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Examining Agricultural Diversification Strategies in Enhancing Food Security at Household Level: A Case Study of Chilanga District of Lusaka Province.

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Abstract

This study investigated the agricultural diversification strategies in enhancing food security at the household level, focusing on the unique context of Chilanga District in Lusaka Province. With a growing population and increasing pressure on agricultural resources, ensuring food security had become a critical concern in Zambia. Through a mixture of qualitative and quantitative research methodology, this study examined the agricultural diversification strategies adopted by households in Chilanga District. It also evaluated the effects of agricultural diversification strategies on household food security. The study revealed that more than 41% of the farmers practiced crop diversification strategies, through the cultivation of multiple crops. 100% agreed that it enhanced food availability, access, and utilization within households where more than 75% households had meals twice a day. Agricultural practices not only mitigated risks associated with climate variability and market fluctuations but also improved dietary diversity and nutritional intake. However, challenges such as limited access to resources, inadequate extension services, and market constraints hindered the full potential of diversification. The study underscored the need for supportive policies, investment in agricultural infrastructure to foster sustainable diversification practices. The study provided valuable lessons and policy implications for enhancing food security through agricultural diversification in similar contexts. It also underscored the importance of promoting diversified agricultural practices as a sustainable pathway towards improving food security and livelihoods at the grassroots level. The study contributed to the existing literature on agricultural diversification and food security by offering empirical evidence and practical recommendations tailored to the specific needs of households in Chilanga District.

Keywords: Crop diversification Strategies, Food security, Household level.

1. INTRODUCTION

1.1. Background

According to the Food and Agriculture Organization (FAO), it said that about 3 billion people throughout the world are not unable to afford healthy diets (FAO et al., 2021). This estimated number of people were accounting for 768 million in 2020 and were undernourished, representing an increase of 117.7 million from 2019 according to (FAO et al., 2021). Additionally, out of this number above, a total of 410 million

lived in Asia and a total number of 281.6 million lived in Africa, specifically in sub-Saharan Africa FAO et al., 2021.

In Zambia, providing food security for all has been a challenge due to the fact that many farmers are small scale-farmers who many practice mono cropping using very old farming practice called chitemina system which includes cutting down of trees and then burning them to produce ashes which act as fertilizer for the crops. (Libanda et al., 2016; Hichaambwa and Mofya-Mukuka, 2016). Nevertheless, agriculture remains an important sector in Zambia according to (IAPRI 2015). Currently, the agriculture is credited for nearly 11% of GDP, whereby making it the second in size compared to the copper mining which brings up to 80% in foreign earnings, according to (AFDB, UNDP and OECD 2016).

In order to promote crop diversification in Zambia, the government of Zambia introduced the e-voucher program in 2016, under the Farmer Input Support Program (FISP), which was meant to provide inputs to support the vulnerable farmers and lessen the cost of farming. This program gave an opportunity to farmers to choose which inputs to utilize for their specific farming needs, according to (Chapoto and Chisanga, 2016).

According to the Eighth National Development Plan agricultural diversification strategies were emphasized upon through the ministry of finance and national planning.

With main lessons of this plan gotten from the previous plans it now features the socio-economic transformation with improved livelihood in its new theme. With the overall aim looking to improve the efficiency and competitiveness of the economy to sustainably lift the living standards of the people. It has a theme, "Socio-Economic Transformation for Improved Livelihoods." The overall aim of this plan is to improve the efficiency and competitiveness of the economy to sustainably lift the living standards of the people (Ministry of Finance and National Planning, 2022).

As a result, beginning 2022/2023 farming season, the government of Zambia encouraged the food reserve agency to not only supply farmers with maize seed but include a variety of crops including cassava, millet and cotton which are climate resilient. And this was done to remodel as well as expand FISP TO CASP which supported the aim of the 8thNDP.

Agricultural diversification has remained undeveloped in Zambia, especially that of maize which has always being the main crop cultivated in Zambia, according to (Mwanamwenge and Cook, 2019; and Chapoto and Chisanga, 2016). According to Zulu et al. (2016), there has been an urgent need to migrate from the polices promoting the cultivation of maize ones that promotes diversificationof crops that can give them a higher yield and earnings per hectare to improve their living standards.

In addition, Heumesser and Kray (2019) added, that depending on the types of crops, diversification can bring about many benefits in the areas of managing pests, as well as the quality of soil, just to mention a few, according to (Maggio et al., 2018: Sichoongwe et al., 2014).

According to Heumesser and Kray (2019), a farm that is more diversified with better nutrition and greater resilience results in environmental and economic wellbeing of the household. Furthermore, the more varieties of foods are available to households and local markets, the more improved people's living standards will be. Crop diversification also leads to improved soil textures and improved environment.

1.2 Statement of the Problem

In spite of government efforts and other stakeholders, to promote food security, some of the interventions such as crop diversification have shown low adoption rates by small-scale farmers (Salick and Byg, 2015). According to Kinkase (2017), key knowledge of crop diversification technics are not fully utilized. This

makes the local farmers more vulnerable as some of the strategies imposed on them cannot be applied in certain districts (Kinkase 2017). And according to Mulenga et al., (2019) maize productivity in Zambia, has been affected in many regions, The agriculture sector in Zambia has been experiencing hostile effects of climate change, which is shown by increased frequency, and severity of seasonal droughts, unstable distribution of rains, increased temperatures, and seasonal floods in some areas. The recurrent droughts in Southern Province of Zambia have compromised its agrarian economy. As a result, the livelihood of the farming community has been exposed to serious limitations on food security and agriculture development among the small holder farmers who depend on rain-fed agriculture for their survival. This study therefore, bridges the knowledge gap in the available literature on the agricultural diversification strategies.

1.2.1. General Objective

The general objective of this study is to examine agricultural diversification strategies in enhancing food security at household level.

1.2.2. Specific Objectives

1. To establish the existing agricultural diversification strategies among the small-scale farmers.
2. To examine factors influencing farmer's decisions to diversify their agricultural activities.
3. To evaluate the effects of agricultural diversification strategies on household food security.

Hypothesis: Increased adoption of agricultural diversification strategies positively correlates with improved food security outcomes in regions facing environmental variability and socio-economic challenges.

Implementing crop diversification strategies among small-scale farmers leads to enhanced food security and increased income levels due to improved resilience against environmental shocks, expanded market opportunities, reduced production risks, and enhanced nutritional diversity.

1.3.Identification of Variables

Variables refer to the characteristics, attributes, or phenomena that are being studies and measured. Variables can take on different values and are used to test hypotheses, determine relationships, or assess the impact of interventions or treatments. They are essential components of research design and analysis, providing the framework for investigating the research questions.

Key Variables:

- Crop Diversity: The range and variety of crops grown by farmers.
- Food Security: The availability, accessibility, and utilization of food by individuals and households.
- Income: The monetary returns generated from agricultural activities.
- Environmental Factors: Climate, soil conditions, water availability, etc.
- Socio-economic Factors: Market access, government policies, land tenure, education level, household size, etc.

1.4. Conceptual Framework.

The developed conceptual framework provided the relationship and interactions between variables and further illustrated how the crop diversification strategies contribute to food security at household level and indeed at national level. Primarily, farmers are exposed to external factors like inadequate rainfall, governance, and policies. These factors influence farmers' decisions whether to diversify their agricultural practices or not. The mono cropping system that most small-scale farmers choose to use as they try to earn a living have some implications on the livelihoods of the people. Depending on the geographical locations,

the socioeconomic of small-scale farmers is affected either positively or negatively, especially with adverse effects of the climate change.

The conceptual framework also helps to justify the research. It is important therefore, to emphasize that the conceptual framework is a theory, however tentative or incomplete it may be. What is often called the "research problem" is a part of the conceptual framework, and formulating the research problem is often seen as a key task in designing the study. It is part of the conceptual framework (although it is often treated as a separate component of a research design or proposal) because it identifies something that is going on in the world, something that is itself problematic or that has consequences that are problematic.

