month (in Maloti)?

2. Vitamin A rich vegetables and tubers (pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)

8.4 How frequently did you consume Vitamin A rich vegetables and tubers within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.5 Where do you get your Vitamin A rich vegetables and tubers products? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.6 What is your average expenditure on Vitamin A rich vegetables and tubers per month (in Maloti)?

3. White roots and tubers (white potatoes or other foods made from roots)

8. HOUSEHOLD FOOD CONSUMPTION [Continue]

- 8.7 How frequently did you consume white roots and tubers within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)
- 8.8 Where do you get your white roots and tubers? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers
- 8.9 What is your average expenditure on white roots and tubers per month (in Maloti)?

□ □ □ □ □ □ □ □

4. Dark green leafy vegetables (spinach, kale, thepe, leshoabe)

- 8.10 How frequently did you consume dark green leafy vegetables within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)
- 8.11 Where do you get your dark green leafy vegetables? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.12 What is your average expenditure on dark green leafy vegetables per month (in Maloti)?

□ □ □ □ □ □ □ □

5. Other vegetables (other vegetables (e.g. tomato, onion)

- 8.13 How frequently did you consume other vegetables within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)
- 8.14 Where do you get other vegetables? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.15 What is your average expenditure on other vegetables per month (in Maloti)?

□ □ □ □ □ □ □ □

6. Vitamin A rich fruits (apricots, peaches, ripe mango, papaya, fresh and dried, and juices from these fruits)

- 8.16 How frequently did you consume Vitamin A rich fruits within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)
- 8.17 Where do you get your Vitamin A rich fruits? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.18 What is your average expenditure on Vitamin A rich fruits per month (in Maloti)?

□ □ □ □ □ □ □ □

7. Other fruits (other fruits, including wild fruits and 100% fruit juice made from these)

- 8.19 How frequently did you consume other fruits within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)



8. HOUSEHOLD FOOD CONSUMPTION [Continue]

8.20 Where do you get your other fruits? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.21 What is your average expenditure on other fruits per month (in Maloti)?

9. Organ meat (liver, kidney, heart or other organ meats or blood-based foods)

8.22 How frequently did you consume organ meat within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.23 Where do you get your organ meat? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.24 What is your average expenditure on organ meat per month (in Maloti)?

9. Flesh meats (beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds)

8.25 How frequently did you consume flesh meats within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.26 Where do you get your flesh meats products? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.27 What is your average expenditure on flesh meats per month (in Maloti)?

10. Eggs (eggs from chicken, duck, guinea fowl or any other egg)

8.28 How frequently did you consume eggs within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.29 Where do you get your eggs? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.30 What is your average expenditure on eggs month (in Maloti)?

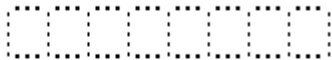
11. Fish and seafood (fresh, dried or canned)

8.31 How frequently did you consume fish and seafoods within the last 7 days? Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.32 Where do you get your fish and sea foods? Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

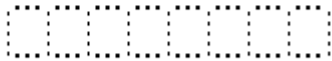


8. HOUSEHOLD FOOD CONSUMPTION [Continue]

8.33 What is your average expenditure on fish and sea foods per month (in Maloti)?


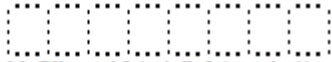
12. Legumes, seeds and nuts (dried beans, dried peas, lentils, nuts, seeds or foods made from these (eg. peanut butter))
 8.34 How frequently did you consume legumes, seeds and nuts within the last 7 days?
 Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.35 Where do you get your legumes seeds and nuts?
 Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.36 What is your average expenditure on legumes, seeds and nuts per month (in Maloti)?


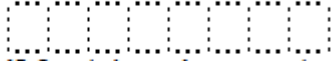
13. Milk and milk products (milk, cheese, yogurt or other milk products)
 8.37 How frequently did you consume milk and milk products within the last 7 days?
 Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.38 Where do you get your milk and milk products?
 Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.39 What is your average expenditure on milk and milk products per month (in Maloti)?


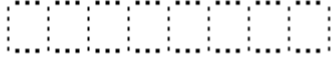
14. Oils and fats (oil, fats or butter added to food or used for cooking)
 8.40 How frequently did you consume oils and fats within the last 7 days?
 Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.41 Where do you get your oils and fats products?
 Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.42 What is your average expenditure on oils and fats per month (in Maloti)?