The diagram below shows the conceptual framework clearly highlighting the impacts of crop diversification on small-scale farmers at household level.

CONCEPYUAL FRAMEWORK

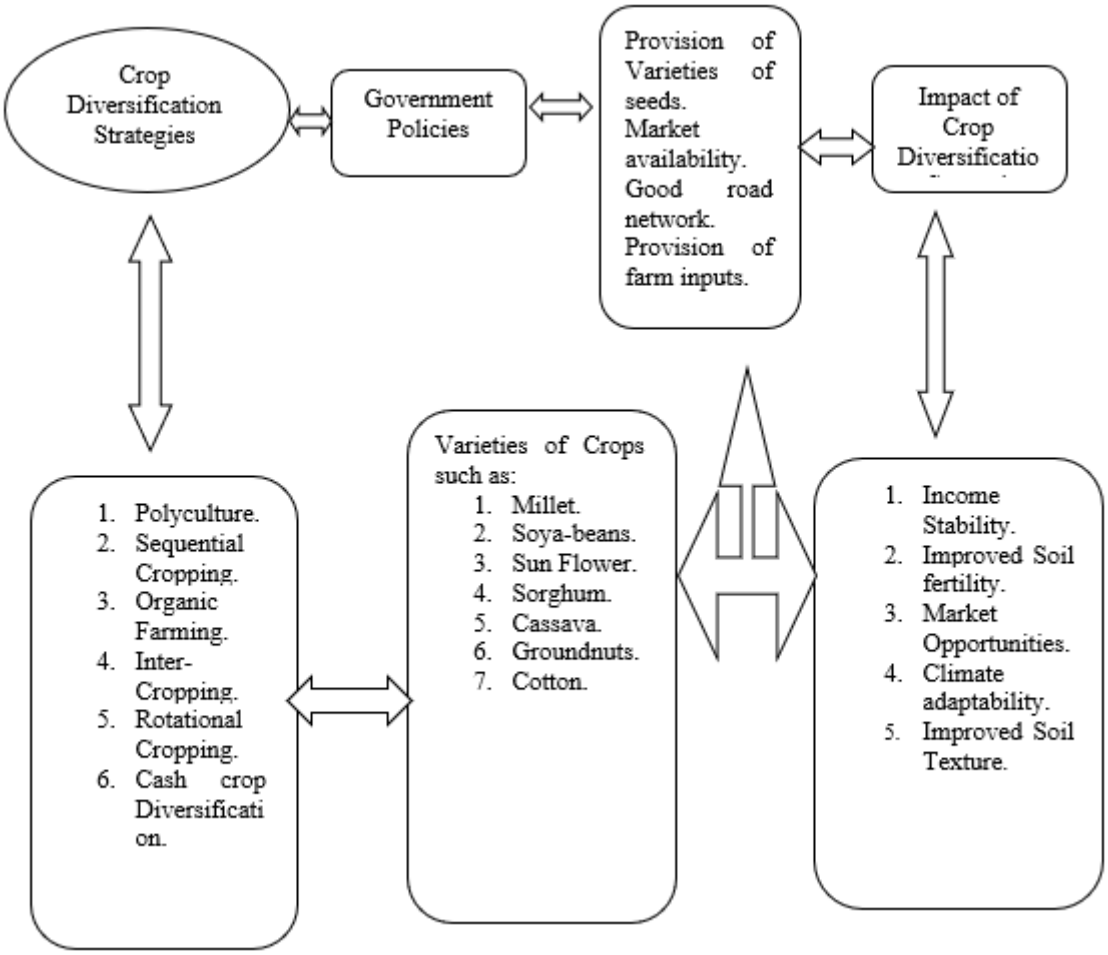


FIGURE 1: Agricultural Diversification Strategies Conceptual Framework.

1.5. Significance of the Study.

The present research work focuses on Zambia's production of maize and how it is affected by climate change. This is the more reason to diversify to other drought resilient crops such as Soya beans, sunflower, cassava, Sorghum, just to mention a few.

According to Sichongwe et al. crop diversification is a good source of agricultural benefits in terms of pest control as well soil quality, among other things (Maggio et al., 2018: Sichoongwe et al., 2014).

Furthermore, a study conducted by Waha et al (2018) illustrated the importance of crop diversification in stabilizing food production especially in Africa.

The study, therefore, focused on Zambia's alternatives to maize production and the need to diversify to other drought resilient crops, which include soya beans, finger millet, sorghum and cassava, which also play a vital role in the production of mealie meal, which is Zambia's main staple food.

This research, therefore, wouldl contribute to the existing collection of knowledge on agricultural diversification strategies and its role in enhancing food security at the household level. The findings would be valuable for policymakers, agricultural extension services, and local communities in designing and implementing effective strategies to improve food security in Chilanga District and similar regions of Zambia.

In addition, crop diversification has many benefits for the small-scale farmers, which include stable income to meet other basic needs such as education, and other necessities of life, most especially meeting family food security., according to (Khanam et al., 2018).

The Social benefits of crop diversification also include creation of employment for farm workers. In addition, the implementation of crop diversification in relation with zero or minimum tillage produces greater increases in food security to (Waha et al, 2018; Kassie et al., 2015).

1.6 Scope of the Study.

This study will be conducted in Chilanga District of Lusaka Province, and the focus will be on the household level. The choice of Chilanga District as the study area is mainly driven by the fact that it does not contain many commercial farmers but rather most of the farmers in the district are small-scale farmers and peasant farmers. Additionally, it is also within the working area of the researcher and is cheaper to study due to its ease of access and proximity to Lusaka.

CHAPTER TWO: LITTERATURE REVIEW

2.0. Overview

This chapter presents various studies done by other researchers in crop diversification strategies. The discussion is guided by the study objectives and each theme is discussed from a global perspective, regional perspective as well as the local perspective.

2.1.0 Agricultural Diversification Strategies among small scale farmers

According to the United Nations, it was estimated that by the year 2019, there were 650 million undernourished people in the world (United Nations, 2022). In addition, since the beginning of the Covid-19 pandemic, that figure has risen to approximately 800 million. In the same manner, around 120 million people were driven into extreme poverty in 2020, thus the first increase in extreme poverty since 1998 while setting back around three years of poverty reduction progress (United Nations, 2022).

According to the World Bank, agriculture is the mainstream for almost every sector around the world. About 37% of the land area is used for agriculture in the world meanwhile contributing 4.3% to the gross domestic product (GDP) alongside forestry and fishery (The World Bank, 2019). According to Feliciano (2019), more than 80% of the poor residing in rural areas considered agriculture to be a more reliable sector in income generation as well as food security than other industries. Moreover, smallholder agriculture involving farms with less than 2 hectares of land and low asset bases can equally be a good starting point for poverty reduction according to (Feliciano, 2019). Similarly, smallholder farms in Asia and the sub-Saharan Africa contribute more than 70% of the food supply. Smallholders' farmers are usually vulnerable to unforeseen occurrences like climate change which generates a gap in the nourishment

supplement. This is due to the little produce stirred for household use with animal rearing being backup food source (Bhatti et al., 2021; Sekaran et al., 2021).

A study conducted by Anderzen, (Anderzén et al. 2020) in Mexico, investigated the profitability of crop diversification strategies in enhancing food security of smallholder coffee farmer's in Mexico. The study found that diversification strategy a bigger impact on food security of the farmers. In addition, (Lopez-Ridaura et al. 2019) conducted a survey where he used samples from 5000 maize and coffee farmer households where he found that households with maize and coffee farms experienced food security in the Western Highlands of Guatemala.

Another study conducted in Pakistan by Dixit et al. (2019), found that crop diversification increases agricultural production and incomes, which in return reduces food prices. He applied the survey dataset of 384 households in the Sinana District of Ethiopia, Mengistu et al. (2021) where he found that crop diversification increases food security in wheat-dependent rural households.

A study conducted by Zanello in Afghanistan, concluded that crop diversification was a great strategy in increasing consumption and improving household dietary needs. (Zanello et al., 2019),. He added that this had a potential to improve rural incomes and food security.

Although crop diversification is adopted by farmers in Afghan, the production levels according to (Ahmadzai, 2022), were low: in 2016/19 almost 50% of households reported only one crop while less than 15% reported growing more than three types of crops.

According to Waha et al. (2018), he concluded that crop diversifiation helped African households to satisfy their consumption needs. The study also found that rainfall and its variability affect the diversification of agricultural products in Africa. Using a sample of 271 smallholder-farming households, Mango et al. (2018) also found that crop diversification enhances households' food security in central Malawi.

According to the study done in Malawi by Feliciano, he said that crop diversification in agriculture has been approached from different perspectives over the period. The multi-crop system, crop rotation, and genetic diversification in crops are some examples of the forms of crop diversification (Feliciano, 2019). Crop diversification is often viewed as the best way to boost revenue while also providing dietary variety for the rural population to combat growing food shortages, and poverty in the thied world countries. (Bezner Kerr et al., 2019). In addition, crop diversification gives farmers access to other crops that they are unable to acquire due to cost or poor infrastructural constraints in isolated rural places where family access to food relies heavily on its own production (physical access) (Adjimoti et al., 2017).

Similarly, a two-year study of households' data in Malawi revealed a positive outcome from practicing crop diversification strategies, according to (Bezner Kerr et al., 2019). It also showed that adding manure and compost affected intercropping and the diversification of legumes in addition to maintaining the environment. Crop diversification in rural areas also takes into account the environmental care

As per Bai et al. (2022), the findings from Rupa Lake in Nepal suggest that crop diversification strategy that incorporates both the raising of awareness and one to one conservation tactics can produce increased crop availability and serves the livelihoods of people in the region, because these crops are crucial to the everyday lives

Based on Nelson Mango et. al (2018) study from Malawi the role of crop diversity in improving household food security articulates that crop diversification among other factors is a viable option in building resilient and affordable agricultural systems in smallholder farming that can contribute significantly to livelihoods, improved health and nutrition, household food security, and ecological sustainability.

Further, according to Hichaambwa and Mofya-Mukuka, (2016), they deduced that crop diversification, is

the growing of more than one crop by a farmer. However, the Ministry of Agriculture and Ministry of Fisheries and Livestock, (2016) looks at crop diversification in a different angle. They describe it as a shift from reliance on one crop to the production of more than one crop.

2.2.0 Factors Influencing the farmers' decisions whether to engage in crop diversification or not.

A study that was conducted from China by Huang Ji-kun et. al (2014), discovers that the reason for growing more than one crop could from having bad weather as a result opting to diversify the crops. He concluded that farmers' decisions in this regards are motivated by their experiences of bad weather occurrences in the last years. This is fair because farmer's behaviors are usually influenced by what their expectations.

According to Alcon et al. (2020) and Latvala et al. (2021), research in Germany revealed that the adoption of crop diversification is driven by demand-side factors. Specifically, the growing societal demand for food produced in an environmentally friendly manner is a key motivator (Alcon et al., 2020; Latvala et al., 2021). This calls for reliable information systems, such as labeling, to authenticate these differentiated products (Akaichi et al., 2022). Additionally, supportive political frameworks play an essential role in promoting sustainable production methods, with crop diversification serving as a crucial tool. It contributes to the shift toward more sustainable food systems in Europe, aligning with initiatives such as the Green Deal, Farm to Fork, and Biodiversity strategies.

Weituschat et al. (2023a) highlighted additional external challenges that may impede the adoption of crop diversification. These include threats such as obstacles arising during the transition from monocropping to diversified agricultural systems. An economic evaluation of the food value chain for diversified systems revealed that the effectiveness of transition strategies, such as labeling or farm subsidies, is influenced by factors like the type of agricultural products, the specific regions, and the characteristics of the value chains. Consequently, the acceptability of these strategies by agricultural food stakeholders becomes a key determinant. This variability makes it difficult to establish a universal approach for promoting crop diversification across Europe, especially beyond the farm gate.

The shortage of agronomists and agricultural experts with expertise in crop diversification poses another significant hurdle in facilitating the transition. In several case studies, particularly in the Mediterranean region, both farmers and farm advisors have reported limited knowledge and experience with crop diversification practices (Weituschat et al., 2022). This indicates a form of "lock-in" to monoculture farming systems.

A dynamic optimization modeling study on the CS 13 dairy farm case demonstrated that incorporating empirically validated pre-crop values—covering a range of crops, including less common ones like oilseeds and temporary forage grasses—into crop rotation decisions could lead to substantial improvements in crop yields and farm profitability over time (Tzemi and Lehtonen, 2022). However, many farmers are unaware of these pre-crop effects and often do not factor them into their management practices. Additionally, they tend to focus on short-term crop management rather than considering longer-term planning.

A study by Pomi Shabaz et al. (2017) in Pakistan highlighted that crop diversification in mixed cropping serves as a self-driven, cost-effective strategy to mitigate the impacts of climate change and market fluctuations, ultimately reducing income instability for farmers. This low-cost practice not only stabilizes incomes but also improves soil fertility and enhances resource efficiency. The research further revealed that farmers who adopt a high level of diversification tend to be more educated compared to those with low levels of diversification. Education plays a significant role in encouraging farmers to engage more

effectively in agricultural diversification, enabling them to select specific crops that help mitigate income variability (Mishra and El-Osta, 2017).

Several external factors also influence the adoption of crop diversification, including market volatility, new agricultural technologies, labor and input costs, and access to markets and farmland. Access to farmland is particularly crucial, as its lack can constrain farmers to smaller scales of operation. In such cases, strategies like product differentiation, local labeling, and targeting high-value markets can help farmers maintain profitability despite lower yields (Verment, Agricultural Food and Markets, 2015). However, leasing land can discourage long-term investments in soil health and pest resistance, resulting in less diverse crop mixes on leased land compared to owned land. The separation theorem (Johnson et al., 2017) suggests that while land ownership influences land conservation practices, leasing conditions, such as the type and duration of leases, may not significantly impact crop diversification practices. Nevertheless, ownership often fosters a greater commitment to long-term land stewardship.

A study conducted across Zambia, Malawi, and Mozambique on cropping system diversification in Eastern and Southern Africa found that land size plays a pivotal role in determining crop diversification. Farmers with limited land often prioritize staple food production over cultivating diverse crops (Maggio et al., 2018). Similarly, research by Hichaambwa and Mofya-Mukuka (2016) highlighted that both land size and farm assets at the beginning of the season significantly influence crop diversification. Additionally, access to markets has been identified as a crucial driver for adopting diverse cropping systems (Hichaambwa and Mofya-Mukuka, 2016; Dube and Guveya, 2016).

A 2014 survey by the Global Conference on Agricultural Research for Development (GCARD) in Zambia underscored the role of agricultural extension workers in promoting crop diversification. However, the number of extension workers was perceived as insufficient, especially given the needs of small-scale farmers who rely heavily on their services for knowledge transfer, information, and training (Sunderland, 2015).

While existing technologies and agricultural knowledge offer options for improving food and nutrition security, continuous research and development in new technologies remain essential. Lessons from the Green Revolution emphasize the need for sustained financial investment in research and the widespread dissemination of innovations (United Nations, 2014). Moreover, research institutions must adopt an interdisciplinary approach to address the diverse needs of farmers. For example, transforming varied agroecological rural economies necessitates collaboration among experts from fields such as biology, agronomy, water engineering, nutrition, economics, and social and political sciences (Sunderland, 2016). Ignaciuk et al. (2017) emphasized that providing extension services and disseminating information about the benefits of crop diversification is essential for enhancing diversification efforts. Additionally, targeting impoverished farmers living in challenging climatic conditions through safety net programs and other capacity-building strategies can amplify the effectiveness of public policies. This not only promotes welfare improvements among the poor but also enhances climate resilience at both the farm level and beyond. To maximize the advantages of crop diversification, policies should focus on encouraging diversification among low-income households while maintaining incentives for specialization on larger, better-capitalized farms.