15. Sweets (sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes)
 8.43 How frequently did you consume sweets and sugary foods within the last 7 days?
 Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
 Often (7 to 10 times) Very often (more than 10 times)

8.44 Where do you get your sweets and sugary foods?
 Own production Purchased from store Relatives
 Employer Food aid Neighbours/ other farmers

8.45 What is your average expenditure on sweets and sugary foods per month (in Maloti)?




8. HOUSEHOLD FOOD CONSUMPTION [Continue]

16. Spices, condiments and beverages (spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages)

- 8.46 How frequently did you consume spices, condiments and beverages within the last 7 days?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 7 times)
- Often (7 to 10 times) Very often (more than 10 times)
- 8.47 Where do you get your spices, condiments and beverages products?
- Own production Purchased from store Relatives
- Employer Food aid Neighbours/ other farmers

8.48 What is your average expenditure on spices, condiments and beverages per month (in Maloti)?

9. HOUSEHOLD FOOD INSECURITY ACCESS SCALE

- 9.1 In the past four weeks, did you worry that your household would not have enough food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.2 In the past four weeks, were you or any household member unable to eat the kinds of food you preferred because of lack of resources?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.3 In the past four weeks, were you or any household member have to eat a limited variety of foods due to a lack of resources?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.4 In the past four weeks, did you or any household member have to eat some foods that you did not want to eat because of lack of resources to obtain other types of food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.5 In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.6 In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.7 In the past four weeks, was there ever no food to eat of any kind in your household because of a lack of resources to get food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.8 In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)
- 9.9 In the past four weeks, did you or any household member go a whole day and night without eating because there was not enough food?
- Never (0 times) Rarely (once or twice) Sometimes (3 to 10 times)
- Often (more than 10 times)

10. MINIMUM DIETARY DIVERSITY FOR WOMEN - ADULT 1



10. MINIMUM DIETARY DIVERSITY FOR WOMEN - ADULT 1 [Continue]

Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.

Write down all food and drinks mentioned by the respondent. When the respondent has finished, probe for meals and snacks not mentioned.

10.1 Breakfast

10.2 Snack

10.3 Lunch

10.4 Snack

10.5 Dinner

10.6 Snack

When the respondent recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

- 10.7 Grains (Porridge, bread, rice, pasta/noodles or other foods made from grains) Yes No
- 10.8 White tubers and plantains (White potatoes, white yams, or any other foods made from white-fleshed roots or tubers, or plantains) Yes No
- 10.9 Legumes (Mature beans or peas (fresh or dried seed), lentils or bean/pea products, including tofu) Yes No
- 10.10 Nuts and seeds (Any tree nut, groundnut/peanut or certain seeds, or nut/seed "butters" or pastes) Yes No



10. MINIMUM DIETARY DIVERSITY FOR WOMEN - ADULT 1 [Continue]

- | | | |
|---|------------------------------|-----------------------------|
| 10.11 Milk and milk products (Milk, cheese, yoghurt or other milk products but NOT including butter, ice cream, cream or sour cream) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.12 Organ meat (Liver, kidney, heart or other organ meats or blood-based foods, including wild game) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.13 Red meats (Beef, pork, lamb, goat) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.14 Poultry and other white meats (rabbit, wild game meat, chicken, duck or other bird) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.15 Fish and seafood (Fresh or dried fish, shellfish or seafood) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.16 Eggs (Eggs from poultry or any other bird) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.17 Dark green leafy vegetables (spinach, rapa sepaile) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.18 Vitamin A-rich vegetables, roots and tubers (Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.19 Vitamin A-rich fruits (peaches, apricots, ripe mango, ripe papaya) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.20 Other vegetables (tomato, onion) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.21 Other fruits (including torofei, feikha, monokotsoai) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.22 Other oils and fats (Oil; fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds; and all animal fat) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.23 Savoury and fried snacks (Crisps and chips, fried dough or other fried snacks) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.24 Sweets (Sugary foods, such as chocolates, candies, cookies/sweet biscuits and cakes, sweet pastries or ice cream) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.25 Condiments and seasonings (Ingredients used in small quantities for flavours, such as chillies, spices, herbs, fish powder, tomato paste, flavour cubes or seeds) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.26 Other beverages and foods (Tea or coffee if not sweetened, clear broth, alcohol) | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 10.27 Did you eat anything (meal or snack) OUTSIDE of the home yesterday? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

11. INDIVIDUAL DIETARY DIVERSITY - ADULT 2

- 11.1 What is the gender of the adult? Female Male Other
 Please describe the foods (meals and snacks) that eaten by the adult yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.
Write down all food and drinks mentioned by the respondent. When the respondent has finished, probe for meals and snacks not mentioned.