Investments in infrastructure and input-output markets are also critical for stimulating crop diversification (Ignaciuk et al., 2017; Maggio et al., 2018). Reducing barriers for small and medium-sized enterprises to expand services in underserved areas and engage in input supply and crop procurement for a variety of products can contribute to diversification. This includes providing financing options for these businesses

and facilitating access to domestic, regional, and international markets (Ignaciuk et al., 2017).

Governments can further promote diversification by reforming public market boards to broaden the range of crops purchased and reduce the dominance of these institutions in the market. Input subsidy policies must be re-evaluated within the context of diversification strategies, as subsidies on maize seeds, for instance, can distort prices and unintentionally encourage monocropping among smallholder farmers (Maggio et al., 2018).

The recent increase in the price of a 50KG bag of maize sold to the Food Reserve Agency (FRA) has partly hindered agricultural diversification. This is because many small-scale farmers may choose to grow maize for its higher monetary return. To address this, the government, through the FRA, should expand storage facilities and create markets for other crops, offering competitive purchase prices to encourage diversification.

2.3.0. Effects of Crops diversification strategies on household food security.

A study by Myeni, Moeletsi et al. (2020) conducted in Poland emphasized the importance of crop diversity in farming systems as a crucial adaptation strategy to cope with future climate variability. Diversification helps small farms reduce exposure to production losses and increases their resilience to environmental changes (Arib, Sghaier et al., 2020). Moreover, it mitigates risks such as income instability, food insecurity, and poor nutrition (Mango, Makate et al., 2018).

Angevin, Bockstaller et al. (2020) found that crop diversification can improve farmers' financial security and strengthen their integration into local markets. Researchers also highlighted its role in promoting sustainable rural development by enhancing connections between agriculture and other economic sectors. Sustainable agriculture leverages technology to optimize productivity while minimizing environmental harm. Diversification enables farmers to participate in the Sustainable Agricultural and Rural Development (SARD) concept (Salvion, Henke, Vanni et al., 2020).

In a 2016 European Parliament resolution on the Common Agricultural Policy's role in job creation, it was noted that diversified agricultural activities could encourage young people to return to rural areas, foster entrepreneurship, and focus on innovation and the promotion of area-specific products.

A study spanning seven regions, including Central and Southern America, Eastern Asia, and parts of Africa and Europe, highlighted that crop diversification is increasingly endorsed as a strategy to enhance agricultural sustainability while maintaining sufficient food and feed production (Bullock et al., 2017). While the effectiveness of diversification strategies depends on ecological and agronomic contexts (Duru and Therond, 2015), a systematic review found these strategies to have overwhelmingly positive impacts on productivity and the environment. This was particularly evident in rice, maize, and wheat systems, which account for 34% of species analyzed and contribute nearly 60% of the global calories and proteins derived from plants.

Rosa-Schleich et al. (2019) found that most of the assessed effect sizes demonstrated a positive impact of diversification strategies on crop yields. This positive effect applied to nearly all strategies, except agroforestry, where productive performance tended to be more variable. However, agroforestry almost consistently showed significant benefits for soil quality, particularly by enhancing soil organic carbon levels, thus confirming its potential role in mitigating climate change through atmospheric carbon dioxide sequestration.

The study further observed that combining multiple diversification strategies—such as rotation with agroforestry or rotation with associated plants—enhanced the productive performance of cropping systems. However, the effectiveness and implementation of these strategies depended on the initial

diversification level and local soil and climate conditions. For example, in northern countries, approximately 80% of US corn alternates with soybeans and/or wheat, while in France, intensive rotations often involve wheat, maize, or wheat alternating with soybean and/or barley (Mignolet et al., 2016). These variations highlight differing levels of diversification across regions.

Makate et al. (2016) noted that diversified crop rotations improve farm production, leading to increased cash flow for farmers throughout the year. Similarly, Ureta, Cocchi, and Solis (2016) recorded an average 21% rise in farm revenue, and Perz (2014) identified a favorable correlation between crop diversification and income in the Brazilian Amazon. Hansen, Hellin, and Rosenstock (2019) emphasized that integrating diverse crops can enhance and stabilize farmers' incomes. Additionally, diversification boosts agricultural productivity, with areas practicing diversified cropping experiencing higher and more consistent yields over time (Gliessman & Amador, 2019).

In Zambia, De Schutter (2014) revealed that food insecurity was prevalent among rural populations. Well-off households, which produced more food, generally had more frequent meals and greater dietary diversity compared to less well-off households. These disparities were attributed to variations in agricultural production strategies, particularly in gaining access to farm inputs and labor.

2.4.0. Personal critique of literature review

The study findings highlighted that, while farmers may not fully understand the intricacies of crop diversification strategies, they still engaged in such practices. Therefore, educational initiatives should focus on enhancing farmers' comprehension of diversification strategies, prioritizing locally relevant indicators that are easier for them to interpret rather than overly complex scientific metrics.

As observed in East Africa, Ngetich et al. (2022) conducted research in Kenya on crop diversification strategies among small-scale farmers. The study provided valuable insights into how farmers successfully implemented these strategies. The positive outcomes and benefits experienced by the farmers underscore the potential for crop diversification to improve livelihoods in both the short and long term. Through these strategies, farmers can make informed decisions regarding crop selection, field management (such as planting schedules and agronomic practices), and diversification of production systems. Specific approaches like intercropping, planting cover crops, and constructing water harvesting structures were consistently applied across the study areas.

2.5.0. Establishment of research gaps

Although various studies have explored crop diversification strategies, there remains insufficient information in Zambia regarding small-scale farmers' awareness of the benefits of adopting such strategies. Many farmers report a limited understanding of the specific approaches that could enhance their livelihoods and boost their family incomes. Furthermore, some existing research lacks critical insights, as it primarily focuses on general farming practices rather than delving into the nuances of crop diversification.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0. Overview

This chapter outlines the methodology employed in this study. It details the research paradigm, design, target population, sampling methods, research instruments, data collection processes, data analysis techniques, and ethical considerations.

3.1. Research Design

The study utilized a case study research design to investigate agricultural diversification strategies at the

household level in Chilanga District, Lusaka Province. This design facilitated the collection of detailed information from respondents about the practices implemented in the area. A case study approach was chosen due to its cost-effectiveness, manageability, and time efficiency.

The research employed a mixed-methods approach, combining both qualitative and quantitative methods. As noted by Cresswell (2014), this approach allows for the exploration and understanding of the meanings individuals or groups associate with social or human challenges. The qualitative aspect focused on gathering descriptive and theoretical insights, while the quantitative aspect captured numerical data, such as the number of farmers impacted by maize dependency and those transitioning to crop diversification to enhance family income and related statistics.

3.2. Sampling Procedure

Non-probability sampling technique was used to select farmers, which were easily accessed and available for research in Chilanga District. Therefore, convenience-sampling method was used because it makes it easy to collect data from farmers that are near the researcher in Chilanga District.

3.3. Target populations and Sample size

The study focused on farmers in Chilanga District as the target population. A sample size of 100 households was selected using simple random sampling from the entire district, which encompassed all the farms in the area. Questionnaires were chosen as the data collection tool for several reasons. First, given the large population size, sampling was necessary. This aligns with Rowley (2014), who states that questionnaires are commonly used in surveys to collect data from large groups, typically ranging from 100 to 1,000 participants. Taherdoost (2016) also emphasizes the importance of sampling when it is impractical to gather data from the entire population to answer research questions.

Additionally, Chilanga District presented a finite population that could be listed or mapped, with each element having an equal probability of selection. Moreover, each household or farm was mutually exclusive, meaning they were distinct and did not overlap, as highlighted by Alvi (2016) and Sharma (2017). Lastly, the decision to sample helped reduce the time and resources required by avoiding the need to analyze the entire population, as noted by Rowley (2014).

3.4. Instruments of data collection

Primary data for this study was collected using self-administered questionnaires, which were distributed directly to farmers or households. Structured questions were chosen for their ease of coding and analysis. A conceptual framework was employed to guide the study, while the theoretical framework was based on constructivism, which posits that knowledge and attitudes are socially constructed rather than biologically determined, as noted by Bryant et al. (2016). To capture both singular and multiple perspectives, the study combined survey questionnaires with in-depth interviews to address the research questions. Pragmatism was applied as the research paradigm, using multiple methods to resolve practical issues, as emphasized by Cresswell (2014). This paradigm focuses on solving real-world problems and is commonly adopted by practical-minded researchers (Creswell and Clark, 2016).

Before data collection, the questionnaire was piloted with ten respondents. As Canals (2017) highlights, piloting tools with a small sample helps to identify potential obstacles in data collection. The pilot phase allowed adjustments to be made to questions that were deemed too personal, ambiguous, or redundant. It also helped streamline the questionnaire to ensure it could be completed within a few minutes.

3.5. Data Analysis

Data analysis techniques SPSS and MS Excel were

The collected data was analyzed using SPSS version 20, employing descriptive statistics such as frequen-

cies and percentages. Descriptive analysis was utilized to generate frequency tables, pie charts, and bar graphs for data presentation. As noted by Akhtar (2016), exploratory studies are typically conducted when there is limited prior research available for reference. These studies aim to develop insights and a deeper understanding of the subject matter, serving as a foundation for more detailed investigations in the future.

3.6. Ethical Consideration

This research, while employing anonymous questionnaires, collected personal data that could potentially link individuals to specific events or transactions. It also included in-depth interviews with identifiable experts. To safeguard the privacy of participants, consent was obtained prior to administering questionnaires or conducting interviews. The research instruments were designed to avoid requiring any identifying information from respondents. All collected personal data was handled with the utmost confidentiality, and participants were informed that the data would be used solely for research purposes. Additionally, permission was sought from relevant authorities, including the Ministry of Agriculture at the Chilanga Agriculture Department Office.

CHAPTER FOUR: PRESENTATION OF RESEARCH FINDINGS AND DISCUSSION OF RESULTS.

4.0. Overview.

This chapter presents and analyzes the participants' responses, accompanied by a discussion of the findings. The results are displayed using tables and charts for clarity. The discussion aligns with the outlined research objectives, which are: to systematically identify the current agricultural diversification strategies adopted by small-scale farmers, to explore the factors influencing their decisions to diversify agricultural activities, and to assess the impact of these strategies on household food security.

4.1.0. Presentation of Research Findings: Respondents' background information

The demographic information of the respondents primarily centers on their gender, educational background, age, and length of professional experience. This data was collected to assess the effectiveness of their participation in agricultural diversification strategies aimed at improving household food security, while also providing insights into the respondents' characteristics.

Distribution of the respondents by age.

The researcher aimed to determine the age distribution of the respondents by including a question about their age in the questionnaire. The results of this inquiry are presented in Table 1, which illustrates the respondents' age categories.

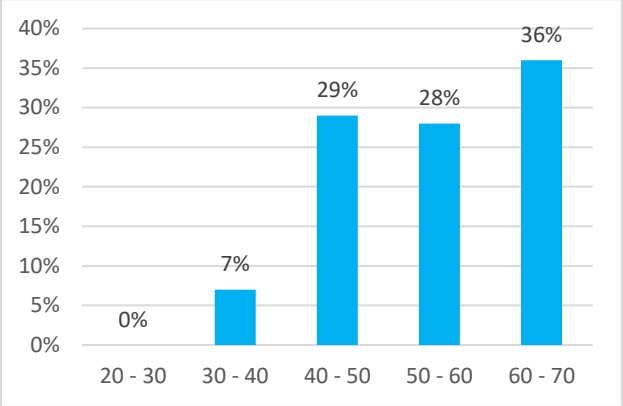
Table 1: Distribution of the respondents by age.

Age group	Frequency	Percentage (%)
20 - 30	0	0%
30 - 40	7	7%
40 - 50	29	29%
50 - 60	28	28%
60 - 70	36	36%
Total	100	100%

Source: Field Data, 2024.

The data indicated that farmers in Chilanga District included both middle-aged and older individuals, with ages spanning from 40 to 70 years. Specifically, 29% of respondents were between 40 and 50 years old, 28% were aged 50 to 60, and 36% were between 60 and 70 years. The farmers' age distribution is further illustrated in Figure 1 below.

Figure 1: Distribution of respondents by age.



Source: Field data 2024

The data illustrated in Figure 1 showed that most farmers participating in the study were aged between 60 and 70 years, followed by those in the 40 to 50 age group. Older farmers are generally expected to show greater satisfaction with their farming systems, as they tend to settle into their professions for long-term productivity. In contrast, younger farmers often prioritize swift and immediate outcomes.

Educational background of the respondents.

The study aimed to determine the highest educational qualifications of the respondents, with the findings summarized in Table 2. The results indicate that 46% of the farmers had completed secondary education, 39% had attended colleges or universities, and 15% had only attained primary education. These findings are detailed in the table below.

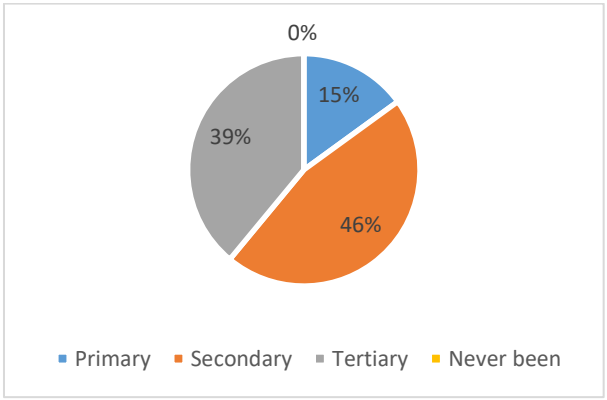
Table 2: Educational background of farmers

Category	Frequency	Percentage (%)
Primary	15	15%
Secondary	46	46%
Tertiary	39	39%
Never been	0	0%
Total	100	100%

Source: Field data.

The figure below highlights the percentages of the farmers' qualification. It can be seen from the figure below that the majority of the farmers in Chilanga District have had some form of education background ranging from primary level, secondary level and up to tertiary level. At least all respondents indicated a non-zero education background.

Figure 2: Respondents' educational background.

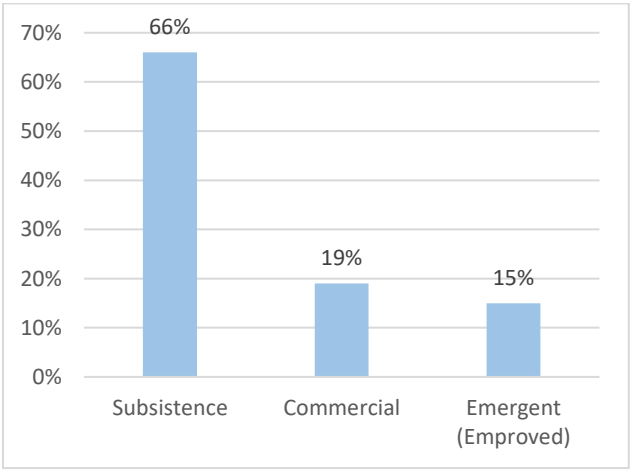


Source: Field data 2024.

4.2.0. Crop diversification strategies: Distribution of the respondents based on their farming scale and land capacity.

To ascertain the size and scale of the farming activities practiced in Chilanga district, the study sought to find out to what extent farmers are engaged in agricultural activities. The respondents were asked as to what type of farmers they were actually were. The table below shows the results from the questionnaires. The study shows that 66% of the respondents were subsistence farmers, 19% percent were commercial farmers and 15% practiced what is called emergent or improved type of farming. This is a type of farming system which involves the use of advanced and innovative farming tools and technology basically to improve the productivity.