11.2 Breakfast

11.3 Snack



11. INDIVIDUAL DIETARY DIVERSITY - ADULT 2 [Continue]

11.4 Lunch

11.5 Snack

11.6 Dinner

11.7 Snack

When the respondent recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

11.8 Grains (Porridge, bread, rice, pasta/noodles or other foods made from grains)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.9 Tubers and plantains (White potatoes, white yams, or any other foods made from white-fleshed roots or tubers, or plantains)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.10 Pulses (Mature beans or peas (fresh or dried seed), lentils or bean/pea products, including tofu)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.11 Nuts and seeds (Any tree nut, groundnut/peanut or certain seeds, or nut/seed "butters" or pastes)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.12 Milk and milk products (Milk, cheese, yoghurt or other milk products but NOT including butter, ice cream, cream or sour cream)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.13 Organ meat (Liver, kidney, heart or other organ meats or blood-based foods, including wild game)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.14 Meat and poultry (Beef, pork, lamb, goat, rabbit, wild game meat, chicken, duck or other bird)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.15 Fish and seafood (Fresh or dried fish, shellfish or seafood)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.16 Eggs (Eggs from poultry or any other bird)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.17 Dark green leafy vegetables (List examples of any medium-to-dark green leafy vegetables, including wild/foraged leaves)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.18 Vitamin A-rich vegetables, roots and tubers (Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside (see Appendix 2 for other less-common vitamin A-rich vegetables)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
11.19 Vitamin A-rich fruits (Ripe mango, ripe papaya)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know



11. INDIVIDUAL DIETARY DIVERSITY - ADULT 2 [Continue]

- | | | | |
|---|------------------------------|-----------------------------|-------------------------------------|
| 11.20 Other vegetables (tomato, onion) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 11.21 Other fruits (including torofei, feikha, monokotsoai) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 11.22 Other oils and fats (Oil; fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds; and all animal fat) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 11.23 Sweets (Sugary foods, such as chocolates, candies, cookies/sweet biscuits and cakes, sweet pastries or ice cream) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 11.24 Other beverages and foods (Tea or coffee if not sweetened, clear broth, alcohol) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 11.25 Condiments and seasonings (Ingredients used in small quantities for flavours, such as chillies, spices, herbs, fish powder, tomato paste, flavour cubes or seeds) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 11.26 Did the adult anything (meal or snack) OUTSIDE of the home yesterday? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |

11.27 If you don't know what the adult consumed the previous day, please provide reasons

12. CHILD DIETARY DIVERSITY

- | | | | |
|----------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 12.1 Age of the child | <input type="checkbox"/> 6-11 months | <input type="checkbox"/> 12-23 months | <input type="checkbox"/> 24-35 months |
| | <input type="checkbox"/> 36-47 months | <input type="checkbox"/> 48-59 months | |
| 12.2 Gender of the child | <input type="checkbox"/> Female | <input type="checkbox"/> Male | |
| 12.3 Is the child breastfeeding? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |

Please describe the foods (meals and snacks) that the child ate yesterday during the day and night.
Always ask what different ingredients the meal or drink contained! (e.g. porridge with or without milk)

12.4 Before breakfast

12.5 For breakfast

12.6 Between breakfast and lunch

12.7 For lunch



12. CHILD DIETARY DIVERSITY [Continue]

12.8 Between lunch and dinner

12.9 For dinner

12.10 After dinner

When the respondent recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

- | | | | |
|---|------------------------------|-----------------------------|-------------------------------------|
| 12.11 Grains (Porridge, bread, rice, pasta/noodles or other foods made from grains) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.12 Tubers and plantains (White potatoes) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.13 Legumes (Mature beans or peas (fresh or dried seed), lentils or bean/pea products, including tofu) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.14 Nuts and seeds (Any tree nut, groundnut/peanut or certain seeds, or nut/seed "butters" or pastes) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.15 Milk and milk products (Milk, cheese, yoghurt or other milk products but NOT including butter, ice cream, cream or sour cream) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.16 Organ meat (Liver, kidney, heart or other organ meats or blood-based foods, including wild game) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.17 Meat and poultry (Beef, pork, lamb, goat, rabbit, wild game meat, chicken, duck or other bird) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.18 Fish and seafood (Fresh or dried fish, shellfish or seafood) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.19 Eggs (Eggs from poultry or any other bird) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.20 Dark green leafy vegetables (Spinach, sepaille, rapa) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.21 Vitamin A-rich vegetables, roots and tubers (Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.22 Vitamin A-rich fruits (peaches, apricots) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.23 Other vegetables (tomato, onion) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.24 Other fruits (including torofei, feikha, monokotsoai) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.25 Oils and fats (Oil; fats or butter added to food or used for cooking, including extracted oils from nuts, fruits and seeds; and all animal fat) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.26 Sweets (Sugary foods, such as chocolates, candies, cookies/sweet biscuits and cakes, sweet pastries or ice cream) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |
| 12.27 Condiments and seasonings (Ingredients used in small quantities for flavours, such as chillies, spices, herbs, fish powder, tomato paste, flavour cubes or seeds) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Don't know |