Figure 3: Distribution of the respondents based on their farming scale.



Source: Field data 2024

The study also sought to establish the types of crops popularly grown by the respondents in the district.

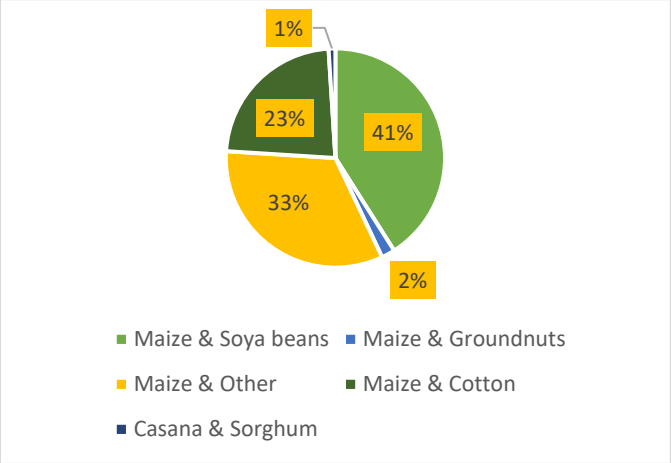
Table 3: Types of crops grown.

Category	Frequency	Percentage (%)
Maize & Soya beans	41	41%
Maize & Groundnuts	2	2%
Maize & Other	33	33%

Maize & Cotton	23	23%
Cassava & Sorghum	1	1%
Total	100	100%

Source: Field data 2024

Figure 4: Types of crops based on the respondents



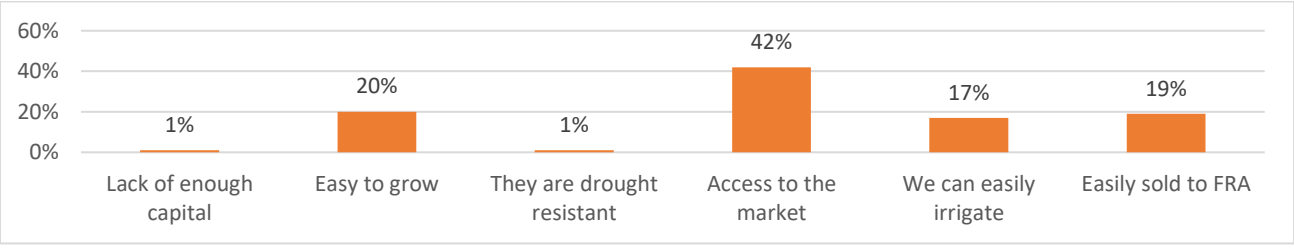
Source: Field data 2024

The figure above indicates that the majority of the respondents are very much into growing maize probably due to its easy access to the market as shown in this study. It shows that 41% of the respondents grow Maize and a combination of soya beans. While 33% grow maize and other combination of crops, including vegetables and tomatoes. 23% grow maize and cotton, 2% combine maize with groundnuts and 1% combine Cassava and Sorghum basically for their adaptability to climate change.

Reasons for growing the types of crops by the respondents.

The study sought to establish the reasons behind the respondents growing the various types of crops. The Table and the figure below display the various responses expressed by the respondents.

Table 5: Reasons for growing different types of crops.



Source: Field data 2024

As shown by figure 9 above, the majority of the respondents said that the reason for choosing the particular crop was primarily due to its access to the market, precisely the FRA, which offers ready market to the farmers. The study shows that 42% of the respondents chose to grow what they grow due to access to the market. 20% of the respondents says the crops are easy to grow. 19% of the respondents attribute their reason for access to the FRA, which easily buys their produce. 17% of the respondents alluded their choice

of crops to the fact that they can easily irrigate, while 1% of the respondents said it was due to both lack of capital and also drought resistant respectively.

4.3.0. Factors influencing farmers' decisions to diversify

The table below highlights the various reasons influencing farmers' decisions to diversify their crops. It indicates that almost every respondent questioned gave a reason for their growing more than one crop. The majority indicated that availability of market or easy access to the market was the most and strongest reason for them to engage or do their crop diversification strategies

Table 4: Factors influencing farmers' decision to diversify

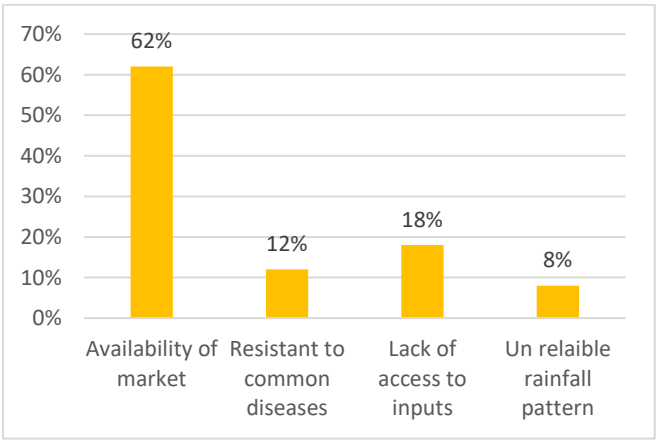
Category	Frequency	Percentage (%)
Availability of market	62	62%
Resistant to diseases	12	12%
Lack of access to inputs	18	18%
Un reliable rainfall pattern	8	8%
Total	100	100%

Source: Field data 2024

Factors influencing farmers' decision to diversify.

The figure below shows various reasons for engaging in crop diversification. The study identified that 62% of the respondents attribted their diversifying due to availability of market. 18% of the respondents said it is due to lack of access to inputs, 12% of the respondents alluded to the ability of the crops to resist the common diseases, and 8% said mainly due to the eratic or unreliable rainfall pattern.

Figure 5: Factors influencing farmers' decision to diversify.

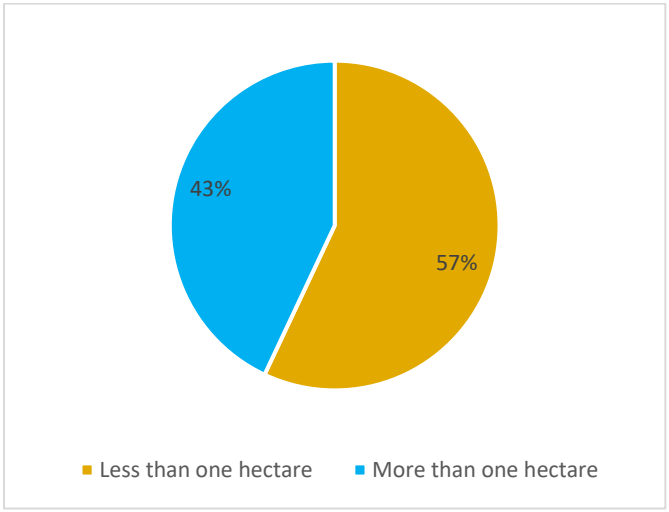


Source: Field data 2024

Size of the farm.

The researcher sought to ascertain whether the size of the farm or land owned by the small holder farmers has a bearing on their decision to diversify their crops or not. Below are the results showing the farm sizes of the respondents.

Figure 6: Size of the farmland.



Source: Field data 2024

The figure above shows the distribution of the respondents based on the size of the farm or land. The study shows that the majority of the respondents have a farm or land which is less than one hectare. The study shows that 57% of the respondents do not enough land do their farming activities which are able to incorporate crop diversification strategies. The study also shows that 43% of the respondents have a farm land that is bigger than one hectare.

Effects of farm size on crop diversification strategies.

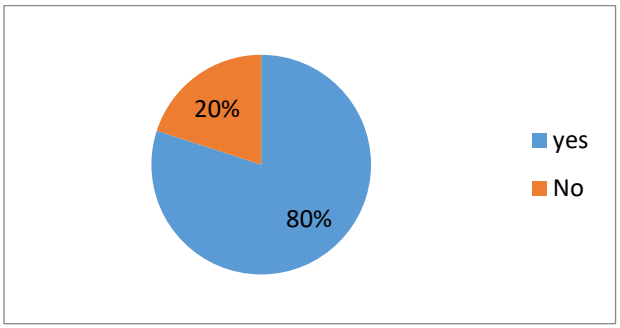
The availability of land or the size of the farm plays an important role in crop diversification. This is because the larger the farms a farmer has means having more land to allocate to different crops, whereas smaller farms might have to focus on fewer crops due to limited space. However, smaller farms can also diversify their crops by focusing on niche or specialty crops, implementing agro forestry practices, or engaging in mixed farming systems where they integrate crops with livestock or other agricultural activities. While the scale of the farm does influence diversification possibilities, it's not the only determining factor. In order to ascertain the effects of land size on the small holders' decision to diversify, the respondents were asked to indicate their answers. The table and the subsequent figure below show how the size of the land affects the small holders' ability to diversify or not.

Table 5: Effects of farm size on crop diversification strategies

Category	Frequency	Percentage (%)
yes	80	80%
No	20	20%
Total	100	100%

Source: Field data 2024

Figure 7: Effects of farm size on crop diversification strategies



Source: field data 2024

The figure above shows that 80% of the respondent agreed that the size of the farm land has a huge bearing on the farmers' decision to grow other crops, while 20% said the effect of the land size is not really important. Whether a farmer has a big farm land or not

4.4.0 Effects of crop diversification strategies on household food security.

Crop diversification strategies can have several effects on household food security, both positive and negative, depending on various factors such as the context, agricultural practices, market dynamics, and socio-economic conditions. This study sought to establish the effects of agricultural diversification strategies on household food security.

Distribution of the respondents based on an increase in their income levels after diversification.

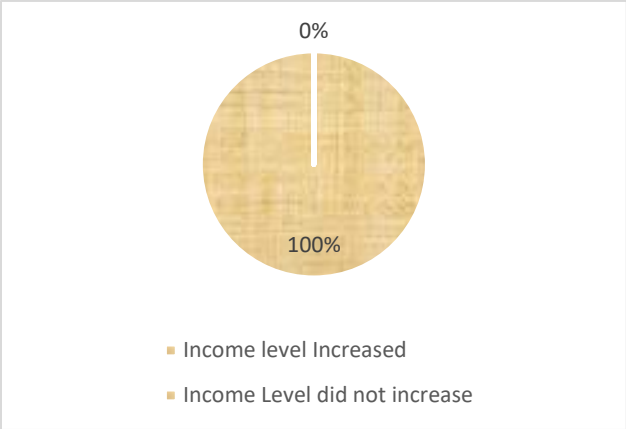
Table 6: Distribution of the respondents based on the effects of crop diversification strategies on their income levels.

Category	Frequency	Percentage (%)
Income level Increased	100	100%
Income Level did not increase	0	0%
Total	100	100%

Source: Field data 2024.

The study sought to ascertain the effects of agricultural diversification strategies on the income levels of the small-holder farmers. From the study it is easier to notice the impact of the crop diversification strategies on the household income level of the respondents. The figure below shows that 100% of the respondents affirmed to the fact there was a significant increase in their income levels mainly due to the different varieties of crops to sale. Others mentioned that with varieties of crops comes with it more market and different buyers. The results are tabulated in the table above.

Figure 8: Distribution of the respondents based on the effects of crop diversification strategies on their income levels.



Source: Field data 2024.

Number of meals per day.

In order to further ascertain the impact of crop diversification strategies, the respondents were asked to indicate the numbers of meals each respondents' family are able to eat reportedly following crop diversification.

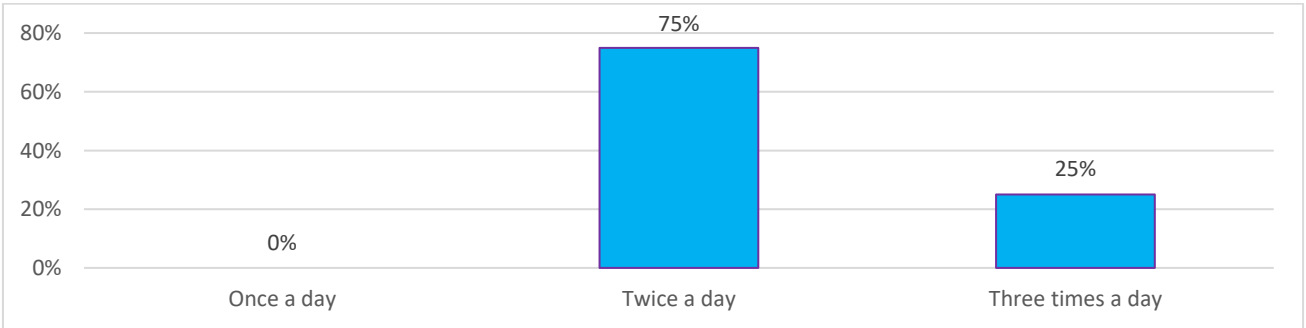
Table 7: Distribution of the respondents based on the number of meals per day

Category	Frequency	Percentage (%)
Once a day	0	0%
Twice a day	75	75%
Three times a day	25	25%
Total	100	100%

Source: Field data 2024.

The figure below shows the distribution of the respondents based on the number of meals per day. The study shows that at least no family goes on empty stomach in the district or have one meal per day. It further shows that 75% of the respondents have a decent meal at least twice a day, and 25% of the respondents have decent meals three times a day. A health indication of the effectiveness of crop diversification strategies. The results are graphically shown in the figure below.

Figure 17: Distribution of the respondents based on the number of meals per day



Source: Field data 2024

Effects of agricultural diversification strategies on soil fertility

The study further sought to ascertain the possible effects of agricultural diversification strategies on the soli. The results were recorded in the table below.

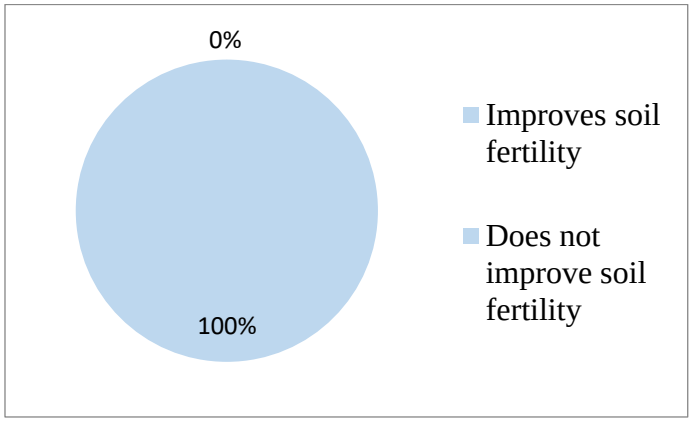
Table 8: Effects of agricultural diversification strategies on soil fertility.

Category	Frequency	Percentage (%)
Improves soil fertility	100	100%
Does not improve soil fertility	0	0%
Total	100	100%

Source: Field data 2024

As shown by the figure below, the study shows that when the respondents grow more than one crop and practice crop rotation, especially crops like soya beans, tubers like cassava and sweet potatoes, the results are that there is 100% soil improvement in the farm. The study shows all the respondents questioned, answered yes to the question about the effect of agricultural diversification on soil fertility.

Figure 9: Effects of agricultural diversification strategies on soil fertility



Source: Field data 2024.

4.5.0 Discussions of research findings

Regarding agricultural diversification strategies to improve household food security, the respondents provided several key findings. These findings align with the conclusions of Nelson Mango et al. (2018) in Malawi, which highlighted the role of crop diversification as a practical and effective approach to fostering resilient and cost-efficient agricultural systems. Such systems in smallholder farming significantly contribute to livelihoods, better health and nutrition, enhanced household food security, and ecological sustainability.