12. CHILD DIETARY DIVERSITY [Continue]

12.28 If you don't know what the child consumed the previous day, please provide reasons

13. NUTRITIONAL KNOWLEDGE OF THE CARETAKER/MOTHER

13.1 During the last 4 weeks how would you rate your health? Very good Good Not good/not poor
 A little poor Very poor Don't know

13.2 Do you suffer from the following diseases? (allow up to 3 answers)

- Asthma Cardiovascular disease Diabetes
 Hypertension None

13.3 Have you suffered from any diseases or symptoms during the last 30 days? (allow up to 3 answers)

- Bad breathe Cholera Diarrhoea
 Ear/Throat problem Eye problems Fainting
 Fever Flu/Cold Headache
 Hepatitis High cholestrol Intestinal worms
 Measles Pneumonia Skin problems
 Stomach ache Tetanus Tiredness/Fatigue
 Tuberculosis Vomiting Weakness
 None Other (specify)

13.4 Other (specify)

13.5 Can you name anything that helps you and other household members from getting diarrhoea? Yes No (Skip to 13.8)

13.6 If yes, please specify the preventative measures from getting diarrhoea

- Washing hands Exclusive breastfeeding Use lactrine/no contact with faecal matter
 Protect food and water supplies with cover Boiling water Other (specify)

13.7 Other (specify)

13.8 Which diseases or problems are caused by deficiency in iron? (allow up to 3 answers - do not prompt)

- Tiredness/fatigue Low concentration Weak immune system
 Shortage of blood Reduction in intelligence Small statue
 Soreness of the mouth Unusual quantity of hair Don't know
 Other (specify)

13.9 Other (specify)

13.10 Do you know foods which have ample amounts of iron? (allow up to 3 answers prompt)

- Green leafy vegetables Peas Soybean/Chick/Peas/lentil
 Meat Fish Orange coloured fruits and vegetables
 Liver Don't know Other (specify)

13.11 Other (specify)

13.12 Which diseases or problems are caused by deficiency in vitamin A? (allow for 3 answers)

- Leading to eye blindness Night blindness Measles
 Diarrhoea Worms Don't know
 Other (specify)

13.13 Other (specify)



13. NUTRITIONAL KNOWLEDGE OF THE CARETAKER/MOTHER [Continue]

13.14 Do you know which foods have ample amounts of **vitamin A**? (allow up to answers - do not prompt)

- | | | |
|---|---|---|
| <input type="checkbox"/> Green leafy vegetables | <input type="checkbox"/> Orange vegetables and fruits | <input type="checkbox"/> Milk and milk products |
| <input type="checkbox"/> Eggs | <input type="checkbox"/> Offals | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Other (specify) | | |

13.15 Other (specify)

13.16 Please name any nutritious suppliments you received in the last year (March 2021 to February 2022)? (allow up to 3 answers)

- | | | |
|--|-------------------------------|------------------------------------|
| <input type="checkbox"/> Iodine | <input type="checkbox"/> Iron | <input type="checkbox"/> Vitamin C |
| <input type="checkbox"/> Vitamin A | <input type="checkbox"/> Zinc | <input type="checkbox"/> None |
| <input type="checkbox"/> Other (specify) | | |

13.17 Other (specify)

13.18 Who do you think is the most informed person within your household concerning nutrition education?

- | | | |
|-------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Mother | <input type="checkbox"/> Father | <input type="checkbox"/> Domestic helper |
| <input type="checkbox"/> Male child | <input type="checkbox"/> Female child | <input type="checkbox"/> Aunt |
| <input type="checkbox"/> Uncle | <input type="checkbox"/> Grandparents | <input type="checkbox"/> Other (specify) |

13.19 Other (specify)

13.20 Who do you think is the most informed person within your household concerning agricultural information?

- | | | |
|-------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Mother | <input type="checkbox"/> Father | <input type="checkbox"/> Domestic helper |
| <input type="checkbox"/> Male child | <input type="checkbox"/> Female child | <input type="checkbox"/> Aunt |
| <input type="checkbox"/> Uncle | <input type="checkbox"/> Grandparents | <input type="checkbox"/> Other (specify) |

13.21 Other (specify)

Have you heard of the following macronutrients?

- | | | |
|---------------------|------------------------------|-----------------------------|
| 13.22 Protein | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 13.23 Carbohydrates | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 13.24 Fat | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Please mention foods that supply the following macronutrients (allow up to 3 answers)

13.25 Other (specify)

13.26 Protein

- | | | |
|--|---|-----------------------------------|
| <input type="checkbox"/> Beans | <input type="checkbox"/> Beef | <input type="checkbox"/> Cheese |
| <input type="checkbox"/> Chicken | <input type="checkbox"/> Dairy products | <input type="checkbox"/> Eggs |
| <input type="checkbox"/> Fish | <input type="checkbox"/> Milk | <input type="checkbox"/> Sardines |
| <input type="checkbox"/> Don't know | | |
| <input type="checkbox"/> Other (specify) | | |

13.27 Carbohydrates

- | | | |
|--------------------------------|-------------------------------------|--|
| <input type="checkbox"/> Bread | <input type="checkbox"/> Potatoes | <input type="checkbox"/> Rice |
| <input type="checkbox"/> Maize | <input type="checkbox"/> Don't know | <input type="checkbox"/> Other (specify) |

13.28 Other (specify)

13.29 Fat

- | | | |
|--|-------------------------------------|------------------------------|
| <input type="checkbox"/> Butter | <input type="checkbox"/> Groundnuts | <input type="checkbox"/> Oil |
| <input type="checkbox"/> Don't know | | |
| <input type="checkbox"/> Other (specify) | | |

13.30 Other (specify)

13.31 Are you aware of any health problems that are associated with eating none or too little of fresh fruits and vegetables? Yes No Don't know



13. NUTRITIONAL KNOWLEDGE OF THE CARETAKER/MOTHER [Continue]

13.32 During the last year (April 2021 to March 2022), have you noticed or received any information about healthy eating or healthy diets? Yes No (Skip to next section)

13.33 If yes, where did you find, see or get this information on healthy eating/diet?

- | | | |
|--|--|--|
| <input type="checkbox"/> Radio | <input type="checkbox"/> TV | <input type="checkbox"/> Doctor |
| <input type="checkbox"/> Nutrition educator | <input type="checkbox"/> Newspaper | <input type="checkbox"/> Health centre |
| <input type="checkbox"/> Internet | <input type="checkbox"/> Friends/relatives | <input type="checkbox"/> School |
| <input type="checkbox"/> Community health worker | <input type="checkbox"/> Church | <input type="checkbox"/> Other (specify) |

13.34 Other (specify)

14. FARM OPERATIONS

14.1 What type of farming are you involved in? Subsistence farming Commercial farming

14.2 Who owns the farm / project? Individual Family Cooperative Community project Other (specify)

14.3 Other (specify)

14.4 Are you a beneficiary of any agricultural development project? Yes No

14.5 If yes to 14.4, name the agricultural development project

14.6 District

14.7 Village

14.8 Do you own your farm land? Owned Rented Communal

14.9 What is the area size of your farm/ project?

15. LIVESTOCK PRODUCTION

In the past year, what livestock did you produce?

15.1 **Sheep?** Yes No

15.2 What was the main reason for production? Selling Household consumption Both Other (specify)

15.3 Other (specify)

15.4 Did the household sell part of the produce? Yes No

15.5 Did the household consume part of the produce? Yes No

15.6 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest) Other (specify)

15.7 Other (specify)

15.8 **Goats?** Yes No



15. LIVESTOCK PRODUCTION [Continue]

15.9 What was the main reason for production? Selling Household consumption Both
 Other (specify)

15.10 Other (specify)

15.11 Did the household sell part of the produce? Yes No

15.12 Did the household consume part of the produce? Yes No

15.13 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

15.14 Other (specify)

15.15 Pigs? Yes No

15.16 What was the main reason for production? Selling Household consumption Both
 Other (specify)

15.17 Other (specify)

15.18 Did the household sell part of the produce? Yes No

15.19 Did the household consume part of the produce? Yes No

15.20 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

15.21 Other (specify)

15.22 Poultry? Yes No

15.23 What was the main reason for production? Selling Household consumption Both
 Other (specify)

15.24 Other (specify)

15.25 Did the household sell part of the produce? Yes No

15.26 Did the household consume part of the produce? Yes No

15.27 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

15.28 Other (specify)

15.29 Rabbits? Yes No

15.30 What was the main reason for production? Selling Household consumption Both
 Other (specify)

15.31 Other (specify)

15.32 Did the household sell part of the produce? Yes No

15.33 Did the household consume part of the produce? Yes No

15.34 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)



15. LIVESTOCK PRODUCTION [Continue]

15.35 Other (specify)

16. VEGETABLE PRODUCTION

In the past year, what vegetables did you produce?