The study showed that 66% of the respondents were subsistence farmers, while 19% percent were commercial farmers and 15% practiced emergent or improved type of farming. Improved farming is a type of farming system, which involves the use of advanced and innovative farming tools and technology to improve the productivity.

The study revealed that the majority of the respondents in Chilanga district have been in the farming business for more than 10 years. The results show that 60 percent of the farmers in Chilanga district have been farming between 10 and 15 years, 15% of farmers have been farming between 1 and 5 years, while

13% and 12% have been farming between 15 to 20 years and 5 to 10 years respectively.

The study showed that the majority of the respondents had employed some form of crop diversification strategies. The results show that 41% of the respondents grow Maize and a combination of soya beans. While 33% grow maize and other combination of crops, including vegetables and tomatoes. 23% grow maize and cotton, 2% combine maize with groundnuts and 1% combine Cassava and Sorghum basically for their adaptability to climate change.

The study also sought to identify the various reasons influencing farmers' decisions to diversify their crops. It was discovered that almost every respondent questioned gave a reason for their or not growing more than one crop. The majority indicated that availability of market or easy access to the market was the most and strongest reason for them to engage or do their crop diversification strategies. The study showed that 62% of the respondents attribted their diversifying due to availability of market. 18% of the respondents said it is due to lack of access to inputs, 12% of the respondents alluded to the ability of the crops to resist the common diseases, and 8% said mainly due to the eratic or unreliable rainfall pattern.

The availability of land or the size of the farm plays an important role in crop diversification. This is because the larger the farms a farmer has means having more land to allocate to different crops, whereas smaller farms might have to focus on fewer crops due to limited space. However, smaller farms can also diversify their crops by focusing on niche or specialty crops, implementing agro forestry practices, or engaging in mixed farming systems where they integrate crops with livestock or other agricultural activities. The study shows that 57% of the respondents do not have enough land to do their farming activities that can enable them to incorporate crop diversification strategies. The study also shows that 43% of the respondents have a farmland that is bigger than one hectare. As a result, 80% of the respondent agreed that the size of the farmland has a huge bearing on the farmers' decision to grow other crops, while 20% said the effect of the land size is not important. Whether a farmer has a big farmland or not, he can still plant a variety of crops.

The study also showed that many families have a substantial income to go about their daily living or have one meal per day. The result showed that 75% of the respondents have a decent meal at least twice a day, and 25% of the respondents have decent meals three times a day. A health indication of the effectiveness of crop diversification strategies. The study further showed that 95% of the respondents were able to sale their produce with easy. This is because most of the respondents have a ready market for their produce by means of either the government intervention or local buyers. It further showed that only 5% of the respondents find it a challenge to sell their produce.

The study also sought to examine the effects of crop diversification on the soil fertility. The results showed that when the respondents grow more than one crop and practice crop rotation, especially crops like soya beans, tubers like cassava and sweet potatoes, the results are that there is 100% soil improvement in the farm. The study shows all the respondents questioned, answered yes to the question about the effect of agricultural diversification on soil fertility.

5.0. CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1.0 Overview

This chapter outlines the main conclusions and recommendations of the study. These conclusions are in line with the specific objectives of the of the study which was to establish the existing agricultural diversification strategies among the small-scale farmers. To examine factors influencing farmer's decisions to diversify their agricultural activities and to evaluate the effects of agricultural diversification

strategies on household food security.

5.2.0 Conclusion

In recent years, notable progress has been made in crop diversification; however, there is still considerable room for improvement. The agricultural sector remains predominantly composed of small-scale farmers relying on rain-fed systems, which face mounting challenges such as land degradation, declining soil fertility, climate variability, limited access to farming equipment, and insufficient knowledge and application of diversification techniques. The lack of crop diversification constrains agriculture's potential to alleviate poverty, ensure sustainable environmental management, and promote nutritious diets. Diversification, however, offers agronomic benefits like improved pest control and enhanced soil quality. This study focused on examining agricultural diversification strategies to enhance household food security and promote sustainable income generation, with Chilanga District as the case study. Its objectives were to identify existing diversification strategies among small-scale farmers, analyze the factors influencing farmers' decisions to diversify, and assess the impacts of diversification on household food security.

The research hypothesized that adopting agricultural diversification strategies would positively correlate with improved food security outcomes in areas experiencing environmental variability and socio-economic challenges. Several factors influence farmers' decisions to diversify, including market information access, availability of resources like land and capital, government policies and subsidies, risk perception, environmental and socio-cultural conditions, and individual traits like education and farming experience.

The implementation of diversification strategies among small-scale farmers has been shown to enhance food security and boost income levels by improving resilience to environmental shocks, broadening market opportunities, reducing production risks, and increasing dietary diversity.

However, the study revealed that while small-scale farmers do engage in crop diversification, adoption remains minimal and insufficient to achieve significant economic impacts. One key issue is the absence of markets for their diversified crops; without buyers, farmers often produce solely for home consumption. Additionally, many farmers fail to recognize the economic value of diversification, which prevents them from fully realizing its benefits. Consequently, a substantial number of respondents indicated that their income levels remained unchanged despite diversification efforts.

5.3.0 Recommendations

Based on a thorough evaluation of the findings, the following recommendations have been proposed. Firstly, the government should implement policies aimed at improving farmers' access to and control over land. As smallholder farmers contribute significantly to food production, increasing their access to land would enable them to cultivate more crops, thereby enhancing food and nutrition security and reducing poverty. Bhattacharyya (2018) highlights that access to land is crucial for small-scale farmers to engage in crop diversification. In Chilanga District, many farmers face land shortages that hinder diversification efforts. Similarly, a study in Ethiopia by Goshu et al. (2014) found that larger landholdings among farming households improved food security and reduced poverty. Ashfaq et al. (2016) further noted that greater land access facilitates crop diversification.

Secondly, recognizing that most small-scale farmers are resource-constrained, experience low agricultural productivity, and often struggle with food insecurity, the government should expand its policy of mechanizing agriculture by providing farm equipment and tools. To achieve this, strategies encouraging

private sector participation in supplying these services should be prioritized (MoFNP, 2016). The study shows that farmers using ploughs to till their land are better positioned to diversify. Therefore, equipping small-scale farmers with tools like ploughs is essential to enable crop diversification.

Using ploughs reduces the time needed for farming tasks. For instance, a plough can prepare land in a few hours, a task that would otherwise take an entire day using a hoe. This efficiency underscores the importance of equipping farmers with such tools to effectively adopt agricultural diversification strategies.

Lastly, the government should consider improving market access by bringing trading hubs closer to farmers. Distance to markets significantly influences access to organized trade and economic resources. While some farmers in remote areas diversify for food security purposes, food security alone is insufficient. Farmers also need financial resources for essentials such as school fees and farming inputs. Closer markets would encourage farmers to diversify for commercial purposes, increasing their economic opportunities.

Kumar and Chattopadhyay (2020) highlighted that expanding infrastructure, such as road networks, marketing, and storage facilities, is a vital prerequisite for promoting crop diversification for commercial purposes. This expansion plays a key role in ensuring sustainable incomes and employment for farmers. Moreover, the creation of market support services is essential, including the strengthening of farming marketing cooperatives to enable collective harvesting and assist in finding buyers. However, these cooperatives currently focus primarily on facilitating the acquisition of farming inputs, which limits their broader potential. The Ministry of Agriculture should ensure that small-scale farmers produce high-quality crops, as this is necessary to attract buyers.

Improving road networks is particularly critical for farmers located far from markets, as poor infrastructure makes it difficult for them to sell their produce and access support from extension officers. The Ministry of Agriculture should also introduce appraisal systems for farmers, encouraging those who miss training sessions to participate. Additionally, the government could establish awards to recognize small-scale farmers who excel in crop diversification each year, motivating them to continue their efforts and achieve even greater results.

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