16.1 Tomatoes?

 Yes

 No

16.2 What was the main reason for production?

 Selling

 Household consumption

 Both

 Other (specify)

16.3 Other (specify)

16.4 Did the household sell part of the produce?

 Yes

 No

16.5 Did the household consume part of the produce?

 Yes

 No

16.6 How was the majority of the produce used?

 Sold to the market

 Consumed by the household

 Wasted (rains, drought, pest)

 Other (specify)

16.7 Other (specify)

16.8 Cabbage?

 Yes

 No

16.9 What was the main reason for production?

 Selling

 Household consumption

 Both

 Other (specify)

16.10 Other (specify)

16.11 Did the household sell part of the produce?

 Yes

 No

16.12 Did the household consume part of the produce?

 Yes

 No

16.13 How was the majority of the produce used?

 Sold to the market

 Consumed by the household

 Wasted (rains, drought, pest)

 Other (specify)

16.14 Other (specify)

16.15 Pumpkin?

 Yes

 No

16.16 What was the main reason for production?

 Selling

 Household consumption

 Both

 Other (specify)

16.17 Other (specify)

16.18 Did the household sell part of the produce?

 Yes

 No

16.19 Did the household consume part of the produce?

 Yes

 No

16.20 How was the majority of the produce used?

 Sold to the market

 Consumed by the household

 Wasted (rains, drought, pest)

 Other (specify)

16.21 Other (specify)

16.22 Onions?

 Yes

 No

16.23 What was the main reason for production?

 Selling

 Household consumption

 Both

 Other (specify)


16. VEGETABLE PRODUCTION [Continue]

16.24 Other (specify)

16.25 Did the household sell part of the produce? Yes No

16.26 Did the household consume part of the produce? Yes No

16.27 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

16.28 Other (specify)

16.29 Spinach? Yes No

16.30 What was the main reason for production? Selling Household consumption Both

Other (specify)

16.31 Other (specify)

16.32 Did the household sell part of the produce? Yes No

16.33 Did the household consume part of the produce? Yes No

16.34 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

16.35 Other (specify)

16.36 Other green leafy vegetables (rapa, sepaile)? Yes No

16.37 What was the main reason for production? Selling Household consumption Both

Other (specify)

16.38 Other (specify)

16.39 Did the household sell part of the produce? Yes No

16.40 Did the household consume part of the produce? Yes No

16.41 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

16.42 Other (specify)

16.43 Carrots? Yes No

16.44 What was the main reason for production? Selling Household consumption Both

Other (specify)

16.45 Other (specify)

16.46 Did the household sell part of the produce? Yes No

16.47 Did the household consume part of the produce? Yes No

16.48 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

16.49 Other (specify)

16.50 Beetroot? Yes No



16. VEGETABLE PRODUCTION [Continue]

16.51	What was the main reason for production?	<input type="checkbox"/> Selling	<input type="checkbox"/> Household consumption	<input type="checkbox"/> Both
		<input type="checkbox"/> Other (specify)		
16.52	Other (specify)			
<input type="text"/>				
16.53	Did the household sell part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.54	Did the household consume part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.55	How was the majority of the produce used?	<input type="checkbox"/> Sold to the market	<input type="checkbox"/> Consumed by the household	<input type="checkbox"/> Wasted (rains, drought, pest)
		<input type="checkbox"/> Other (specify)		
16.56	Other (specify)			
<input type="text"/>				
16.57	Cucumber?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.58	What was the main reason for production?	<input type="checkbox"/> Selling	<input type="checkbox"/> Household consumption	<input type="checkbox"/> Both
		<input type="checkbox"/> Other (specify)		
16.59	Other (specify)			
<input type="text"/>				
16.60	Did the household sell part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.61	Did the household consume part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.62	How was the majority of the produce used?	<input type="checkbox"/> Sold to the market	<input type="checkbox"/> Consumed by the household	<input type="checkbox"/> Wasted (rains, drought, pest)
		<input type="checkbox"/> Other (specify)		
16.63	Other (specify)			
<input type="text"/>				
16.64	Green pepper?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.65	What was the main reason for production?	<input type="checkbox"/> Selling	<input type="checkbox"/> Household consumption	<input type="checkbox"/> Both
		<input type="checkbox"/> Other (specify)		
16.66	Other (specify)			
<input type="text"/>				
16.67	Did the household sell part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.68	Did the household consume part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.69	How was the majority of the produce used?	<input type="checkbox"/> Sold to the market	<input type="checkbox"/> Consumed by the household	<input type="checkbox"/> Wasted (rains, drought, pest)
		<input type="checkbox"/> Other (specify)		
16.70	Other (specify)			
<input type="text"/>				
16.71	Broccoli?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.72	What was the main reason for production?	<input type="checkbox"/> Selling	<input type="checkbox"/> Household consumption	<input type="checkbox"/> Both
		<input type="checkbox"/> Other (specify)		
16.73	Other (specify)			
<input type="text"/>				
16.74	Did the household sell part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.75	Did the household consume part of the produce?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
16.76	How was the majority of the produce used?	<input type="checkbox"/> Sold to the market	<input type="checkbox"/> Consumed by the household	<input type="checkbox"/> Wasted (rains, drought, pest)
		<input type="checkbox"/> Other (specify)		



16. VEGETABLE PRODUCTION [Continue]

16.77 Other (specify)

16.78 **Cauliflower** Yes No
 16.79 What was the main reason for production? Selling Household consumption Both
 Other (specify)

16.80 Other (specify)

16.81 Did the household sell part of the produce? Yes No
 16.82 Did the household consume part of the produce? Yes No
 16.83 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

16.84 Other (specify)

16.85 **Green peas?** Yes No
 16.86 What was the main reason for production? Selling Household consumption Both
 Other (specify)

16.87 Other (specify)

16.88 Did the household sell part of the produce? Yes No
 16.89 Did the household consume part of the produce? Yes No
 16.90 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

16.91 Other (specify)

16.92 **Green beans?** Yes No
 16.93 What was the main reason for production? Selling Household consumption Both
 Other (specify)

16.94 Other (specify)

16.95 Did the household sell part of the produce? Yes No
 16.96 Did the household consume part of the produce? Yes No
 16.97 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

16.98 Other (specify)

17. CROP PRODUCTION

17.1 **Maize** Yes No
 17.2 What was the main reason for production? Selling Household consumption Both
 Other (specify)

17.3 Other (specify)

17. CROP PRODUCTION [Continue]

17.4 Did the household sell part of the produce? Yes No
 17.5 Did the household consume part of the produce? Yes No
 17.6 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

17.7 Other (specify)

17.8 Wheat
 17.9 What was the main reason for production? Yes No Selling Household consumption Both
 Other (specify)

17.10 Other (specify)

17.11 Did the household sell part of the produce? Yes No
 17.12 Did the household consume part of the produce? Yes No
 17.13 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

17.14 Other (specify)

17.15 Beans
 17.16 What was the main reason for production? Yes No Selling Household consumption Both
 Other (specify)

17.17 Other (specify)

17.18 Did the household sell part of the produce? Yes No
 17.19 Did the household consume part of the produce? Yes No
 17.20 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

17.21 Other (specify)

17.22 Sorghum
 17.23 What was the main reason for production? Yes No Selling Household consumption Both
 Other (specify)

17.24 Other (specify)

17.25 Did the household sell part of the produce? Yes No
 17.26 Did the household consume part of the produce? Yes No
 17.27 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
 Other (specify)

17.28 Other (specify)

17.29 Potatoes
 17.30 What was the main reason for production? Yes No Selling Household consumption Both
 Other (specify)



17. CROP PRODUCTION [Continue]

17.31 Other (specify)

- 17.32 Did the household sell part of the produce? Yes No
- 17.33 Did the household consume part of the produce? Yes No
- 17.34 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
- Other (specify)

17.35 Other (specify)

18. FRUIT PRODUCTION

In the past year, which fruits did you harvest?

- 18.1 Peaches? Yes No
- 18.2 What was the main reason for production? Selling Household consumption Both
- Other (specify)

18.3 Other (specify)

- 18.4 Did the household sell part of the produce? Yes No
- 18.5 Did the household consume part of the produce? Yes No
- 18.6 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
- Other (specify)

18.7 Other (specify)

- 18.8 Apples? Yes No
- 18.9 What was the main reason for production? Selling Household consumption Both
- Other (specify)

18.10 Other (specify)

- 18.11 Did the household sell part of the produce? Yes No
- 18.12 Did the household consume part of the produce? Yes No
- 18.13 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
- Other (specify)

18.14 Other (specify)

- 18.15 Apricots? Yes No
- 18.16 What was the main reason for production? Selling Household consumption Both
- Other (specify)

18.17 Other (specify)

- 18.18 Did the household sell part of the produce? Yes No
- 18.19 Did the household consume part of the produce? Yes No
- 18.20 How was the majority of the produce used? Sold to the market Consumed by the household Wasted (rains, drought, pest)
- Other (specify)



18. FRUIT PRODUCTION [Continue]

18.21 Other (specify)

18.22 Grapes?

Yes No

18.23 What was the main reason for production?

Selling Household consumption Both

Other (specify)

18.24 Other (specify)

18.25 Did the household sell part of the produce?

Yes No

18.26 Did the household consume part of the produce?

Yes No

18.27 How was the majority of the produce used?

Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

18.28 Other (specify)

18.29 Pears?

Yes No

18.30 What was the main reason for production?

Selling Household consumption Both

Other (specify)

18.31 Other (specify)

18.32 Did the household sell part of the produce?

Yes No

18.33 Did the household consume part of the produce?

Yes No

18.34 How was the majority of the produce used?

Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

18.35 Other (specify)

18.36 Prunes?

Yes No

18.37 What was the main reason for production?

Selling Household consumption Both

Other (specify)

18.38 Other (specify)

18.39 Did the household sell part of the produce?

Yes No

18.40 Did the household consume part of the produce?

Yes No

18.41 How was the majority of the produce used?

Sold to the market Consumed by the household Wasted (rains, drought, pest)

Other (specify)

18.42 Other (specify)

19. WOMEN'S ROLES

19.1 Which of the following are your daily responsibilities?

- | | | |
|---|--|---|
| <input type="checkbox"/> Formal employment | <input type="checkbox"/> Agricultural activities | <input type="checkbox"/> Food preparation and cooking |
| <input type="checkbox"/> Household chores (laundry, cleaning the house) | <input type="checkbox"/> Caring for children | <input type="checkbox"/> Self employment (non-farm) |
| <input type="checkbox"/> Agricultural employment (other farms) | <input type="checkbox"/> Career development (studying) | <input type="checkbox"/> Other (specify) |



19. WOMEN'S ROLES [Continue]

19.2 Other (specify)

Do you perform the following agricultural activities?

- 19.3 Production Yes No
- 19.4 Postharvest handling Yes No
- 19.5 Processing Yes No
- 19.6 Selling agricultural produce Yes No
- 19.7 Access to credit Yes No
- 19.8 Agricultural trainings Yes No
- 19.9 Access to extension services Yes No

19.10 Which agricultural activities (that are specific to your farm) do you perform?

Do you take part in decision making related to the following?

- 19.11 Use of agricultural land Yes No
- 19.12 Purchase of agricultural inputs Yes No
- 19.13 Where the outputs will be sold Yes No
- 19.14 How much of the outputs should be sold Yes No
- 19.15 How much of the outputs should be retained for household consumption Yes No

19.16 Who is the main decision maker on the use of income that is earned by the different household members?

- Woman only Man only Both (woman and man)
- Other (specify)

19.17 Other (specify)

19.18 Who is the main decision maker on the use of farm income?

- Woman Man Both (woman and man)
- Other (specify)

19.19 Other (specify)

19.20 Who is the main decision maker on non- food expenditure?

- Woman Man Both (woman and man)
- Other (specify)

19.21 Other (specify)

19.22 Who is the main decision maker on food expenditure?

- Woman Man Both (woman and man)
- Other (specify)

19.23 Other (specify)

19.24 Who is mainly responsible for food preparation?

- Woman Man Both (woman and man)
- Other (specify)

19.25 Other (specify)

19.26 Who is mainly responsible for food purchase in the household?

- Woman Man Both (woman and man)
- Other (specify)



19. WOMEN'S ROLES [Continue]

19.27 Other (specify)

19.28 Who is mainly responsible for feeding the children in the household?
 Woman Man Both (woman and man)
 Other (specify)

19.29 Other (specify)

20. THE CONTRIBUTION OF AGRICULTURE TO HOUSEHOLD NUTRITION STATUS

20.1 Does your involvement in agriculture contribute to household nutrition status? Yes No
If yes, how does it contribute to the following?

20.2 Food quality

20.3 Food quantity

20.4 Diet diversity

20.5 Income generation

20.6 Women empowerment

20.7 Improvement of quality of life

20.8 Other (elaborate)



20. THE CONTRIBUTION OF AGRICULTURE TO HOUSEHOLD NUTRITION STATUS [Continue]

20.9 If no, what are the challenges?

THANK YOU



APPENDIX D – CONSENT FORM



A LETTER OF CONSENT TO PARTICIPATE IN THE FOOD AND NUTRITION SECURITY RESEARCH

DEPARTMENT OF SUSTAINABLE FOOD SYSTEMS AND DEVELOPMENT

I, the undersigned..... (Full names in print) have read the details of the project, or have listened to the oral explanation thereof, and declare that I understand it. I have had the opportunity to discuss relevant aspects with the researcher and declare that I voluntarily participate in the project. I hereby give consent to participate in the project.

Signature

Signed at (place)

On (date)

APPENDIX E – LANGUAGE EDITING

Michelle Woolley

WRITER EDITOR PROOFREADER TRANSLATOR

Bachelor of Library and Information Science: B.Bibl.
Reference & Research Librarian

Bachelor of Arts Honours in Translation Studies and Editing

Associate Member of Professional EDITORS' Guild (PEG)

CERTIFICATE OF EDITING

This letter certifies that I have edited the Thesis detailed below.

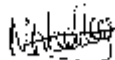
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LESOTHO: THE ROLE OF COMMERCIAL AGRICULTURE

Author:

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Regards
Michelle Woolley



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